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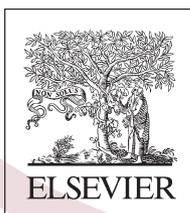
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Abstracts of the 14th World Congress of the International  
Hepato-Pancreato-Biliary Association

27-29 November 2020

Virtual Congress



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**Abstracts of the 14th World Congress of the International Hepato-Pancreato-Biliary Association,  
27-29 November 2020, Virtual Congress**

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OBB-01

## HEPAT1CA - QUANTITATIVE MAGNETIC RESONANCE IMAGING PREDICTS INDIVIDUAL FUTURE LIVER PERFORMANCE AFTER LIVER RESECTION

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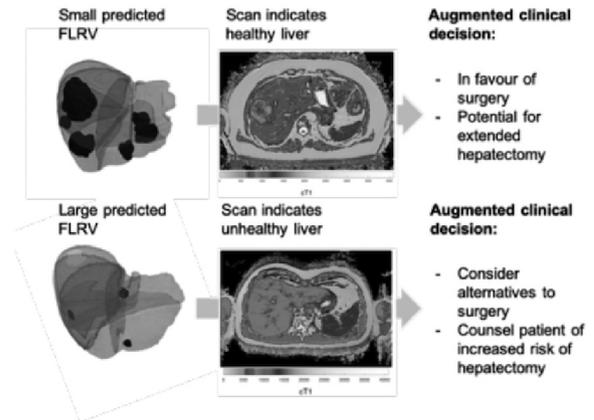
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**Introduction:** The future liver performance (FLP) of an individual undergoing liver resection for cancer is critical for their survival and recovery. Here, we report the development and clinical testing of HepT1ca, a novel magnetic resonance image (MRI) technology that combines multiparametric MRI signal processing with automated anatomical liver segmentation to estimate FLP.

**Method:** HepaT1ca combines iron-corrected T1 (cT1) mapping with a 3D U-net pipeline to automatically delineate the liver volume and Couinaud segments based on anatomical landmarks. HepaT1ca combines quantitative cT1 mapping with accurate estimation of the future liver remnant (FLR) volume to predict FLP. We evaluated the ability of HepaT1ca to predict post-operative morbidity, length of stay and regenerative capacity in a prospective 2-centre observational clinical trial (ClinicalTrials.gov NCT03213314).

**Results:** 135 of 143 patients recruited and scanned underwent liver resection. 84% of participants had colorectal liver metastases; the remainder had primary liver cancer or other secondary cancers. The HepaT1ca score showed a significant linear correlation with the modified Hyder-Pawlik score, an indicator of post-operative morbidity (adjusted  $R^2=0.26$ ,  $P < 0.001$ ), and liver regenerative performance (adjusted  $R^2=0.46$ ,  $P < 0.001$ ). Furthermore, in patients with an FLR  $< 90\%$ , a mean cT1  $> 795$ ms was associated with a longer duration of hospital stay (median (IQR) of 6.5 (5.3-12) vs. 5 (4-7.1);  $P=0.005$ ). cT1 also correlated with histological measures of inflammation and hepatocyte ballooning.

**Conclusion:** HepaT1ca is a non-invasive quantitative MRI technology for predicting FLP. HepT1ca informs individualised operative risk and augments patient and surgeon decision-making prior to liver resection.



[Figure: Concept diagram showing use of quantitative MRI in a clinical workflow highlighting exemplar]

OBB-02

## MINIMALLY INVASIVE APPROACHES TO BILIARY TRACT CANCERS AND NODAL SAMPLING: NOT ALL APPROACHES ARE SIMILAR

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As minimally invasive approaches (MIS) to biliary tract cancers become more commonplace, understanding whether they offer adequate locoregional clearance is critical. We sought to study how laparoscopic and robotic approaches compare to open surgery for both intrahepatic cholangiocarcinoma (ICC) and gallbladder cancer (GBC).

From 2010-2016, the National Cancer Database was queried for all patients who underwent hepatic resection of ICC of any stage and T1b or more advanced GBC. Patients were grouped by approach: open(OA), laparoscopic(LA), and robotic(RA). To measure appropriateness of oncologic therapy, rate of lymph node (LN) dissection, quality of LN dissection, and R0 resection were evaluated.

In this cohort of 8,612 patients [4,034 with ICC (OA:3,281, LA:675, RA:78) and radical cholecystectomy for 4,578 with GBC (OA:1,893, LA:2,588, RA:97)], MIS was used 40% of the time. R0 resection was achieved in 71% OA, 67% LA, and 77% RA,  $p < 0.001$ . Rates of LN dissection were 58% for ICC (OA: 61% LA: 46% RA:

44%,  $p < 0.001$ ) and 49% for GBC (OA: 59% LA: 41% RA: 58%,  $p < 0.001$ ). When lymphadenectomy was performed, mean LN number examined was 4.4 (OA: 4.7 LA: 3.7 RA: 4.9,  $p < 0.001$ ). When lymphadenectomy was performed, 6+LN were retrieved rarely in both ICC (OA: 27%, LA 24%, and RA: 35%) and GBC (OA: 15%, LA: 7% and RA: 14%),  $p < 0.001$ .

As MIS approaches are increasingly used for ICC and GBC, monitoring surgical quality will be paramount. Laparoscopy, in particular, may fall short in achieving margin-negative resection and adequate regional lymphadenectomy.

### OBB-03 HYPOTHERMIC OXYGENATED PERFUSION VS. NORMOTHERMIC REGIONAL PERFUSION IN LIVER TRANSPLANTATION FROM NON- HEART BEATING DONORS-FIRST INTERNATIONAL COMPARATIVE STUDY

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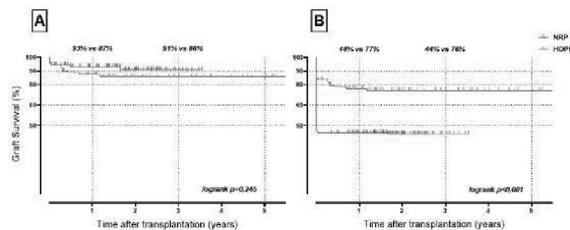
**Introduction:** End-ischemic hypothermic oxygenated perfusion (HOPE) and *in-situ* normothermic regional perfusion (NRP) improve outcomes in liver transplantation (LT) from controlled donation after circulatory death (DCD) but a direct comparison is lacking.

**Methods:** This multicentre study included all NRP procedures performed in France and all HOPE procedures performed in Zurich up to 2020, starting in 2015 and 2012, respectively. The primary endpoint was 1-year graft survival. To account for differences in graft utilization, an intention-to-treat analysis was performed including perfused grafts which were discarded. A propensity score matching was applied to correct for major donor, graft and recipient differences.

**Results:** A total of 225 NRP and 104 HOPE procedures were performed with 107 (47%) and 92 (88%) transplants per group. NRP grafts were retrieved from younger donors (50 vs. 61,  $p < 0.001$ ) with shorter functional donor warm ischemia times (22 vs. 31min,  $p < 0.001$ ). We observed no difference in ischemic cholangiopathy (3.3% vs. 2.2%, NS), primary non-function (0% vs 4.3%  $p=0.12$ ) and hepatic artery thrombosis (2.2 vs. 2.2%, NS) resulting in comparable graft survival rates (**Figure**). However, the

intention-to-treat analysis disclosed superior graft survival after HOPE. Propensity score-matched analysis showed higher peak serum transaminases after HOPE (ALT 1576 vs. 468 and AST 3559 vs. 653,  $p < 0.001$ ), while graft and patient survival were comparable.

**Conclusion:** In DCD LT, NRP and HOPE both achieved benchmark graft and patient survival rates with comparable outcomes in risk-adjusted donor-recipient combinations. However, utilization rates were significantly higher in the HOPE cohort suggesting superior clinical effectiveness.



[Tumor-censored graft survival (A) and intention-to-treat analysis for graft survival (B) ]

### OBB-04 SINGLE-CENTER EXPERIENCE OF LIVER TRANSPLANTATION FOR CHOLANGIOCARCINOMA

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**Introduction:** Cholangiocarcinoma remains a rare and aggressive biliary malignancy. Traditionally, curative resection was considered the cornerstone of treatment, however, more recently liver transplantation (LT) offered an alternative option for unresectable patients. The aim is to assess clinical outcomes in patients with cholangiocarcinoma proceeding to LT.

**Methods:** Prior to 2007, all resectable patients proceeded to a curative resection. A hilar cholangiocarcinoma protocol was commenced in 2007 within our institution whereby diagnosed patients were enrolled onto a registry and considered for LT. Data on all patients with a diagnosis of cholangiocarcinoma between 2007 and 2019 were studied within a prospectively maintained institutional database.

**Results:** A total of 58 patients were initially enrolled and considered for LT. Thirty-eight patients proceeded to LT upon completion of neoadjuvant chemoradiation (26 male, mean age 55.6 +/- 11.4). Common complications included hepatic artery stenosis (n=3), portal vein stenosis (n=7) and bile leak (n= 3). Re-transplantation was required for 4 patients occurring within 30 (n=3) and 45 days (n=1), respectively. Twelve patients developed recurrence (31.6%), 2 were intrahepatic. There were 11 deaths during the study period (n=9 from recurrent disease; n=2 unrelated causes). Overall 1-, 3- and 5- year survival rates were 94.3%, 56.9% and 50.6% respectively. Disease-free survival was 87.8%, 57.8% and 46.2% at 1-, 3 and 5- years. Graft survival was rates were 83.7%, 52% and 44.5% at 1-, 3- and 5- years respectively.

**Conclusion:** Liver transplantation provides a 50% 5-year survival rate for appropriately selected patients who would otherwise have no surgical treatment option.

OBB-06

## AN ONLINE CALCULATOR TO PREDICT RECURRENCE AFTER HEPATECTOMY FOR COLORECTAL LIVER METASTASIS: REFLECTING THE NEW ERA OF GENETIC AND BIOLOGICAL FEATURES

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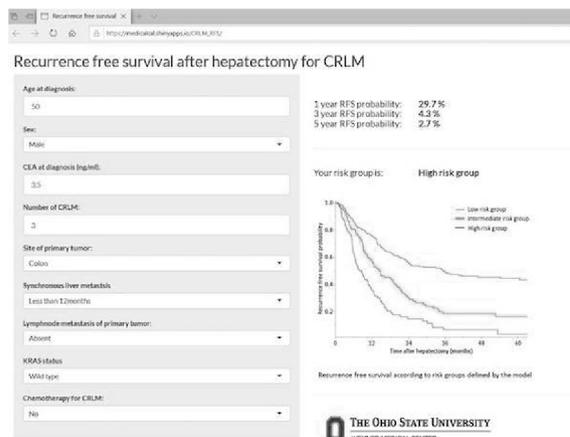
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**Introduction:** The risk of recurrence after hepatectomy for colorectal liver metastasis (CRLM) remains high. The objective of the current study was to develop a novel online calculator to estimate the risk of CRLM recurrence using pathological, genetic, and morphologic tumor characteristics.

**Methods:** Patients who underwent hepatectomy for CRLM between 2001-2018 were identified from a multi-institutional international database. A prognostic model was developed in the training set and validated using an external cohort. An online calculator to estimate 1, 3, 5-year recurrence-free survival (RFS) was developed and compared with the clinical risk score (CRS) using Harell's c-index.

**Results:** Among 1,125 patients who underwent CRLM resection, one-third of patients had mtKRAS (n=343, 30.4%). Overall 1-, 3-, 5-year RFS was 61.1%, 33.9%, and 28.1%, respectively. An on-line calculator that included clinical, pathological, KRAS status, as well as response to chemotherapy was developed ([https://medicalcal.shinyapps.io/CRLM\\_RFS/](https://medicalcal.shinyapps.io/CRLM_RFS/)) (Figure). 5-year RFS among low, intermediate, and high-risk group patients was 43.1%, 16.1%, and 3.3%, respectively (p < 0.001). The new prognostic model performed better than the CRS among all patients with CRLM (c-index: 0.71 vs. 0.61), as well as among patients with wtKRAS (c-index: 0.68 vs. 0.62) or mtKRAS (c-index: 0.73 vs. 0.61) tumors. External validation of the on-line prognostic calculator revealed good to very-good accuracy (c-index: 0.66).

**Conclusion:** A novel online calculator that incorporated patient, tumor, KRAS status, as well as response to chemotherapy was more accurate in stratifying patients relative to RFS compared with the traditional CRS. These data highlight the importance of incorporating clinical and genetic information in estimating prognosis among patients with CRLM.



Figure

OBB-08

## PREDICTING INDIVIDUAL 10-YEAR SURVIVAL AFTER RESECTION OF COLORECTAL LIVER METASTASES

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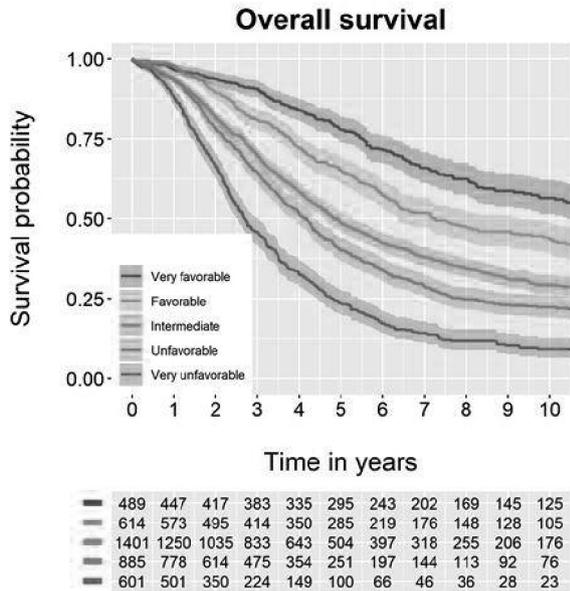
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**Background:** The aim of this study was to predict the chance of 10-year overall survival (OS) for individual patients after resection of CRLM based on patient, tumor, and treatment characteristics.

**Methods:** Consecutive patients after complete resection of CRLM were included from two centers (1992-2008). A simplified score was built to categorize patients into 5 categories regarding the likelihood of 10-year OS. Discrimination was assessed using the time-dependent Area Under the Curve (AUC) at 10-years after resection of CRLM, and with internal-external cross-validation.

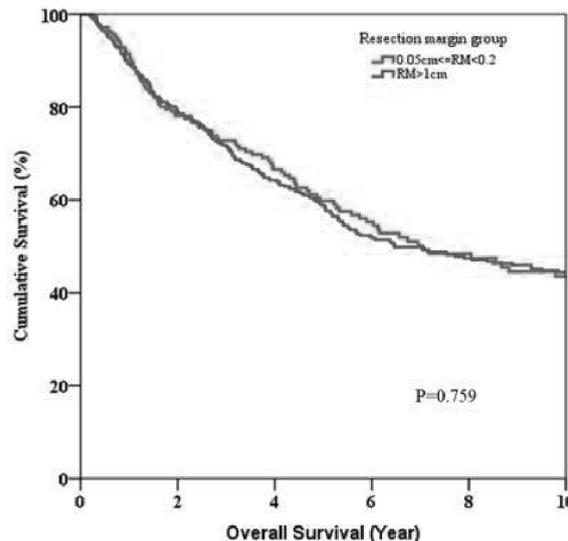
**Results:** A total of 3990 patients were eligible. The 10-year OS rate probability was 30%, with 497 actual 10 year survivors. Independent factors for 10-year OS were; age at resection CRLM, location colorectal cancer (CRC), nodal status CRC, number CRLM, diameter CRLM, resection margin, extrahepatic disease, KRAS mutation status, BRAF mutation status, and histopathological growth pattern. Perioperative HAIP chemotherapy was the only independent treatment factor for 10-year OS. The individual predicted 10-year OS ranged from 6% to 53%. Five risk groups were identified based on the independent factors with a chance of 10-year OS of 9% (n=601), 22% (n=885), 30% (n=1401), 44% (n=614), and 55% (n=489). Internal-external cross-validation validation demonstrated a pooled AUC of 0.71 (95%CI 0.53-0.90) of the full model and 0.69 (95%CI 0.50-0.88) of the simplified model.

**Conclusion:** The probability of 10-year survival can be predicted after resection of CRLM based on 11 independent prognostic factors and varies from 6% to 53%.



[Predicting individual 10-year survival after resection of colorectal liver metastases]

resection should not be excluded from those anticipated to have close resection margin.



[Overall survival of patients of CM group vs WM group after resection of HCC ]

**OBB-09**  
**LONG TERM OUTCOME OF PATIENTS WITH CLOSE RESECTION MARGIN AFTER HEPATECTOMY FOR HCC: A PROPENSITY SCORE ANALYSIS AT A SINGLE CENTRE**

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**Introduction:** Traditionally, hepatectomy was recommended only if 10mm margin can be achieved. We analyzed the long term outcome of those with close resection margin after hepatectomy for HCC.

**Methods:** From 1989-2017, 1793 patients underwent resection of HCC at Queen Mary Hospital, Hong Kong. 1697 patients (94.6%) achieved R0 resection. 216 (12.7%), 838 (49.4%) and 605 (35.7%) patients had resection margin 0.5-2mm, >2-10mm and >10mm respectively. The outcomes of those with close margin (0.5-2mm) (CM group) were compared with those with wide margin (>10mm) (WM group) using propensity score matching in terms of tumour size, number and differentiation in a ratio of 1:2.

**Result:** After matching, there were 211 patients in the CM group and 422 patients in the WM group. The demographic data was comparable between the 2 group as shown in table 1 except CM group had significantly more blood loss (800ml vs 600ml, p=0.007). The 1-year, 3-year, 5-year and 10-year overall survival was 91.5%, 72.8%, 59.8% and 43.5% for the CM group and 89.3%, 71.7% , 58.8% and 44.4% for the WM group, respectively (P=0.759) [Figure 1]. The 1-year, 3-year, 5-year and 10-year disease free survival was 64.9%, 46.1%, 37% and 27.1% for the CM group and 62.1%, 41.5%, 39.3% and 30.8% for the WM group, respectively (P=0.702).

**Conclusion:** Surgeons should always aim for wide negative margin. However, resection of HCC with close margin could still achieve good long term survival and, thus,

	CM group (n=211)	WM group (n=422)	P-value
Age	59.0 (24-80)	57.0 (18-82)	0.267
Sex (M:F)	174:37	333:89	0.291
AFP (ng/ml)	39.5 (1-530600)	76 (1-1111200)	0.378
ICG retention at 15min (%)	10.05 (1.2-53.1)	10.3 (1.6-52.7)	0.718
Blood loss (L)	0.8 (0.01-10.0)	0.6 (0.01-15.0)	0.007
Tumour size (cm)	5 (0.7-22.0)	5 (1.0-23.0)	0.538
No of tumour	1 (1-multiple)	1 (1-multiple)	0.755
Presence of microvascular invasion	104 (49.3%)	198 (46.9%)	0.574
Follow up duration (months)	46.9 (3.2-267.5)	58.8 (1.2-335.7)	0.045

[Demographic data of patients in CM group and WM group]

**OBB-10**  
**CAN PERI-OPERATIVE LACTATE KINETICS PREDICT LIVER FAILURE FOLLOWING MAJOR LIVER RESECTION?**

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**Introduction:** Evidence from sepsis literature, and growing evidence in trauma suggest hyperlactataemia is prognostic of poor outcome. Some evidence suggests a similar relationship following liver resection. The current study is aimed at assessing the relationship between lactate kinetics and post hepatectomy liver failure (PHLF).

**Methods:** A dataset was collated of up to 50 sequential serum lactate concentrations in all patients who underwent major hepatic resection from 2015-2019. Lactate values were taken from the start of surgery. Data were analysed using 'R' (R-Studio v1.2.5001). Values were split into 24h epochs, and means were compared using Mann-Whitney U tests.

**Results:** A total of 1275 patients were included (58.4% male). Scatterplots with best fit lines (generalised additive model) of lactate concentration against time were produced and were compared between subgroups (Figure 1). For patients undergoing major liver resection, postoperative day 1-3 lactate was significantly elevated in those who developed PHLF(A-C) compared to those with no PHLF (Table 1) and subsequent kinetic profile was different.

**Conclusion:** These data suggest that early and sustained hyperlactatemia may predict subsequent PHLF. We plan further analysis to characterise individual patients' lactate trajectories via machine learning, using this data to build and ratify a model predicting patients' risk of PHLF and other adverse outcomes based on their lactate dynamics and other factors influencing the post hepatic resection outcomes.

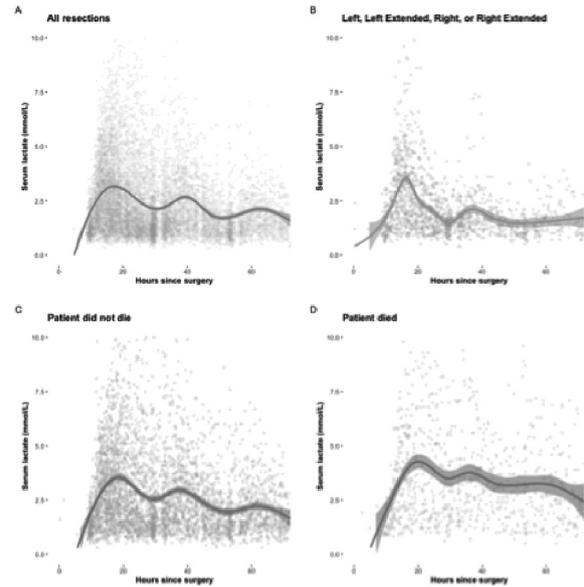


Figure 1

Table 1

	No PHLF (mmol/L)	PHLF A-C (mmol/L)	No PHLF vs PHLF A-C	PHLF C (mmol/L)	No PHLF vs PHLF C
Day 1 mean peak lactate	3.44	4.67	p<0.00001	5.424	p<0.00001
Day 2 mean peak lactate	2.69	4.92	p<0.00001	5.68	p<0.00001
Day 3 mean peak lactate	2.04	2.86	p<0.00001	3.70	p<0.00001

OYIA-01

**HEPATOCELLULAR ADENOMA IN MEN. A NATIONWIDE ASSESSMENT**

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**Introduction:** In contrast to women, men with hepatocellular adenoma (HCA) are extremely rare (incidence of 4 in ten million). Survival-rate and risk of malignant transformation into hepatocellular carcinoma (HCC) is currently unknown. We correlated histopathology and clinical data of all Dutch male HCA patients.

**Methods:** Samples of all Dutch male HCA patients between 2000 and 2019 were collected using PALGA (Dutch Pathology Registry). Histopathology was revised by two expert pathologist, supplemented by immunohistochemistry. Additional molecular analyses were performed to confirm malignancy (hTERT) and/or subtype of HCA.

**Results:** Sixty-six patients from 22 medical centres, with 67 tumours initially diagnosed as HCA were included. After expert-revision 26/67(38.2%) HCA, 17/67(25%) borderline HCA/HCC and 24/67(35.3%) HCC were diagnosed. Diagnosis was concordant with initial diagnosis in 30/67(44.8%) patients, and discordant in 37/67(55.2%) patients. Diagnosis changed from HCA to HCC in 8/67(11.9%) patients, and from HCC to HCA in 1/67(1.5%) patient. Clinical data matching 46 expert-revision patients was available. Of 22 HCA patients, four (18.1%) developed HCC, of which two died from HCC (9.0%). Of 11 borderline HCA/HCC, two died (18.1%). Three of the four HCA patients with clinical HCC development were beta-catenin mutated-HCA, one was inflammatory-HCA.

**Conclusion:** HCA in men is difficult to diagnose and additional immunohistochemical stainings and/or molecular analyses are important; 35.3% were probable or certain HCC's after revision. If HCA is confirmed after expert revision, there is still 18.1% risk of developing HCC and 9.0% mortality. It's advisable to perform diagnostics in expert centres, and to approach this tumour as potential HCC.

OYIA-02

**A PATIENT-DERIVED ORGANOID AND ARTIFICIAL INTELLIGENCE-BASED WORKFLOW FOR OPTIMISING CHEMOTHERAPEUTICS TO IMPROVE OUTCOMES IN PANCREATIC CANCER**

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Pancreatic ductal adenocarcinoma is one of the most aggressive solid tumors. Despite numerous advances in surgical techniques, survival has remained largely unchanged over the last decade. As such, pancreatic cancer has been described as a 'systemic disease' - and one which chemotherapy plays a pivotal role both pre- and post-surgery. Tools that can predict the most effective chemotherapeutic regimens for patients are urgently needed to improve survival in this dismal disease so as to optimise biological effects while minimising side effects and fitness for surgery.

We have established a biobank of patient-derived organoids from endoscopic ultrasound biopsies of pancreatic adenocarcinoma. Using an optimised technique these are generated within a clinically applicable timeframe for high-throughput drug screening that can inform therapeutic decisions. By applying artificial intelligence, we are able to optimize drug combinations to maximise clinical efficacy while minimising toxicity. The inclusion of preclinical drugs in our screening panel in addition to standard therapeutics allows for the derivation of novel drug combinations. This work forms the basis for an interventional trial at our centre. We also employ the use of highly sensitive proteomics to profile patients that demonstrate similar therapeutic responses to identify predictive biomarkers of chemosensitivity.

We present a platform for personalized medicine in pancreatic cancer that employs organoid technology and artificial intelligence to predict chemosensitivity and therapeutic response for individual patients.

OYIA-03

**ABLATIVE RADIATION PROVIDES COMPARABLE 1-YEAR SURVIVAL TO SURGERY AFTER NEOADJUVANT CHEMOTHERAPY FOR LOCALLY ADVANCED PANCREATIC ADENOCARCINOMA**

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**Introduction:** For patients with locally advanced pancreatic ductal adenocarcinoma (LA PDAC), ablative radiation to biologically effective doses of  $\geq 100$  Gy can provide locoregional control. In this study, we compared survival after ablative radiation versus resection in patients with LA PDAC.

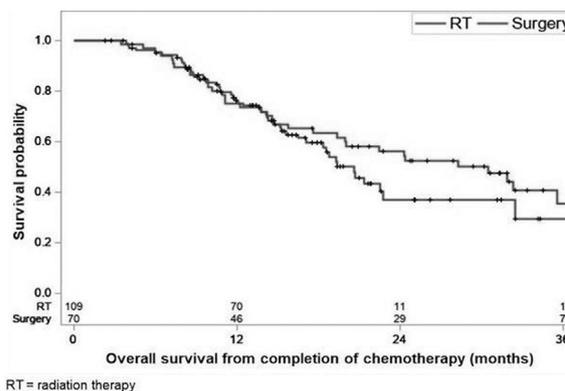
**Methods:** Patients with LA PDAC treated with neoadjuvant chemotherapy between 2014-18 at our institution were identified. Patients with resected AJCC 7<sup>th</sup> Ed. ypT3 or ypT4 tumors, or those requiring vascular resection, were compared to unresected patients treated with ablative radiation. Overall survival (OS) was calculated from completion of chemotherapy using Kaplan Meier methods and the log rank test was used to compare groups.

**Results:** 170 patients were included for analysis: 70 underwent resection (39.1%) and 109 (60.9%) received ablative radiation. Age, gender, ECOG status, CA 19-9, and nodal status were not different between groups. Patients treated with ablative radiation had a larger tumor size (3.2cm [0.0, 10.9] vs. 2.6cm [0, 7.1],  $p < 0.001$ ), and were more likely to have arterial and venous encasement (all  $p < 0.001$ ) (Table 1). There was no significant difference in median OS for radiation (20.6 months, 95% C.I. 17.1-32.4) compared to surgery (30.5 months, 95% C.I. 19.4-40.7) ( $p=0.22$ ), and 1-year survival was similar between groups (77% for radiation, 75% for surgery) (Figure 1).

**Conclusion:** In patients with LA PDAC, ablative radiation is associated with a 1-year survival comparable to that achieved with resection. Ablative radiation may be a promising alternative to surgical resection in select subsets of PDAC and warrants further prospective investigation.

**Table 1** Patient and tumor characteristics among patients undergoing ablative radiation or resection for locally advanced pancreatic adenocarcinoma

Variable	Ablative Radiation	Resection	p-value
Age, median (range) (years)	67.6 (42.4-90.6)	68.4 (45.3-85.1)	0.71
Female gender, N (%)	55 (50.5)	35 (50.0)	>0.95
ECOG performance status 2+, N (%)	16 (14.7)	4 (5.7)	0.09
CA 19-9 at diagnosis, median (range) (u/mL)	218 (0.0-9635.0)	117 (0.0-80195.0)	0.18
Nodal involvement, N (%)	40 (36.7)	22 (31.4)	0.52
Celiac artery or hepatic artery encasement, N (%)	48 (44)	5 (7.2)	<0.001
Superior mesenteric artery encasement, N (%)	43 (39.4)	6 (8.7)	<0.001
Superior mesenteric vein or portal vein encasement, N (%)	35 (32.1)	5 (7.2)	<0.001
Follow up time from chemotherapy completion, median (range) (months)	15.9 (3.7-34.3)	26.9 (2.3-48.1)	N/A



**Figure 1** Comparison of overall survival between ablative radiation (RT) and surgery

OYIA-04

**RISK FACTORS FOR POSTOPERATIVE BILE LEAK AND OUTCOMES IN PATIENTS UNDERGOING MINIMALLY INVASIVE HEPATECTOMY: A CONTEMPORARY ACS NSQIP ANALYSIS**

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**Introduction:** Despite advances in surgical technique, bile leak remains a common complication associated with morbidity following hepatectomy. We sought to identify risk factors of biliary leak and outcomes in patients undergoing minimally-invasive hepatectomy.

**Methods:** An ASC-NSQIP multi-institutional retrospective cohort study from 2014-2017. Distribution of bile leak by surgical approach was identified. Univariate and multivariate factors associated with bile leak and outcomes were evaluated using chi-square and logistic regression.

**Results:** Of 13,955 patients who underwent hepatectomy, 10,190(73%) were open, 3438(24.6%) were laparoscopic and 323(2.3%) were robotic. A laparoscopic approach was associated with decreased bile leak for all hepatectomies (5.4% vs 8.4%; p=0.028) compared to robotic. Multivariate operative risk factors for bile leak in minimally-invasive hepatectomies included laparoscopic (vs robotic) approach (OR=0.51 [95% CI 0.33-5.06]; p=0.003), conversion (OR=2.28 [95% CI 1.62-3.10]; p< 0.001), biliary reconstruction (OR=4.11 [95% CI 2.14-7.90]; p< 0.001) and transfusion (OR=1.88 [95% CI 1.28-2.75]; p=0.001). Bile leak was associated with increased reoperation (0.8% vs 8.9%; p< 0.001), 30-day readmission (5.4% vs 27.2%; p< 0.001), 30-day mortality (0.6% vs 1.9%; p=0.042), increased median length of stay (3 days vs 6 days; p< 0.001), and any (15.2% vs 65.3%; p< 0.001), surgical (9.7% vs 59.6%; p< 0.001) and medical (6.9% vs 28.6%; p< 0.001) complications for patients who underwent minimally-invasive hepatectomy (Table 1).

**Conclusion:** Risk factors for developing bile leak in patients undergoing minimally-invasive hepatectomy were identified. Bile leaks were associated with multiple additional complications, and the robotic approach was a greater risk for bile leak than laparoscopic approach.

Table 1. Multivariable Analysis of Factors Associated with Bile Leak

	Robotic		Lap		MI	
	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value
<b>Preoperative</b>						
Age, per year increase	-	-	1.01 (1.00-1.02)	0.0382	1.01 (1.00-1.02)	0.0348
Gender, Female vs. Male	-	-	-	-	-	-
Diabetes, Yes vs. No	-	-	-	-	-	-
Hypertension, Yes vs. No	-	-	-	-	-	-
Steroid Use, Yes vs. No	18.78 (2.89-123.16)	0.0022	2.25 (1.11-4.56)	0.0237	2.54 (1.33-4.86)	0.0048
ASA, per unit increase	-	-	-	-	-	-
<b>Pathology</b>						
Malignant: Cholangiocarcinoma, Yes vs. No	8.15 (2.46-27.06)	0.0006	-	-	1.58 (0.96-2.62)	0.0733
Benign: Hepatic Adenoma, Yes vs. No	-	-	-	-	-	-
Benign: Hemangioma, Yes vs. No	-	-	0.40 (0.15-1.04)	0.0612	0.36 (0.14-0.95)	0.0383
Benign: Focal Nodular Hyperplasia, Yes vs. No	-	-	-	-	-	-
Benign: Biliary or Hepatic Cyst, Yes vs. No	9.14 (2.29-36.38)	0.0017	-	-	-	-
Biliary Stent, Yes vs. No	-	-	-	-	2.10 (0.88-5.00)	0.0935
<b>Operative</b>						
<b>Surgical Approach</b>						
Open vs. Robotic	-	-	-	-	-	-
Lap vs. Robotic	-	-	-	-	0.51 (0.33-0.79)	0.0025
Minimally Invasive Approach with Conversion, Yes vs. No	6.04 (1.36-26.82)	0.0181	2.31 (1.63-3.26)	<0.0001	2.28 (1.62-3.19)	<0.0001
Concurrent Intraop Ablation, Yes vs. No	-	-	-	-	-	-
Pringle, Yes vs. No	-	-	1.50 (1.02-2.19)	0.0370	1.44 (1.00-2.08)	0.0508
<b>Tumor Size, cm</b>						
>5 vs. <2	-	-	1.67 (1.09-2.56)	0.0176	1.45 (0.98-2.15)	0.0645
2-5 vs. <2	-	-	2.15 (1.35-3.42)	0.0013	2.11 (1.38-3.22)	0.0006
Biliary Reconstruction, Yes vs. No	26.17 (2.10-325.92)	0.0112	4.97 (2.67-9.28)	<0.0001	4.11 (2.14-7.90)	<0.0001
Transfusion, Yes vs. No	-	-	2.01 (1.33-3.03)	0.0008	1.88 (1.28-2.75)	0.0013

NA backward selection method with a level of p<0.10 was used to select variables for final multivariable models.

OYIA-05

**PHARMACOLOGICAL ACTIVATION OF NRF2 ENHANCES METABOLIC REMODELLING AND FUNCTIONAL LIVER REGENERATION FOLLOWING MAJOR HEPATECTOMY**

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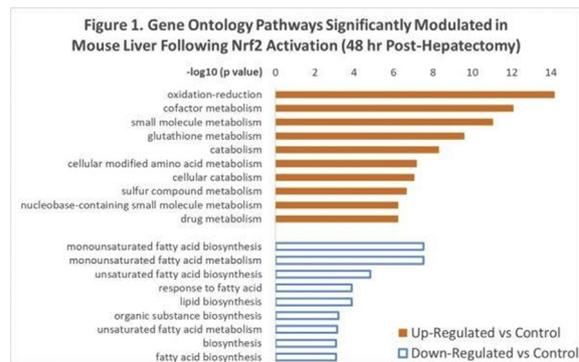
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**Introduction:** Post-hepatectomy liver failure (PHLF; 10% incidence) remains a risk following major liver resections. Two-stage surgeries attempt to address the inadequate future liver remnant but with inherent risks. Pharmacological enhancement of liver regeneration could improve outcomes and extend resectability. The transcription factor Nrf2 regulates a battery of metabolic and cell defence genes. We hypothesized that Nrf2 activation would enhance liver regeneration following hepatectomy.

**Methods:** The effects of an Nrf2 activator were evaluated in a mouse major hepatectomy model. Liver volume and function (indocyanine green clearance) were assessed using magnetic resonance imaging and multispectral optoacoustic tomography, respectively. Hepatocyte size was assessed through phalloidin immunofluorescence tissue staining. RNASeq and RT-qPCR were used to determine gene expression changes in mouse liver tissue and primary human hepatocytes.

**Results:** Nrf2 activation significantly enhanced post-hepatectomy regeneration of liver volume and reduced the loss of hepatic function in mice. This was associated with a significant increase in hepatocyte hypertrophy during early regeneration. RNASeq revealed that Nrf2 activation caused an upregulation of redox, cofactor and glutathione metabolism genes, congruent with increases in NADP/H content and glutathione levels, as well as the downregulation of lipid synthesis genes (Figure 1). Notably, such genes were similarly modulated in primary human hepatocytes following in vitro treatment with the Nrf2 activator.

**Conclusions:** Nrf2 activation can improve liver regeneration by enhancing metabolic remodelling and hepatocyte hypertrophy, which translates into an improvement in hepatic function. Our results suggest Nrf2 as a novel target in the treatment of liver pathology, especially the avoidance of PHLF.



**OYIA-06  
NATURAL HISTORY AND OPTIMAL  
TREATMENT STRATEGY OF  
INTRADUCTAL PAPILLARY  
MUCINOUS NEOPLASM OF PANCREAS**

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**Background:** With increasing detection of intraductal papillary mucinous neoplasms(IPMN), a tailored approach is needed. We explored the natural history of IPMN and suggest optimal treatment based on malignancy risk using nomogram and Markov decision model.

**Methods:** Patients with IPMN, who underwent surveillance or surgery, were included. Change in worrisome features/high-risk stigmata and malignancy conversion rate was calculated through radiologic and pathologic reviews. Life expectancy and quality-adjusted life year (QALY) were compared using a nomogram predicting malignancy.

**Results:** Overall, 2,006 patients with histologically confirmed or radiologically typical IPMN were enrolled. Of these, 1,773(88.4%) had branch duct(BD), 81(4.0%) had main duct and 152(7.6%) had mixed type at initial diagnosis. The cumulative risk of developing worrisome feature/ high-risk stigmata was 19.0% at 5-year and 35.0% at 10-year- follow-up. The progression of malignancy rate at 10-year follow-up was 79.9% for main and mixed type IPMN and 5.9% for BD-IPMN. Nomogram based malignancy risk prediction is well correlated with natural history based on pathologic biopsy and shows good stratification of the survival. Decision model recommends surgery to maximize overall survival and quality-adjusted life year for patients under 75-years old, especially those with over 35% malignancy risk

**Conclusion:** Compared to the high risk of malignancy (79.9%) in main and mixed type IPMN, that (5.9%) of BD-IPMN are very indolent. The nomogram-based decision model suggests surgery rather than surveillance for patients with high malignancy rate. Optimal treatment strategy between surgery and surveillance should consider patient’s health status, malignancy risk, and centre’s experience.

Life Expectancy and Quality Adjusted Life Year according to treatment group (years)

Age	Malignancy risk	Life Expectancy		QALY	
		Surveillance	Surgery	Surveillance	Surgery
<65	G1	13.29	12.43	13.29	12.08
	G2	10.98	12.13	10.98	11.51
	G3	5.79	12.61	5.31	12.54
65≤Age<75	G1	11.27	12.56	11.27	12.44
	G2	8.33	10.46	8.33	10.32
	G3	6.96	8.65	6.38	8.14
≥75	G1	9.25	10.18	9.25	10.09
	G2	7.41	8.07	7.41	7.95
	G3	4.06	5.30	3.72	5.00

more than 1 year

more than 1.5 years

QALY: quality adjusted life year, G1: below 10% of malignancy risk, G2: between 10 and 35% of malignancy risk, G3: over 35% of malignancy risk

Life Expectancy and Quality Adjusted Life Year according to treatment group in IPMN.

**OYIA-08  
NEOADJUVANT FOLFIRINOX VERSUS  
NEOADJUVANT  
CHEMORADIOTHERAPY AND  
ADJUVANT CHEMOTHERAPY FOR  
RESECTABLE AND BORDERLINE  
RESECTABLE PANCREATIC CANCER:  
UPDATE ON THE NATIONWIDE  
MULTICENTER PREOPANC-2  
RANDOMIZED TRIAL**

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G. van Tienhoven<sup>4</sup>, J. W. Wilmink<sup>5</sup>,  
B. Groot Koerkamp<sup>1</sup> and Dutch Pancreatic Cancer Group (DPCG)

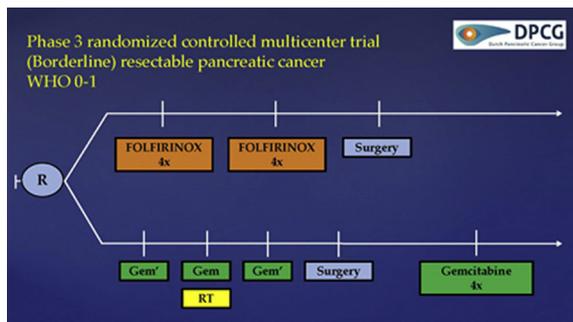
<sup>1</sup>Surgery, Erasmus University Medical Center, <sup>2</sup>Surgery, Amsterdam UMC, University of Amsterdam, <sup>3</sup>Medical Oncology, Erasmus University Medical Center, <sup>4</sup>Radiotherapy, and <sup>5</sup>Medical Oncology, Amsterdam UMC, University of Amsterdam, Netherlands

**Background:** Two randomized studies have found superior R0 resection rate with neoadjuvant chemotherapy compared to upfront surgery for (borderline) resectable pancreatic cancer. The PREOPANC-2 trial compares two neoadjuvant regimens in patients with resectable and borderline resectable pancreatic cancer ((B)RPC).

**Material and methods:** This multicenter randomized controlled trial includes patients with pathologically proven pancreatic cancer, WHO performance score < 2, and both <90 degrees arterial and <270 degrees venous abutment on imaging. Patients are randomized to receive 8 cycles of neoadjuvant FOLFIRINOX chemotherapy without adjuvant treatment (arm A), or 3 cycles of neoadjuvant gemcitabine combined with hypofractionated radiotherapy (36 Gy in 15 fractions), followed by surgery and adjuvant 4 cycles of gemcitabine, similar to the intervention arm of the PREOPANC-1 trial. The primary endpoint is OS by intention-to-treat. Secondary endpoints include progression-free survival, quality of life, and (R0) resection rate. Blood samples for biomarkers are collected at five time points. Sample size is 368 patients, with 2.5 years accrual and 1.5 years follow-up after last inclusion.

**Results:** All 15 centers performing pancreatic surgery in the Netherlands are open and 199 (54%) patients have been randomized. Last three monthly accrual rates were 15, 16, and 18 patients. More than 50% of all eligible patients in the Netherlands have been enrolled in the last months. Biomarkers have been collected for 90% of sampling moments.

**Conclusion:** Rapid accrual of patients in an RCT comparing two neoadjuvant regimens for (B)RPC is feasible. Results of the PREOPANC-2 trial are anticipated in the summer of 2022.



Study overview PREOPANC-2 trial.

## OYIA-09

### THE IMMUNE MICRO-ENVIRONMENT OF TREATMENT NAÏVE AND NEOADJUVANT TREATED PANCREATIC DUCTAL ADENOCARCINOMA TISSUES FROM THE PREOPANC-1 RANDOMIZED CONTROLLED TRIAL

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**Objectives:** To investigate the immune micro-environment in tumors of patients with pancreatic ductal adenocarcinoma (PDAC) after immediate surgery or neoadjuvant therapy and its relation to survival outcome.

**Methods:** We analysed tumor samples from 50 patients without and 53 patients with neoadjuvant chemo-radiotherapy. Immune profiling of FFPE tumor samples was performed using the NanoString PanCancer assay and the expression of 770 immune related genes was measured. We used the two sample T-test for comparison of gene expression levels between the two groups. The multivariate Cox proportional hazards model was performed to identify independent prognostic predictors. The Kaplan-Meier method with a log-rank test was applied to compare the survival distributions between groups.

**Results:** Total tumor infiltrating lymphocytes (TILs) was equally distributed between treatment groups. B cell infiltration was decreased significantly ( $p < 0,001$ ) in the neoadjuvant group, whereas T cell infiltration did not vary between groups. Furthermore, CXCL12 expression, a chemokine involved in tumor proliferation and progression, was significantly ( $p < 0,0001$ ) higher in neoadjuvant treated tumors. However, its receptor CXCR4 was down regulated. In addition, high expression of the ALCAM gene was strongly associated with poor prognosis in both treatment

arms. Results from immune cell type ratios as prognostic factor will follow.

**Conclusion:** The tumor immune micro-environment after neoadjuvant treatment differs from treatment naïve tumors, indicating that neoadjuvant treatment affects the distribution of immune cells in PDAC tumors.

## OYIA-10

### RESPONSE TO AND SURVIVAL AFTER FIRST-LINE FOLFIRINOX OR GEMCITABINE/NAB-PACLITAXEL FOR LOCALIZED PANCREATIC DUCTAL ADENOCARCINOMA

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**Introduction:** We sought to evaluate radiographic and serologic measures of response to first-line chemotherapy with FOLFIRINOX or gemcitabine/nab-paclitaxel (GA) for localized pancreatic cancer (PDAC) and their association with survival

**Methods:** All patients diagnosed with localized PDAC at MD Anderson between 2010 and 2017 who received at least 3 cycles of first-line chemotherapy with FOLFIRINOX or GA were included. 495 patients were treated with FOLFIRINOX (n= 295; 60%) or GA (n= 200; 40%) as first-line chemotherapy. Main outcomes/measures reviewed were: resection rate, radiographic (RECIST 1.1/ change in tumor volume/anatomic stage) and serologic (CA 19-9) metrics of response, overall survival.

**Results:** Patients treated with FOLFIRINOX were younger, had better ECOG performance status but more invasive tumors (all  $P < 0.01$ ). Overall survival was similar (FOLFIRINOX vs GA: 48 months vs NR for resected,  $P = 0.8$ ; 18 vs 17 months for non-resected,  $P = 0.2$ ). 30% of patients (n= 101) with elevated pretreatment CA 19-9 had a normalization after chemotherapy, 11% (n= 56) of patients had RECIST partial response, 5% of BR and LAPC patients were anatomically downstaged. Decrease in tumor volume after therapy was seen in 67% of the patients (n= 331), with median decrease of 20% of the pretreatment volume. There were no differences between FOLFIRINOX and GA in terms of radiographic and serologic response to therapy. RECIST progressive disease, decrease in tumor volume and posttreatment CA 19-9 level were independent predictors of survival.

**Conclusion:** Radiographic and serologic metrics of response to first-line chemotherapy are important prognostic factors and similar between FOLFIRINOX and GA.

## OYIA-11

## TRANSATLANTIC REGISTRIES OF PANCREATIC SURGERY IN THE USA, GERMANY, THE NETHERLANDS, AND SWEDEN (GAPASURG): COMPARING VARIABLES, PATIENTS, TREATMENT STRATEGIES, AND OUTCOMES

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**Introduction:** Pancreatic surgery registries facilitate both quality improvement and clinical research. We aimed to compare existing registries for variables collected, patient, tumor, and treatment characteristics, and outcomes.

**Methods:** Fifty-one core parameters for pancreatoduodenectomies (2014-2017) in registries from the USA, Germany, the Netherlands, and Sweden were compared with relative and absolute largest differences (RLD; ALD) between extremes (smallest vs. largest).

**Results:** Overall, 22983 pancreatoduodenectomies were included (15224, 3558, 2795, and 1406 in the USA, Germany, the Netherlands, and Sweden, respectively). Design of the registries varied as 18/51 (35.3%) core parameters were not available. Preoperative chemotherapy in patients with pancreatic ductal adenocarcinoma was administered most often in the USA (27.6%, 4.9%, 7.0%, and 3.4%, RLD 8.1, ALD 24.2%,  $p < 0.001$ ). Minimally invasive procedures were performed most often in the Netherlands (7.8%, 4.5%, 13.5%, and unknown, RLD 3.0, ALD 9.0%,  $p < 0.001$ ). Median length of stay was 8.0, 16.0, 12.0, and 11.0 days (RLD 2.0, ALD 8.0,  $p < 0.001$ ). Reoperation was performed most frequently in Germany and Sweden (5.7%, 17.1%, 8.7%, and 11.2%, RLD 3.0, ALD 11.4%,  $p < 0.001$ ). In-hospital mortality was 1.3%, 4.7%, 3.6%, and 2.7% (RLD 3.6, ALD 3.4%,  $p < 0.001$ ).

**Conclusion:** Considerable differences exist in design, patients, treatment strategies, and outcomes in registries of pancreatic surgery among four Western countries. The absolute largest nationwide differences of 24.3% for preoperative chemotherapy, 9.0% for minimally invasive surgery, 11.4% for reoperation rate, and 3.4% for in-

hospital mortality require further study and improvement. This analysis provides core parameters for future registries on pancreatic surgery.

## OYIA-12

## ADJUVANT THERAPY IN DISTAL CHOLANGIOCARCINOMA FOLLOWING PANCREATODUODENECTOMY: A NATIONAL CANCER DATABASE ANALYSIS

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**Background:** There is conflicting evidence for the benefit of adjuvant chemotherapy following resection of distal cholangiocarcinoma (dCCA), especially for node-negative (N0) resections. We aimed to evaluate the association of adjuvant chemotherapy with survival after surgical resection of dCCA.

**Methods:** Using National Cancer Database (NCDB) data from 2004 to 2015, we identified patients with resection of non-metastatic dCCA. Patients with neoadjuvant radiotherapy and chemotherapy were excluded. Propensity score matching on 16 hospital-, patient- and pathological-level variables was used to account for treatment selection bias. A multivariable Cox proportional hazards model was then used to analyze the association of chemotherapy with survival.

**Results:** Of 3,881 (38%) adjuvant chemotherapy and 4,342 (62%) non-adjuvant chemotherapy patients, 3,026 adjuvant chemotherapy and 3,026 non-adjuvant chemotherapy patients remained in the cohort after matching. Clinicopathologic and demographic variables were well balanced after matching. After matching, adjuvant chemotherapy was associated with higher survival (median 28.6 vs 18.7 months,  $p < 0.001$ ). After multivariable adjustment, adjuvant chemotherapy remained associated with a survival benefit (HR: 0.64, 95% CI 0.60 - 0.69,  $p < 0.001$ ). Stratified and multivariable interaction analyses showed that this benefit was restricted to patients with node positive disease (HR: 0.84, CI95%: 0.74-0.96,  $p=0.013$ ) and R1 resection (HR: 0.79, CI95%: 0.69-0.90,  $p < 0.001$ ).

**Conclusion:** In this large retrospective cohort study, adjuvant chemotherapy after dCCA resection was associated with a survival benefit in patients with node-positive and margin positive disease. Adjuvant chemotherapy should be considered routinely after node-positive and margin positive resection of dCCA.

OYIA-13

**PREOPERATIVE PREDICTION SCORE OF HEPATOCELLULAR CARCINOMA RECURRENCE IN LIVING DONOR LIVER TRANSPLANTATION: VALIDATION OF SNAPP SCORE DEVELOPED AT ASAN MEDICAL CENTER**

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The application of the previously proposed scoring systems is not readily available due to the lack of simplicity for predicting hepatocellular carcinoma (HCC) recurrence. We

aimed to develop and validate the new score system, which can predict HCC recurrence after living donor liver transplantation (LDLT) by using morphologic and biologic data. Predictors for HCC recurrence after LDLT were developed (n = 627) and validated (n = 806) in 1433 patients between 2007 and 2016 at Asan Medical center (AMC) to create the SNAPP score [tumor Size and Number, alpha-fetoprotein (AFP), vitamin K absence-II (PIVKA-II), positron emission tomography (PET)]. On multivariable Cox proportional hazards regression, the SNAPP factors were independently associated with HCC recurrence. The SNAPP score was highly predictive of HCC recurrence (C statistic, 0.802), and 5-year post-LT recurrence rates were significantly different between low, intermediate, and high SNAPP score groups. The performance of the SNAPP score (C-index [95%CI], 0.903 [0.820-0.987]) on predicting tumor recurrence after LDLT was better than that of the NYCA, the RETREAT, and the MoRAL score. The SNAPP score provides excellent prognostication after LDLT for HCC patients. Hence, we can help voluntary patients' decisions about whether to undergo LDLT or not.

**OL01 - Liver: Metastases**

OL01-01

**POPULATION-BASED STUDY ON PRACTICE VARIATION REGARDING PREOPERATIVE SYSTEMIC CHEMOTHERAPY IN PATIENTS WITH COLORECTAL LIVER METASTASES AND IMPACT ON SHORT-TERM OUTCOMES**

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**Introduction:** Indications for preoperative chemotherapy for colorectal liver metastases (CRLM) vary. Use of preoperative chemotherapy may influence postoperative outcomes. This study assessed variation in use of preoperative chemotherapy for CRLM and related postoperative outcomes in the Netherlands.

**Methods:** All patients who underwent liver resection for CRLM in the Netherlands between 2014 and 2018 were included from a national auditing database. Case-mix factors contributing to use of preoperative chemotherapy, hospital variation and postoperative outcomes were assessed using multivariable logistic regression. Postoperative outcomes were postoperative complicated course (PCC), 30-day morbidity and 30-day mortality.

**Results:** In total, 4323 (69.6%) patients were included of whom 1314 (31.1%) patients received preoperative chemotherapy and 3009 patients did not. Patients receiving chemotherapy were younger (mean (+SD) 63.3 (10.2) versus 67.1 (10.3)  $p < 0.01$ ) and had less comorbidity (Charlson scores 2+ (18% versus 27%,  $p < 0.01$ ). Unadjusted hospital variation concerning administration of preoperative chemotherapy ranged between 4% and 100%. After adjusting for case-mix factors, three hospitals administered significantly more preoperative chemotherapy than expected and six administered significantly less preoperative chemotherapy than expected. PCC was 12.1%, 30-day morbidity was 8.8% and 30-day mortality was 1.5%. No association between preoperative chemotherapy and PCC (OR 1.22, 0.97 - 1.53,  $p = 0.09$ ), 30-day morbidity (OR 1.16, 0.90 - 1.48,  $p = 0.25$ ) or 30-day mortality (OR 1.18, 0.68 - 2.01,  $p = 0.55$ ) was observed. **Conclusions:** Significant hospital variation in use of preoperative chemotherapy for CRLM was present in the Netherlands. No association between postoperative outcomes and preoperative chemotherapy was observed.

OL01-02

**NOVEL NOMOGRAMS TO PREDICT LYMPH NODE METASTASIS AND LIVER METASTASIS IN PATIENTS WITH EARLY COLON CARCINOMA**

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**Background:** Lymph node status and liver metastasis (LIM) are important in determining the prognosis of early colon carcinoma. We attempted to develop and validate nomograms to predict lymph node metastasis (LNM) and LIM in patients with early colon carcinoma.

**Methods:** A total of 32,819 patients who underwent surgery for pT1 or pT2 colon carcinoma were enrolled in the study based on their records in the SEER database. Risk factors for LNM and LIM were assessed based on univariate and multivariate binary logistic regression. The C-index and calibration plots were used to evaluate LNM and LIM model discrimination. The predictive accuracy and clinical values of the nomograms were measured by decision curve analysis. The predictive nomograms were further validated in the internal testing set.

**Results:** The LNM nomogram, consisting of seven features, achieved the same favorable prediction efficacy as the five-feature LIM nomogram. The calibration curves showed perfect agreement between nomogram predictions and actual observations. The decision curves indicated the clinical usefulness of the prediction nomograms. Receiver operating characteristic curves indicated good discrimination in the training set (area under the curve [AUC] = 0.667, 95% CI=0.661-0.673) and the testing set (AUC=0.658, 95% CI=0.649-0.667) for the LNM nomogram and encouraging performance in the training set (AUC=0.766, 95% CI=0.760-0.771) and the testing set (AUC=0.825, 95% CI=0.818-0.832) for the LIM nomogram.

**Conclusion:** Novel validated nomograms for patients with early colon carcinoma can effectively predict the individualized risk of LNM and LIM, and this predictive power may help doctors formulate suitable individual treatments.

OL01-03

**EXTENDED INDICATIONS FOR LAPAROSCOPIC PARENCHYMA-SAVING RESECTION OF POSTEROSUPERIOR LIVER SEGMENTS IN PATIENTS WITH COLORECTAL METASTASES. PSM ANALYSIS OF OUTCOMES IN COMPARISON WITH OPEN HEPATECTOMY**

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**Background:** Indications for laparoscopic liver resection (LLR) of posterosuperior segments (RSS) for colorectal liver metastases (CRLM) are commonly restricted to small, superficial lesions not adjacent to large vessels. There is no long-term survival comparative estimation after LLR and open liver resection (OLR). We aimed to compare outcomes after parenchyma-sparing LLR with extended indication and open liver resection (OLR) for CRLM located in PSS.

**Methods:** Two Russian centers took part in the study. Patients with hemihepatectomy, extrahepatic tumors were excluded. Logistic regression was used for 1:1 propensity score matching (PSM).

**Results:** PSS were resected in 77 patients. LLR were performed in 51 (66%) patients. Twenty pairs of patients were matched. Demographic and preoperative data are presented in the table. After matching, no differences were found in terms of blood loss, ICU and hospital stay, which were better for LLR group before PSM. No 90-day mortality was observed within both groups. After PSM, no difference was found in 5-year overall survival after LLR and OLR (78% and 63%, respectively) and 4-year disease-free survival (27% in both groups).

**Conclusions:** Expanding indication for laparoscopic parenchyma-sparing resection of PSS for CRLM are justified in majority of patients if performed in high volume specialized centers expertized in laparoscopic liver surgery.

progression in the regenerating liver post-hepatectomy in vivo and using patient-derived colorectal liver metastasis (CRLM) organoids ex vivo.

**Methods:** Male CBA mice underwent induction of colorectal liver metastases (CRLM) in conjunction with 70% partial hepatectomy. They were treated with either control or RASi, captopril 250mg/kg via intra-peritoneal injection. Mouse livers were collected for qRT-PCR. Tumour and liver tissue was obtained from consenting patients undergoing CRLM resection at Austin Health, Melbourne. Fresh human tissue samples were processed to facilitate the growth of organoids in vitro. Cellular proliferation assays (MTT) were used to assess the efficacy of RASi on tumour proliferation.

**Results:** In the regenerating liver RASi significantly reduced tumour burden ( $p < 0.01$ ). RASi treatment was associated with a significant down-regulation of c-myc expression in tumour samples ( $p < 0.05$ ). 10mM captopril significantly attenuated tumouroid proliferation in vitro compared to control ( $p < 0.001$ ).

**Conclusions:** Tumour progression in the regenerating liver is significantly diminished by RASi and is accompanied by a significant reduction in c-myc expression in vivo. Patient-derived CRLM tumoroids mimic in vivo disease and can be used for drug testing. High dose RASi attenuates patient-derived tumoroid proliferation in vitro.

#### OL01-03 Demographic data

Factors	Before matching			After matching		
	LLR (n=51)	OLR (n=26)	P	LLR (n=20)	OLR (n=20)	P
Median size of largest metastatic tumor, mm	40 (10-98)	46 (15-100)	0,384	50 (15-98)	44 (15-100)	0,309
Rate of metastases >50 mm, n (%)	17 (33%)	10 (39%)	0,656	9 (45%)	7 (35%)	0,519
Proximity to the large hepatic vessels, n (%)	12 (24%)	8 (31%)	0,493	5 (25%)	6 (30%)	0,655
Anatomical resection, n (%)	22 (43%)	9 (35%)	0,471	7 (35%)	8 (40%)	0,744
Difficulty index, point	7,0 (4,8-11,1)	6,1 (2,9-10,7)	0,091	7,2 (4,8-11,8)	6,4 (2,9-10,7)	0,189
Positive response to neoadjuvant chemo (RECIST), n (%)	27 (53%)	16 (62%)	0,473	13 (65%)	12 (60%)	0,744
Positive response to adjuvant chemo (RECIST), n (%)	36 (71%)	18 (69%)	0,902	15 (75%)	14 (70%)	0,723

#### OL01-04 RENIN-ANGIOTENSIN INHIBITOR TREATMENT ATTENUATES PROGRESSION OF COLORECTAL LIVER METASTASIS

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**Introduction:** Experimental and clinical data demonstrates that liver regeneration following hepatectomy drives tumour progression in the future liver remnant. We have previously shown using a murine model that treatment with the renin-angiotensin inhibitor (RASi) captopril attenuates tumour growth in the non-regenerating liver. This study aimed to assess the efficacy of RASi for attenuating CRLM

#### OL01-05 GUT MICROBIOTA COMPOSITION IN CRC PATIENTS WITH LIVER METASTASIS

Y. Wei

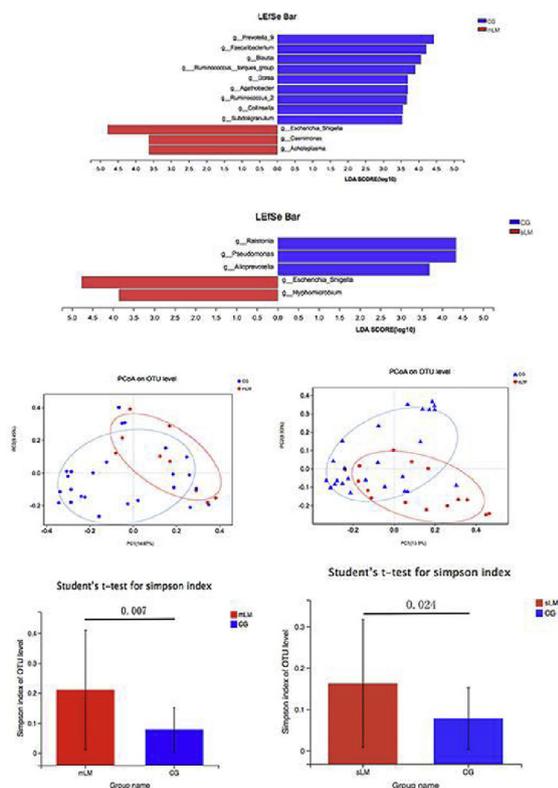
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**Introduction:** Liver metastases contribute to the high mortality rates of colorectal cancer (CRC). Until now, no study has reported the gut microbiota composition in CRC patients with liver metastasis. **Method:** We conducted a cross-sectional and case-control study, to analysis the gut microbiota of CRC with synchronous liver metastasis patients at initial diagnosis (sLM) and patients who develop metachronous liver metastasis (mLM) after surgery, compared to patients without liver metastasis (CG). Gut microbiota were analyzed by 16s RNA gene sequencing with mucosal samples.

**Result:** An analysis of the mucosal microbial diversity with two methodologies (Shannon and Simpson indices) showed that alpha-diversity of the mucosal microbiome

was significantly higher in CG group compared with that of sLM or mLM groups. Principal coordinate analysis (PCoA) on geuns level with Bary-Curtis distance showed a separated gut microbiota of both sLM and mLM from CG. LefSe analysis identified 5 predominated taxa between the sLM and CG groups, 12 predominated taxa between the mLM and CG groups on genus level with LAD score > 3.0. It was noted that *Escherichia\_Shigella* had higher relative abundance in the Both sLM and mLM groups compared to the CG group (P < 0.05)

**Conclusion:** CRC patients with synchronous or metachronous liver metastasis showed a different gut microbiota. Whether gut microbiota contribute to liver metastasis need further validation.



Variance analysis of mucosal samples in mLM and CG, sLM and CG groups

### OL01-06 THE EFFECT OF ADJUVANT CHEMOTHERAPY AFTER HEPATECTOMY FOR COLORECTAL LIVER METASTASIS DEPENDS ON RAS MUTATION STATUS

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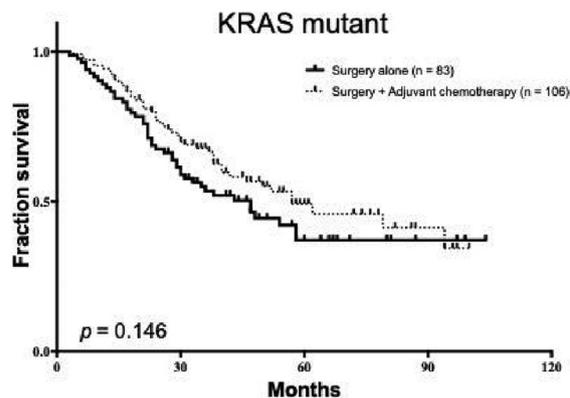
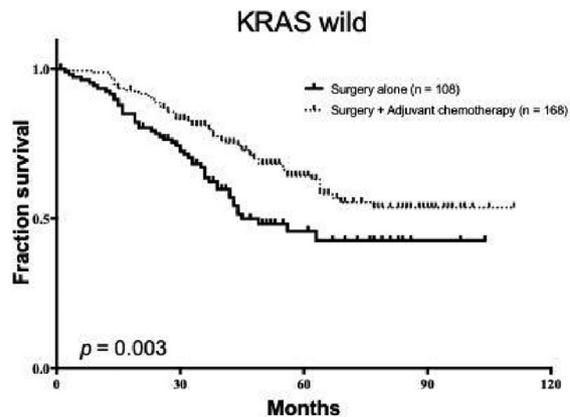
**Background:** Previous randomized controlled trial showed that adjuvant systemic chemotherapy after surgical

resection did not prolong the overall survival (OS) of patients with colorectal liver metastasis (CLM), suggesting the selection for administration of adjuvant chemotherapy. Molecular analysis might help to select patients who obtain a survival benefit by adjuvant chemotherapy.

**Method:** Data from patients who underwent curative liver resection for CLM between 2010 and 2017 at two Japanese high-volume centers with known KRAS mutation status were analyzed retrospectively. Patients were divided into two groups according to their KRAS status and the relationship between adjuvant chemotherapy and OS was investigated.

**Result:** A total of 467 patients underwent curative resection, of whom 190 (40.1%) patients had mutant KRAS (KRAS-MT). Adjuvant chemotherapy was administered to 274 (59%) patients. Among patients with KRAS wild type (KRAS-WT), patients who received adjuvant chemotherapy after surgery had significantly prolonged OS compared to those who underwent surgery alone (5-year OS; 64.2% vs. 45.3%, p = 0.003), while among patients with KRAS-MT, OS were not different between patients who received adjuvant chemotherapy after surgery and those who underwent surgery alone (5-year OS; 49.2% vs. 36.7%, p = 0.146). Multivariate analysis showed adjuvant chemotherapy as prognostic factor among patients with KRAS-WT (Hazard ratio 0.529 [0.358 - 0781], p = 0.001).

**Conclusion:** Adjuvant chemotherapy after resection of CLM offers more survival benefit in patients with KRAS-WT compared to those with KRAS-MT.



Overall survival of patients who received adjuvant chemotherapy and those who did not

OL01-07

## DOUBLING TIME OF RESIDUAL TUMOR VOLUME FOR METASTATIC NEUROENDOCRINE TUMORS DETERMINES SURVIVAL OUTCOMES AFTER HEPATIC RESECTION

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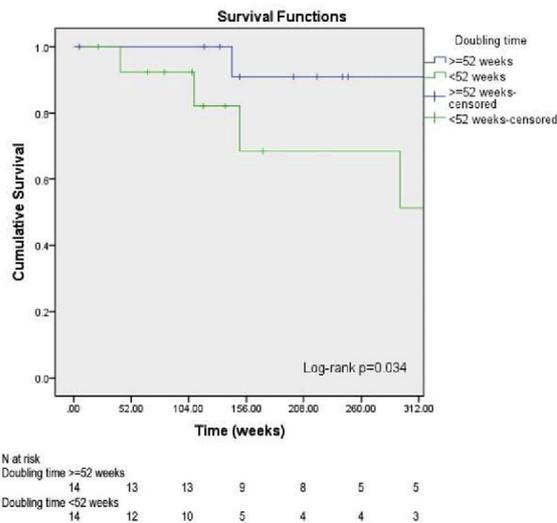
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**Introduction:** Estimates of the percentage of resectable tumor to guide debulking surgery for metastatic gastroentero-pancreatic neuroendocrine tumors (GEP-NET) does not account for tumor biology and absolute hepatic tumor burden. Thus, we studied the growth kinetics of residual metastatic disease after debulking surgery for GEP-NET to determine whether these tumor-specific factors correlated with survival.

**Methods:** Patients with measurable residual metastatic disease by imaging after debulking surgery for GEP-NET with or without resection of primary tumors between 2000-2017 were studied. Residual tumor volumes were measured over time to determine tumor growth kinetics. The primary outcome of interest was time from debulking surgery to adjuvant therapy or death.

**Results:** Twenty-eight patients had residual metastatic GEP-NET and half had an estimated  $\geq 90\%$  debulking resection. Median residual tumor volume (Y0) after debulking surgery was 3.0 (IQR 0.45-20.8) ml. Median tumor volume doubling time was 53.9 (IQR 29-159.2) weeks. Grade of tumor differentiation, Ki-67 index, and estimated percentage of debulking were not associated with outcomes. Multi-variate analysis showed that, after adjusting for Y0 and the use of somatostatin-analogues post-operatively, only tumor volume doubling time  $\geq 52$  weeks was associated with the time to adjuvant therapy or death (HR 0.17 95%CI 0.04-0.82). Patients with a tumor doubling time  $\geq 52$  weeks had improved overall survival at 1, 3, and 5 years when compared to a doubling time  $< 52$  weeks (100.0%, 90.9%, 90.9% vs 92.3%, 68.4%, 68.4%;  $p=0.034$ ).

**Conclusions:** Tumor volume doubling time, not the proportion of debulking performed, determines outcomes after debulking surgery for residual metastatic GEP-NET.



Kaplan-Meier curve of time to adjuvant therapy or death, stratified by doubling time of residual tumor

OL01-10

## RESPONSE TO INDUCTION CHEMOTHERAPY WITH ANTIBODIES ON THE PRIMARY TUMOR AND THE LIVER METASTASES IN SYNCHRONOUS METASTASTIC CRC PATIENTS

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**Introduction:** Treatment sequence and therapy combination are not standardized for metastatic colorectal cancer patients who present with synchronous disease. We investigated two different systemic therapy combinations to identify the best response both at the primary site and the liver metastases in potentially resectable patients.

**Methods:** Between 2014 and 2019 some 103 patients with liver metastases and a primary CRC were neoadjuvantly treated with Folfex/Xelox and either Bevacizumab or an EGFR-inhibitor for a total of 2 months. Thereafter liver resection was performed, followed by primary tumor resection 4 weeks later. The radiological response of both liver metastases and primary were evaluated and compared to pathological response (Rödel and Rubbia Brandt).

**Results:** Of 103 treated synchronously metastasized patients, 66 patients received Folfox/Xelox alone prior resection of liver metastases followed by primary resection, 63 with antibody-therapy. 24 received an EGFR antibody combined with chemotherapy and 38 Bevacizumab with Folfox/ Xelox. The histological evaluation of the primary tumor demonstrated a better response to the VEGF antibody-therapy, which was more pronounced clinically (Table 1). 96 patients received chemotherapy before liver resection, 87 with antibody-therapy. The radiological response and histological evaluation is shown in Table 1.

**Conclusion:** A combined induction chemotherapy with a VEGF antibody reveals clinical, radiological and histological better response both at the primary tumor and at the liver metastases compared to an EGFR-therapy and should be preferably used in patients with potential resectable synchronously metastasized colorectal cancer.

Table 1 Histological and radiological response to induction chemotherapy with VEGF or EGFR antibody-therapy

Histological Response of the primary tumor		Histological Response of the liver metastases			
Antibody- Therapy	n=63	TRG (Rödel)	Antibody- Therapy	n=87	TRG (Rubbia Brandt)
VEGF	39	1,96	VEGF	59	2,84
EGFR	24	1,57	EGFR	28	3,25
Radiological Response on the liver metastases					
Antibody- Therapy	CR 1%	PR 81%	SD 16%	PD 2%	
VEGF	100%	56%	75%	100%	
EGFR	0%	44%	25%	0%	

## OL01-11

### HISTOPATHOLOGIC GROWTH PATTERNS OF COLORECTAL LIVER METASTASES FOR PREDICTING SURVIVAL AFTER LIVER RESECTION: DATA FROM THE OSLO-COMET RCT

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**Introduction:** Based on clinico-pathological factors and biological markers, different score systems have been developed to stratify prognosis of patients with colorectal liver metastases (CRLM). We aimed to investigate the impact of tumor growth patterns (GP) on overall survival (OS) in patients undergoing liver resection for CRLM.

**Methods:** OSLO-COMET was a randomized controlled trial (NCT01516710) into laparoscopic vs open liver resection for CRLM recruiting 280 patients from Oslo University Hospital, Oslo, Norway from 2012 to 2016. A comprehensive biobank of all resected specimens was generated. Pathological specimens of 90 patients were evaluated with particular attention given to GP (desmoplastic n=43, replacement n=12, pushing n=14, and mixed n=21). Survival data for the comparison of GPs were analyzed with Kaplan-Meier plots, log-rank tests for

equality of survival curves, and Cox proportional hazard regression. To identify predictors of survival, univariable and multivariable Cox-regression analyses were performed.

**Results:** Median follow-up was 85 months (95%CI, 83 - 86) and 5-year OS compiled 51% in this cohort. Patients with desmoplastic and replacement GPs had significantly better OS than patients with pushing and mixed GPs (p=0.01). Divided into two groups (desmoplastic and replacement GPs in Group 1, n=55; pushing and mixed GPs in Group 2, n=35), 5-year OS in Group 1 and Group 2 were 60% and 36%, respectively (p=0.001, HR 0.41). At multivariable analysis including other known clinicopathological prognostic variables, pushing and mixed GPs were independent predictors for poor OS (p=0.028, HR 1.95).

**Conclusion:** Histopathologic GP is a practical and reproducible factor of estimating prognosis after resection of CRLM.

## OL01-12

### FINDING THE OPTIMAL TREATMENT FOR STAGE IV RECTAL CANCER: A NATIONWIDE COMPARISON OF TWO STRATEGIES

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**Introduction:** The M1-schedule (short-course pelvic radiotherapy (5x5Gy) followed by systemic therapy and subsequent local treatment of tumour sites) was compared to the liver first approach (LFA: systemic therapy, local treatment of liver metastases with subsequent (chemo) radiotherapy and rectum surgery) for patients with stage IV rectal cancer.

**Methods:** Consecutive patients with stage IV rectal cancer and potentially resectable liver metastases who were treated with the M1-schedule or LFA between 2006 and 2018 were analysed in nine tertiary referral centres in the Netherlands. Survival and oncological outcome were assessed.

**Results:** Of the 281 patients, 117 of the 147 (79.6%) patients completed the M1-schedule and 94 of the 134 patients (70.1%) completed the LFA (p = 0.068). Most patients failed completion due to disease progression. The 3-year OS was 59.7% (95% CI: 51.6-69.1) and 53.9% (95% CI: 45.9-63.3, p=0.370) and the median PFS was 16.6 and 16.2 months for M1-schedule and LFA, respectively (p=0.753). Radiologic complete response rates were higher in M1-schedule (10% vs. 4.3%), but did not reach significance (p=0.253). Pathologic complete responses were similar (13% vs. 11.5%, p=0.829). The duration of the M1-schedule was 7 weeks shorter than the LFA (37 vs 45 weeks, p=< 0.001). Surgical and oncological complication rates were comparable in both groups.

**Conclusion:** Both schedules have similar overall and progression free survival outcomes but the M1-schedule is 7 weeks shorter. Although significance was not reached, radiological complete responses were higher with M1-schedule. This schedule could lead to more rectum sparing treatment for stage IV rectal cancer patients.

## OL01-13

### NOMOGRAM TO PREDICT THE RISK OF RECURRENCE AFTER CURATIVE LIVER RESECTION FOR NEUROENDOCRINE LIVER METASTASIS

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**Introduction:** We sought to develop and externally validate a novel nomogram to predict recurrence and long-term prognosis of patients undergoing curative liver resection for neuroendocrine liver metastasis (NELM).

**Methods:** Patients who underwent curative liver resection for NELM were identified from an international multicenter database between 1980-2015. A nomogram to predict recurrence was developed and validated externally.

**Results:** Among 279 patients with NELM who underwent resection, multivariable analysis identified primary tumor location (pancreatic vs. others, HR 2.1, 95% CI 1.3-3.4), tumor grade (moderate vs. well, HR 1.9, 95% CI 1.1-3.1; poor vs. well, HR 1.6, 95% CI 0.7-3.3), lymphatic metastasis (HR 2.6, 95% CI 1.4-4.6) and the type of hepatectomy (major resection vs. parenchymal-sparing resection, HR 0.3, 95% CI 0.1-0.6) to be independently associated with recurrence-free survival (RFS). A weighted nomogram was constructed based on the beta-coefficients of the final multivariable model. The nomogram demonstrated a good ability to predict risk of recurrence in both test and external validation cohorts (c-index; test cohort: 0.754; validation cohort: 0.748). Specifically, the calibrated nomogram predicted survival that closely corresponded to actual survival with a good net benefit for most threshold probabilities especially between 20% to 60% in both the development and validation cohorts.

**Conclusions:** A novel nomogram predicted recurrence-free survival rates for patients with NELM with excellent discrimination and calibration. The proposed nomogram may be helpful to discuss with patients their anticipated prognosis following resection of NELM.

## OL01-14

### RISK FACTORS OF R1 RESECTION IN LAPAROSCOPIC AND OPEN LIVER SURGERY FOR COLORECTAL LIVER METASTASES: A EUROPEAN MULTICENTRE STUDY

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**Objective:** To assess the risk factors associated with R1 resection in patients undergoing open (OLS) and laparoscopic liver surgery (LLS) for CRLMs.

**Background:** The impact of R1 resection on the outcome of patients after liver resection for colorectal liver metastases (CRLMs) has been continuously appraised, but factors affecting R status have not been clearly defined.

**Methods:** A cohort study of patients who underwent OLS and LLS for CRLMs in nine European referral centres between January 1<sup>st</sup> 2004 and December 31<sup>st</sup> 2018 was performed. A multivariate analysis and the receiver operating characteristic (ROC) curves were used to investigate the risk factors for R1 resection.

**Results:** Overall, 3387 consecutive liver resections for CRLMs were included. OLS was performed in 1792 cases, LLS in 1595; the R1 resection rate was 14% and 14.2% respectively. The risk factors for R1 resection were: the type of resection (non-anatomic: p=0.001, 0.031 and anatomic/non-anatomic: p<0.001), the number of nodules (p=0.008, <0.001) and the size of tumour (p=0.009, 0.007). In the LLS group only, blood loss was associated with higher risk of R1 (p=0.020), while the Pringle's manoeuvre had a protective effect (p=0.032). The predictive size of tumour for R1 resection was >45mm in OLS and >30mm in LLS, while having more than 2 lesions was significant in both groups.

**Conclusions:** The study describes the risk factors for R1 resection following liver surgery for CRLMs, which may be used to plan better the perioperative strategies to reduce the incidence of R1 resection during OLS and LLS.

## OL01-15

### CIRCULATING TUMOR DNA AS SURVEILLANCE FOLLOWING RESECTION OF COLORECTAL LIVER METASTASES - RESULTS FROM A PROSPECTIVE SINGLE CENTER TRIAL

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**Background:** Following curative intended liver surgery an intensive surveillance program using CT-scans is used to detect disease recurrence. This is a relative expensive and resource demanding approach. In patients with known CRC, circulating tumor-DNA (ctDNA) can be found in the blood and correlates with tumor burden. The aim of this study was to investigate whether ctDNA, could detect disease relapse in patients operated for CRC liver metastases.

**Method:** Curatively intended liver resection was performed in all patients at Aarhus University Hospital, Denmark. Fresh frozen tumor samples were collected perioperatively from which a patient specific mutation analysis was performed. In each patient one cancer specific mutation was identified and used as target for ctDNA analysis in longitudinal blood samples in a 3-year follow up

period. Patient records and CT scans were reviewed and compared with ctDNA levels.

**Results:** 68 patients were included in the study. Median follow up time was 28 month; median time to relapse was 7 months. 47 out of 68 patients relapsed during the study period. No patients without relapse were ctDNA positive. 29 out of 47 patients with relapse were ctDNA positive, however in 18 patients with relapse, ctDNA were below the detection limit, giving a specificity of 100% and a sensitivity at 62%.

**Conclusion:** ctDNA can be used as a clinical tool especially in the event of a positive ctDNA sample. Further research has to be performed in order to increase the sensitivity of this method, before it will be able to fully/ partially replace frequent CT-scans.

#### OL01-16

### APPROPRIATE SURGICAL SELECTION IN PATIENTS WITH BREAST CANCER LIVER METASTASES TO OPTIMIZE SURGICAL OUTCOME: A NOMOGRAM BASED ON A MULTI-INSTITUTIONAL EXPERIENCE

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**Background and aims:** Favorable survivals and better outcomes compared with oncologic treatments only have been recently reported in patients with Breast Cancer Liver Metastases (BCLM). hence the need to focus on the factors determining a patient's prognosis following hepatectomy and to develop a nomogram to predict oncological outcome.

**Methods:** Using a multicentric database including patients who underwent hepatectomy for BCLM at three Italian HPB referral centers between 2000 and 2018, we sought to identify the predictors of survival and develop a clinical tool to predict patient's prognosis after liver resection for BCLM. The predictive ability of the nomogram to predict recurrence was assessed using the c-index.

**Results:** 154 patients undergoing surgery with curative intent were included in the analysis. Number of liver lesions (HR 1.66; 95% CI, 1.01-2.67; p=0.035), tumor size (HR 1.71; 95% CI, 1.22-2.97; p=0.019), triple negative status (HR = 1.07; 95% CI, 1.21 - 2.76; p=0.027), presence of extrahepatic metastases (HR=1.36; 95% CI, 1.19 - 2.91, p=0.032), response to preoperative chemotherapy (HR 1.97; 95% CI, 1.56 - 3.12; p=0.028) were the predictors of recurrence free survival. The nomogram demonstrated a good ability to predict risk of recurrence (c-index of 0.741). Patients were stratified by Predicted Recurrence Risk (PRR) groupings: PRR < 20%, PRR 20-40%, PRR 40-80%, PRR >80%, which correlated with disease free-survival at 3-year of 85%, 61%, 34%, and 0%, respectively.

**Conclusion:** The developed nomogram accurately (c-index >75 %) staged and predicted the prognosis of patients undergoing liver resection for BCLM, providing an accurate tool to select candidates to resection

#### OL01-17

### THE IMPACT OF SURGICAL APPROACH ON ONCOLOGICAL OUTCOMES AND EFFICIENCY OF TREATMENT SEQUENCING FOR SYNCHRONOUS COLORECTAL LIVER METASTASIS

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**Introduction:** Patients with synchronous colorectal liver metastasis (CRLM) can be managed by 3 surgical approaches: classical (primary-first (PF)), liver-first (LF) or simultaneous resection (SR). The effect of these strategies on oncological outcomes and overall efficiency of treatment sequencing is unclear.

**Method:** A retrospective analysis of prospectively collected data from a single institution was conducted. Perioperative data including return to adjuvant therapy and overall time for completion of intended systemic and surgical therapies were analysed. Long-term outcomes were compared using the log-rank test.

**Results:** Between 2010 and 2019, 499 patients with synchronous CRLM were resected: 60.3%(n=301) PF, 25.7%(n=128) LF and 14.0%(n=70) SR. There was no difference in baseline characteristics between the 3 groups. Hospital stay was longer in the SR group (median 9 days vs. 7 days for both PF and LF, p< 0.001). More patients underwent major hepatectomies in the LF group (56.3%(n=72) vs. 34.4%(n=24) SR and 44.5%(n=134) PF, p=0.019). Return to intended adjuvant treatment was similar for all groups (63 days (SR) vs. 54 days (LF) vs. 51.5 days (PF), p=0.6774), and total time to complete all curative therapies was significantly lower in the SR group (9.7 months vs. 11.3 months (LF group) vs. 12.1 months (PF group), p< 0.001), regardless of the type of hepatic resection. Overall survival and disease-free survival were similar between all groups (p>0.05).

**Conclusions:** Efficient treatment sequencing resulting in shorter time to complete all curative therapies such as seen with simultaneous resection in selected patients might improve overall patient experience without compromising oncological outcomes.

#### OL01-19

### SAFETY AND FEASIBILITY OF ADJUVANT HEPATIC ARTERIAL INFUSION PUMP CHEMOTHERAPY IN PATIENTS WITH RESECTABLE COLORECTAL LIVER METASTASIS; A PHASE II TRIAL IN THE NETHERLANDS

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**Introduction:** Adjuvant hepatic arterial infusion pump (HAIP) chemotherapy after resection of colorectal liver metastasis (CRLM) was associated with a 2-year increased survival in Memorial Sloan Kettering Cancer Center. Due to the promising results published on HAIP chemotherapy we have started a HAIP program in the Netherlands. We now present our long-term safety and feasibility results.

**Methods:** A phase II study was performed in 2 centers in The Netherlands. Patients with resectable CRLM without extrahepatic disease were eligible. All patients underwent 6 cycles of adjuvant HAIP chemotherapy with floxuridine. Safety was determined by HAIP chemotherapy-related complications grade III or higher from surgery until 90 days after finishing the last cycle. Feasibility was determined by the number of completed cycles.

**Results:** Twenty patients were included. The median number of floxuridine cycles completed was 5 and all patients completed at least 3 cycles at full dose. Nine patients (45%) had 14 grade III or higher complications. Two patients (10%) required a reoperation for a malfunctioning or flipped pump. One patient (5%) developed biliary obstruction that resolved with temporary stent placement. One patient (5%) developed hepatic artery thrombosis after 4 cycles with subsequent pancreatitis, portal vein thrombosis, and died from liver failure. None of the patients developed arterial bleeding or dissection, pseudo-aneurysm, extrahepatic perfusion, or pump pocket infection.

**Conclusion:** Adjuvant HAIP chemotherapy was safely introduced in the Netherlands in a phase II trial. Long-term follow-up of this trial and an ongoing phase III trial are required to determine survival benefit.

#### OL01-20

### CAN THE PRESENCE OF KRAS MUTATION BE A JUDGE TO DETERMINE THE RESECTION TYPE OF COLORECTAL LIVER METASTASIS?

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**Introduction:** Colorectal cancer harboring KRAS mutations are known to exhibit a high rate of vascular invasion and hematogenous metastases. Although it is generally accepted that non-anatomical resection (NAR) in colorectal liver metastasis (CRLM) is comparable to safety and efficacy compared to anatomical resection (AR) and doesn't affect the oncologic outcome, there are reports that AR has oncologic benefit in KRAS-mutated CRLM. This study aimed to compare survival outcomes between AR versus NAR resection for CRLM, according to KRAS mutational status.

**Methods:** 344 patients who underwent hepatic resection of CRLM with known KRAS mutational status were reviewed from 2007 to 2018. Among them, 117 KRAS mutated CRLMs and 227 KRAS wild type CRLMs were compared.

**Results:** Both KRAS wild type and mutated type, the size of the resected tumor, tended to be larger in the AR group than in the NAR group ( $p < 0.001$ , respectively). In the short term surgical outcome, hospital stay was significantly

longer in the AR group (15.65 vs. 11.27 days,  $p < 0.001$ ), and there was no difference between the two groups in EBL, postoperative complications, and 30-day mortality. There was no difference in disease-free survival (DFS) between AR and NAR in both the KRAS wild type and the mutated type ( $p=0.326$ ,  $p=0.954$ , respectively). In addition, there was no difference in intrahepatic DFS between AR and NAR in both the KRAS wild type and the mutated type ( $p=0.165$ ,  $p=0.516$ , respectively).

**Conclusions:** The presence of KRAS mutation cannot determine the resection type of colorectal liver metastasis.

#### OL01-21

### PERIOPERATIVE RADIOFREQUENCY ABLATION OR MICROWAVE ABLATION OF COLORECTAL LIVER METASTASES: A SINGLE CENTRE EXPERIENCE

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**Introduction:** Radiofrequency ablation (RFA) and microwave ablation (MWA) are generally accepted to treat colorectal liver metastases (CRLM) with a curative intent. MWA is considered to have better outcomes than RFA but true comparing data are scarce.

**Methods:** This single centre retrospective cohort study analysed 121 consecutive patients who underwent open surgery and ultrasound guided ablation between January 2013 and August 2018. The main objective was to compare RFA with MWA ablation outcomes, including local tumor progression per lesion (LTP), complete ablation rates per lesion, overall survival (OS), progression-free survival (PFS) and postoperative complication rates. Logistic regression models were used for univariable and multivariable analysis to identify predictors of LTP.

**Results:** Forty-two patients underwent RFA of 96 lesions between 2013 and 2015 and 79 patients MWA of 192 lesions between 2015 and 2018. The median number of ablated CRLM was 2 (range 1-12) with a median diameter of 11 mm (range 1-31). Incomplete ablations were observed in 2 CRLM (2.1%) for RFA and 5 CRLM (2.6%) for MWA ( $p=0.787$ ). LTP after complete ablation within one year occurred in 6 CRLM (6.3%) treated with RFA and in 11 CRLM (5.7%) treated with MWA ( $p=0.860$ ). Complications after RFA and MWA requiring re-intervention (e.g. abscess and biloma drainage) within 30 days were observed in 2 (4.8%) and 6 (7.6%) patients, respectively ( $p=0.550$ ). Ablation technique, operator (surgeon or interventional radiologist), size of ablated lesion and neoadjuvant chemotherapy were not associated with LTP.

**Conclusion:** Perioperative RFA seems equally effective as MWA for CRLM up to 31mm.

OL01-22

## NOVEL THERAPEUTIC TARGETS IN THE CANCER ASSOCIATED STROMA DEFINE POOR PROGNOSIS COLORECTAL CANCER AND COLORECTAL LIVER METASTASES

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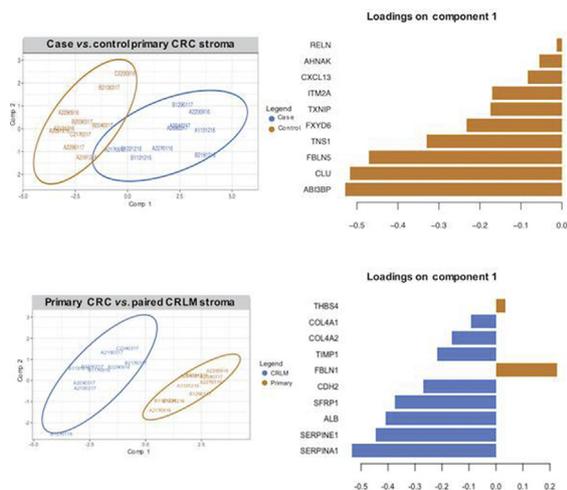
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**Introduction:** Cancer associated stroma (CAS) is emerging as a key determinant of metastasis in colorectal cancer (CRC), however very little is known about the CAS in colorectal liver metastases (CRLM). This study aimed to characterise the transcriptome of CAS in CRLM and identify novel stromal biomarkers or targetable pathways of metastasis.

**Method:** A nested case-control study design from a prospectively maintained database of paired primary CRCs and CRLMs was adopted. Differential gene expression (DGE), followed by pathway enrichment and sparse partial least square discriminant analysis (sPLS-DA) were performed after isolating epithelial tumour and CAS RNA by laser capture microdissection. The transcriptomes of epithelial tumour versus the CAS between case and control CRC as well as paired primary CRCs and CRLMs were compared.

**Results:** Isolated tumour and CAS from ten primary CRCs, ten paired CRLMs, and ten control stage-matched primary CRCs that had not developed metastases were included (60 RNA samples in total). Median follow up was 62, 63 and 45 months for case primary, control primary and CRLM groups, respectively. DGE and sPLS-DA identified a number of novel targetable stromal genes (shown below) and pathways including *phospholipases*, *BMP signalling* and *MAPK pathways* that defined poor prognosis CRC and the CAS of CRLM.

**Conclusion:** This study is the first to describe key differences in CAS gene expression between paired primary CRC and CRLM, as well as identifying a number of targetable genes and pathways whose prognostic relevance specifically in the CAS of CRC and CRLM have not been previously described.



sPLS-DA fitted onto two components, and corresponding ten topmost predictive genes

HPB 2021, 23 (S1), S13–S112

OL01-23

## MORPHOLOGY OF TUMOR-ASSOCIATED MACROPHAGES DICTATES THE PROGNOSIS OF PATIENTS WITH COLORECTAL LIVER METASTASES

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**Background:** In the era of precision medicine there is a need of reliable prognostic markers to cope with the clinical heterogeneity of patients with colorectal liver metastases (CLM) and, for their predominance in metastatic tissues, tumor-associated macrophages (TAMs) emerge as promising candidates. The aim of this study was to test the presence of discrete TAMs in CLM patients, and to test their role on recurrence-free survival (RFS).

**Methods:** NCT038888638 is a single-center study that examined a cohort of CLM patients that underwent hepatectomy between 2005 and 2017. TAMs cell density, cell area and cell perimeter were quantified in 3 non-contiguous and non-overlapping areas of by means of immuno-reactive area of CD163+ macrophages. The association of TAMs metrics and RFS was tested by using receiver operating characteristics (ROC) curves, and multivariate Cox regression analysis.

**Results:** 101 patients resected between 2005 and 2017 were considered. Among density (AUC=0.555;95% CI=0.410-0.701;P=0.449), perimeter (AUC=0.526;95% CI=0.383-0.671;P=0.708) and area (AUC=0.791;95% CI=0.572-0.841;P=0.006) of CD163+ TAMs, only the latter was significantly associated with differences in survival time. Small and large TAMs, as defined by using the best cutoff value extrapolated from the ROC curve (area:60.39 $\mu\text{m}^2$ ;Se=0.79;Sp=0.44), were clearly associated with significantly different 5-year RFS rates of 27.8% and 0.2% respectively (P< 0.001). At the multivariate analysis, including TAMs area and several prognostic factors, only TAMs area was found to be independently statistically associated with RFS (HR=3.41;95%CI=1.13-5.43;P=0.001).

**Conclusions:** Macrophage morphology is associated with CLM patients' prognosis. Quantitative morphometric characterization of TAMs can serve as an easily quantifiable correlate of functional diversity with prognostic significance.

OL01-24

## EXPRESSION PATTERN OF CXCR4/ CXCL12 IS RELATED TO SURVIVAL AFTER HEPATIC RESECTION FOR COLORECTAL LIVER METASTASES

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**Introduction:** The chemokine network such as interaction between CXCR4 and CXCL12 plays a role in the induction of organ-specific metastases. The present study evaluated CXCR4/CXCL12 expression pattern in colorectal liver metastases (CRLM) and determined whether the expression patterns affect tumor progression.

**Methods:** We examined pattern of CXCR4 and CXCL12 immunohistochemistry in 92 CRLM patients. CXCL12/CD133 immunoreactivity was also evaluated. The median follow-up time of these patients was 38 months. Clinicopathological data of these patients were evaluated. Overall survival rates were evaluated by the Kaplan-Meier method. The expression profile of CXCR4 in the colorectal cancer cell line was determined by fluorescence microscopy.

**Results:** The cytoplasmic CXCR4 expression was greater in 36 patients than that indicated by CXCR4 staining intensity of hepatocytes. CXCL12 was also expressed in hepatocytes surrounding the tumors at high and low levels in 68 (74%) and 24 (26%), respectively. High levels of nuclear CXCR4 expression were observed in 23 patients which significantly correlated with CXCL12 expression in hepatocytes. The nuclear CXCR4 expression in the cancer cell line increased after exposure to CXCL12. The univariate and multivariate analyses demonstrated that high levels of nuclear CXCR4 and the increased CXCL12 expression in hepatocytes were significantly better prognostic factors for overall and hepatic disease-free survival in patients with CRLM.

**Conclusion:** The CXCR4 expression in CRLM together with the upregulation of CXCL12 in hepatocytes may help to predict the clinical outcomes of patients with CRLM after hepatic resection and to determine whether adjuvant chemotherapy may be required.

## OL02 - Liver: Primary Tumours

### OL02-01

#### RISK FACTORS, PATTERNS AND LONG-TERM PROGNOSIS OF EARLY AND LATE RECURRENCE IN PATIENTS WITH HEPATITIS B VIRUS-ASSOCIATED HEPATOCELLULAR CARCINOMA

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**Background:** Survival after liver resection of hepatocellular carcinoma (HCC) remains poor due to a high incidence of recurrence. We sought to investigate risk factors, patterns, and long-term prognosis among patients with early and late recurrence after liver resection for hepatitis B virus (HBV)-associated HCC.

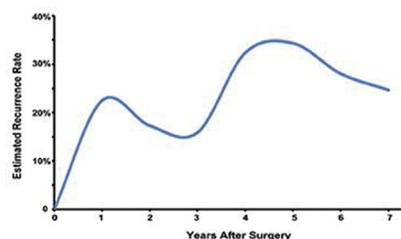
**Methods:** Data of consecutive patients undergoing curative resection for HBV-associated HCC were analyzed. According to the time to recurrence after surgery, recurrence was divided into early ( $\leq 2$  years) and late recurrence ( $> 2$  years). Characteristics, patterns of initial recurrence and post-recurrence survival (PRS) were compared between patients with early and late recurrence. Risk factors of early

and late recurrence, and predictors of PRS were identified by univariable and multivariable Cox-regression analyses.

**Results:** Among 894 patients, 322 (36.0%) and 282 (31.5%) developed early and late recurrence, respectively. On multivariable analyses preoperative HBV-DNA  $> 10^4$  copies/ml was associated with both early and late recurrence, while postoperative no/irregular antiviral therapy was associated with late recurrence. Compared with patients with late recurrence, patients with early recurrence had a lower proportion of intrahepatic only recurrence (72.0% vs. 91.1%,  $P < 0.001$ ), as well as a lower chance of receiving potentially-curative treatments for recurrence (33.9% vs. 50.7%,  $P < 0.001$ ) and a worse median PRS (19.1 vs. 37.5 months,  $P < 0.001$ ). Multivariable analysis demonstrated that early recurrence was independently associated with worse PRS (HR 1.361,  $P = 0.006$ ).

**Conclusions:** Risk factors associated with early recurrence and late recurrence were different. Early recurrence was associated with worse post-recurrence survival among patients with recurrence.

**Figure.** The estimated rate of recurrence (per year) over time after curative liver resection of hepatitis B-associated HCC.



### OL02-02

#### EFFECT OF PERFORMANCE STATUS ON SHORT-TERM AND LONG-TERM OUTCOMES AFTER LIVER RESECTION FOR HEPATOCELLULAR CARCINOMA: A MULTICENTER STUDY

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**Background:** The Barcelona Clinic Liver Cancer (BCLC) categorizes a patient with performance status (PS)-1 as advanced stage of hepatocellular carcinoma (HCC) and surgical resection is not recommended. However, in real-world clinical practice, PS-1 is often not a contraindication to surgery for HCC. The aim of current study was to define the impact of PS on the surgical outcomes of patients undergoing liver resection for HCC.

**Methods:** Using a multi-institutional database, 1,531 consecutive patients who underwent a curative-intent resection of HCC between 2005 and 2015 were identified. After categorizing patients into PS-0 (n=836) versus PS-1 (n=695), perioperative mortality and morbidity, overall survival (OS) and recurrence-free survival (RFS) were compared.

**Results:** Overall perioperative mortality and major morbidity among patients with PS-0 (n=836) and PS-1 (n=695) were similar (1.4% vs. 1.6%,  $P=0.525$  and 9.7% vs. 10.2%,  $P=0.732$ , respectively). In contrast, median OS and RFS was worse among patients who had PS-1 versus PS-0 (34.0 vs. 107.6 months, and 20.5 vs. 60.6 months, both  $P < 0.001$ , respectively). On multivariable Cox-regression analyses, PS-1 was independently associated with worse OS (HR: 1.301, 95% CI: 1.111-1.523,  $P < 0.001$ ) and RFS (HR: 1.184, 95% CI: 1.034-1.358,  $P = 0.007$ ).

**Conclusions:** Patients with PS-1 versus PS-0 had comparable perioperative outcomes. However, patients with PS-1 had worse long-term outcomes as PS-1 was independently associated with worse OS and RFS. Routine exclusion of HCC patients with PS-1 from surgical resection as recommended by the BCLC guidelines is not warranted.

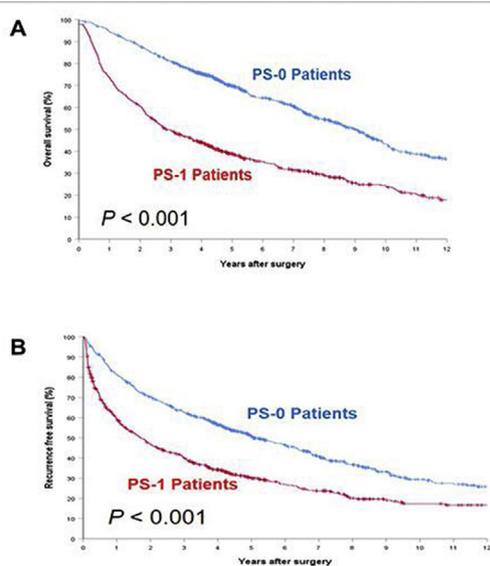


Figure. Comparison of overall survival (A) and recurrence-free survival (B) curves between patient

#### OL02-03

### PROGNOSTIC IMPACT OF ATM EXPRESSION IN ASIAN PATIENTS WITH NONBNONC-HEPATOCELLULAR CARCINOMA

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**Background:** The aim of this study was to clarify the prognostic value of expression of Ataxia telangiectasia mutated (ATM) in hepatocellular carcinoma (HCC).

**Methods:** The Cancer Genome Atlas (TCGA) database was used to examine ATM mRNA expression in HCC (n = 371). In addition, immunohistochemical phospho-ATM (pATM) expression in HCC was assessed for 22 Japanese patients with NAFLD-related HCC who underwent hepatectomy.

**Results:** TCGA data showed that patients with nonBnonC-HCC (n = 199) had significantly worse overall survival

(OS) than those with Hepatitis B and/or Hepatitis C (HB/HC)-related HCC (n = 172) ( $p < 0.001$ ). In Asian nonBnonC-HCC cohort in TCGA (n = 52), patients with ATM high expression had significantly worse OS than those with ATM low expression ( $p = 0.046$ ). Whereas in non-Asian nonBnonC-HCC (n = 147), Asian HB/HC-HCC (n = 106), or non-Asian HB/HC-HCC (n = 66) cohort in TCGA, there were no significant differences in OS between patients with ATM high expression and those with ATM low expression. Immunohistochemical examination in Japanese patients with NAFLD-related HCC revealed that patients with pATM high expression had significantly worse OS than those with pATM low expression ( $p = 0.007$ ). Furthermore, multivariate analysis in OS showed that pATM expression was an independent prognostic factor (HR, 4.311,  $p = 0.026$ ).

**Conclusions:** ATM high expression in HCC might be an adverse prognostic factor for Asian patients with nonBnonC-HCC.

#### OL02-04

### COMBINED HEPATECTOMY AND MICROWAVE ABLATION FOR MULTIFOCAL HEPATOCELLULAR CARCINOMA: LONG-TERM OUTCOMES AND PROGNOSTIC FACTORS

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**Background:** It remains to be clarified whether combined hepatectomy and microwave ablation for multifocal hepatocellular carcinoma (HCC) is feasible. This aim of this study was to examine the perioperative and oncological outcomes after combined hepatectomy and microwave ablation for multifocal HCC.

**Methods:** This retrospective study included 81 patients who underwent combined hepatectomy and microwave ablation for multifocal HCC in our institute between July 1994 and December 2017. We analyzed overall survival (OS) and recurrence-free survival (RFS), and evaluated factors related to prognosis.

**Results:** The 81 patients included 57 men and 24 women, with a median age of 67 years. Fifty-four patients (67%) were infected to Hepatitis C virus, and 71 patients (88%) had Child-Pugh class A liver function. The median maximum tumor size was 32 mm and the median number of tumors was three. Median follow-up time was 45.6 months for the entire cohort. OS rates were 1-year: 96%, 3-year: 72%, 5-year: 54%, and 10-year: 35%; RFS rates were 1-year: 77%, 3-year: 37%, 5-year: 22%, and 10-year: 12%. The major complication rate (Clavien-Dindo classification IIIa or above) after surgery was 10%, with one patient of in-hospital mortality. Multivariate analysis showed that des- $\gamma$ -carboxy prothrombin level  $> 100$  mAU/mL was an independent risk factor for OS, and maximum tumor size  $> 5$  cm was an independent risk factor for RFS. **Conclusions:** Our results indicate that combined hepatectomy and microwave ablation is safe and feasible for selected patients with multifocal HCC.

## OL02-05

### THE UTILITY OF IMMUNE-NUTRITIONAL INDEX AS PROGNOSTIC INDICATOR FOR INTRAHEPATIC CHOLANGIOCARCINOMA: A MULTI-CENTER ANALYSIS OF 385 RESECTED CASES

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**Introduction:** The prognosis of Intrahepatic cholangiocarcinoma (IHC) after resection has been poor because of high rate of recurrence. Preoperative immune-nutritional index has been reported as useful prognostic assessment in various malignancies.

**Purpose:** The aim of this study was to evaluate the prognostic value of immune-nutritional index in patients with ICC after curative resection.

**Materials and methods:** Overall survival (OS) of 385 cases of ICC between 2000 and 2016 were analyzed, according to various *immune-nutritional indexes containing Glasgow Prognostic score (GPS), Controlling Nutrition Status (CONUT), Prognostic nutritional index (PNI), Neutrophil/Lymphocyte ratio (NLR), and Lymphocyte/Monocyte ratio (LMR).*

**Results:** The 2-, 5-, and 10- years OS were 66.2%, 40.6%, and 22.7%, respectively. Every *immune-nutritional* index could be identified as a significant prognostic factor: GPS (1/2 vs 0, Hazard ratio [HR]= 2.2, p< 0.0001), CONUT (≥2 vs 0/1, HR=1.4, p=0.011), PNI (< 40 vs ≥40, HR=1.5, p=0.0044), NLR (≥2.6 vs <2.6, HR=1.4, p=0.0099), and LMR (3.7> vs ≤ 3.7, HR=1.5, p=0.0079). In multivariate analysis, CONUT could be an independent reliable predictor which had no relation to background tumor profiles such as tumor size, multiple lesion, CA19-9 level, and lymph-node metastasis. Thus, patients with high CONUT (≥2) showed poorer prognosis than patients with low CONUT 0/1 (Median survival 33 vs 51 months, p=0.01).

**Conclusions:** The prognosis of ICC after surgery would rely on preoperative immuno-nutritional status. Immuno-nutritional, especially CONUT, could be utilized as prognostic indicator for preoperative assessment of ICC.

## OL02-08

### REPEAT HEPATECTOMY VERSUS RADIOFREQUENCY ABLATION IN THE MANAGEMENT OF RECURRENT HEPATOCELLULAR CARCINOMA: AN AVERAGE TREATMENT EFFECT ANALYSIS

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**Introduction:** Hepatocellular carcinoma (HCC) is the most common primary malignancy of the liver with high rates of recurrence post-resection. Various treatments are available for managing recurrent HCC following initial curative resection. This is a retrospective study which aims to determine the average treatment effect of liver re-resection over radiofrequency ablation (RFA) in patients with recurrent HCC following initial curative resection.

**Methods:** From 2000 to 2016, a total of 219 patients who met the study criteria were included. This group was selected from a cohort of 1063 patients who had recurrent HCC following initial resection during the study period.

**Results:** The median overall survival (OS) for RFA and repeat hepatectomy (RH) was 56.6 months (IQR, 29.6 - Not Reached) and 85.5 months (IQR, 31.0 - Not Reached) (p = 0.6006) respectively while the median time to recurrence was 16.2 months (IQR, 7.8 - 78.0) and 26.1 months (IQR, 9.1 - 126.5) (p = 0.0269) respectively. After propensity score matching, the median OS for RFA and RH was 53.3 months (IQR, 27.5 - Not Reached) and 85.5 months (IQR, 33.5 - Not Reached) (p = 0.8474) respectively while the median time to recurrence months was 11.1 (IQR, 5.0 - 33.2) and 28.0 months (IQR, 9.1 - Not Reached) (p = 0.0225) respectively.

**Conclusion:** Repeat hepatectomy is preferred in the management of recurrent HCC following initial resection.

## OL02-09

### THE USE OF STATIN IS ASSOCIATED WITH BETTER DISEASE-FREE SURVIVAL IN PATIENTS WITH HEPATITIS B-RELATED HEPATOCELLULAR CARCINOMA AFTER CURATIVE TREATMENT

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**Background and aims:** The association of use of statins and risk of hepatocellular carcinoma (HCC) hepatitis B-infected (HBV) patients has been reported. This study aimed to examine the effect of statin on survival after curative treatment for HCC in HBV population.

**Methods:** We conducted a hospital-based population study of HBV-related HCC patients by using the Hospital Authority database. We use propensity score (PS) weighting to minimise baseline confounders and “indication bias”. The weighted Cox regression analyses was performed for the overall and disease-free survival.

**Results:** A total of 4337 patients with HBV-related HCC received curative treatment during study period. After PS weighting of baseline covariates, the 1-year, 3-year and 5-year overall survival of statin users and non-statin users were 93.1% vs 90.5%, 77.9% vs 74.8% and 69.0% vs 63.4% respectively (p=0.946). The 1-year, 3-year and 5-year disease-free survival of statin users and non-statin users were 71.6% vs 62.9%, 52.9% vs 43.0% and 47.7% vs 34.3% respectively (p=0.005). In subgroup analysis,

concurrent use of statin and antiviral therapy was associated with a better disease-free survival ( $p=0.022$ ) compared to antiviral therapy alone.

**Conclusion:** Statin use is associated with better disease-free survival in patients with HBV-related HCC after curative treatment. Additive HCC chemopreventive effect was seen with the concomitant use of antiviral and statin. Further prospective studies are warranted to investigate the potential use of statin in antiviral therapy users.

## OL02-11

### REPEATED SURGICAL RESECTION OF RECURRENT TUMOR AFTER INITIAL HEPATECTOMY FOR INTRAHEPATIC CHOLANGIOCARCINOMA

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**Background:** Treating strategy for recurrent tumor after initial hepatic resection of intrahepatic cholangiocarcinoma (ICC) is yet controversial.

**Methods:** Patients undergoing surgical resection for initial tumor of ICC between 1995 and 2016 were identified and recurrence was researched. A retrospective analysis was performed to assess the oncological benefit of resection of recurrent tumors.

**Results:** A total of 133 patients underwent initial radical resections for ICC. The 3- and 5-year overall survival rates in the 133 patients after initial surgery were 68% and 48%, respectively. The median and range of tumor size was 4.5 (1.2-12) cm. Hilar invasion was seen in 44 of 133 patients. Lymph node metastasis was histologically diagnosed in 29 patients. Tumor recurrence was diagnosed in 94 of 133 patients; 18 patients of them underwent repeated resection of the recurrent tumor. The resected recurrent tumor sites were liver in 13 patients, lung in 4 patients, and bile duct in 1 patient. The median OS after diagnosis of tumor recurrence was 34.8 months in re-resection group and 19.6 months in non-re-resection group ( $P = 0.04$ ). The 3- and 5-year overall survival rates were 48% and 21% in re-resection group, and 13% and 5% and non-re-resection group. The median disease-free survival after re-resection of recurrent tumors ( $n = 18$ ) was 11.2 months and 1-year disease-free survival was 36%.

**Conclusion:** Re-resection of recurrent tumor may be useful for selected patients. Effective adjuvant chemotherapy would be needed because disease-free survival after re-resection was unsatisfactory.

## OL02-13

### REGIONAL LYMPHADENECTOMY IN HEPATOMA RESECTION: INSIGHT INTO PROGNOSIS

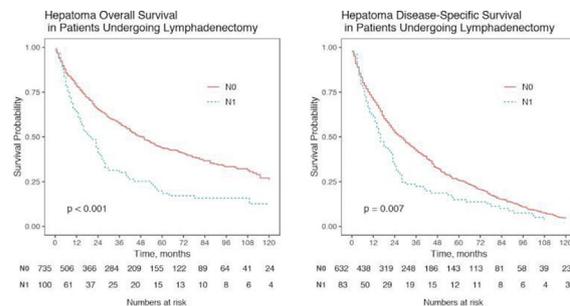
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**Background:** Developing chemotherapeutics for hepatocellular carcinoma (HCC) suggest adjuvant therapy trials are coming. Selection criteria for these trials are undetermined, but prior experience with intrahepatic

cholangiocarcinoma suggests that surgical determination of lymph node is important.

**Methods:** Patients with HCC who underwent liver resection (LR) were identified from Surveillance Epidemiology and End Results (SEER-18) database (2003-2015). Cohort-based clinicopathologic comparisons were made based on completion of regional lymphadenectomy. Propensity-score matching reduced bias. Unadjusted and adjusted analysis of overall (OS) and disease-specific survival (DSS) were performed.

**Results:** Among 5395 patients, 835 (15.4%) underwent regional lymphadenectomy. Patients undergoing lymphadenectomy had larger tumors (7.0vs4.8cm) and higher t-stage (30.9 vs. 17.6% T3+, $p < 0.001$ ). Node positivity rate was 12.0%. Median OS (50 months), and DSS (28vs.29 months) were similar between cohorts, but node-positive patients had decreased OS (20 months) and DSS (16 months, $p < 0.01$ ). Matched patients undergoing lymphadenectomy had equivalent unadjusted OS (46vs.43 months, $p=0.869$ ) and DSS (27vs.29 months,  $p=0.306$ ) to non-lymphadenectomy patients. The prognostic impact of node positive disease persisted after matching (OS 24 months, DSS 19 months,  $p < 0.01$ ). Adjusted overall mortality hazard was independently elevated in patients with N1 disease (1.71 unmatched, 1.56 matched, $p < 0.01$ ). Disease-specific mortality hazard was independently elevated at 1.40, $p < 0.01$  before matching, 1.25, $p=0.09$  after matching).  
**Conclusion:** Regional lymphadenectomy is seldom performed in patients undergoing surgery for HCC, but it provides useful prognostic information which persists when adjusted for T-stage. As the era of adjuvant therapy for HCC begins, surgeons should increasingly consider performing regional lymphadenectomy to facilitate optimal multidisciplinary management.



Survival comparison in HCC patients undergoing lymphadenectomy

## OL02-14

### SHOULD WE RESECT OR TRANSPLANT HEPATOCELLULAR CARCINOMA BEYOND UCSF CRITERIA?

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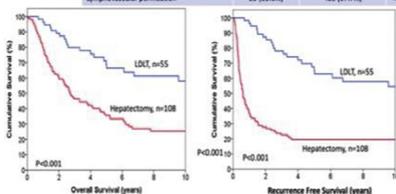
**Introduction:** Limited data is available on long-term outcomes after surgical treatment for advanced hepatocellular carcinoma(HCC). The aim of this study was to evaluate the perioperative and long-term outcomes after resection vs. living donor liver transplant(LDLT) for HCC beyond UCSF criteria.

**Methods:** This was a single-center retrospective study from 2000-2018. Data was collected from a prospective maintained dataset. All HCC patients who had tumor stage beyond UCSF criteria were included. Propensity score matching (PSM) at 1:2 was used to adjust for age, tumor number and size between the 2 groups.

**Results:** During study period, 55 and 721 patients underwent LDLT and resection for HCC beyond UCSF. Table 1 showed the patient demographic and tumor stage before/after PSM. There was no difference in hospital mortality (1.8% in LDLT, 0% in resection,  $p=0.810$ ) but LDLT patients had a higher risk of perioperative complication (38.5 vs. 17%,  $p=0.048$ ). Despite matching of age, tumor number and size, LDLT patients had better overall and recurrence free survivals. (Figure 1) at 1-, 3- and 5-year (OS: 96.4 vs. 80.2%, 79.8 vs. 46.4% and 68.7 vs. 35.6%) and (RFS: 96.4 vs. 37.6%, 78 vs. 22.6%, 65.2 vs. 19.5%).

**Conclusion:** LDLT offered better OS and RFS for HCC beyond UCSF criteria, and should be offered as a treatment option for advanced HCC.

Variables	Before PSM		P value	After PSM	
	LDLT (n=55)	Hepatectomy (n=721)		Hepatectomy (n=110)	P value
Age, years (median, range)	55 (32-73)	59 (13-84)	0.046	55 (16-84)	0.798
Gender (n, % male)	48/7	599 (83.1%)	0.392	98/12	0.730
AFP ng/ml (median, range)	39.0 (2-117850)	122 (1-1112000)	0.118	71.3 (1.9-53430)	0.330
MELD	11.2 (6-34)	7.5 (6-20)	<0.001	7.5 (6-16)	<0.001
Pre-transplant child Pugh score	6.0 (5-15)	5 (5-9)	<0.001	5.0 (5-8)	0.053
Tumor number (pathological) (n, %)			<0.001		0.375
1	9 (16.4%)	388 (53.8)		38 (34.5%)	
2	10 (18.2%)	92 (12.8)		18 (16.4%)	
3	9 (16.4%)	40 (5.5)		3 (2.7%)	
4 or more	27 (49.0%)	201 (27.9)		51 (46.4%)	
Tumor size (pathological) (median, range)	4.0 (1.2-19.5)	9.75 (1.4-28)	<0.001	4.5 (1.4-19.0)	0.502
Lymphovascular permeation	35 (63.6%)	488 (67.7%)	<0.001	72 (65.5%)	0.330



## OL02-15

### ALPPS VERSUS PVE IN HEPATITIS-RELATED HEPATOCELLULAR CARCINOMA- COMPARISON OF ONCOLOGICAL OUTCOMES

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**Introduction:** ALPPS has been popularised for future liver remnant (FLR) augmentation in liver metastasis or noncirrhotic liver tumors in recent years. Data on the oncological outcomes of ALPPS in chronic hepatitis or cirrhosis related HCC remained limited.

**Methods:** Consecutive patients received hepatectomy after future liver remnant (FLR) modulation by either ALPPS or PVE were recruited. Inclusion criteria were hepatitis B or C carrier, pathologically confirmed HCC and successful flow modulation. Data for clinicopathological details and oncological outcome were reviewed for ALPPS and compared with portal vein embolization (PVE).

**Results:** From 2002 to 2019, 126 patients with HCC underwent FLR modulation (54 ALPPS and 72 PVE) followed by hepatectomy. Hepatitis B surface antigenicity was positive in 112 patients. ALPPS induced absolute FLR volume

increment by 47.1%, or FLR estimated total liver volume by 11.7% in 6 days. No difference in morbidity (19.6% vs 31.4%,  $P=0.2$ ) and mortality (5.6% vs 5.8%,  $P=1.000$ ) with PVE was observed. Five-year overall survival for ALPPS and PVE was 52.8% and 61.8% ( $P=0.663$ ). The overall HCC recurrence rate was 50% and there was no significant difference between two groups (48.1% vs 51.4%,  $P=0.86$ ). Presence of vascular invasion ( $P=0.038$  OR 1.6 95%CI 1.03-2.74) and post-operative complication ( $P=0.008$  OR 1.95 95%CI 1.19-3.2) were the two independent factors associated with post-hepatectomy HCC recurrence.

**Conclusion:** No significant difference in HCC recurrence between two FLR modulation approach was demonstrated. ALPPS conferred a comparable efficacy and oncological outcomes in comparison to PVE

## OL02-16

### MOLECULAR VALIDATION OF THE 8TH EDITION AJCC CANCER STAGING SYSTEM IN PATIENTS WITH RESECTED PANCREATIC CANCER: PROPOSAL OF INTEGRATIVE TRANSLATIONAL STAGING SYSTEM

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**Introduction:** Even though the 8th edition AJCC cancer staging system for pancreatic cancer has validated with major clinicopathologic factors in multiple clinical cohorts, there is still an unmet need for integrative consideration using multi-omics data to stratify the patients with pancreatic cancer elaborately.

**Methods:** We performed a comprehensive analysis and profiling using genomic, transcriptomic, and proteomic data from TCGA-PAAD and other translational cohorts (4 cohorts,  $n=340$ ). Molecular features and major subtypes were analyzed mutually with clinical and pathologic factors, especially the 8th AJCC staging system.

**Results:** Aggressive molecular subtypes, basal-like and squamous subtype, were significantly associated with a higher nodal stage, but tumor size didn't show a clear association with molecular features. The activated stroma of pancreatic cancer microenvironment was significantly correlated with poor differentiation and large tumor size. The mutational pattern of KRAS and several transcriptomic pathways such as epithelial-mesenchymal transition and DNA repair were differently presented in each clinical stage from the 8th AJCC TNM staging system. The optimal algorithm was identified to show significantly higher performance for the prediction for cancer relapse and cancer-specific survival in discovery and validation cohorts. The in silico prediction for molecular target agents and immunotherapy were performed for final clusters from optimal stratification system revealed from the integrative analysis.

**Conclusions:** Our comprehensive multi-omics analysis reveals clear needs for the combination of clinical staging and molecular profiling and provides crucial evidence for precision strategy in patients with resectable pancreatic cancer.

OL02-18

### CONSENSUS MOLECULAR SUBTYPES REFLECTING DISTINCT CLINICAL PHENOTYPES OF HEPATOCELLULAR CARCINOMA: DECIPHERING RESECTABLE HEPATOCELLULAR CARCINOMA

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**Purpose:** Hepatocellular carcinoma (HCC) is a heterogeneous disease with therapeutic resistance even in the early stage. Current genomic subtyping systems reflect the heterogeneity of HCC, but its clinical use is hampered by discrepancies among different studies.

**Method:** By integrating 15 previously established genomic signatures for HCC subtypes, we identified five clinically and molecularly distinct consensus subtypes using transcriptomic data from 8 HCC cohorts with 1754 patients (Discovery set; n=1006, Validation set; n=748).

**Result:** We demonstrated five consensus subtypes of HCC showing distinct molecular and clinical features regarding STM, CIN, IMH, BCM, and DLP subtypes. Briefly, STM (STeM) is characterized by high stem cell features, vascular invasion, and sensitivity to sorafenib. CIN (Chromosome INstable) has moderate stem cell features, but high genomic instability and low immune activity. IMH (IMmune High) is characterized by high immune activity predicting possible responders for immunotherapies. BCM (Beta-Catenin with Male high predominance) is characterized by prominent beta-catenin activation, low miRNA expression, and hypomethylation. DLP (Differentiated and Low Proliferation) is differentiated with high HNF4A activity. Lastly, we developed and validated a robust predictor of integrated consensus subtype with subtype-specific serum biomarkers using integrative genomic and statistical analysis.

**Conclusion:** Consensus subtypes of HCC from the comprehensive genomic analysis showed distinct biological and clinical phenotypes, including different dependency for oncogenic pathways and discriminated therapeutic efficacy. Based on clinical relevance of consensus subtypes for current available therapeutic options in terms of molecular target therapies and immunotherapies, our findings may provide the foundation for rationalized biomarker-based clinical trials for resectable HCC.

OL02-19

### ROLE OF ROBOTIC LIVER RESECTION IN PATIENTS WITH HCC AND CLINICALLY SIGNIFICANT PORTAL HYPERTENSION

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**Introduction:** Clinically significant portal hypertension (CSPH) increases the risks of complications after surgery,

although a minimally invasive approach seems to improve outcomes. The aim of this work is to evaluate peri-operative and long-term outcomes in patients with and without CSPH who underwent robotic liver resection (RLR) for HCC.

**Methods:** This is a single center, retrospective study on prospectively collected data, including all consecutive patients treated for HCC with RLR from June 2014 to November 2019. Patients were divided in two groups, with and without CSPH.

**Results:** 76 patients were enrolled, 48 without CSPH and 28 with CSPH. No statistically significant differences were found in terms of complexity of liver resections ( $p=0,17$ ), operative time ( $p=0,20$ ), estimated blood loss ( $p=0,41$ ), conversion to laparotomy ( $p=0,27$ ) and intra-operative need of packed red blood cells ( $p=0,50$ ). No differences were found analyzing length of hospital stay ( $p=0,42$ ), length of intensive care unit stay ( $p=0,87$ ), post-operative complications ( $p=0,73$ ), and readmission rate at both 30-days ( $p=0,70$ ) and 90-days ( $p=0,78$ ). No cases of unresolved liver decompensation were registered.

**Conclusions:** Our study shows that robotic approach reduces the gap in terms of post-operative outcomes between CSPH and no-CSPH patients. RLR is safe in patients with preserved liver function or with a mild impairment (Child-Pugh A-B8) and CSPH. BCLC criteria should be implemented with a better defined role of minimally invasive liver surgery, to offer more radical treatments in this subgroup of patients.

OL02-21

### BLOCKADE OF CXCR4 IN HEPATOCELLULAR CARCINOMA CELL LINES INHIBIT ANGIOGENESIS IN VIVO USING XENOGRAFT MICE

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**Introduction:** Previously we identified SOX4 modulates the CXCL12 promoter in HCC cells, and CXCR4 in endothelial cells was regulated for tumor neovascularization in turn. This mechanism of angiogenesis via chemotaxis should be validated in animal study.

**Methods:** Hep 3B cells (BCRC 60434) were inoculated in Male BALB/c nude mice and the tumor size was observed twice week. at a cell density of  $2 \times 10^6$  in xenograft mice for 8-10 weeks and monitored for tumor growth with AMD3100 treatment or DMSO as vehicle control. The growth of tumors was compared via the SUVmax, SUVmean, metabolic tumor volume (MTV) and total lesion glycolysis (TLG) of the control and treated groups.

**Results:** In vitro study showed the tube formation and migration could be inhibited with AMD3100. PET images, representative via <sup>18</sup>F-FDG PET/CT, was shown in tumor activity images in whole-body coronal views. The MTV and TLG of the treated group showed significantly decreased values compared to those of the control group (MTV and TLG of control vs. treated,  $P < 0.05$ ). Reticulin and CD34 staining, but not SOX4 in tumor sections derived

from Hep3B cells treated with AMD3100 had significant decrease in angiogenesis.

**Conclusion:** These data showed that the CXCL12/CXCR4 axis was crucial for SOX4-mediated angiogenesis in vivo, which was blocked via its receptor antagonist, AMD3100.

#### OL02-22

### PREOPERATIVE INFLAMMATORY MARKERS AS PROGNOSTIC PREDICTORS AFTER HEPATOCELLULAR CARCINOMA RESECTION: DATA FROM A WESTERN TERTIARY REFERRAL CENTER

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**Background:** Recently, systemic inflammatory markers have been validated as preoperative risk factors for patients with hepatocellular carcinoma (HCC) in several eastern series. Our aim was to evaluate prognostic significance of neutrophil to lymphocyte ratio (NLR), platelet to lymphocyte ratio (PLR), monocyte to lymphocyte ratio (MLR) and prognostic nutritional index (PNI) after HCC curative resection.

**Methods:** From a prospective database, consecutive adult patients undergoing HCC resection were included from 2000 to 2018. Exclusion criteria were: extra-hepatic disease, R1/R2 resection, perioperative death, and other preoperative locoregional treatments. Prognostic index were calculated until 7 days before surgery. Optimal cut-offs for NLR, PLR, MLR and PNI were determined by plotting the Receiver Operator Curves (ROC) using the Youden index to determine the best cut-off. Overall survival (OS) and disease free survival (DFS) curves were calculated using the Kaplan-Meier method and compared with log-rank test.

**Results:** 162 patients with a mean age of  $62 \pm 11$  years were included. Based on the ROC curve, the optimal cut-offs for OS were NLR (1.715), PLR (115.05), MLR (1.750), and PNI (39.0). The optimal cut-offs for DFS were NLR (2.475), PLR (100.25), MLR (2.680), and PNI (48.2). High preoperative NLR ( $>1.715$ ) was associated with poor OS ( $P=0.018$ , Figure 1A). PLR, MLR and PNI were not predictors for OS. High NLR ( $>2.475$ ,  $P=0.047$ , Figure 1B) and PLR ( $>100.25$ ,  $P=0.028$ ) were significantly associated with poor DFS.

**Conclusions:** High preoperative NLR was a negative prognostic factor for OS and DFS, and high PLR was adversely associated with DFS following curative resection in HCC patients.

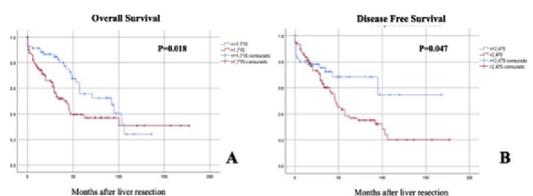


Figure 1: Kaplan-Meier survival curves comparing overall survival (A) and disease free survival (B)

#### OL02-23

### INCIDENCE OF CHOLANGIOCARCINOMA IN PATIENTS WITH HISTORY OF COLORECTAL CANCER. MULTICENTER EXPERIENCE

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**Introduction:** Cholangiocarcinoma (CCA) represents one the most common primary malignancy of the liver. Cirrhosis, HCV infection, Cholestatic diseases represent well known predisposing factors. Late diagnosis of CAA is associated with a poor prognosis. History of colorectal cancer (CRC) is supposed to be a risk factor.

**Method:** Data were retrospectively collected from two different HPB surgical centers in Italy (Ancona, Roma-Gemelli) to identify all patients with CCA and CRC between January 2000 to December 2018. All the data from patient history, surgical and oncological treatments were examined. Histopathological examination of both CCA and CRC characteristics were analysed. Genetics characteristics of both tumours were collected.

**Results:** A total of 26 patients developed biopsy-proven CCA after CRC. The median time between CRC and CCA diagnosis was 111,7 months. All the CRC were successfully treated with surgery and 5 patients underwent adjuvant chemotherapy. Median age at the CCA diagnosis was 66,8 years. 23 (88,4%) patients underwent R0 surgical treatment. 3 patients underwent palliative treatments. After a median followup of 73,4 months, 5 years survival was 61,5%.

**Conclusions:** To our knowledge, this is the largest series of patients with CCA and CRC. Treatment can allow a significant 5 year survival. It is also mandatory a follow up for CAA in CRC patients.

#### OL02-24

### PREDICTION OF FUTILITY IN RUPTURED HEPATOCELLULAR CARCINOMA

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**Introduction:** Prognosis of ruptured hepatocellular carcinoma(HCC) was often poor despite aggressive treatment.- This study aimed to identify factors that predict futility in ruptured HCC.

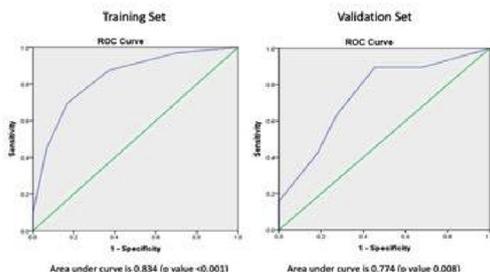
**Method:** A retrospective analysis of all ruptured HCC patients from 2003-2016 was performed. Significant predictors for hospital mortality was analyzed using Cox regression and predictive performance was assessed using receiver operating characteristics(ROC) curve. The scoring system was subsequently validated in a prospective observational study from 2017-2019.

**Results:** The training set consisted of 315 ruptured HCC patients with overall hospital mortality=137/315(43.5%). Transarterial embolization was the mainstay of treatment(145/315,46%) and 51(16.2%) received surgical treatment. Comparison of baseline characteristics between patients with/without hospital mortality was listed in table 1. In multivariate analysis, MELD>14[HR 7.322(4.128-12.988), bilobar HCC[HR 2.555(1.383-4.719),p=0.003], known history of HCC[HR 3.129(1.771-5.529),p< 0.001] and complicated by variceal bleeding[HR 53.414(5.919-481.999),p< 0.001] were significant predictors for hospital mortality. With such scoring system, the ROC curve of training set was in Figure 1(AUC=0.834,p< 0.001). It was validated prospectively from 2017-2019 with 70 patients. Hospital mortality was similar(27/70,38.6%). The median age was 62(32-89) year old and most had hepatitis B related HCC (52/70,74.3%). Rupture was the first clinical presentation in 20(28.6%) patients. The median MELD was 13.33(6-29) and 15(36.6%) presented with shock. The median size of HCC was 12.3(6-29) and most patients had multifocal disease. The area under curve was 0.823(0.719-0.926),p< 0.001 in validation cohort.(Figure 1) When the score was >5, patients had 100% hospital mortality.

**Conclusions:** The scoring system(>5) accurately predicted hospital mortality after ruptured HCC. It could be used to guide treatment intervention and resuscitation in this population.

Table 1. Clinical and tumor characteristics of all patients				
	Overall (n=315)	No hospital mortality (n=178)	Hospital mortality (n=137)	P value
History of HCC vs. 1 <sup>st</sup> presentation (n,%)	143(172)	51(28.7)-127(71.3)	92(67.2)-45(32.8)	<0.001
Age (years)	59 (32-92)	58 (32-88)	61 (35-92)	0.110
Sex (male, n,%)	251(64)	145(33)	106(31)	0.371
HBV (n,%)	234 (74.3%)	128 (71.9%)	106 (77.4%)	0.016
BMI (kg/m <sup>2</sup> , median, range)	23.0 (14.4-33.7)	22.2 (14.4-33.7)	23.8 (18.9-32.6)	0.082
Era 1 2003-2009 (n,%)	155 (49.2%)	86 (48.3%)	69 (50.4%)	0.72
Era 2 2010-2016 (n,%)	160 (50.8%)	92 (51.7%)	68 (49.6%)	
Time from HCC diagnosis (months)	0.7 (0-101.4)	0.2 (0-101.4)	2.0 (0-80.4)	<0.001
MELD (median, range)	12.53 (6-46)	10.57 (6-30)	17.93 (7-46)	<0.001
Platelet (median, range)	205 (12-1023)	191 (41-529)	218 (12-1023)	0.036
INR (median, range)	1.2 (0.9-4.6)	1.2 (0.9-3.7)	1.4 (0.9-4.6)	<0.001
Tumor size (median, range)	11.1 (1.4-22)	10 (1.7-22)	11.1 (1.4-21)	0.022
>=3 tumor (n,%)	185 (58.7)	82 (46.1)	103 (75.2)	<0.001
Bilobar disease (n,%)	194 (61.6)	94 (52.8)	100 (73)	<0.001
Vascular invasion (n,%)	105 (33.3)	53 (29.8)	52 (38.0)	0.127
Extrahepatic disease (n,%)	71 (22.5)	33 (18.5)	38 (27.7)	0.053
Variceal bleed within same admission (n,%)	18 (5.7%)	1 (0.6)	17 (12.4)	<0.001

$$\text{Score} = 2 * (\text{meld} > 14) + 4 * (\text{with GIB}) + 1 * (\text{Bilobar}) + 1 * (\text{known history of HCC})$$



## OL03 - Liver: Surgical Outcomes

### OL03-01

#### NONINVASIVE MARKERS (ALBI AND APRI) PREDICT POST-HEPATECTOMY LIVER FAILURE IN PATIENTS WITH HEPATOCELLULAR CARCINOMA

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**Backgrounds and aims:** Post-hepatectomy liver failure (PHLF) remains the primary cause of in-hospital mortality after hepatectomy. Identifying the predictors of PHLF is important to improve surgical safety. We aimed to identify predictive accuracy of two noninvasive markers, albumin-bilirubin (ALBI) and aspartate aminotransferase to platelet count ratio index (APRI), for predicting PHLF in patients with hepatocellular carcinoma (HCC).

**Methods:** Patients treated with HCC resection from 2013 to 2016 at 7 Chinese hospitals were retrospectively analyzed. The independent predictors of PHLF were identified by univariable and multivariable analyses and further were used for the construction of preoperative and postoperative nomogram models. Receiver operating characteristic (ROC) curves of these two predictive models, and ALBI, APRI, Child-Pugh, model for end-stage liver disease (MELD) scores were constructed to compare their predictive accuracy for PHLF.

**Results:** Of the 767 patients included, 102 (13.3%) experienced PHLF. Multivariable logistic regression analysis identified that high ALBI grade (>2.6) and high APRI grade (>1.5) were independent risks of PHLF in both preoperative and postoperative models. Two nomogram predictive models and corresponding web-based calculators were subsequently constructed. The areas under the ROC curves of the postoperative and preoperative models, APRI, ALBI, MELD and Child-Pugh scores in predicting PHLF were 0.844, 0.789, 0.626, 0.609, 0.569, and 0.560, respectively.

**Conclusion:** ALBI and APRI showed more accurate ability for predicting PHLF than Child-Pugh and MELD. We established two online calculators combining ALBI and APRI, which could be useful for individually predicting the occurrence of PHLF in HCC patients.

**Figure.** Receiver operating characteristic curves of preoperative and postoperative predictive models, and albumin-bilirubin (ALBI), aspartate transaminase to platelet ratio index (APRI), Child-Pugh and MELD scores for predicting post-hepatectomy liver failure (PHLF). AUC, area under the curve; CI, confidence interval.

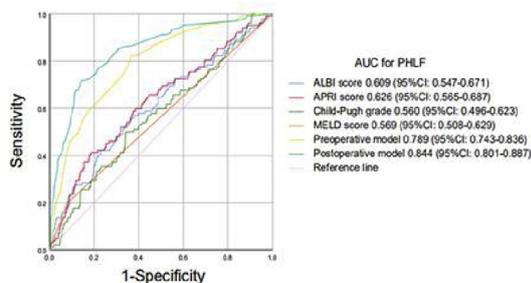


Figure. AUC for Major Morbidity PHLF

### OL03-02 ASSOCIATION OF POSTOPERATIVE MORBIDITY WITH SURVIVAL AND RECURRENCE FOLLOWING HEPATECTOMY FOR HEPATOCELLULAR CARCINOMA: A LARGE-SCALE MULTICENTER STUDY

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**Background and aims:** Postoperative morbidity following hepatectomy for hepatocellular carcinoma (HCC) is common and its impact on oncological outcome remains unclear. To investigate if postoperative morbidity impacts long-term survival and recurrence after HCC resection.

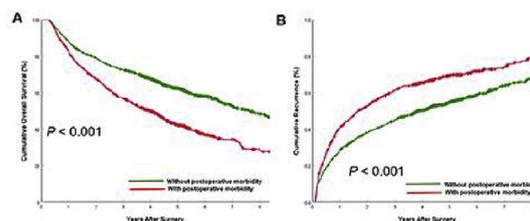
**Methods:** A multicenter database of curative-intent hepatectomy for HCC collected data from 10 Chinese hospitals. After excluding patients with postoperative early deaths ( $\leq 90$  days), early ( $\leq 2$  years) and late ( $> 2$  years) recurrence rates, overall survival (OS), and time-to-recurrence (TTR) were compared between patients with and without postoperative morbidity.

**Results:** Among 2,161 patients eligible for the study, 758 (35.1%), 29 (1.3%) and 67 (3.1%) had postoperative 30-day morbidity, 30-day mortality and 90-day mortality, respectively. Multivariable analysis showed that diabetes mellitus, obesity, Child-Pugh grade B, cirrhosis, and intraoperative blood transfusion were independent risks of postoperative morbidity. The rates of early and late recurrence among patients with postoperative morbidity were greater than those without (50.7% vs. 38.8%,  $P < 0.001$ ; and 41.7% vs. 34.1%,  $P = 0.017$ ). Postoperative morbidity

was associated with a significant reduction in median OS (48.1 vs 91.6 months;  $P < 0.001$ ) and median TTR (19.8 vs 46.1 months;  $P < 0.001$ ). After adjustment of confounding factors, multivariable Cox-regression analyses showed that postoperative morbidity was associated with a 27.8% and 18.7% greater likelihood of mortality (HR 1.278; 95% confidence interval: 1.126-1.451) and recurrence (1.187; 1.058-1.331).

**Conclusions:** This large multicenter study provides strong evidence that postoperative morbidity adversely impacts long-term oncologic outcomes after hepatectomy for HCC. The prevention and management of postoperative adverse events may be oncologically important.

**Figure.** Cumulative incidence of overall survival (A) and recurrence (B) curves comparisons between patients with and without postoperative 30-day morbidity.



### OL03-03 REPEAT HEPATECTOMY FOR EARLY AND LATE RECURRENCE OF HEPATOCELLULAR CARCINOMA: A MULTICENTER STUDY WITH PROPENSITY SCORE MATCHING ANALYSIS

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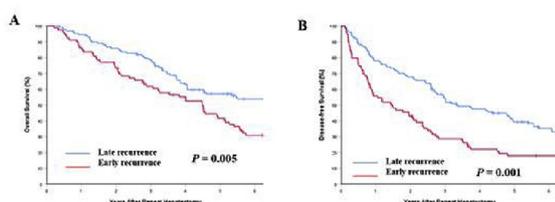
**Background:** Repeat hepatectomy is a feasible treatment for intrahepatic recurrence after hepatectomy of hepatocellular carcinoma (HCC), yet the survival benefit remains ill-defined. The current study was to define long-term oncologic outcomes after repeat hepatectomy among patients with early recurrence ( $\leq 1$  year after initial hepatectomy) and late recurrence ( $> 1$  year).

**Methods:** Patients undergoing curative-intent repeat hepatectomy for recurrent HCC were identified using a multi-institutional database. Patient clinical characteristics, overall survival (OS) and disease-free survival (DFS) were compared among patients with early and late recurrence before and after propensity score matching (PSM).

**Results:** Among all the patients, 81 and 129 had early and late recurrence from which 74 matched pairs were included in the PSM analytic cohort. Before PSM, 5-year OS and DFS following resection of an early recurrence were 41.7% and 17.9%, respectively, which were worse compared with patients who had resection of a late recurrence (57.0% and 39.4%, both  $P < 0.01$ ). After PSM, 5-year OS and DFS among patients with early recurrence were worse compared with patients with late recurrence (41.0% and 19.2% vs. 64.3% and 43.2%, both  $P < 0.01$ ). After adjustment for other confounding factors on multivariable Cox-regression analysis, early recurrence remained independently associated with decreased OS and DFS (HR 2.22, 95% CI 1.35-3.34, and HR 1.86, 95% CI 1.26-2.74).

**Conclusion:** Repeat hepatectomy for early recurrence was associated with worse OS and DFS compared with late recurrence. These data may help inform patient and selection of patients being considered for repeat hepatectomy of recurrent HCC.

**FIGURE.** Cumulative incidence of overall survival (A) and disease-free survival (B) curves comparisons between patients with early recurrence and late recurrence after repeat hepatectomy in the entire cohort.



**OL03-05**  
**LIGATING THE CORRESPONDING INFLOW AND OUTFLOW VESSELS DURING HEPATECTOMY: A PROSPECTIVE RANDOMIZED CONTROLLED TRIAL AND ANIMAL STUDY**

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**Background:** We have devised a simple bleeding control technique ligating the corresponding inflow and outflow vessels without hilus dissection before the parenchyma transection during hepatectomy. The main objective of this study is to investigate the role of this simple technique on postoperative metastasis and survival.

**Methods:** During the past 10 years, 330 patients with primary HCC were performed hepatectomy with the new hemorrhage control technique, and prospective randomized controlled trial was applied. Circulating tumor cells (CTC) were detected in 24 hours postoperatively. We further applied a mice model ligating the pedicle of the lesion-located hepatic lobe before hepatectomy to imitate the clinic practice, and evaluated the role of the new technique on postoperative metastasis and survival.

**Results:** The new technique prolonged postoperative overall and disease-free survival for patients with primary HCC, and

reduced the number of circulating CTC postoperatively, when compared with the conventional hepatectomy. In the animal model, hepatectomy with the new technique showed lower metastasis, and longer survival when compared with conventional surgery. Human specific-AFP expressed at a high level in the serum of the metastasis bearing mice, but not expressed in metastasis-free mice.

**Conclusion:** Ligating the inflow and outflow vessels of the lesion-located hepatic lobe before hepatectomy reduces postoperative metastasis and prolongs survival of primary HCC. These results also indicate a potential mechanism that the new technique prevents hematogenous metastasis owing to its coincidence to principles of oncological surgery to avoid the intraoperative spread of tumour cells during hepatectomy.

**OL03-06**  
**RECOMMENDED MINIMAL NUMBER OF HARVESTED LYMPH NODES FOR INTRAHEPATIC CHOLANGIOCARCINOMA**

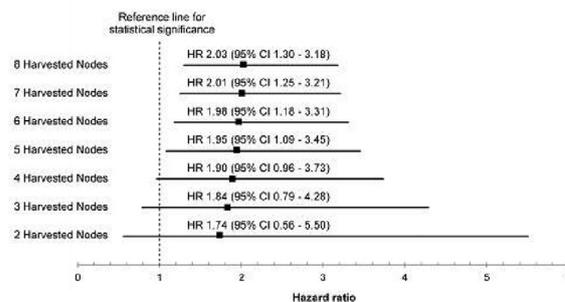
S. H. Kim, D. H. Han, G. H. Choi, J. S. Choi and K. S. Kim  
 Hepatobiliary and Pancreatic Surgery, Yonsei University College of Medicine, Republic of Korea

**Background:** Lymph node (LN) metastasis is one factor indicating a poor prognosis after radical surgery for intrahepatic cholangiocarcinoma (ICC). Although several guidelines have recommended that LN dissection be strongly considered at the time of ICC surgery, no clear evidence regarding the appropriate number of harvested LNs has been established. Thus, we aimed to identify the minimum number of harvested LNs required for ICC by using a Bayesian Weibull model.

**Methods:** Data from 142 patients who underwent radical hepatectomy (R0) for ICC from January 2000 to December 2018 were retrospectively reviewed. A Bayesian Weibull model was developed to analyze the effect of number of harvested LNs on survival of patients without (N0; n=71) and with (N1; n=71) metastatic nodes. We also compared the percentage of N1 patients (i.e., the N1 rate) in each of five subgroups categorized according to the number of harvested LNs (1-4, 5-8, 9-12, 13-16, and  $\geq 17$ ).

**Results:** In patients with 5 or more harvested LNs, the hazard ratio (HR) for LN metastasis was above the reference line (the HR with 5 harvested LNs: 1.95 [1.09-3.45]). The N1 rate of the 1-4 harvested LNs subgroup was lower than that of the other subgroups (e.g., 1-4 vs. 5-8: 16.1% vs. 39.4%,  $p=0.014$ ).

**Conclusion:** Our results suggest that at least 5 LNs should be harvested in patients who undergo radical surgery for ICC to promote accurate staging and potentially improve survival.



Hazard ratio of lymph node metastasis according to the number of harvested lymph nodes

Node number	Node status	5-year survival (%)	95% CI	Hazard ratio	95% CI
Actual survival	N0	50.5	38.0 - 67.0	2.07	1.33 - 3.21
	N1	30.7	20.5 - 46.1		
4 harvested LN	N0	56.7	39.9 - 71.7	1.90	0.96 - 3.73
	N1	34.0	18.7 - 51.7		
5 harvested LN	N0	56.0	42.0 - 69.1	1.95	1.09 - 3.45
	N1	32.5	19.4 - 47.8		
6 harvested LN	N0	55.5	43.1 - 67.5	1.98	1.18 - 3.31
	N1	31.3	19.8 - 45.0		

Results from the Bayesian Weibull Proportional Hazard Model

### OL03-07

#### PORTAL VEIN EMBOLIZATION FOR HEPATOCELLULAR CARCINOMA: A PROPENSITY SCORE MATCHING ANALYSIS

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**Introduction:** Portal vein embolization (PVE) increased the size of future liver remnant (FLR) which allowed patients became operable due to inadequate volume. The aim of the study is to review the outcome of patients who had undergone PVE and hepatectomy for hepatocellular carcinoma (HCC).

**Methods:** Patients received hepatectomy for HCC from January 2002 to December 2018 in single centre were reviewed. PVE Patients who had FLR < 30% of estimated standard liver volume (ESLV) would be included. Patients with PVE were compared with patients without. PSM matching was performed in 1:10 for comparison.

**Results:** There were total 1433 patients. 1371 patients had undergone hepatectomy alone (nPVE) and 62 patients had PVE. PVE patients had FLR < 30%. The FLR had increased significantly after PVE ( $p < 0.001$ ). PVE patients had more major liver resections ( $p < 0.001$ ). They had more blood loss ( $p = 0.025$ ) and longer operative time ( $p < 0.001$ ). They also had more ( $p = 0.013$ ) and bigger tumors ( $p = 0.001$ ). There was no difference in the disease-free and overall survival. A PSM analysis was performed and 682 patients in nPVE were identified. There was no difference in comorbidities, and liver function. More patients received major resection in PVE group ( $p < 0.001$ ), but there was no difference in intra- and post-operative outcome, so as the pathology. The disease-free survival was better in PVE group (PVE 24.6 vs 15.3 months, 5-year 45.4% vs 34.0%,  $p = 0.032$ ).

**Conclusions:** PVE not only had increased the resectability of HCC in patients with small FLR, patients also had better disease-free survival.

### OL03-08

#### CLINICAL SCORING MODEL DETERMINES SURGICAL MODALITY FOR SOLITARY AND SMALL HEPATOCELLULAR CARCINOMA WITH CHILD-PUGH A LIVER FUNCTION

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**Introduction:** Previous study indicated that clinical scoring model (CSM) could accurately predict the severity of cirrhosis. This study aimed to compare the therapeutic efficacy of liver resection (LR) and percutaneous microwave coagulation therapy (PMCT) for solitary and small hepatocellular carcinoma (HCC) using CSM.

**Methods:** In this study, 228 patients with single HCC  $\leq 3$  cm and Child-Pugh A liver function were retrospectively reviewed. Among these patients, 131 patients underwent LR, and 97 patients received PMCT. The short and long-term outcomes were compared between the two procedures. **Results:** There was no 90-days mortality in either group. Major complications were significantly more frequent in the LR group compared to the PMCT group (18.8% vs 4.6%,  $p = 0.003$ ). The 1-, 3-, and 5-year overall survival (OS) rates for the LR group and PMCT group were 97.2%, 91.6%, 65.2% and 90.1%, 72.4%, 42%, respectively ( $p = 0.006$ ). The 1-, 3-, and 5-year disease-free survival (DFS) rates for the LR group and PMCT group were 95.4%, 74.5%, 51.7% and 83.4%, 51.2%, 31.5%, respectively ( $p = 0.004$ ). Nevertheless, subgroup analyses suggested that HCC patients with CSM score  $\geq 4$ , PMCT may provide long-term outcomes that are similar to LR and lower complications.

**Conclusions:** LR may provide better OS and DFS rates than PMCT for solitary HCC  $\leq 3$  cm and Child-Pugh A liver function. PMCT should be optimal choice for HCC patients with CSM score  $\geq 4$ .

### OL03-09

#### IMPACT OF PERIOPERATIVE STEROID ADMINISTRATION IN PATIENTS UNDERGOING MAJOR HEPATECTOMY (RCT)

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**Objective:** To evaluate the clinical benefit of perioperative steroid administration for major hepatectomy with extrahepatic bile duct resection.

**Background:** To date, 5 randomized controlled trials have assessed the clinical benefit of perioperative steroid administration in hepatectomy. However, all of these studies involved a substantial number of "minor" hepatectomies. The benefit of steroid administration for patients undergoing "complicated" hepatectomy such as major hepatectomy with extrahepatic bile duct resection is still unclear.

**Methods:** Patients with suspected hilar malignancy scheduled to undergo major hepatectomy with extrahepatic bile

duct resection were randomized into the control or steroid group. The steroid group received 500mg hydrocortisone immediately before hepatic-pedicle clamping, followed by 300mg hydrocortisone on postoperative day (POD) 1, 200mg on POD 2, and 100mg on POD 3. The control group received only physiologic saline. The primary endpoint was the incidence of postoperative liver failure.

**Results:** A total of 94 patients were randomized to the control (n=46) or steroid (n=48) group. There were no between-group differences in the baseline characteristics. There were no significant differences between the groups in the incidence of grade B/C postoperative liver failure (control group, n=8, 17%; steroid group, n=4, 8%; P=0.188) and other complications. Serum bilirubin levels on PODs 2 and 3 were significantly lower in the steroid group than those in the control group; however, these median values were within normal limits in both groups.

**Conclusion:** Perioperative steroid administration did not reduce the risk of postoperative complications, including liver failure following major hepatectomy with extrahepatic bile duct resection.

### OL03-10

#### AGE-ADJUSTED CHARLSON-COMORBIDITY INDEX PREDICTS SHORT-TERM AND LONG-TERM OUTCOMES AFTER HEPATIC RESECTION OF HEPATOCELLULAR CARCINOMA

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**Objective:** This study aimed to evaluate the predictive value of Age-adjusted Charlson Comorbidity Index (ACCI) on outcomes after hepatic resection for hepatocellular carcinoma (HCC).

**Methods:** The subjects were 763 patients who underwent hepatic resection for HCC. The ACCI scores were grouped into 2 categories : ACCI  $\leq 4$  (n=725) and ACCI  $\geq 5$  (n=38). The Outcome variables included postoperative complication (Clavien-Dindo classification  $\geq 3$ ) and overall survival. We used multivariable logistic regression analysis and multivariate Cox proportional hazards model to compare the incidence rate of postoperative complication and overall survival between patients with ACCI  $\leq 4$  and ACCI  $\geq 5$ .

**Results:** Patients with ACCI  $\geq 5$  had a significant higher proportion of postoperative complications than those with ACCI  $\leq 4$  (28.9% vs. 12.7%, p = 0.0043), respectively. The 3-, 5-, 7- year overall survival rates were 78%, 65%, and 51% in ACCI  $\leq 4$  group, and 69%, 49%, and 29% in ACCI  $\geq 5$  group (p = 0.012). Multivariate analyses revealed that the odds ratio for postoperative complications and the hazard ratio for overall survival of ACCI  $\geq 5$  group with reference to ACCI  $\leq 4$  group were 3.37 (p = 0.0020) and 1.82 (p = 0.0028), respectively. The distribution of deaths due to HCC-related, liver-related, and other causes were 65.4%, 12.1%, and 22.5% in ACCI  $\leq 4$  group, 27.3%, 9.1%, and 63.6% in ACCI  $\geq 5$  group (p < 0.001).

**Conclusions:** ACCI predicted the short-term and long-term outcomes after hepatic resection of HCC.

### OL03-11

#### PREOPERATIVE RISK ASSESSMENT FOR LOSS OF INDEPENDENCE AFTER HEPATIC RESECTION IN ELDERLY PATIENTS: A PROSPECTIVE MULTICENTER STUDY

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**Backgrounds:** Hepatic resection often results in loss of independence in preoperatively self-sufficient elderly people. Elderly patients should therefore be carefully selected for surgery. However, a preoperative risk assessment method for loss of independence after hepatic resection has not been established.

**Methods:** In this prospective, multicenter study, 347 independently-living patients aged  $\geq 65$  years, scheduled for hepatic resection, were divided into study (n=232) and validation (n=115) cohorts. We investigated the risk factors for postoperative loss of independence in the study cohort and verified our findings with the validation cohort. Loss of independence was defined as transfer to a rehabilitation facility, discharge to residence with home-based healthcare, 30-day readmission for poor functionality, and 90-day mortality (except for cancer-related deaths).

**Results:** In the study cohort, univariate and multivariate analyses indicated that frailty, age  $\geq 76$  years, and open surgery were independent risk factors for postoperative loss of independence. Proportions of patients with postoperative loss of independence in the study and validation cohorts were respectively 3.0% and 0% among those with no applicable risk factors, 8.1% and 12.5% among those with one applicable risk factor, 25.5% and 25.0% among those with two applicable risk factors, and 56.3% and 50.0% among those with all three factors applicable (P < 0.001 for both cohorts). Areas under the receiver operating characteristic curves for the study and validation groups were 0.777 and 0.783, respectively.

**Conclusions:** Preoperative risk-assessments using these three factors may be effective in predicting and planning for postoperative loss of independence after hepatic resection in elderly patients.

OL03-12

### EARLY VERSUS LATE RECURRENCE OF HEPATOCELLULAR CARCINOMA AFTER SURGICAL RESECTION BASED ON POST-RECURRENCE SURVIVAL: AN INTERNATIONAL MULTI-INSTITUTIONAL ANALYSIS

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**Introduction:** To define early versus late recurrence based on post-recurrence survival (PRS) among patients undergoing curative resection for hepatocellular carcinoma (HCC).

**Method:** Patients who underwent curative-intent resection for HCC between 2000 and 2017 were identified from an international multi-institutional database. The optimal cut-off time point to discriminate early versus late recurrence was determined relative to PRS.

**Results:** Among 1,004 patients, 443 (44.1%) patients experienced recurrence with a median recurrence-free survival time of 12 months. A cut-off time point of 8 months was defined as the optimal threshold based on sensitivity analyses relative to PRS for early (n=165, 37.2%) versus late relapse (n=278, 62.8%)(p=0.008). Early recurrence was associated with worse PRS (median PRS, 27.0 vs. 43.0 months, p=0.019), as well as Overall survival (OS) (median OS, 32.0 versus 74.0 months, p< 0.001) versus late recurrence. In addition, patients who recurred early were more likely to recur at extra- ± intrahepatic (35.5% vs. 19.8%, p=0.003) sites. Patients undergoing curative re-treatment of late recurrence had a comparable OS with patients who had no recurrence (median OS, 139.0 vs. 140.0 months); patients with early recurrence had inferior OS after curative re-treatment versus patients with no recurrence (median OS, 69.0 vs. 140.0 months, p=0.036), yet still better than patients who received palliative treatment for early recurrence (median OS, 69.0 vs. 21.0 months, p< 0.001).

**Conclusions:** Eight months was identified as the cut-off value to differentiate early versus late recurrence. Curative-intent treatment for recurrent intrahepatic tumors was associated with reasonable long-term outcomes.

OL03-14

### SURVIVAL OUTCOME OF TWO OR MORE RESECTIONS OF RECURRENCE WITH OR WITHOUT EXTRAHEPATIC DISEASE AFTER FIRST CURATIVE RESECTION FOR COLORECTAL LIVER METASTASES

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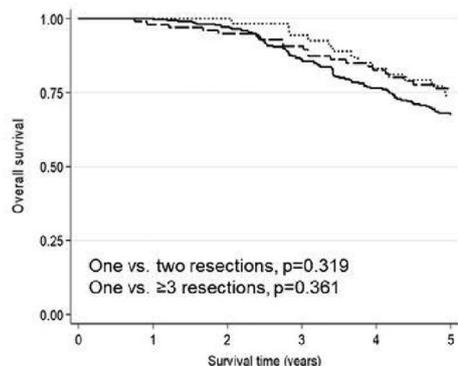
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**Introduction:** Recurrence is common after hepatectomy for colorectal liver metastases (CLM). We sought to determine the oncologic impact of resection for recurrent disease after curative hepatectomy for CLM.

**Methods:** Clinicopathologic characteristics of 3160 patients undergoing initial hepatectomy for CLM during 1998-2016 at two academic institutions were collected. Patients with incomplete resection or synchronous extra-hepatic disease were excluded. Overall survival (OS) was analyzed using Kaplan-Meier method and a Cox proportional hazards model.

**Results:** A total of 2160 patients met the inclusion criteria. Of these, 1456 patients (67.4%) recurred and 478 patients (32.8%) underwent resection of recurrent disease. Resection of recurrent disease resulted in significantly increased 5-year OS compared to no resection (70.2% vs. 24.0%; p< 0.001). 5-year OS did not differ by number of resections (one 67.7% vs. two 76.3%; p=0.319) (one vs. ≥3 73.2%; p=0.361) (Figure 1). Pattern of recurrence after initial hepatectomy significantly impacted 5-year OS for patients who underwent resection of single recurrent disease, with 5-year OS of 81.6% for lung resection vs. 64.3% for liver resection (p=0.028) vs. 54.1% for resection of other sites (p< 0.001).

**Conclusions:** Resection of recurrent disease significantly improves survival for patients who underwent curative hepatectomy CLM, regardless of number of resections. Surgical management of recurrent disease should be strongly considered for patients who have undergone initial hepatectomy for CLM.



No. at risk	0	1	2	3	4	5
One resection	322	322	304	240	193	153
Two resections	99	97	92	81	70	57
≥ three resections	57	57	57	50	43	37

Overall survival by number of resections for recurrent disease

OL03-16

### SURVIVAL OUTCOMES OF PATIENTS WITH RESECTED COLORECTAL LIVER METASTASES BASED ON THE TUMOUR BURDEN SCORE

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**Background:** The tumour burden score (TBS) is a novel prognostic model for patients undergoing hepatic resection

of colorectal liver metastases based on the Metro-ticket paradigm. The aim of this study is to apply the TBS model to evaluate the survival outcomes in an Australian population.

**Method:** All patients who had undergone curative-intent liver surgery for colorectal liver metastases from 2006 were identified from the South Australian Clinical Registry for Metastatic Colorectal Cancer. Preoperative imaging and postoperative pathology were calculated using the Pythagorean theorem whereby  $[TBS^2 = (\text{maximum tumour diameter})^2 \times \text{number of liver lesions}]^2$ . Patients were stratified into 3 groups; zone 1:  $TBS < 3$ , zone 2:  $TBS \geq 3$  to 9, and zone 3:  $TBS > 9$ .

**Results:** A total of 510 patients met inclusion criteria. The overall 5-year survival was 52.3%. An incremental worsening of 5-year survival was noted as TBS increased. 5-year survival for preoperative CT TBS zones 1 [n = 210 (41.2%)], 2 [n = 282 (55.3%)] and 3 [n = 18 (3.5%)] were 60.9%, 48.0% and 18.2% respectively;  $P < 0.001$ . 5-year survival for postoperative pathology TBS zones 1 [n = 143 (28.0%)], 2 [n = 339 (66.5%)] and 3 [n = 28 (5.5%)] were 64.8%, 47.6% and 44% respectively;  $P = 0.002$ . 5-year survival for imaging-based TBS and pathology-based TBS were comparable.

**Conclusion:** The TBS model has good discriminatory ability for survival in patients undergoing hepatic resection of colorectal liver metastases. This model may facilitate patients selection for surgery and further systemic treatment.

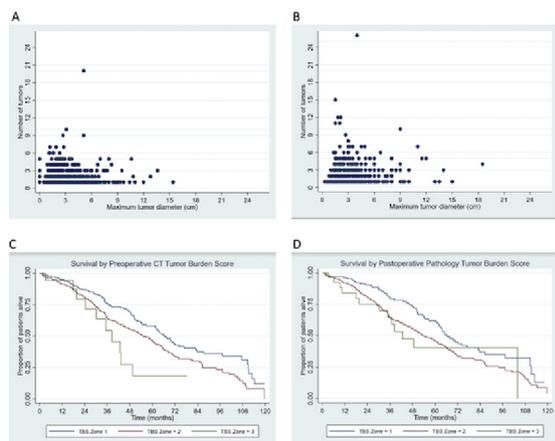


FIGURE 1. Distribution according to TBS model and overall survival stratified by TBS

### OL03-19

## MAJOR LAPAROSCOPIC VERSUS OPEN RESECTION FOR HEPATOCELLULAR CARCINOMA: A PROPENSITY SCORE-MATCHED ANALYSIS BASED ON SURGEON LEARNING CURVE

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**Introduction:** We aim to compare perioperative and long-term outcomes of laparoscopic and open surgery based on surgeon learning curve for laparoscopic liver resection (LLR) after propensity score-matched analysis (PMS).

**Methods:** A retrospective study of all patients with histologic diagnosis of hepatocellular carcinoma who underwent major hepatectomy between January 2013 and December 2018. A PMS analysis was used to compare the LLR and open major liver resection (OLR) before and after the learning curve was maximized.

**Results:** Among 405 patients, 106 underwent LLR and 299 underwent OLR; 79 were women and 326 were men. The mean age was 57.7 years. The learning curve was maximized after 42 cases. Compared to OLR, LLR had more liver-related injury and grade  $\geq 3$  complications during the learning phase. The LLR group had less blood loss, fewer transfusion requirements, and fewer liver-related injuries during the experienced phase. Hospital stay was significantly shorter during and after maximization of the learning curve in LLR compared to OLR. Operative time was comparable in the two phases. Overall, LLR was associated with less blood loss, fewer complications, and shorter hospital stay compared to open surgery. There was no significant difference in long-term survival outcomes between the two groups.

**Conclusions:** LLR was associated with higher incidence of liver-related complications during the surgeon's learning phase compared to the open approach. This association was significantly diminished with surgeon experience. Overall perioperative outcomes such as estimated blood loss, surgical complications, and hospital stay remained better for LLR compared to OLR.

Variable	OLR (n = 83)	LLR (n = 83)	P value
Operative time, minutes, mean (SD)	299.9 ± 0.95	303.8 ± 107.5	0.823
Blood transfusion, n (%)	10 (12%)	5 (6%)	0.179
Overall morbidity, n (%)	56 (68.3)	36 (43.4)	0.001
Clavien-Dindo classification, n (%)			0.005
Grade I/III	50 (60.2%)	31 (37.3%)	
Grade III/IV/V	6 (7.3%)	7 (8.4%)	
Liver failure, n (%)	7 (8.4%)	6 (7.2%)	0.773
Bile leak, n (%)	1 (1.2%)	3 (3.6%)	0.311
LOH, days, mean (SD)	11.3 ± 6.4	9.5 ± 5.9	0.046

Overall perioperative outcomes of laparoscopic and open liver resection groups after propensity score matching

### OL03-20

## TIME OF PULMONARY COMPLICATION AND RELATED FAILURE TO RESCUE AFTER LIVER SURGERY

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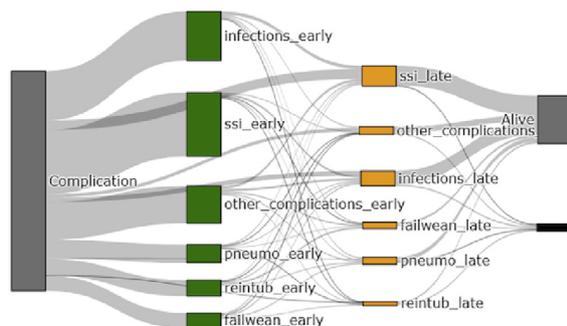
**Introduction:** Liver surgery is associated with adverse changes in respiratory function (i.e. vital capacity reduction, hypoxemia, respiratory muscle damage and atelectasis).

These factors interact with pre-existing comorbidities and postoperative pain to create a risk of pneumonia and respiratory failure, which may result in death.

**Methods:** Patients who underwent liver resections from the ACS-NSQIP Project between 2005 and 2017 were included in the analysis. Morbidity and in-hospital mortality were determined according with early ( $\leq 5$  post-operative days [PODs]) and late ( $>5$  PODs) occurrence.

**Results:** Among the 36,643 patients included in the registry, the incidence of complications increased from 16% (n=3,509) among partial hepatectomy patients to 33% (n=972) among trisegmentectomy patients. Among the 1,007 patients who had pneumonia (15% of complications), 792 (79%) patients had an early-pneumonia compared with 215 (21%) patients who had a late-pneumonia. While early-pneumonia was associated with factors related to surgery (operative time  $>360$  minute, odds ratio [OR], 1.83, 95% CI:1.54-2.17; trisegmentectomy, OR=1.51, 95%CI:1.18-1.92) and patient characteristics (history of congestive heart failure, OR=3.03, 95%CI:1.29-6.18; severe COPD, OR=2.70, 95% CI:2.05-3.52; and sepsis prior to surgery, OR=2.17; 95% CI:1.40-3.22), occurrence of early infective complications increased the risk of late-pneumonia (urinary tract infections, OR=2.60, 95%CI:1.27-4.95; sepsis, OR=3.98, 95%CI:2.32-6.52; septic shock, OR=2.3, 95%CI:1.14-4.43; all  $p < 0.02$ ) independently of surgical characteristics. Incidence of failure-to-rescue increased from 10% for early-pneumonia patients to 16% for late-pneumonia patients ( $p=0.022$ ; Figure 1).

**Conclusion:** While early-pneumonia was associated with patient and surgical characteristics, late-pneumonia was associated with early infective complications and a higher incidence of failure-to-rescue.



### OL03-22

## COMBINED LIVER AND MULTIVISCERAL RESECTIONS: A COMPARATIVE ANALYSIS OF SHORT AND LONG-TERM OUTCOMES

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**Introduction:** En-bloc liver and adjacent organs resections are technically demanding procedures aiming to obtain clear surgical margins. Few studies reported the outcomes of multivisceral liver resections (MLRs); therefore the indications are poorly defined. Our aim was to compare short

and long-term outcomes of patients submitted MLRs with those of contemporary patients submitted to isolated hepatectomies.

**Methods :** Consecutive adult patients submitted to liver resections between 2000 and 2018 were studied from a prospective database (1263 hepatectomies). A case-matched 1:2 study was performed comparing MLRs and isolated hepatectomy. The paired variables were sex, age, and type of liver resection. Additionally, a risk analysis was performed to evaluate the association between MLRs and perioperative morbidity and mortality.

**Results:** During the study period, 53 MLRs were compared with 106 well-matched controls. The groups were homogeneous regarding baseline characteristics. Patients undergoing MLRs had higher estimated blood loss ( $991 \pm 1492$  vs.  $507 \pm 591$  ml;  $P=0.011$ ), longer hospital stay ( $13 \pm 12$  vs.  $8 \pm 6$  days;  $P=0.003$ ) and higher postoperative mortality (9.4% vs. 1.9%,  $P=0.042$ ). No difference in surgical complications was observed. Number of resected organs was not an independent prognostic factor for perioperative complications (Odds ratio [OR] 1 organ= 1.8 [0.54-6.05]; OR  $\geq 2$  organs= 4.0 [0.35-13.84]) or perioperative mortality (OR 1 organ= 5.2 [0.91-29.51]; OR  $\geq 2$  organs= 6.5 [0.52-79.60]). No difference in overall ( $P=0.771$ ) and disease-free survival ( $P=0.28$ ) was observed.

**Conclusion:** MLRs are feasible but incurs in higher perioperative morbidity and mortality even in a high-volume center. MLRs did not negatively affect long-term outcomes.

### OL03-23

## PREOPERATIVE APRI+ALBI SCORE ALLOWS RISK STRATIFICATION PRIOR TO LIVER RESECTION

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**Background:** Preoperative risk assessment for postoperative liver dysfunction (LD) still poses a major challenge in patients undergoing liver resection. Aspartate Aminotransferase/Platelet Ratio Index (APRI) and Albumin-Bilirubin Grade (ALBI) are validated markers in patients suffering from hepatic pathologies. Within this analysis, we aimed to validate our recent exploratory findings in a larger cohort focusing on clinically relevant outcome parameters and subsequently develop a web based application system to facilitate easy clinical translation.

**Methods:** Assessing the National Surgical Quality Improvement Program (NSQIP) database, we identified 13401 patients undergoing liver resection from 2014 to 2017 for preoperative blood values and detailed 30-day postoperative outcomes. Preoperative APRI+ALBI score was calculated from these routine laboratory tests.

**Results:** The scores (APRI and ALBI) significantly predicted postoperative grade C liver dysfunction, 30-days mortality and LD associated 30-days mortality upon receiver operating characteristic analyses (all  $P < 0.001$ ). The combination of both scores was superior to MELD as well as each individual score. Upon multivariable analysis APRI+ALBI remained an independent predictor of postoperative LD associated 30-day mortality. We further developed a web based application to calculate the APRI+ALBI score to define the specific risk of

postoperative grade C LD and more importantly 30-day mortality for the APRI+ALBI score.

**Conclusion:** APRI+ALBI is vital to predict clinically meaningful postoperative outcome after liver resection. Further we developed a web based application to allow clinical translation of these findings and facilitate quick and easy risk assessment prior to liver resection using routine laboratory parameters.

### OL03-24

## ZERO HOSPITAL MORTALITY AND IMPROVED LONG TERM SURVIVAL IN LAPAROSCOPIC HEPATECTOMY FOR PATIENTS WITH HCC - A PROPENSITY SCORE ANALYSIS OF 836 PATIENTS

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**Objective:** To investigate the long-term outcomes of pure laparoscopic hepatectomy versus open hepatectomy for hepatocellular carcinoma (HCC).

**Methods:** Propensity score matching of patients receiving laparoscopic and open approach in a ratio of 1:3 was conducted. Blood for cytokine and chemokines expression was collect prospectively for comparison before and after surgery.

**Results:** There were 209 patients and 627 patients in the laparoscopic group and the open group, respectively. The laparoscopic group had less blood loss (200 vs 500 mL;  $P < 0.001$ ), shorter operation time (201 vs 277 minutes;  $P < 0.001$ ), and shorter hospital stay (4 vs 7 days;  $P < 0.001$ ). There was zero hospital mortality in laparoscopic group. The 1, 3, and 5-year overall survival rates were 98.3%, 90.5%, and 82.4%, respectively, in the laparoscopic group, and 78.7%, 67.9%, respectively, in the open group ( $P=0.006$ ). The median disease-free survival was 73.1 months in the laparoscopic group and 42.7 months in the open group. The 1, 3, and 5-year disease-free survival rates were 84.1%, 66.0%, and 54.6%, respectively, in the laparoscopic group, and 73.1%, 52.1%, 44.2%, respectively, in the open group ( $P=0.003$ ). The median IL6 and IL8 were comparable before surgery. The median IL6 and IL8 were significantly lower in patients receiving laparoscopic hepatectomy.

**Conclusions:** An improved survival benefit is observed for laparoscopic hepatectomy for HCC with lower perioperative IL6 and IL8 expression.

### OL03-27

## MAXIMUM PERIOPERATIVE AND EARLY POSTOPERATIVE ARTERIAL LACTATE CONCENTRATIONS PREDICT POST-HEPATECTOMY LIVER FAILURE AND ASSOCIATED MORBIDITY AFTER LIVER RESECTION

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Elizabeth Hospital Birmingham, and <sup>3</sup>Hepatobiliary Surgery, Aintree University Hospital, Liverpool University Hospitals NHS Foundation Trust, United Kingdom

**Introduction:** Post-hepatectomy liver failure (PHLF) remains a critical complication after liver surgery. In contrast to liver transplantation evidence for lactate as a marker of liver dysfunction after resections is limited. We evaluated perioperative lactate dynamics to predict PHLF and associated morbidity.

**Methods:** Single-centre study with validation in two international high-volume units. We performed ROC-analysis to assess the predictive value of lactate for PHLF and analysed patient risk-groups according to calculated cut-off-levels.

**Results:** In the exploration cohort (n=509) the 90-day mortality, overall-morbidity and severe-morbidity was 3.3%, 40.9% and 29.3%, PHLF occurred in 12.2% of patients (4.5% ISGLS-grade A, 4.1% ISGLS-B and 3.5% ISGLS-C). ROC-analysis revealed an AUC of 0.829 for maximum lactate within 24h (Lactate\_Max) to predict clinically-relevant grade B/C-PHLF (CR-PHLF). This was confirmed in the validation group (n=482; AUC 0.812). Optimal cut-off in the exploration cohort was 28mg/dl (3.1 mmol/l), which together with the lactate upper normal range value (20 mg/dl) was incorporated in an analysis for association with complications leading to three distinguished risk- groups assessed in the whole cohort (n=991). Lactate\_Max level  $\geq 28$ mg/dl patients significantly more often developed CR-PHLF (16.8%) than cases with levels between 20-27.9 mg/dl (6.3%) or  $< 20$ mg/dl (0.5%;  $p < 0.001$ ). This also applied for 90-d mortality (7.2%/2.6%/0.9%), severe-morbidity (36%/20.6%/10.2%) and associated complications like renal failure (5.7%/3.2%/1.4%) and haemorrhage (5.6%/1.6%/1.4%; all  $p < 0.005$ ; Figure 1). Similar findings were confirmed for Lactate\_POD1 levels.

**Conclusion:** Perioperative lactate-values are powerful and readily available predictors for CR-PHLF and associated complications after hepatectomy with potential for post-operative care decision-making.

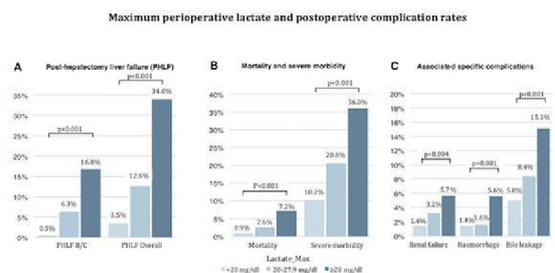


Figure 1. Postoperative complications in the overall cohort (n=991) stratified by different levels of lactate within 24h.

### OL03-28

## INTAKE OF SELECTIVE SEROTONIN RE-UPTAKE INHIBITORS MODULATES POSTOPERATIVE OUTCOME AFTER LIVER RESECTION FOR MALIGNANT TUMORS

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Franz Josef Hospital, and <sup>3</sup>HPB Surgery, Mayo Clinic, United States

**Introduction:** Intra-platelet serotonin has been implicated in the process of liver regeneration and in the development of disease recurrence after liver resection for malignant diseases. While the effect of serotonin on liver regeneration and tumor promotion were only observed in independent experiments, we recently demonstrated a bivalent association in patients undergoing liver resection. This raised the question whether pharmacologic modification of intra-platelet serotonin might be beneficial for this patient cohort.

**Methods:** 497 patients were included out of our prospectively maintained institutional data base. Perioperative intake of selective serotonin reuptake inhibitors (SSRI) was recorded. Patients were followed up for postoperative liver dysfunction (LD), severe morbidity and disease recurrence.

**Results:** 52 patients (10.5%) were treated with SSRI during the perioperative course. Patients with SSRI intake showed a significantly higher incidence of severe morbidity (16.6% vs 29.5%,  $p=0.031$ ) and LD (10.4% vs 25.0%,  $p=0.004$ ). On the contrary, patients with SSRI intake showed a significantly decreased incidence of disease recurrence after 6 months (23.3% vs 4.7%,  $p=0.005$ ) and after 12 months (44.2% vs 24.4%,  $p=0.015$ ), which could also be confirmed in the subgroup analysis of patients with colorectal cancer liver metastases ( $p=0.024$ ,  $p=0.048$ , respectively).

**Conclusion:** Within this study, we present solid evidence for a central impact of serotonin modification on the surgical and oncological outcome of patients undergoing liver resection. Intriguingly, treatment with SSRI seems to exert a dual effect on patients' outcome via disruption of both liver regeneration and tumor growth. Further, our data elucidates a potential pro-tumorigenic role of SSRIs, which clearly has to be confirmed in prospective trials.

### OL03-29

#### ROLE OF INTEGRATED FUNCTIONAL ASSESSMENT PATHWAY USING <sup>99m</sup>Tc-MEBROFINATE SPECT-CT SCAN, ICG, ELASTOGRAPHY AND HVPG IN PATIENTS AT RISK OF POST HEPATECTOMY LIVER FAILURE

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**Introduction:** The study hypothesized that pre-operative integrated functional assessment pathway including liver function tests, ICG test, elastography and HVPG measurements, <sup>99m</sup>Tc-Mebrofenin scan, allow identification of patients at risk of PHLF and to improve post-operative outcomes.

**Methods:** <sup>99m</sup>Tc-Mebrofenin SPECT-CT scan data were processed to assess the anatomical volumes, global liver function and lobar liver function (scintigraphy) as well as dynamic uptake. Amsterdam criteria of FRLF were taken as the cut-off for patients at risk of PHLF (2.69%/min/m<sup>2</sup>).

LiMON-ICG module was used to assess the ICG PDR and R15. Elastography were performed using Fibroscan 502(EchoSens). HVPG was measured in patients with HCC planned for resection. ISGLS definition of PHLF was used. Post-operative outcomes before (2011-2016) and after (2018-2019) the introduction of the functional assessment pathway were compared.

**Results:** There was a significant reduction in the PHLF rates before and after the introduction of pathway [154/1180 (13%) vs. 20/353 (5.7%);  $p=0.0001$ ]. In the subgroup of HCC resections, PHLF reduced from 10%(17/179) to 1.8%(1/53)( $p=0.052$ ). Of the at-risk patients who had <sup>99m</sup>Tc-Mebrofenin SPECT-CT scan (CRLM: 24; HCC:23; Hilar CC:10; IHCC:4) and progressed to resectional surgery (CRLM:17;HCC:13;Hilar:4;IHCC:2), none developed PHLF. Based on the scan findings, three patients were excluded from surgical pathway and 11 patients were considered for alternate surgical strategy. One patient died of acute pulmonary oedema. Three patients had Clavien-Dindo Grade I-II infective complications.

**Conclusion:** Early results of the novel integrated functional assessment pathway demonstrate its feasibility and is associated with reduced incidence of PHLF.

### OL03-30

#### IS SERUM D-LACTATE A NEW BIOMARKER OF POSTOPERATIVE COMPLICATIONS AFTER LIVER RESECTION?

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**Introduction:** L-lactate is considered a prognostic factor for postoperative complications. However, the role of D-lactate produced by intestinal bacteria is not known in patients undergoing liver resection. The aims of the study were to assess factors related to the increase of serum lactates values and investigate the association between lactate isoforms and postoperative complications.

**Methods:** From February 2018 through October 2018, perioperative data of 68 consecutive patients underwent hepatic resection at the Division of Hepatobiliary Surgery, Verona University Hospital were prospectively collected. Serum levels of both L- and D-lactate were evaluated by arterial sampling before (T0) and after (T1) general anesthesia induction, before (T2) and after (T3) Pringle maneuver, during laparotomy suture (T4), 2-(T5) and 4-(T6) hours after surgery, in postoperative day 1(T7), 2(T8), 3(T9) and at discharge (T10).

**Results:** Complication Clavien-Dindo grade  $\geq 3$  and mortality were 20.6 and 1.5%, respectively. Factors related to the increase of perioperative serum lactates were major liver resection (T7, L-lactate  $p=0.001$  and D-lactate  $p=0.018$ ), hilar clamping (D-lactate, T3  $p=0.004$ ; T4,  $p=0.013$ ), operative time > 300 minutes (L-lactate, T7  $p=0.005$ ; T9  $p=0.034$ ), and mean arterial

pressure < 80 mmHg (L-lactate, T3 p=0.031; T4 p=0.021). Higher L-lactate values were associated to overall postoperative complications (T4, p=0.049; T9, p=0.002). Instead, higher D-lactate values resulted specifically associated only to postoperative infections (T7, p=0.007).

**Conclusion:** In this preliminary study we observed that surgery-related factors increase both isoforms of serum lactate. L-lactate raise if postoperative complications whereas higher D-lactate values may be used as biomarker of postoperative infections.

### OL03-31

## IS THERE A ROLE FOR SURGERY IN T2 AND T3 HEPATOCELLULAR CARCINOMA? A PROPENSITY-MATCHED ANALYSIS OF THE NATIONAL CANCER DATABASE

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**Introduction:** The role of hepatectomy for hepatocellular carcinoma (HCC) with multifocality or vascular involvement remains ill-defined. Our objective was to evaluate the potential benefit of surgical resection for patients with these high-risk tumors.

**Methods:** The National Cancer Database was used to identify patients with HCC with vascular involvement and/or multifocal disease (T2 and T3, AJCC Seventh Edition) between 2010 and 2016. Propensity score matching (k nearest neighbors, no replacement, 1:1) was used to create two balanced groups: patients treated with surgical resection and those treated with non-surgical modalities (ablation, radiation including radioembolization, chemotherapy including TACE, or any combination thereof). Groups were matched using patient, clinical, and liver-specific characteristics. Patients undergoing orthotopic liver transplant were excluded. Median overall survival (OS) was calculated using Kaplan-Meier method and adjusted analyses were performed using Cox proportional hazards models.

**Results:** A total of 24,488 patients met inclusion criteria, including 2,231 (9.1%) treated with surgical resection. Median OS for the cohort was 17.7 months. Following propensity matching, surgical resection was associated with a survival advantage (36.7 months) compared to non-surgical treatment (19.9 months, log-rank P < .001, Figure). Adjusted analysis demonstrated an OS advantage of surgery versus non-surgical treatments in both unmatched (adjusted hazard ratio, 0.58, 95% confidence interval, 0.54 - 0.62) and matched groups (adjusted hazard ratio, 0.55, 95% confidence interval, 0.51 - 0.60).

**Conclusion:** Surgical resection is associated with a survival advantage in HCC with multifocal disease and/or vascular involvement. The presence of these features

should not contraindicate consideration of hepatectomy in suitable candidates.

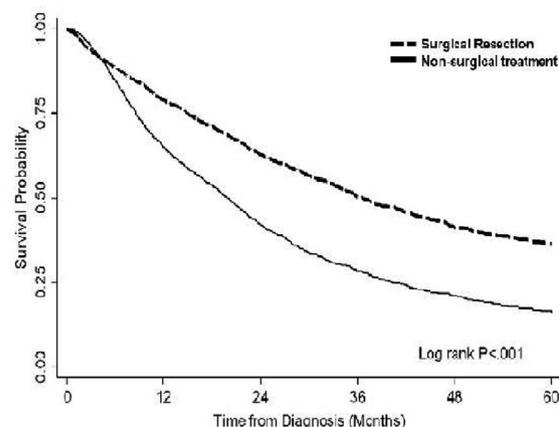


Figure. Survival in matched cohorts

### OL03-32

## DIFFERENCES IN OUTCOME OF LAPAROSCOPIC LIVER SURGERY BETWEEN NATIONWIDE DAILY PRACTICE AND HIGH-VOLUME CENTERS

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**Introduction:** Laparoscopic liver surgery has gradually been adopted in daily clinical practice (DCP). Although widely accepted that outcomes are better in high-volume expert (HVE) centers, it is unclear how outcomes compare in the various difficulty score strata.

**Methods:** This was an international, retrospective multicenter study including data from 20 DCP liver surgery centers in the Netherlands and three HVE centers (January 2011-December 2016). Consecutive patients undergoing elective LLS for all indications were included. Patients were stratified into low-, moderate- and high-risk Southampton difficulty score groups.

**Results:** A total of 2425 patients were included: 885 patients from DCP and 1540 patients from the HVE centers. In each risk group, the conversion rate was higher (6.7%; 5.7% and 11.4% absolute increase; all p < 0.001) and hospital stay was longer (2.0; 3.3 and 2.2 days longer, all p < 0.001) in DCP centers compared to HVE centers. In the low-risk group, the rate of intraoperative incidents did not

differ significantly, whereas it was significantly higher (24.5% vs 12.5%; p= 0.043) in the high-risk group in DCP compared to HVE centers. In none of the risk groups did severe postoperative complications and 90-day/in-hospital mortality differ between DCP and HVE centers.

**Conclusion:** Outcomes of LLS for low-risk patients in DCP are similar to HVE centers, whereas high-risk procedures in DCP are more challenging and may have slightly inferior outcomes. Collaborating networks of liver centers could be established with each center focusing on a specific risk group and aiming for high volume LLS in the respective risk group.

OL03-33

**SHORT-TERM OUTCOMES AFTER MINIMALLY-INVASIVE LIVER RESECTION FOR SINGLE SMALL HEPATOCELLULAR CARCINOMA: AN ANALYSIS FROM THE IGOMILS (ITALIAN GROUP OF MINIMALLY INVASIVE LIVER SURGERY) REGISTRY**

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**Introduction:** Safety of liver resection for hepatocellular carcinoma (HCC) improved over time, also in relation to the diffusion of minimally-invasive liver surgery (MILS). Aim of this study is to analyze short-term outcomes of MILS for solitary HCC < 3 cm at a nationwide level.

**Methods:** Patients who underwent MILS for single HCC < 3 cm between November 2014 and December 2019 were identified from the IGoMILS Registry.

**Results:** 748 patients underwent MILS: 73.5% were male (mean age 68.1 ± 9.6 years). 93% of patients were Child A, 6.9% Child B and 0.1% Child C; portal hypertension was present in 35.5% of cases. Mean HCC size was 2.1±6.3 cm, with 54.1% of tumors localized in the antero-medial segments and 45.9% in postero-superior segments. 85% of procedures were pure laparoscopic, 13.1% robotic and 1.9% performed by hybrid technique, with an overall conversion rate of 5.5%. 66.3% were wedge resections, 31.5% anatomic resections and 2.1% major hepatectomies. Intraoperative transfusions rate was 2.5%, with a mean blood loss of 182.4±283.3 ml. Mortality was nil. Overall morbidity rate was 23.3% (not significantly different between that following MILS in the antero-lateral segments than that in the postero-superior segments: 21.7% vs.

25.1%; p=0.281, respectively) with 3.9% of major complications. Biliary fistula occurred in 2.4% of patients and ascites in 6.9%. Mean postoperative stay was 5.5 ± 4.5 days.

**Conclusions:** MILS for HCC < 3 cm should be carefully evaluated in the therapeutic decision making process, being associated with low operative risk, even following difficult posterior segments resection.

OL03-34

**OPTIMAL HEPATIC SURGERY: ARE WE MAKING PROGRESS IN NORTH AMERICA?**

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**Introduction:** Hepatic surgery is high-risk, but regionalization has occurred, and more minimally invasive hepatectomies (MIH) are being performed. Best practices have been defined with the goal of improving outcomes. The aim of this analysis was to determine whether optimal outcomes have increased in recent years.

**Methods:** The ACS-NSQIP procedure-targeted hepatectomy database was queried. Analyses were performed for major (≥ 3 segments), partial (≤2 segments) and all hepatectomies. Optimal hepatic surgery was defined as the absence of mortality, serious morbidity, the need for a postoperative biliary procedure or reoperation, prolonged length of stay (LOS < 75<sup>th</sup> percentile) or readmission. Tests of trend, Chi-square and multivariable analyses (MVA) were performed.

**Results:** From 2014-17, 12,880 hepatectomies including 4,028 major and 8,852 partial resections were performed. MIH increased over time (p< 0.01) and was performed more frequently in partial hepatectomies (p< 0.01, Table). Operative time decreased over time (p< 0.01) and was lower in partial hepatectomies (p< 0.01). Mortality and LOS were lower, and LOS decreased for partial hepatectomies (all p< 0.01). On MVA, bile leaks decreased (p< 0.02) and optimal hepatic surgery increased over time (p< 0.01).

**Conclusions:** Over a four-year period in North America, minimally invasive hepatectomies have increased while operative time, perioperative transfusions, bile leaks and prolonged length of stay have decreased. Optimal hepatic surgery has increased for partial and all hepatectomies and is achieved more often in partial than in major resections.

OL03-34

	MIS Approach (%)	Operative Time (min)	Grade B/C Bile Leak (%)	30-Day Mortality (%)	Prolonged LOS (%)	Optimal Surgery (%)
Major	15.7*	257†	4.2	1.7	35.2	55.0
Partial	37.2*‡	183†‡	2.0†	0.7‡	19.1†‡	73.6*‡
All	30.8*	203†	2.7†	1.2	24.0†	67.9*

\*p<0.01 increased over time, †p<0.01 decreased over time ‡p<0.01 vs Major Hepatectomy

OL03-35

### OSTEOPONTIN AFFECTS ONCOLOGICAL OUTCOME AFTER LIVER RESECTION FOR COLORECTAL METASTASIS

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**Introduction:** Osteopontin (OPN) - a chemoattractant and matrix protein - was previously described to be expressed by a variety of malignant tumors. As such, colorectal carcinoma was found to produce OPN. Further, a close relation of OPN to oncological outcome could be identified. Yet, OPN was not investigated in patients with colorectal cancer liver metastasis (CRCLM).

**Method:** Within this analysis 48 patients undergoing liver resection for CRCLM were included. Circulating OPN was evaluated prior to the operation. Further, OPN was stained on tumor tissue gathered during liver resection. Patients were followed up for disease recurrence.

**Results:** OPN expression in tumor tissue was tightly associated to circulating levels. Further, OPN was found to be significantly increased in patients that develop disease recurrence within two years after curative liver resection (median OPN no recurrence = 49.97 ng/mL vs median OPN recurrence = 72.38 ng/mL,  $p = 0.013$ ). This difference was found to obtain a strikingly high predictive potential evaluated via receiver operating characteristics (AUC = 0.833,  $p = 0.015$ ). Based on this analysis an optimal cut-off was identified at 60 ng/mL of OPN. Indeed, patients above this cut-off showed a significantly reduced disease-free survival when compared in a Kaplan-Meier analysis (difference in median disease-free survival = 1.3 years,  $p = 0.042$ ).

**Conclusions:** OPN is a marker for early disease recurrence in patients suffering from CRCLM. Thus, assessment of OPN might be a useful tool for preoperative patient evaluation and should hence be included in the work-up of this patient cohort.

OL03-36

### PREDICTORS OF CONVERSION AND OUTCOMES FOR PATIENTS UNDERGOING MINIMALLY INVASIVE HEPATECTOMY: A CONTEMPORARY ASC NSQIP ANALYSIS

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**Introduction:** Minimally-invasive techniques are growing for liver resections. Laparoscopic and robotic liver resections may differ in unplanned conversions. We sought to identify risk factors for conversion and if conversion was associated with increased morbidity and mortality.

**Methods:** This is an ACS-NSQIP multi-institutional retrospective study from 2014-2017. Patients were grouped into open, robotic and laparoscopic hepatectomy. Univariate and multivariate analysis (MVA) of factors associated with conversion and outcomes were investigated.

**Results:** Of 14,055 patients who underwent hepatectomy, 10,279(73.1%) were open, 3,452(24.6%) were laparoscopic and 324(2.3%) were robotic. The rate of unplanned conversions was significantly lower in robotic vs laparoscopic (5.6% vs 15.4%;  $p < 0.001$ ). Robotic hepatectomy was associated with decreased conversion for minor (5.5% vs 13.7%;  $p < 0.001$ ), major (5.9% vs 23.8%;  $p = 0.003$ ) and right (3.2% vs 24.4%;  $p = 0.007$ ) hepatectomy compared to laparoscopic. Operative factors associated with conversion on MVA included concurrent intraoperative ablation (OR=1.49 [95% CI 1.13-1.96];  $p = 0.005$ ), Pringle (OR=2.15 [95% CI 1.70-2.73];  $p < 0.001$ ), and laparoscopy (OR=3.00 [95% CI 1.85-4.86];  $p < 0.001$ ). Patients who underwent minimally-invasive hepatectomy with conversion were associated with increased bile leak (13% vs 4.5%;  $p < 0.001$ ), 30-day readmission (11.7% vs 5.9%;  $p < 0.001$ ), 30-day mortality (1.6% vs 0.5%;  $p = 0.008$ ), length of stay (5 days vs 3 days;  $p < 0.001$ ), and increased surgical (29.7% vs 9.7%;  $p < 0.001$ ), wound (9.1% vs 3.6%;  $p < 0.001$ ) and medical (17% vs 6.6%;  $p < 0.001$ ) complications (Table 1).

**Conclusion:** Minimally-invasive hepatectomies with conversion are associated with increased complications. More conversions are associated with the laparoscopic approach compared to robotic.

Table 1. Outcomes Associated with Conversion, Robotic and Lap Combined

	MI w/ Conversion	MI	p-value
Total Patients [N]	548	3228	MI w/C vs. MI
Bile Leak [N (%)] †	71 (13.0)	143 (4.5)	<.0001
Reoperation [N (%)]	10 (1.8)	38 (1.2)	0.2109
30-day Readmission	64 (11.7)	189 (5.9)	<.0001
30-day Mortality	9 (1.6)	17 (0.5)	0.0083
LOS, days [Median (Q1-Q3)]	5 (4-7)	3 (2-5)	<.0001
Any Complication	211 (38.5)	471 (14.6)	<.0001
Surgical Complication	163 (29.7)	312 (9.7)	<.0001
Bleeding Requiring Transfusion	131 (23.9)	199 (6.2)	<.0001
Reoperation	10 (1.8)	38 (1.2)	0.2109
Need for Invasive Intervention Postoperatively	50 (9.1)	115 (3.6)	<.0001
Wound	23 (4.2)	49 (1.5)	<.0001
Dehiscence	3 (0.5)	4 (0.1)	0.0677
Superficial SSI	20 (3.6)	45 (1.4)	0.0002
Medical Complication	93 (17.0)	212 (6.6)	<.0001
Cardiac Arrest	4 (0.7)	9 (0.3)	0.1070
Sepsis	26 (4.7)	44 (1.4)	<.0001
Septic Shock	7 (1.3)	21 (0.7)	0.1704
DVT	14 (2.6)	17 (0.5)	<.0001
UTI	20 (3.6)	44 (1.4)	0.0001
Acute Renal Failure	4 (0.7)	11 (0.3)	0.2569
Ventilator >48h	8 (1.5)	17 (0.5)	0.0208
Pulmonary Embolism	4 (0.7)	19 (0.6)	0.7641
Unplanned Reintubation	6 (1.1)	28 (0.9)	0.6224
Pneumonia	15 (2.7)	54 (1.7)	0.0854
Stroke / CVA	0 (0.0)	5 (0.2)	0.4564
Myocardial Infarction	7 (1.3)	19 (0.6)	0.0882
Liver Failure (Grade A, B or C)	18 (3.3)	45 (1.4)	0.0014

OL03-37

**IMPACT OF 2016 ENHANCED RECOVERY AFTER SURGERY (ERAS) RECOMMENDATIONS ON OUTCOMES AFTER HEPATECTOMY**

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**Introduction:** The Enhanced Recovery After Surgery (ERAS) society published new recommendations for hepatectomy in 2016. Yet, no studies have formerly assessed its impact. The aim of the present study was to assess the impact of 2016 ERAS new guidelines on hepatectomy outcomes at a tertiary center.

**Method:** Postoperative outcomes of patients undergoing hepatectomy 18 months before and after ERAS implementation according to the 2016 guidelines were compared after propensity-score matching (PSM). Primary endpoint was 90-day morbidity and mortality.

**Results:** From 2016 to 2019 288 patients underwent hepatectomy including 141 procedures performed before and 147 after ERAS implementation. Before PSM, ERAS patients had an older age (66 vs. 62 years, p=0.01), higher ASA score (p=0.01), more cirrhosis (26% vs. 16%, p=0.03), and less laparoscopic procedures (31% vs. 47%). After PSM, both groups became well-balanced for all baseline variables. Median CCI score (0 vs. 21, p=0.02) and overall morbidity (41% vs. 64%, p< 0.001) were lower in the ERAS group, which was due to a higher rate of medical (Clavien grade 2) complications in the control group (35% vs. 15%, p=0.001). Blood loss (350 vs. 400 ml, p=0.67), operative time (235 vs. 240 min, p=0.61), 90-day mortality (4.5% vs. 3.6%, p=1.00), severe postoperative morbidity (18% vs. 22%, p=0.49), hospital stay (8 vs. 9 days, p=0.34) and readmission rate (10% vs. 7.3%, p=0.64) were similar between the 2 groups.

**Conclusion:** Perioperative ERAS program for hepatectomy results in improved outcomes due to a decreased rate of medical postoperative morbidity.

regression to evaluate associations between patient survival and predictor variables.

**Results:** 80 patients underwent robotic major hepatectomy, of which, 34% were for colorectal liver metastasis, 33% for hepatocellular carcinoma, 16% for intrahepatic cholangiocarcinoma, 5% for gallbladder cancer, and 12% for 'other' malignant lesions. Median age was 65 years (63±12.5), 46% were women, BMI was 28 (28±6.0) kg/m<sup>2</sup> and ASA Class was 3 (3± 0.6). Five patients experienced postoperative complications. 11 patients were readmitted within 30 days. Disease free survival, overall survival, operative duration, estimated blood loss (EBL), conversions to open, perioperative complications, tumor size, length of stay, in-hospital mortality, readmission within 30days are stratified by pathology and depicted in Table1 and Figure1. Patients with intrahepatic cholangiocarcinoma had a significantly larger tumor size and consequently longer operative time (p=0.001, p=0.01, respectively). Patients undergoing resection for hepatocellular carcinoma had the longest disease-free survival, with a median disease-free survival of 55 months (b=-2.095, s.e.=0.946, p=0.027). **Conclusion:** Our experience supports that robotic major hepatectomy is safe and feasible for patients with malignant liver disease. Our complications were limited. A reduction in disease recurrence was noted in patients undergoing robotic major hepatectomy for hepatocellular carcinoma.

Variables	Hepatocellular Carcinoma	Colorectal Liver Metastasis	Intrahepatic Cholangiocarcinoma	Gallbladder Cancer	Other	Total   p-value
<b>Demographic</b>						
Number of patients	26	27	13	4	10	80
Age	66 (63±13.1)	62 (62±13.4)	66 (65±13.2)	74 (73±10.2)	64 (62±10.6)	0.45
Sex (Men/Women)	17M/9W	17M/10W	5M/8W	0M/4W	4M/6W	43M/37W
BMI	28 (27±5.7)	28 (24±5.0)	31 (32±7.5)	25 (26±3.4)	28 (30±6.1)	0.08
MELD score	9 (9±5.6)	7 (8±2.4)	8 (10±4.7)	7 (8±2.4)	7 (8±1.1)	0.16
Heavy alcohol use	8 Patients (31%)	6 Patients (22%)	2 Patients (15%)	2 Patients (50%)	3 Patients (30%)	22 Patients (28%)
ASA Class	3 (3±0.6)	3 (3±0.5)	3 (3±0.5)	3 (3±0.5)	3 (3±0.5)	0.78
<b>Intraoperative</b>						
Operative Duration	267 (274±84.7)	328 (348±127.9)	257 (264±69.9)	216 (201±40.5)	277 (271±97.0)	0.01
EBL	200 (233±204.9)	150 (238±266.3)	100 (176±140.8)	150 (163±110.9)	125 (151±201.9)	0.66
Intraoperative Complications	0	0	0	0	0	0
Tumor Size	5 (5±2.8)	3 (3±1.8)	6 (6±2.5)	4 (4±1.7)	5 (4±1.9)	0.001
<b>Postoperative</b>						
In-hospital mortality	0	0	1	0	0	1
Length of stay (days)	4 (4±2.4)	4 (4±1.8)	4 (6±6.7)	3 (3±1.7)	4 (4±1.5)	0.33
Readmission within 30 days	4	3	2	0	3	12
<b>Survival</b>						
Disease-free survival (months)	55	21	20	N/A	45	0.03
Overall Survival (months)	60	25	23	N/A	N/A	N/A

Pathology vs. Variables

OL03-38

**SHORT AND LONG-TERM OUTCOMES OF PATIENTS UNDERGOING ROBOTIC MAJOR HEPATECTOMY FOR MALIGNANT TUMORS**

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**Introduction:** This study was undertaken to examine our institutional experience with major robotic liver resections for malignant lesions and to identify factors affecting patient outcomes.

**Methods:** Patients undergoing robotic major hepatectomy from 2013 to 2019 were prospectively followed. Patients were stratified by pathology and analyzed utilizing Cox Proportional-Hazards analysis and multivariate linear

OL03-39

**IMPROVED MORTALITY, MORBIDITY AND LONG-TERM OUTCOME AFTER ANATOMICAL HEPATECTOMY WITH THE GLISSONEAN PEDICLE APPROACH IN PATIENTS WITH HEPATOCELLULAR CARCINOMA: 30 YEARS EXPERIENCE AT TWU**

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**Background:** We evaluated the morbidity and mortality after anatomical hepatectomy with the glissonean pedicle

approach, and attempted to clarify whether there might be differences in long-term outcomes in relation to the morbidity in patients with hepatocellular carcinoma (HCC). **Methods:** Anatomical hepatectomy with the glissonian pedicle approach was developed in 1984. 1953 patients with HCC underwent various anatomical hepatectomies between 1985 and 2014. The morbidity (Clavien-Dindo class IIIa or more) and mortality (30-day and 90-day) were evaluated among six 5-year eras (1985-1989, 1990-1994, 1995-1999, 2000-2004, 2005-2009, 2010-2014).

**Results:** 460 patients (24%) showed morbidity after hepatectomy. The overall 30-day and 90-day mortality rates were 1.7% and 3.6%, respectively. Blood loss >2L (45%, 34%, 33%, 17%, 14%, 8%:  $p < 0.0001$ ) and bile leakage (29%, 15%, 19%, 11%, 13%, 7%:  $p < 0.0001$ ), and morbidity (41%, 23%, 28%, 17%, 20%, 14%:  $p < 0.0001$ ) were decreased gradually over the eras. 30-day (3.9%, 3.0%, 1.8%, 1.3%, 0.3%, 0.5%:  $p = 0.0074$ ) and 90-day mortality (7.8%, 4.3%, 3.8%, 2.8%, 2.2%, 1.4%:  $p = 0.0036$ ) were significantly improved over the eras. Blood loss >2L ( $p = 0.0244$ ) was an independent risk factor for 30-day mortality, and blood loss >2L ( $p = 0.0271$ ) and bile leakage ( $p = 0.0078$ ) were independent risk factors for 90-day mortality on multivariate analysis. Bile leakage ( $p = 0.004$ ) and morbidity ( $p < 0.0001$ ) were significant independent prognostic factors for overall survival in patients with HCC.

**Conclusions:** Anatomical hepatectomy with the glissonian pedicle approach was achieved safely in patients with HCC. For more safety and longer survival, blood loss, bile leakage, and morbidity should be reduced.

#### OL03-40

### HEPATIC UPTAKE INDEX IN THE HEPATOBILIARY PHASE OF GD-EOB-DTPA-ENHANCED MAGNETIC RESONANCE IMAGING ESTIMATES FUNCTIONAL LIVER RESERVE AND PREDICTS POST-HEPATECTOMY LIVER FAILURE

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**Background:** Recent evidence suggests that gadolinium-ethoxybenzyl-diethylenetriamine penta-acetic-acid-enhanced magnetic resonance imaging (Gd-EOB-DTPA MRI) may be used to evaluate liver function. The aim of this study was to assess whether the signal intensity of Gd-EOB-DTPA MRI may be used to predict functional liver reserve and post-hepatectomy liver failure (PHLF) in patients undergoing hepatectomy for liver tumors.

**Methods:** This is an observational retrospective study on 137 preoperative Gd-EOB-DTPA MRIs of patients undergoing hepatectomy. Mean signal intensity of liver ( $L_{20}$ ) and spleen ( $S_{20}$ ) were measured on T1-weighted single-breath-hold 3D fat-saturated gradient-echo sequences acquired 20 minutes after Gd-EOB-DTPA administration. The hepatocellular uptake index (HUI) of liver volume ( $V_L$ ) was calculated with the following formula  $V_L[(L_{20}/$

$S_{20})-1]$  and was tested with several clinical score systems for liver diseases and to the occurrence of PHLF.

**Results:** Patients with unhealthy liver had significantly lower values of HUI in comparison with those with normal function. This was found for MELD score  $\leq 9$  vs.  $> 9$  ( $p = 0.0488$ ), BILCHE score  $\leq 2$  vs.  $> 2$  ( $p = 0.0208$ ), ALBI grades ( $p = 0.0357$ ) and Humanitas score  $\leq 6$  vs.  $> 6$  ( $p = 0.0311$ ). Twenty-two (16%) patients developed PHLF, and two (1.4%) died within 90-day. HUI was significantly lower in those patients with PHLF ( $p = 0.001$ ). Receiver operating characteristics curve analysis revealed valuable HUI ability in predicting PHLF (AUC=0.84; 95%CI=0.71-0.92;  $p < 0.001$ ), with a cutoff value of 574.33 (98% sensitivity; 83% specificity).

**Conclusions:** HUI measured on preoperative Gd-EOB-DTPA MRI identifies patients with unhealthy liver and predicts PHLF. This index could be used to discriminate those patients at higher risk of complications after hepatectomy.

#### OL03-42

### PREOPERATIVE NOMOGRAM TO PREDICT POST-HEPATECTOMY LIVER FAILURE IN PATIENTS UNDERGOING LIVER RESECTION

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**Background:** Post-hepatectomy liver failure (PHLF) is a rare but serious complication after liver resection (LR) and a leading cause of mortality. The aim of the present study was to define preoperative predictors of PHLF and propose a predictive nomogram to be utilized in preoperative planning.

**Methods:** Consecutive patients planned for LR from October 2014 to August 2016 were prospectively recruited. Clinical and laboratory data including liver stiffness and indocyanine green retention at 15 min (ICG-R15) were collected at inclusion and until three months after LR. PHLF was defined by 50-50 criteria and/or postoperative peak total bilirubin  $> 7$ mg/dL.

**Results:** Four hundred and eighteen LRs were performed in 244 men and 174 women whose median age was 62 years. PHLF was observed in 19 patients (4.6%) after major LR in 17 and minor LR in two. Mortality rate in patients developing PHLF was 21.1% while mortality rate in the entire cohort of 418 patients was 2.2%. Independent predictors of PHLF were diabetes mellitus (odds ratio (OR): 6.6; 95% confidence interval (CI):1.1-39.3), pre-operative chemotherapy cycles  $\geq 8$  (OR: 4.1; CI:0.8-20.9), tumor size  $\geq 51$ mm (OR: 4.8; CI:0.9-26.1), platelet count  $< 150,000$ /mL (OR: 8.7; CI:1.3-56.8), ICG-R15 (OR: 10.4; CI:1.9-58.1) and number of resected liver segments  $\geq 3$  (OR: 12.9; CI:1.3-125.4). Nomogram built with these six factors had area under receiver operating characteristic curve of 0.92 and goodness-of-fit of  $p = 0.44$ .

**Conclusion:** Predictive nomogram incorporating ICG-R15 would improve the safety of LR by enabling surgeons to identify high-risk patients and adapt the surgical strategy in them.

OL03-43

**ROLE OF INDOCYANINE GREEN TEST IN A WESTERN COHORT: NOMOGRAM TO PREDICT 90-DAY MAJOR COMPLICATIONS AFTER MAJOR HEPATECTOMY**

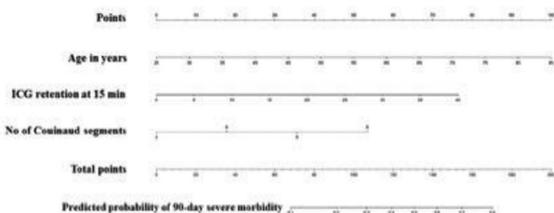
M. Rajakannu<sup>1</sup>, D. Cherqui<sup>2</sup>, G. Pittau<sup>2</sup>, O. Ciaccio<sup>2</sup>, A. Sa Cunha<sup>2</sup>, D. Castaing<sup>2</sup>, R. Adam<sup>2</sup> and E. Vibert<sup>2</sup>  
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**Background:** Incidence of severe morbidity after major hepatectomy (MH) has remained significantly high despite considerable improvement in mortality rates over last two decades. No risk model is currently available to identify those patients at higher risk of major complications after MH.

**Methods:** Patients undergoing MH for various hepatobiliary diseases were prospectively recruited. Pre-operative clinical and laboratory data including liver stiffness and indocyanine green retention at 15 min (ICG-R15) were analyzed to identify independent risk factors for major complications, defined as >Grade II complications according to Clavien-Dindo grade of surgical complications during the 90-day post-operative period. A nomogram was built with only pre-operative predictors and validated by Heat map plot.

**Results:** Complications observed after 164 MHs (56.7% men, median age-62 years) were Grade I (12.8%), Grade II (39%), Grade IIIa (9.8%), Grade IIIb (17.1%), Grade IVa (0.6%), Grade IVb (0%) and Grade V (2.4%). Three pre-operative parameters namely, patient's age, ICG-R15, and extent of liver resection (3-6 segments), were identified and internally validated as independent predictors in 49 patients (29.9%) who developed severe morbidity. A nomogram built with these three factors had a good discriminatory performance with area under receiver operating curve of 0.76 and an excellent Goodness-of-fit in Heat map plot.

**Conclusions:** This novel and simple nomogram accurately predicts major post-operative complications in a patient undergoing MH and enables personalized pre-operative planning in patients at risk.



Nomogram to predict major complications after major hepatectomy

OL03-45

**A SIMPLE PREOPERATIVE SCORE TO PREDICT POSTOPERATIVE MORTALITY AFTER MAJOR HEPATECTOMY**

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**Background:** Patients undergoing liver surgery have associated chronic liver disease or other comorbidities that might place them at increased risk for postoperative complications and mortality. A preoperative predictive score able to predict postoperative mortality in patients undergoing a major hepatectomy may improve both preoperative patient's optimization and clinical decision making.

**Methods:** The 2014-16 NSQIP hepatectomy Participant Use Files were queried for patients undergoing major hepatectomy (N=4469). Patients who had missing data on preoperative factors were excluded. Multivariable regression models were used to develop a score to predict who has higher odds for mortality after major hepatectomy.

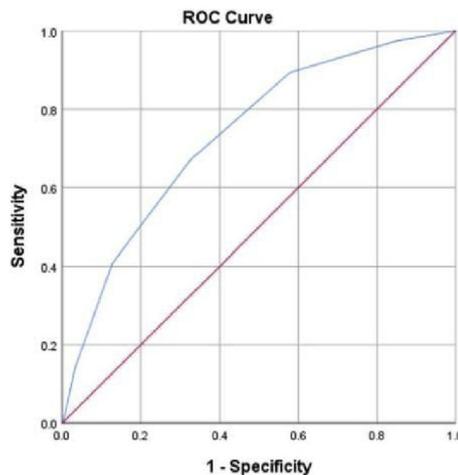
**Results:** Of 4469 patients who underwent a major hepatectomy 2161 (48.4%) were of female gender and 2308 (51.6%) of male gender. Factors associated with postoperative mortality were preoperative Albumin-Bilirubin score (ALBI) grade 2 or 3 (p< 0.001), history of congestive heart failure(CHF) (p< 0.001), diabetes mellitus (p< 0.001), patient functional status (p=0.001), hypertension (p=0.003), age ≥ 65 (p< 0.001), male gender (p< 0.001), weight loss >10% (p=0.003) and preoperative chronic use of steroids (p< 0.001). In developing a Preoperative Prognostic Score for 30 days postoperative mortality, each factor was weighted 1. Higher scores were associated with a stepwise greater risk of 30-days mortality. Finally, our predictive score demonstrates very good discrimination for 30-days mortality (AUROC=0.734, 95% CI: 0.69-0.779).

**Conclusions:** Preoperative simple clinical information and laboratory tests can identify which patient undergoing a major hepatectomy is at higher risk for postoperative mortality and help guide surgeons with the final treatment plan.

Table: Hepatectomy Prognostic Score for 30-Days mortality and ROC curve assessing the accuracy of the score

Cumulative Score	Odds Ratio	95% Confidence Intervals	p-value
0	Reference		
1	1.71	0.46-6.35	0.42
2	5.09	1.53-16.91	<b>0.008</b>
≥3	12.46	3.93-39.61	<b>&lt;0.001</b>

\* Grade 2 or 3 ALBI score=1, History of CHF=1, Diabetes Mellitus =1, Patient dependent=1, Hypertension=1, Age ≥ 65 =1, Male Gender =1, Weight Loss >10%=1 and Preoperative use of steroids=1



Diagonal segments are produced by ties.

**OL04 - Liver: Technical Surgery**

OL04-02

**ROBOTIC VERSUS OPEN  
HEPATECTOMY FOR  
HEPATOCELLULAR CARCINOMA: A  
RETROSPECTIVE PROPENSITY-  
MATCHED ANALYSIS**

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**Introduction:** The aim of this study was to compare the short and long term outcomes of robotic hepatectomy with open hepatectomy for hepatocellular carcinoma (HCC).

**Method:** Data for patients who underwent robotic hepatectomy for HCC from September 2010 to September 2019 were retrieved from the departmental hepatectomy database. Propensity scores were calculated using the following factors: gender, age, American Society of Anaesthesiologists score, Child's grading, hepatitis status, magnitude of resection, size and number of tumor and vascular invasion. These robotic cases were matched with a similar group of patients who underwent open hepatectomy in a 1:1 ratio within this 9-year period.

**Results:** Eighty-five patients in the robotic group was compared to 85 patients in the open group. The two groups were comparable in patient demographics, disease characteristics and magnitude of resection. Blood loss was less in the robotic group (148ml vs 437ml,  $P < 0.001$ ). Hospital stay was shorter in the robotic group (4 vs 9 days,  $P < 0.001$ ). There were less major complications in the robotic group ( $n=1$  vs  $n=11$ ,  $P=0.006$ ). The 5-year overall survival was significantly better after robotic surgery (85.2% vs 67.4%,  $P=0.015$ ). The operative time, transfusion requirement, margin involvement, 30-day mortality, disease-free survival and choice for subsequent treatment of HCC recurrence all showed no difference among the two groups.  
**Conclusions:** Robotic hepatectomy for HCC could be achieved with reduced blood loss, less major complications and shorter hospitalization, as compared to open hepatectomy. It could also achieve a better 5-year overall survival.

OL04-04

**THE MOST MINIMALLY-INVASIVE  
ALPPS - USING TERMINAL BRANCHES  
PORTAL VEIN EMBOLIZATION  
(TBPVE) FOR LIVER PARTITION (A  
REPORT OF 24 CASES)**

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cine, China

**Introduction:** Numerous modifications have been suggested for improvement of ALPPS. We suggest Terminal Branches Portal Vein Embolization (TBPVE) as a minimally-invasive way to partition the liver. The intra-hepatic

portal vein communication can thus be blocked between both liver. As a result, only a single surgical operation is required. This method is termed Terminal branches portal vein Embolization Liver Partition Planned hepatectomy (TELPP).

**Methods:** From February 2016 to November 2017, 24 patients were performed with TELPP. The procedure was that in addition to PVE, embolization agent was infused to the terminal branches of portal vein of S5, S8 or S4. In order to avoid potential enlargement of tumor, in some cases tumor TACE were used at the same time. Standard liver volume (SLV), future liver remnant (FLR) and FLR/SLV are calculated by CT scan taken. Open or laparoscopic hepatectomy was performed in two weeks when the FLR is appropriate.

**Results:** All the patients (most of the liver were cirrhotic; 4 patients with PVTT) achieved enough FLR that had a median increase of 55.6% (from 26.2% to 120.8%) in two weeks. All of them underwent hepatectomy, most of them were extended hemihepatectomy and trisegmentectomy. No server morbidity occurred except 1 case with minor ectopic thrombus. 3 patients died respectively 15, 18, 7 months, all the other 21 patients are surviving.

**Conclusion:** This study shows that TBPVE had a rapid FLR increase similar to ALPPS without its drawback. TELPP is very promising, cause requiring only one single operation instead of two staged operations.

OL04-05

**VENOUS RECONSTRUCTION WITH  
THE PARIETAL PERITONEUM. THE  
LONG TERM PATENCY RATE  
ACCORDING TO THE TYPE OF  
RESECTED VEIN IN 141 PATIENTS**

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**Objective:** We recently described venous reconstruction during HPB surgery with the parietal peritoneum (PP). Our aim is to evaluate the long term patency rate according to the reconstructed vein.

**Methods:** Between 2010-2019, 141 patients underwent pancreatic ( $n=100$ ) or liver ( $n=41$ ) resections with reconstruction of the mesentericoportal vein (96), the vena cava (21), hepatic veins (12), portal confluence (12) with the PP. The PP (mean length=26 mm; 10-100) was harvested from the falciform ligament ( $n=65$ ), hypochondrium ( $n=26$ ), diaphragm ( $n=24$ ), or prerenal ( $n=26$ ) area. Reconstruction was lateral in 136 patients, tubular in 5 patients and urgent in 14. Postoperative anticoagulation was standard and venous patency and stenosis was assessed by routine CT scans. The mean radiological follow-up was 14 (2-65) months.

**Results:** The mean age was 61 (31- 84), females (54; 38%) and transfusion (35; 25%). Two non related mortalities, overall morbidity ( $n=66$ ; 47%) and the mean hospital stay was 18(5-75) with no PP-related or haemorrhagic complications. The global patency rate was ( $n=126$  ; 90%) including 17 (13%) with moderate stenosis. In patients with complete stenosis ( $n=15$ ; 10%), symptomatic thrombosis necessitating reintervention was observed in one patient (<

1%). The patency rate for the vena cava, hepatic veins and the portal confluence (n=45) was 100% and for the mesentericoportal vein (n=96) was 84%. Complete thrombosis was mainly observed after tubular reconstruction (2/15) and distal pancreatectomy (10/15).

**Conclusion:** The PP showed globally a high patency rate in HBP surgery, which was excellent after liver surgery.

#### OL04-07

### AUGMENTED REALITY AND THE NOVEL USE OF INDOCYANINE GREEN AS A NAVIGATIONAL ADJUNCT FOR LAPAROSCOPIC ABLATION OF LIVER TUMORS

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**Introduction:** Laparoscopy can be used as an adjunct to successfully treat hepatocellular carcinoma nodules, as the surgeon manipulates the liver under direct visualization. To successfully perform laparoscopic assisted thermal ablation the surgeon must be skilled at ultrasound to identify the tumor nodule(s). In this study we introduce a novel adjunct to laparoscopic assisted microwave ablation via IV infusion of indocyanine green (ICG) dye.

**Methods:** 25 patients with cirrhosis and MRI-diagnosed hepatocellular carcinoma nodules received ICG (0.3125 -0.625 mg) to distinguish tumor nodules from surrounding regenerative nodules in cirrhotic livers. After infusion a fluorescence system for intraoperative laparoscopic imaging is used to capture the images. The light source is a light-emitting diode (LED) and the detector is a charge-coupled device (CCD) camera.

**Results:** 25 patients were administered low-dose ICG . Contrasting hypoperfusion of the HCC nodules (n=30) is identified within 5 minutes of infusion. Accuracy of HCC nodule identification=100% (Sensitivity = 100%; Specificity = 100%). Figure 1

**Conclusions:** Low-dose ICG infusion can safely be administered as a real-time operative adjunct and provides visualization that augments the ability to identify HCC nodules based on hypoperfusion characteristics of HCC nodules compared with regenerative nodules.

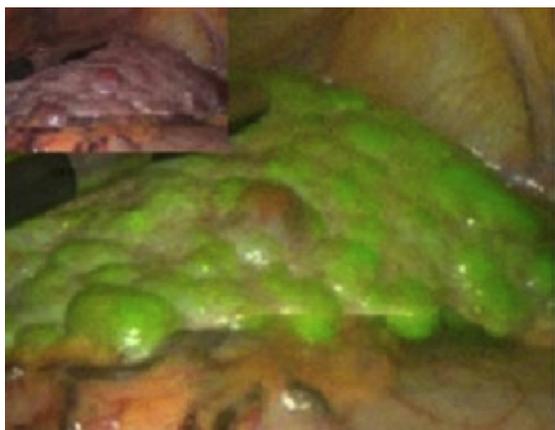


Figure 1. ICG infusion with isolation of solitary HCC nodule

#### OL05 - Liver: Miscellaneous

##### OL05-03

### HUMAN ESC-DERIVED EXPANDABLE HEPATIC ORGANOID ENABLE THERAPEUTIC LIVER REPOPULATION AND PATHOPHYSIOLOGICAL MODELING OF ALCOHOLIC LIVER INJURY

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**Introduction:** Here, we report the generation of human ESC-derived, expandable hepatic organoids (hEHOs) enabling therapeutic liver repopulation and pathophysiological modeling of alcoholic liver injury.

**Methods:** The culture system including a mix of A83-01, Forskolin, R-spondin 1, Wnt3a and EGF along with the extracellular matrix was used to generate hEHOs. The liver repopulation potential of hEHOs was assayed in FRG mouse model of inherited metabolic liver disorders. The tumorigenesis and lineage restriction of hEHOs were evaluated by transplanting the hEHOs into epididymal fat pads of NOD/SCID mice. To model alcoholic liver disease, a derivative model by incorporating human fetal liver mesenchymal cells (hFLMCs) into the hEHOs, referred to as hFLMC/hEHO was generated and treated with 100mM ethanol for 7days.

**Results:** The hEHOs stably maintain phenotypic features of bipotential liver stem/progenitor cells that can differentiate into functional hepatocytes or cholangiocytes. The hEHOs can expand for 20 passages enabling large scale expansion to cell numbers requisite for industry or clinical programs. The hEHOs display remarkable repopulation capacity in injured livers of FRG mice following transplantation. If implanted into the epididymal fat pads of immune-deficient mice, they do not generate non-hepatic lineages and have no tendency to form teratomas. The hFLMC/hEHO can model alcoholic liver disease-associated pathophysiologic changes, including oxidative stress generation, steatosis, inflammatory mediators release and fibrosis, under ethanol treatment.

**Conclusion:** The hEHOs have considerable potential to be a novel, ex vivo pathophysiological model for studying alcoholic liver disease as well as a promising cellular source for treating human liver diseases.

##### OL05-04

### SURGICAL STRATEGY FOR FUTURE REMNANT LIVER HYPERTROPHY: PORTAL VEIN EMBOLIZATION VS. LIVER VENOUS DEPRIVATION

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Preoperative portal vein embolization (PVE) is the standard technique used to increase the size of the future remnant

liver (FRL) before major hepatectomies. Another method to increase the FRL is liver venous deprivation (LVD), but its clinical and operative impact is still unknown. The aim of this study is to compare perioperative findings, morbidity and mortality and the increase in FRL volume (FRL-V) and FRL function (FRL-F) between PVE and LVD. Fifty-two patients undergoing PVE and LVD before a major hepatectomy were retrospectively analyzed between 2015 and 2018. Intra-operative parameters, postoperative complications and histological findings were compared. For the volumetric and functional assessment, we collected the results from CT-scan and 99m-technetium (Tc)-Mebrofenin hepatobiliary scintigraphy (HBS) realized at day 7<sup>th</sup>, 14<sup>th</sup> and 21<sup>th</sup> after embolization procedure. To induce FRL growth 25 patients underwent PVE and 23 LVD. No differences between the two groups were found in terms of intraoperative bleeding (P=0.9), hepatic pedicle clamping (P=0.46), intraoperative red blood cells transfusions (P=0.42) and operative time (P=0.95). Post-operative course was similar when comparing complications in the two arms (P=0.8). No difference in biliary leak (P=0.27), hemorrhage (P=0.11) and liver failure (P=0.6) was found. The two groups were also similar in terms of FRL-V increase, but there was a significant difference in favor of LVD group regarding the FRL-F increase at day 14<sup>th</sup> and 21<sup>th</sup>. LVD technique seems to be feasible, well tolerated and provides fast and important hypertrophy of the FRL, without influencing the morbidity and mortality rate during and after major hepatectomy.

#### OL05-05

### PERCENTAGE GENOME CHANGE AND CHROMOSOME 7Q AMPLIFICATION PREDICT SORAFENIB RESPONSE IN ADVANCED HEPATOCELLULAR CARCINOMA

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**Background:** Sorafenib is the first-line treatment for advanced stage HCC, but its therapeutic efficacy is less than 50%. Biomarkers for predicting the therapeutic efficacy of sorafenib administration to patients with advanced HCC are required. The role of chromosomal copy number aberrations (CNAs) in patients with advanced HCC for with sorafenib were evaluated for drug response.

**Methods:** The response to sorafenib treatment of twenty-three HCC patients who developed advanced recurrence after partial hepatectomy was analyzed using the modified Response Evaluation Criteria in Solid Tumors (mRECIST). Formalin fixed paraffin embedded (FFPE) tissue specimens obtained after tumor resection were analyzed using the Affymetrix OncoScan® FFPE assay.

**Results:** From the 23 patients analyzed in this study, 7 (30.4%) had complete/partial response to sorafenib (CR/PR), 7 (30.4%) had stable disease (SD), and 9 (39.1%) had progressive disease (PD). The mean genome-wide percentage of genome change acquisition via the OncoScan

platform was 19.8% for patients with CR/PR/SD and 50.02% in the PD group (P=0.055). Percentage of genome change above 33% was associated with adverse outcomes for sorafenib treatment in the time-to-progression analysis (P=0.007) and overall survival (P=0.096). Among these CNAs, amplification of chromosome 7q, containing the multidrug resistance gene *ATP Binding Cassette Subfamily B Member 1 (ACBC1)*, significantly associated with poor overall survival (P=0.004) and time-to-progression (P<0.001).

**Conclusions:** Higher percentage genome change and amplification of chromosome 7q in advanced HCC is associated with sorafenib resistance.

#### OL05-06

### LIVER STIFFNESS-BASED MODEL PREDICTS HEPATIC VENOUS PRESSURE GRADIENT IN PATIENTS UNDERGOING HEPATECTOMY AND LIVER TRANSPLANTATION

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**Background:** Invasive hepatic venous pressure gradient (HVPG) measurement is the gold standard test to assess portal hypertension. The aim was to develop a model predictive of clinically significant portal hypertension (HVPG≥10mmHg) using pre-operative noninvasive makers.

**Methods:** 161 patients [66% men, median age of 63 years] who have been planned for liver resection/transplantation were enrolled prospectively and preoperative liver stiffness measurement (LSM), liver function test, and intraoperative HVPG were performed.

**Results:** Median LSM, and HVPG were 9.5kPa, and 5mmHg respectively. No underlying liver disease (F0/1), chronic liver disease (F2/3), and cirrhosis (F4) were found in 32.9%, 32.9% and 34.2% patients respectively. The study cohort was randomly divided into training [n=106] and validation [n=55] sets. Independent predictors of HVPG≥10mmHg in the training set, LSM [p<0.01, OR=1.1], total bilirubin [p=0.04, OR=0.9], alkaline phosphatase [p=0.02, OR=1], and international normalized ratio [p<0.01, OR=41.4], were used to develop a probability score model called HVPG<sub>10</sub>score. Area under receiver operating curve in the training and internal validation sets were 0.91 [95%CI:0.83-0.98] and 0.93 [95%CI:0.86-0.99] respectively with a cutoff of 0.15. HVPG<sub>10</sub>score was calculated by multiplying the probability by 100. In the overall cohort, HVPG<sub>10</sub>score of 15 would predict the individual risk of HVPG≥10mmHg with 83% accuracy, 90% sensitivity, 81% specificity and 96% negative predictive value.

**Conclusions:** HVPG<sub>10</sub>score is an easy-to-use noninvasive continuous scale tool to predict HVPG≥10mmHg. A score < 15 would accurately rule out the need for esophageal varices screening and risk of decompensation in >95% chronic liver disease patients.

**OP01 - Pancreas: Pancreatitis**

OP01-02

**ONCOLOGICAL SUPERIORITY OF RAMPS TO CONVENTIONAL DISTAL PANCREATECTOMY**Y. Mise<sup>1</sup>, F. Ichida<sup>1</sup>, T. Mizuno<sup>1</sup>, R. Yoshioka<sup>1</sup>, Y. Ono<sup>2</sup>, T. Sato<sup>2</sup>, Y. Inoue<sup>2</sup>, Y. Takahashi<sup>2</sup> and A. Saiura<sup>1</sup><sup>1</sup>Hepato-Biliary-Pancreatic Surgery Division, Department of Surgery, Juntendo University School of Medicine, and <sup>2</sup>Cancer Institute Hospital, Japan

**Background:** To improve local radicality of surgical treatment for left-sided pancreatic cancer, radical antegrade modular pancreatectomy (RAMPS) was developed. However, no evidences are available regarding the superiority of RAMPS to conventional distal pancreatectomy (cDP) in terms of long-term outcomes.

**Objective:** To assess the oncological benefit of RAMPS by comparing outcomes between patients who underwent cDP and RAMPS.

**Methods:** Clinical data of patients undergoing cDP and RAMPS between 2009 and 2016 at two high-volume centers were analyzed. Patients having tumors of less than 5cm in size and those whose CA19-9 was less than 500ng/ml were included. Exclusion criteria were as follows; R2 resection, concomitant portal vein or celiac axis resection. Surgical outcomes were compared between patients who underwent cDP (cDP group) and RAMPS (RAMPS group).

**Results:** The cDP and RAMPS groups were composed of 49 and 56 patients, respectively. No differences were found in tumor characteristics (tumor size, CA19-9 level, and lymph node positive rate) between the two groups. Compared to the cDP group, operation time was longer (cDP/RAMPS: 275min/309min, p=0.03) and the amount of blood loss was larger (125ml/435ml, p< 0.01) in the RAMPS group. However, the incidence of major complications was similar between the two groups (4%/14%, p=0.08). No differences were found in the R0 resection rate (cDP/RAMPS: 92%/95%, p=0.57), 3-year overall survival rate (65.6%/60.1%, p=0.86), and 3-year recurrence-free survival rate (53.3%/52.0%, p=0.68). However, 3-year local recurrence rate was lower in the RAMPS group (26.7%/8.6%, p=0.04).

**Conclusion:** RAMPS is superior to conventional procedure in terms of long-term control of local recurrence.

OP01-03

**ACUTE GASTROINTESTINAL INJURY SCORE AND ITS PROGNOSTIC EFFICACY IN PATIENTS WITH ACUTE NECROTIZING PANCREATITIS**O. Rotar<sup>1</sup>, I. Khomiak<sup>2</sup>, V. Rotar<sup>1</sup>, O. Hrama<sup>1</sup> and O. Poliansky<sup>1</sup><sup>1</sup>Bukovinian State Medical University, and <sup>2</sup>A. Shalimov National Institute of Surgery and Transplantology, Ukraine

**Introduction:** Acute necrotizing pancreatitis (ANP) is potentially lethal inflammatory process. Recent researches established that presence of multiorgan failure together with pancreatic infection are major determinants of its mortality. But significance of acute gastrointestinal injury

AGI in course of ANP is still remaining unclear. So aim of our study was to determine frequency and significance of AGI on severity and mortality of ANP.

**Material:** We performed a prospective observational cohort study of 151 patients which were admitted to single intensive care department during early phase of ANP. Acute gastrointestinal injury was established according to ESICM recommendations. Clinical and laboratorial variables as well as plasma lipopolysaccharide, sCD14 receptors and citrulline concentrations were studied.

**Results:** Different levels of AGI were diagnosed in 141 (93.4%) of patients with ANP. Risk of intestinal dysfunction (1st grade) was detected in 24.5% cases, feeding intolerance (2nd grade) - in 35.8%, intestinal failure (3rd grade) - in 33.2% and critical intestinal failure (4th grade) - in 8.0%. Intestinal (3rd and 4th grade of AGI), respiratory, cardiovascular and renal failures were independent factors of mortality in multivariate logistic regression model (Wald's criteria 8.441, 5.464, 5.660 and 3.847, accordingly, p<0.05).

**Conclusion:** AGI is a frequent event during early phase of ANP. Intestinal failure (3<sup>rd</sup> and 4<sup>th</sup> grade of AGI) is strongly associated with unfavorable prognosis.

OP01-04

**SEQUENTIAL ORGAN FAILURE ASSESSMENT (SOFA) SCORE IS SUPERIOR TO CLASSICAL PROGNOSTIC INDICES IN PREDICTION OF SEVERITY, INTENSIVE CARE UNIT ADMISSIONS AND MORTALITY IN ACUTE PANCREATITIS**S. Baey<sup>1</sup>, T. Tan<sup>1</sup>, S. K. Gunasekaran<sup>2</sup>, S. P. Junnarkar<sup>2</sup>, J. K. Low<sup>2</sup>, C. W. Huey<sup>2</sup> and V. G. Shelat<sup>2</sup><sup>1</sup>National University of Singapore, and <sup>2</sup>Tan Tock Seng Hospital, Singapore

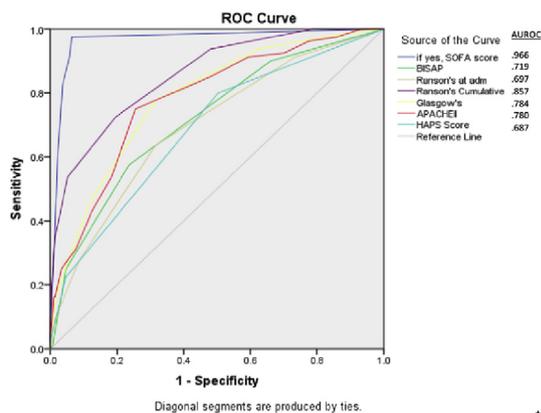
**Introduction:** Acute Pancreatitis (AP) is common and severe AP is potentially lethal. Many prognostic indices (APACHE-II, BISAP, Glasgow's, HAPS, Ranson's, SOFA) are used to predict severity. We evaluate utility of these indices in predicting severity, need for ICU admission, and mortality.

**Methodology:** A retrospective audit of 653 patients with AP from July 2009 to September 2016 is done. The demographic and clinical profile and patient outcomes were collected. Severe acute pancreatitis (SAP) was defined as per revised Atlanta classification.

**Results:** The mean age was 58.7±17.5 years with 58.7% males. Commonly identified etiologies of AP was gallstones(n=404, 61.9%), alcohol(n=38, 5.8%) and hypertriglyceridemia(n=19, 2.9%). 81(12.4%) patients developed SAP, 20(3.1%) required ICU admission and 12(1.8%) deaths were attributed to SAP. All-cause in-hospital mortality was 36(5.5%); 7(1.1%) cardiovascular causes, and 5(0.8%) pneumonia. Ranson's and APACHE-II demonstrated highest sensitivity in predicting SAP(92.6%, 80.2% respectively), ICU admission(100%) and mortality(100%). While SOFA and BISAP demonstrated lowest sensitivity in predicting SAP(13.6%, 24.7% respectively), ICU admission(40.0%, 25.0% respectively) and mortality(50.0%, 25.5% respectively). SOFA demonstrated highest specificity in predicting SAP(99.7%), ICU

admission(99.2%) and mortality(98.9%). SOFA demonstrated highest positive predictive value, positive likelihood ratio, diagnostic odds ratio and overall accuracy in predicting SAP, ICU admission and mortality. The highest Area under Receiver-operator Curves(AUROC) was demonstrated by SOFA and Ranson's cumulative(Ranson score at 48 hours) in predicting SAP(0.966, 0.857 respectively), ICU admission(0.943, 0.946 respectively) and mortality(0.968, 0.917 respectively).

**Conclusion:** SOFA score and Ranson's cumulative are accurate in severity stratification, prediction of ICU admission and mortality in acute pancreatitis.



Area under Receiver-Operator Curve for Prognosticating Severity in Acute Pancreatitis

#### OP01-05 HYPERTRIGLYCERIDEMIA-INDUCED PANCREATITIS: A 3-YEAR RETROSPECTIVE COHORT STUDY ON CLINICAL SEVERITY AND RECURRENCE RATES

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**Introduction:** Hypertriglyceridemia is a well-recognized cause for acute pancreatitis, however, there is a paucity of information regarding triglyceride (TAG) levels and its impact on disease course. We aimed to identify all hypertriglyceridemia-induced pancreatitis (HTGP) from 2016 to 2019 and to evaluate the impact of TAG levels on disease severity and recurrence rates.

**Methods:** 1457 admissions for pancreatitis were screened and 15 patients with HTGP were found. Information regarding recurrence rates, disease severity, length of stay, management, and mortality were extracted and compared against TAG levels.

**Results:** TAG levels on initial presentation ranged from 5 to 131mmol/L (mean 40mmol/L). There was no relation between TAG levels on initial presentation and recurrence rates. Recurrent pancreatitis occurred in 60% of this cohort (n=9). Frequency of recurrence (>2 episodes per year) was associated with persistently high TAG levels ranging from 10 to 50mmol/L. Those who had recurrent episodes with

TAG levels ranging from 6 to 10mmol/L either had poor glycaemic control or a history of alcoholism. Based on the Atlanta criteria, 30% experienced severe pancreatitis (n=5). TAG levels ranged from 10 to 113mmol/L during these severe episodes (median 37mmol/L; mean 53mmol/L). Mean duration of hospitalization for severe pancreatitis was 4 weeks (range: 1-15 weeks). No deaths were directly associated with these episodes of acute pancreatitis.

**Conclusion:** High TAG levels correlate with greater recurrence rates and severe pancreatitis. Poor glycaemic control and alcohol intake also contribute to these outcomes. Early diagnosis and management of HTGP is integral in preventing recurrence and improving long-term outcomes.

#### OP01-06 DISRUPTION OR DISCONNECTION OF THE PANCREATIC DUCT IN PATIENTS WITH SEVERE ACUTE PANCREATITIS: A LARGE PROSPECTIVE MULTI-CENTER COHORT

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**Introduction:** Disruption or disconnection of the pancreatic duct is a common finding following severe pancreatitis. Unselected data and guidelines are currently lacking on the exact incidence and clinical impact.

**Methods:** A total of 927 consecutive patients with severe acute pancreatitis, defined by the revised Atlanta Classification were evaluated for a disrupted/disconnection pancreatic duct. We assessed patient characteristics, diagnostic modalities, invasive interventions and clinical impact of disruption/disconnection of the pancreatic duct. Generalized linear models were used to adjust for pre-specified confounders.

**Results:** Disruption/disconnection of the pancreatic duct was diagnosed in 261/927 patients (28%). An association was found for male gender (OR 1.5, 95% CI 1.1 - 2.1, p=0.008) and parenchymal necrosis (OR 4.6, 95% CI 3.2 - 6.7, p< 0.001). An independent effect of a disrupted/disconnected pancreatic duct on readmission (adjusted OR 1.8, 95% CI 1.2 - 2.7, p=0.003), need for invasive intervention (adjusted OR 10.6, 95% CI 5.5 - 20.5, p< 0.001) and organ failure (adjusted OR 1.7, 95% CI 1.2 - 2.4, p=0.003), with no independent effect on mortality beyond the first week (adjusted OR 0.7, 95% CI 0.4 - 1.1, p = 0.143), was found. We found an independent association with abdominal compartment syndrome (adjusted OR 3.1, 95% CI 1.3 - 7.4, p=0.009).

**Conclusions:** Around one third of patients with severe acute pancreatitis develop a disrupted/disconnected pancreatic duct. Diagnostic modalities and treatment strategies vary widely and the clinical impact is considerable. Efforts should be made to define an optimal diagnostic work-up and treatment strategy to improve outcomes.

OP01-08

### DOES INCREASING EXPERIENCE IMPROVE OUTCOMES OF SURGICAL 'STEP-UP APPROACH' IN ACUTE NECROTIZING PANCREATITIS? LESSONS LEARNT FROM A TERTIARY REFERRAL CENTER

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**Background:** Step-up approach is becoming a standard of care for management of acute necrotizing pancreatitis. We aimed to investigate the learning curve effect on management and outcomes of surgical step-up approach

**Methods:** In a retrospective analysis of prospectively maintained database of patients with acute necrotizing pancreatitis referred to our Division, we divided patients into three distinct time periods: Group-1 (2008-2012), Group-2 (2013-2016) and Group-3 (2017-2019).

**Results:** A total of 335 patients were included, with 92 patients in Group-1, 117 in Group-2 and 126 in Group-3. Patients treated on surgical side in later time period had higher incidence of multiorgan failure (26.1% vs. 49.6% vs. 45.2%,  $p < 0.001$ ), APACHE II scores at presentation (8 vs. 10 vs. 9,  $p=0.006$ ) and at first intervention (9 vs. 11 vs. 10,  $p=0.037$ ), as well higher mCTSI score (8 vs. 10 vs. 10,  $p < 0.001$ ). Over time, median percutaneous drain size (10Fr vs. 12Fr vs. 14 Fr,  $p < 0.001$ ) as well as sepsis reversal after drainage (40.2% vs. 59% vs. 49.2%,  $p=0.026$ ) increased, whereas median number of drains ( $p=0.001$ ) and interventions (4 vs. 3 vs. 3,  $p=0.005$ ) decreased significantly. Necrosectomy requirement, length of stay and mortality remained similar over time despite more severe cases referred to surgical side.

**Conclusion:** With increasing experience of step-up approach, sicker patients with higher severity of pancreatitis could be managed successfully with fewer drains of bigger size and procedures leading to significantly higher sepsis reversal with drainage, with no increase in surgery requirement, length of stay or mortality.

### OP02 - Pancreas: Pancreatic Cysts

OP02-02

### RECURRENCE PATTERNS AFTER SURGICAL RESECTION OF INTRADUCTAL PAPILLARY MUCINOUS NEOPLASM (IPMN) OF PANCREAS; A MULTICENTER, RETROSPECTIVE STUDY OF 1,074 IPMN PATIENTS BY JAPAN PANCREAS SOCIETY

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Hospital, <sup>3</sup>Kyushu University, <sup>4</sup>Teine-Keijinkai Hospital, <sup>5</sup>National Cancer Center Hospital, <sup>6</sup>Kyoto Prefectural University of Medicine, and <sup>7</sup>Kansai Medical University, Japan

**Introduction:** Although there are numerous reports focusing on surgical indication for intraductal papillary mucinous neoplasm (IPMN), the recurrence patterns following surgery are less widely reported. To ascertain optimal treatment and postoperative surveillance for IPMN patients, we analyzed patterns and risk factors for recurrence after surgery for IPMN.

**Methods:** This study is a retrospective, multi-institutional, observational study, including 1,074 patients undergoing surgery for IPMN at 11 academic institutions. We analyzed risk factors for recurrence after classifying postoperative recurrences into metachronous high-risk lesions (malignant progression of IPMN and/or metachronous pancreatic ductal adenocarcinoma) in the remnant pancreas and extra-pancreatic recurrence.

**Results:** Of 1,074 patients undergoing surgery for IPMN, 155 patients (14.4%) developed postoperative recurrence. We found that 34.3% of 70 high-risk lesions in the remnant pancreas occurred over 5 years after surgery, and survival of 36 patients undergoing second operation for high-risk lesions was better than that of 34 patients who did not ( $P=0.04$ ). We found four independent risk factors for metachronous high-risk lesions in remnant pancreas: symptoms ( $P=0.005$ , hazard ratio [HR]: 1.988), location of pancreatic body/tail ( $P < 0.001$ , HR: 3.876), main duct size  $\geq 10$  mm ( $P=0.021$ , HR: 1.900), and high-grade dysplasia/invasive intraductal papillary mucinous carcinoma (IPMC) ( $P < 0.001$ , HR: 3.204). Although six patients (0.7%) with low- or high-grade dysplasia IPMN developed extra-pancreatic recurrence, invasive IPMC was the strongest risk factor for extra-pancreatic recurrence ( $P < 0.001$ , HR: 39.667).

**Conclusion:** We suggest that life-time continuous surveillance might be necessary for IPMN patients. Second surgery for metachronous high-risk lesions in remnant pancreas should be considered.

OP02-03

### THE PREOPERATIVE DYSPLASIA GRADE PREDICTION NOMOGRAM FOR MAIN-DUCT/MIXED TYPE PANCREATIC INTRADUCTAL PAPILLARY MUCINOUS NEOPLASMS (MD-IPMNS): THE DEVELOPMENT AND VALIDATION BASED ON A 7-YEAR SINGLE CENTER DATABASE

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**Introduction:** Surgical indications for MD-IPMN remain controversial due to the risk of pancreatic surgical procedure. Previous guidelines and predictive models were mainly focused on branch duct type IPMNs (BD-IPMNs) and have been relatively insufficient for both development and independent validation.

**Method:** IPMN patients who had undergone resection were collected retrospectively between 2013 and 2019. Patients were separated into MD-IPMN and BD-IPMN based on preoperative imaging. 177 MD-IPMN patients were finally enrolled and divided into training subset and test subset. Logistic regression modeling was used to develop model for identifying low-risk(low-/intermediate-grade dysplasia) or high-risk(high-grade dysplasia or invasive carcinoma) disease. The test subset was used for validating model by AUC, Brier's Score and C-index.

**Results:** We identified 203 IPMN patients underwent resection[MD:193(95.1%), BD:10(4.9%)]. 12 loss-pathology-patients were excluded. In MD-group, high-risk was present in 103 patients(53%) which is comparable to 74 low-risk patients(47%). MD-IPMN predictive nomogram was developed on the training set(70%, 124 patients) and validated on the test set(30%, 53 patients). The significant risk factor associated with high-risk disease including the presence of enhancing nodule(P=0.036), mural nodule(P=0.03), main-duct diameter(P=0.004) and the abnormal of CA19-9 value(P=0.028). Other potential risk factors including age, time since detection and cyst size. Brier's Score were 0.092 and 0.152, C-indexes were 0.94 and 0.85 on training and independent validation sets, respectively; AUCs were 0.916 and 0.856, respectively.

**Conclusions:** We present an independently validated nomogram for the prediction of MD-IPMNs malignant risk which thereby improve the identification of high-risk precursor and help avoid unnecessary damage by redundant surgical procedure.

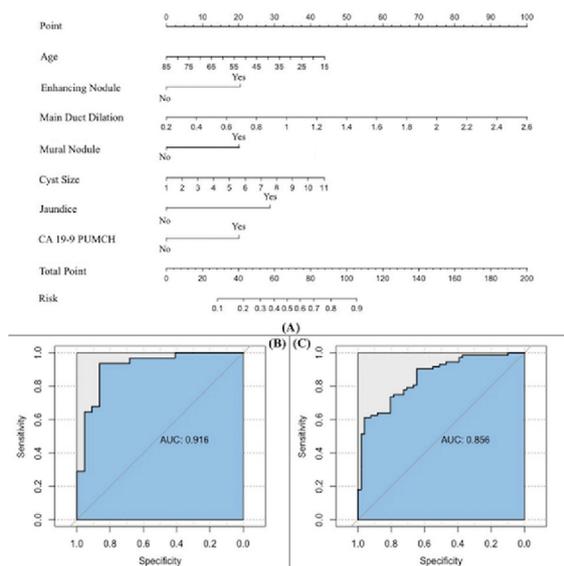


Figure1(A): The predictive nomogram for MD-IPMNs; 1(B) The ROC curve of validation in training group; 1(C) The ROC curve of independent validation in test group.

OP02-05  
**COMPARISON OF PERFORMANCE BETWEEN MACHINE LEARNING TECHNIQUE AND LOGISTIC REGRESSION IN TERMS OF RISK PREDICTION FOR MALIGNANCY OF THE INTRADUCTAL PAPILLARY MUCINOUS NEOPLASM OF PANCREAS**

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**Background:** Most nomograms predicting malignant intraductal papillary mucinous neoplasm (IPMN) of pancreas were developed based on the logistic regression (LR) analysis. This study was to develop a prediction model using machine learning (ML) and compare the performances between ML and LR model.

**Method:** This was a multi-national, multi-institutional, retrospective study. Malignant IPMNs were defined as those with high grade dysplasia and associated invasive carcinoma. Auto ML technique was utilized in R program. Six algorithms of ML (XG boost, deep learning, distributed random forest, generalized linear mode, gradient boosting machine, stacked ensemble [SE]) were utilized and compared. The algorithm which had the best performance was selected, and the performances of ML algorithm and LR model were compared.

**Result:** The total of 3,096 patients were enrolled. The patients were divided into model development set and external validation set with ratio of 2:1. In a multivariate LR, age, sex, main duct diameter, cyst size, mural nodule, and tumor location were independent risk factors for malignant IPMN. LR model consisted of these factors. Of the six algorithms, SE had the highest area under the receiver operating curve (AUC) in the internal validation (AUC, 0.742). The performances were comparable between ML and LR models in the external validation (AUC, 0.725 vs. 0.721).

**Conclusion:** The performance of LR model was comparable to that of ML. The LR model would be more practical because of its clinical convenience.

**OP03 - Pancreas: Tumours**

OP03-01

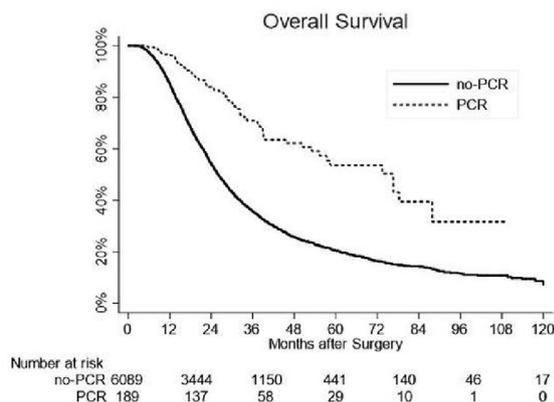
**INCIDENCE AND PROGNOSIS OF PATHOLOGIC COMPLETE RESPONSE FOLLOWING NEOADJUVANT THERAPY FOR PANCREATIC DUCTAL ADENOCARCINOMA**J. Cloyd<sup>1</sup>, C. Shen<sup>2</sup>, M. Dillhoff<sup>2</sup>, A. Manilchuk<sup>2</sup>, T. Pawlik<sup>2</sup> and A. Tsung<sup>2</sup><sup>1</sup>Surgery, and <sup>2</sup>The Ohio State University, United States

**Introduction:** Neoadjuvant therapy (NT) is increasingly utilized for patients with pancreatic ductal adenocarcinoma (PDAC). While a pathologic complete response (pCR) to NT has been shown to be an important prognostic factor in single-institution studies, the incidence, characteristics, and outcomes of pCR have not been investigated in a population-based cohort.

**Methods:** Patients with localized PDAC and known cT and pT stage who received NT prior to pancreatectomy were identified using the National Cancer Database from 2004-2016. The clinical, demographic, socioeconomic, and hospital-related characteristics as well as long-term outcomes of patients who did and did not experience pCR were compared.

**Results:** Among 7,902 patients who underwent NT prior to pancreatectomy, 244 (3.1%) experienced a pCR while 7,658 (96.9%) did not. Patients who experienced a pCR were younger (62.6 vs 63.9 years,  $p < 0.05$ ), had a longer duration of NT (200.5 vs 141.9 days,  $p < 0.001$ ), and were more likely to have advanced cT stage (T4: 26.2% vs 14.6%,  $p < 0.001$ ), cN0 stage (72.4% vs 66.4%,  $p < 0.05$ ) and to have received preoperative radiation (67.6% vs 47.3%,  $p < 0.001$ ). Median overall survival (OS) was longer among patients who experienced pCR compared to those who did not (76.6 vs 26.0 months,  $p < 0.001$ ) (Figure). On multivariate cox regression, a pCR was the strongest predictor of improved OS (HR 0.43, 95% CI 0.32-0.58).

**Conclusions:** A pCR following NT for PDAC occurs infrequently but is associated with significantly improved OS. Better predictors of response to NT and more effective preoperative regimens should be aggressively sought.



Overall Survival of Pathologic Complete Response

OP03-04

**THE TUMOR BURDEN AND IMMUNE DYNAMIC CHANGES IN PANCREATIC CANCER LIVER METASTASIS**

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**Background:** The prognosis of the patient with pancreatic cancer liver metastasis is very poor. Investigating the dynamic changes of pancreatic cancer (PC) liver metastasis may contribute to alleviate PC liver metastasis progression.

**Methods:** Murine pa

necreatic cancer cell line Panc02 was transfected with GFP protein as tumor marker.  $3 \times 10^6$  Panc02<sup>GFP+</sup>/mouse were injected into spleen to establish PC liver metastasis animal model. In 1 hour and Day1, 5, 10, 20, 35 after the operation, four mice were sacrificed and their liver were embedded into paraffin. Immunohistochemistry were used to evaluate the tumor burden and infiltrating CD8<sup>+</sup>T cell.

**Results:** In 1 hour after operation, the tumor cells evenly distributed in liver. The tumor burden of liver metastasis slightly increased in Day5-10 and the distribution of the metastasis became clumped. In Day20, no metastasis was found in some mice but some had large patchy metastasis in their liver. In Day35, some had "normal" liver and some had nodular metastasis in the liver. No obvious characteristic distribution of CD8<sup>+</sup>T cell was found in 1hour and Day1 group. In Day5 CD8<sup>+</sup>T cells distributed in the edge of the metastasis. In Day10, CD8<sup>+</sup>T cells reached the peak and infiltrated in the center of metastasis. In Day20 and Day35 groups, those who had nodular liver metastasis obviously had lower CD8<sup>+</sup>T cell infiltration.

**Conclusions:** Single pancreatic cancer cell successfully developing into nodular liver metastasis is the result of cancer cell and host interaction. Intervening the tumor microenvironment in early stage of metastasis may help reduce PC liver metastasis.

OP03-05

**CLINICAL IMPACT OF ATRX, TSC2, AND PTEN EXPRESSION ON PROGNOSIS IN PATIENTS WITH GRADE 1 AND 2 PANCREATIC NEUROENDOCRINE TUMOR**K. Okano<sup>1</sup>, J. Uemura<sup>1</sup>, M. Oshima<sup>1</sup>, H. Suto<sup>1</sup>, Y. Ando<sup>1</sup>, H. Matsukawa<sup>1</sup>, K. Kadota<sup>2</sup> and Y. Suzuki<sup>1</sup><sup>1</sup>Gastroenterological Surgery, and <sup>2</sup>Pathology, Kagawa University, Japan

**Objective:** The goal of this retrospective study was to clarify the clinical implications of immunohistochemically detected protein expression for genes that are frequently mutated in pancreatic neuroendocrine tumors (PNETs).

**Background:** The clinical management of PNETs is hindered by their heterogenous biological behavior. Whole-exome sequencing recently showed that five genes (*DAXX*/*ATRX*, *MEN1*, *TSC2*, and *PTEN*) are frequently mutated in

PNETs. However, the clinical implications of the associated alterations in protein expression remain unclear.

**Methods:** We collected Grade 1 and 2 (World Health Organization 2017 Classification) primary PNETs samples from 100 patients who underwent surgical resection. ATRX, DAXX, MEN1, TSC2, and PTEN expression were determined immunohistochemically to clarify their relationships with prognosis and clinicopathological findings.

**Results:** Kaplan-Meier analysis indicated that loss of TSC2 (n=58) or PTEN (n=37) was associated with significantly shorter overall survival, and that loss of TSC2 or ATRX (n=41) was associated with significantly shorter recurrence-free survival. Additionally, loss of ATRX or TSC2 was significantly associated with nodal metastasis. In a multivariate analysis, combined loss of TSC2 and ATRX (n=31) was an independent prognostic factor for shorter recurrence-free survival (hazard ratio 10.1, 95% confidence interval 2.1-66.9, p=0.003) in G2 PNETs.

**Conclusions:** Given the widespread availability of immunohistochemistry, loss of ATRX, TSC2, and PTEN expression might be useful as a method of clarifying the behavior of Grade 1 and 2 PNETs in routine clinical practice. Combined loss of TSC2 and ATRX had an especially strong, independent association with shorter recurrence-free survival in patients with G2 PNETs.

#### OP03-06

### GEOGRAPHIC VARIATION IN ATTITUDES REGARDING LOCALLY ADVANCED PANCREATIC CANCER MANAGEMENT

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**Introduction:** Studies suggest attitudes regarding management of locally advanced pancreas cancer (LAPC) vary widely. We sought to examine the influence of geographic practice location on attitudes regarding LAPC management.

**Methods:** An electronic survey was distributed by email to an international cohort of pancreas surgeons. Data collected included practice characteristics, preferences for management, and 6 vignettes (with videos of post-neoadjuvant imaging) to assess attitudes regarding eligibility for exploration. Descriptive and comparative statistics were used to examine differences in attitudes across geographic locations.

**Results:** A total of 153 eligible responses were received from 4 continents: North and South America (NSA, N=94, 61.4%), Europe (EUR, N=25, 16.3%), and Asia (N=34, 22.2%). Neoadjuvant chemotherapy is always recommended by a majority of participants in NSA (81.9%) and

EUR (68.0%), but a minority in Asia (47.1%, P=0.001). The preferred duration of neoadjuvant chemotherapy also varies: participants from Asia commonly prefer 2 months (61.8%), while NSA participants prefer 4 months (52.1%), and responses from EUR were mixed (P=0.006). Participants from Asia are less likely to consider isolated liver (Asia: 67.6% vs. NSA: 90.4% vs. EUR: 72.0%; P< 0.005) or lung (Asia: 61.8% vs. NSA: 88.3% vs. EUR: 72.0%; P< 0.005) metastases contraindications to exploration, and consequently had a greater propensity to consider exploration in a vignette of oligometastatic disease (56.7%, vs. NSA: 25.6% and EUR: 43.5%, P=0.007).

**Conclusions:** In an international survey of pancreas surgeons, attitudes regarding LAPC management varied widely across geographic locations of practice. This variation highlights the need for evidence-based guidelines regarding the optimal management of LAPC.

#### OP03-07

### DISCOVERY PROTEOMIC ANALYSIS OF PANCREATIC TUMOR TISSUE TO IDENTIFY BIOMARKERS FOR THE PREDICTION OF RESPONSE TO NEOADJUVANT CHEMOTHERAPY

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**Introduction:** Neoadjuvant chemotherapy (NAC) has been of recent interest as an alternative to upfront surgery followed by adjuvant chemotherapy in patients with pancreatic ductal adenocarcinoma (PDAC). However, a subset of patients does not respond to NAC and may have been better managed by upfront surgery. Hence, there is an unmet need for accurate biomarkers for predicting NAC response in PDAC. We aimed to identify upregulated proteins in tumor tissue from poor- and good-NAC responders.

**Methods:** Tumor and adjacent pancreas tissue samples were obtained following surgical resection from NAC-treated PDAC patients. SWATH-MS proteomic analysis was performed to identify and quantify proteins in tissue samples. Statistical analysis was performed to identify biomarkers for NAC response. Pathway analysis was performed to characterize affected canonical pathways in good- and poor-NAC responders.

**Results:** A total of 3156 proteins were identified, with 19 being significantly upregulated in poor-responders compared to good-responders (log<sub>2</sub>-ratio >2, p< 0.05). Those with the greatest ability to predict poor-NAC response were GRP78, CADM1, PGES2 and RUXF. Notably, canonical pathways that were significantly upregulated in good-responders included acute phase signalling and macrophage activation, indicating a heightened immune response in these patients.

**Conclusion:** A novel biomarker signature for poor-NAC response in PDAC was identified.

OP03-09

### COMPARATIVE BIOINFORMATICAL ANALYSIS OF PANCREATIC HEAD CANCER AND PANCREATIC BODY/ TAIL CANCER

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**Introduction:** The clinical differences between pancreatic head cancer and pancreatic body/tail cancer have been noticed for a long time. This study is to explore the biological disparities between these two from a bioinformatical perspective.

**Methods:** RNA-seq, mutation and clinical data were downloaded and collected from The Cancer Genome Atlas (TCGA), FireHose and CBioPortal. The patients were divided into 146 cases of pancreatic head cancer and 28 cases of pancreatic body/tail cancer. Then survival analysis was performed. DEGs were screened by R package Deseq2. Gene Ontology (GO), Kyoto Encyclopedia of Genes and Genomes (KEGG) and protein-protein interaction (PPI) were then carried out by DAVID and String. R package maftools and GenVisR were applied to analyze frequently-mutated genes and mutant-allele tumor heterogeneity (MATH) of PDAC.

**Results:** Survival of patients with pancreatic body/tail cancer was better than those with pancreatic head cancer (median survival, 24.05 vs 19.45 months,  $p = 0.048$ ). And 496 significant DEGs were identified including 253 down-regulated genes and 243 up-regulated genes. And there were 13 Go terms (4 biological processes, 6 cellular components and 3 molecular functions) and 3 KEGG pathways (Pancreatic secretion, Fat digestion and absorption, Protein digestion and absorption) ( $FDR < 0.05$ ). MATH scores of pancreatic body/tail cancer were higher than pancreatic head cancer, while chi-square test of top 10 frequently-mutated genes showed little difference between them.

**Conclusion:** There were prognostic and genetic differences between pancreatic head cancer and pancreatic body/tail cancer. PDAC originated from different location may have different biological natures and should be considered with different management.

OP03-10

### EFFICIENT TARGETED THERAPY FOR PANCREATIC CANCER USING NANOSYSTEM AND FOCUSING ON THE SUPPRESSION OF PANCREATIC STELLATE CELL ACTIVATION

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**Introduction:** Pancreatic cancer is characterized by remarkable desmoplasia which causes poor drug delivery and resistance to anticancer therapy. Pancreatic stellate cells (PSCs) play a key role in construction of such tumor environment and enhance the malignancy of pancreatic

cancer cells. We have previously reported PSC activation was suppressed by inhibiting autophagy of PSC using a lysosomal inhibitor, chloroquine (CQ). However, CQ requires high dosage to be effective *in vivo*. In this study, we developed nanoparticle-based drug delivery system (DDS) and evaluated its availability in the tumor-bearing mouse model.

**Methods:** Poly lactic-co-glycolic acid (PLGA) was used as a DDS carrier. The PLGA nanoparticles were loaded with ICG (Nano-ICG) or CQ (Nano-CQ). The accumulation of Nano-ICG in pancreatic tumor was evaluated by *in vivo*-imaging system (IVIS). The effects of CQ, Nano-CQ, or the combination of these agents and gemcitabine (GEM) on the activation of PSC and tumor growth were investigated in the orthotopic xenograft mouse model.

**Results:** Nano-ICG showed pancreatic tumor-specific accumulation and persisted for more than one week after administration. No obvious accumulation was observed in other major organs including liver, kidney, and normal pancreatic tissue. The fraction of activated PSC was significantly decreased in Nano-CQ group compared to the control group. The combination of Nano-CQ and GEM showed the best ability to restrain tumor progression among all the groups.

**Conclusion:** Our PLGA-based nanosystem was considered to be a promising DDS for the treatment of pancreatic cancer and nano-CQ could enhance the efficacy of anti-cancer drugs.

OP03-11

### LYMPH NODE RATIO AS PREDICTOR OF SURVIVAL IN PATIENTS WITH RESECTED PANCREATIC DUCTAL ADENOCARCINOMA

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**Introduction:** Lymph node ratio (LNR) was proven to be predictive of survival in several gastrointestinal cancers. Its predictive role in pancreatic ductal adenocarcinoma (PDAC) remains unknown. This study aimed to assess if LNR predicted overall survival (OS) after pancreatoduodenectomy for PDAC.

**Method:** Data were collected from six international tertiary centers. Patients with PDAC who underwent upfront pancreatoduodenectomy were included (2000-2018). LNR (positive lymph nodes/harvested lymph nodes) was calculated for all patients based on pathology reports. Prognostic

OS factors were assessed using multivariable Cox regression.

**Results:** In total, 1513 patients were included. Ninety-day mortality rate was 5.9% (89/1513). Lymph node invasion (pN+) was present in 1175 patients (77%). Median number of harvested lymph nodes and positive lymph nodes were 18 (IQR 12-24) and 3 (IQR 2-6). Median LNR was 0.148 (IQR 0.042-0.333) in the entire cohort and 0.214 (IQR 0.107-0.372) in pN+ patients. Best LNR threshold to predict OS in pN+ patients was 0.043 (C-index 0.562). A total of 368 and 1101 patients had  $LNR < 0.043$  and  $LNR \geq 0.043$  (44 missing data). Patients with  $LNR \geq 0.043$  had worse median OS (23 vs. 50 months,  $p < 0.001$ ). On multivariable analysis, LNR was an independent OS predictor (HR 4.7, 95% CI 1.1-19.2,  $p=0.033$ ). In the pN+ group, patients with  $LNR \geq 0.043$  also had worse median OS (23 vs. 44 months,  $p=0.037$ ). In N1 and N2 subgroups, LNR was also an independent OS predictor.

**Conclusions:** In this international, multicenter cohort study, LNR was a strong independent prognostic factor of OS in patients with PDAC who underwent pancreateoduodenectomy.

#### OP03-12

### USE OF DEEP LEARNING TO PREDICT TUMOR RESPONSE TO NEOADJUVANT THERAPY IN PANCREATIC ADENOCARCINOMA: PURE AND HYBRID MODELLING

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**Introduction:** Neoadjuvant chemotherapy (NAC) is a growing treatment of pancreatic adenocarcinoma (PDAC) however, determining response to NAC is difficult from preoperative imaging. Our hypothesis is that a deep learning model can be used to predict tumor response to neoadjuvant therapy.

**Method:** Patients with PDAC that received NAC before pancreaticoduodenectomy between November 2009 and February 2019 were identified. Computed tomography (CT) images of the entire pancreas with 5mm width were obtained. Patients were grouped by CAP-TRG grade (0-2 good response vs 3 poor response). Images were used to train a convolutional neural network (CNN) deep learning model (LeNet-type). Image augmentation was used to increase the number of images available for model creation and validation.

**Results:** 81 patients were identified, 35 patients with good response (333 images) and 46 patients with poor response (443 images). A "training set" of 80% of patient images (n=65) was used to create the deep learning model. The model had good internal validity (100%) with loss function  $< 0.02$ . The "testing set" of 20% of patient images (n=16) was analyzed with the trained model. The AOC was 0.7383 ( $p < 0.0001$ ) with Brier statistic of 0.2347. The same procedure was used to analyze patients with  $> 10\%$  reduction in CA19-9 after NAC (n=51). This improved the model with AOC of 0.7846 ( $p < 0.0001$ ) and Brier statistic of 0.1735.

**Conclusion:** Deep learning can be used to predict response to NAC for patients with PDAC from imaging or CA19-9 response. Further model improvements are needed before widespread clinical application.

#### OP03-13

### CONDITIONAL SURVIVAL DURING FOLLOW-UP AFTER RESECTION FOR PANCREATIC CANCER: A POPULATION-BASED STUDY AND PREDICTION MODEL

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**Background:** Conditional survival is the survival probability after already surviving a predefined time period. This may be informative during follow-up, especially when adjusted for tumor characteristics. Such prediction models for patients with resected pancreatic cancer are lacking and therefore conditional survival was assessed and a nomogram predicting 5-year survival at a predefined period after resection of pancreatic cancer was developed.

**Methods:** This population-based study included patients with resected pancreatic ductal adenocarcinoma from the Netherlands Cancer Registry (2005-2016). Conditional survival was calculated as the median and the probability of surviving up to 8 years in patients who already survived 0-5 years after resection using the Kaplan-Meier method. A prediction model was constructed.

**Results:** Overall, 3,082 patients were included with a median age of 67 years. Median overall survival was 18 months (95%CI 17-18 months) with a 5-year survival of 15%. The 1-year conditional survival (i.e. probability to survive the next year) increased from 55% to 74% to 86% at 1, 3, and 5 years after surgery, respectively. The median overall survival increased from 15 to 40 to 64 months at 1, 3, and 5 years after surgery, respectively. The prediction model demonstrated that the probability to achieve 5-year survival at 1 year after surgery varied from 1-58% depending on patient- and tumor characteristics.

**Conclusions:** This population-based study showed that one-year conditional survival was 55% one year after resection and 74% three years after resection in patients with pancreatic cancer. The prediction model is available via [www.pancreascalculator.com](http://www.pancreascalculator.com) to inform patients and caregivers.

#### OP03-14

### PROGNOSTIC VALUE OF TP53, CDKN2A/P16 AND SMAD4/DPC4 IN RESECTED LOCALLY ADVANCED PANCREATIC CANCER

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**Introduction:** Prognostic factors are needed in patients with locally advanced pancreatic cancer (LAPC). We herein evaluate the prognostic impact of TP53, CDKN2A/p16 and SMAD4/DPC4 in patients who received a pancreatectomy with arterial resection (P-Ar) for LAPC.

**Methods:** Gene status was immunohistochemically assessed in patients operated between 2000 and 2017, based on tissue availability. Differences in disease specific survival (DSS) and disease free survival (DFS) between patients with positive and negative status were calculated by using Kaplan-Meier curves and Log-rank test. Relationship between preoperative features and genes expression was evaluated by using logistic regression.

**Results:** Among 99 P-Ars, 38 patients were eligible for this study. The superior mesenteric artery was resected in 16 (42.1%) patients and the celiac axis/hepatic artery in 26 (68.4%) patients. Median DSS and DFS were of 25.3 (14.2-74) and 12.8 (10.3-22) months, respectively. Abnormal immunolabeling of TP53 was present in 21 (55.2%) LPACs. Loss of p16 and SMAD4 was identified in 23 (60.5%) and 22 (57.9%) LPACs, respectively. DSS and DFS were longer in patients with positive SMAD4, positive p53 and loss of p16 (table 1). Association of loss of SMAD4 with abnormal labelling of p53 and p16 expression resulted in shorter DSS (13.3 vs. 26.7 months,  $p=0.03$ ) and DFS (10.3 vs 15 months,  $p=0.01$ ). Preoperative level of Ca 15.3 correlated with SMAD4/DPC4 ( $p=0.01$ ) and worst prognosis ( $p=0.24$ ).

**Conclusion:** Positive SMAD4 and p53 and negative p16 predicted survival in a cohort of 38 patients with LAPC following P-Ar. More patients are required to validate our results.

Table 1 – Median disease specific survival and progression free survival in patients with LA- PDAC based on SMAD4/DPC4, CDKN2A/p16, and TP53 status

	SMAD 4/DPC4			CDKN2A/P16			TP53		
	Intact	Loss	p	Positive	Negative	p	Normal	Abnormal	p
DSS	26.7 (20.9-39)	18.6 (13.3-74)	0.43	18.8 (13.3-NA)	25.3 (15.7-74)	0.88	39 (15.7-NA)	18.8 (14-74)	0.37
DFS	16 (10.8-21)	12.7 (8.1-39.6)	0.83	12 (9.9-18.7)	15 (12-22)	0.77	36 (10.8-21.9)	12.7 (10.3-22)	0.58

### OP03-17

#### PANCREATIC CANCER RISK PREDICTION MODEL USING A MULTI-BIOMARKER PANEL

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The pancreatic ductal adenocarcinoma (PDAC) has dismal survival rate due to late detection. Thus, many researches have been tried to discover diagnostic biomarkers for early detection of PDAC. Previously, we developed the triple marker panel, including leucine-rich alpha-2 glycoprotein (LRG1), transthyretic (TTR), and CA 19-9, with sensitivity of 82.5%; specificity of 92.1%<sup>1</sup>. Now, in this study, using this panel, we were to discover a risk prediction model for pancreatic cancer for early diagnosis with the enzyme-linked immunosorbent assay (ELISA). There were 744

samples assessed with ELISA, including PDACs (n=396) and normal samples (n=348). We proposed a risk prediction model with machine-learning method, logistic regression (LR), and compared it with support vector machine (SVM) and random forest (RF). To commercialize this model, we searched two optimal thresholds to distinguish three risk groups (high, intermediate, and low) that reliably satisfy four measurements, negative predictive value (NPV), positive predictive value (PPV), sensitivity (SEN), and specificity (SPE), simultaneously greater than 0.95%. The Pearson correlation between the triple marker panel examined with ELISA and the individual marker panel examined with ELISA<sup>1</sup> was 0.884. The risk prediction model distinguished pancreatic cancer from normal individuals with AUC 0.935. The thresholds in between low, intermediate and high groups were 0.11 and 0.77, that satisfied NPV 95.15%, PPV 97.55%, SEN 97.55%, and SPE 95.15%. We first validated reproducibility of the performance of the triple marker panel in this study. And our risk prediction model for pancreatic cancer achieved high accuracy prediction, which can be easily used in the clinic.

### OP03-18

#### MOLECULAR PROFILING PRACTICES IN PANCREATIC ADENOCARCINOMA: ACADEMIC VERSUS COMMUNITY PROVIDERS

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**Introduction:** Molecular profiling is currently being explored as a tool for selecting patients in targeted therapy clinical trials and to determine prognosis for patients with pancreatic adenocarcinoma (PDAC). Noninvasive molecular profiling strategies are critical given the invasiveness of obtaining tissue biopsies. We examined the practice patterns of academic versus community providers in relation to molecular profiling practices and PDAC.

**Methods:** We evaluated eighty-two patients referred to a tertiary clinic center to analyze patterns of molecular profiling in patients with metastatic PDAC prior to referral. **Results:** A total of 42/82 (51%) were men, median age being 66 years (range 40-85). 62% (51/82) of patients were referred from the community, 25% (21/82) academic, and 7% (6/82) self-referred. 48% received profiling prior to referral, 30/51 (58%) community and 10/21 (47%) academic. FoundationOne was the most commonly ordered test with 21/82 (25%), and Guardant the second most common with 8/82, (9%). Six patients (7%) received both Guardant and Foundation one testing, and 3/82 (3%) received Caris MiProfile. One received a Mocha assay and one the Ascend/Clariant Fish. Another was self-referred, the test ordered by the primary care physician.

**Conclusion:** This study analyzes practice patterns of PDAC and the use of molecular profiling in Denver, Colorado. Both academic and community providers were found to order profiling about half of the time, with FoundationOne being the most common. Further research is needed to determine which factors affect ordering and impact on trial enrollment and survival.

OP03-19

### CONTROVERSIAL ONCOLOGIC BENEFIT OF ADJUVANT THERAPY FOR AMPULLARY CANCER: A PROPENSITY SCORE MATCHED ANALYSIS

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**Background:** Although surgical treatment is the main stay for ampullary cancer(AC), the role of adjuvant chemotherapy for better prognosis is not confirmed yet.

**Methods:** AC patients who underwent pancreaticoduodenectomy were included between 2011 and 2019. Survival and recurrence were compared between observation(OB) and adjuvant chemotherapy(CTx) group after propensity score matching(PSM) using perioperative variables.

**Results:** Of 476 patients, OB group showed larger tumor size(2.1 vs 1.8cm,  $p=0.002$ ), higher T stage(1,2 vs 3,4; 55.8 vs 19.0%,  $p<0.001$ ), N stage(0 vs 1; 58.3 vs 18.4%,  $p<0.001$ ) using AJCC 7th, poor differentiation(17.5 vs 6.8%,  $p<0.001$ ), lymphovascular invasion(LVI) (83.5 vs 30.1%,  $p<0.001$ ), perineural invasion(PNI) (44.3 vs 13.4%,  $p<0.001$ ), and high carbohydrate antigen 19-9  $>37$  IU/L (42.2 vs 26.7%,  $p=0.006$ ) compared with OB group before PSM. Median follow up period was 33.4months. The 5-year overall survival(OS) (68.8 vs 60.3%,  $p=0.005$ ) and recurrence free survival(RFS) rate(71.5 vs 42.2%,  $p<0.001$ ) showed poor prognosis in CTx group compared OB group before PSM. Higher N stage(Hazard ratio[HR] 3.592, 95% confidence interval(CI) 1.822-7.082,  $p<0.001$ ), tumor size 9HR 1.294, 95% CI 1.044-1.605,  $p=0.019$ ), LVI(HR 2.126, 95% CI 1.180-3.830,  $p=0.019$ ) PNI (HR 1.935, 95% CI 1.206-3.103,  $p=0.006$ ), were prognostic factors for OS. After PSM, perioperative outcomes were comparable. In oncologic outcomes, the 5-year OS(65.7 vs 62.6%,  $p=0.659$ ) and RFS(48.7 vs 56.1%,  $p=0.741$ ) rate was not different between OB and CTx groups even after stratified tumor stage.

**Conclusion:** The patients with adjuvant chemotherapy showed comparable oncologic outcome compared the patients without adjuvant therapy. Large study will give us confirmative results of role of adjuvant therapy for ampullary cancer.

OP03-20

### RELATION BETWEEN QUALITY OF LIFE AND SURVIVAL IN PATIENTS WITH PANCREATIC AND PERIAMPULLARY CANCER: A MULTICENTER COHORT ANALYSIS

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**Background:** A relation between quality of life (QoL) and survival has been demonstrated for several types of cancer,

yet is unclear for patients with pancreatic/periampullary cancer.

**Methods:** Analysis of QoL data from a prospective multicenter patient reported outcome registry in patients with pancreatic/periampullary carcinoma registered in the nationwide Netherlands Cancer Registry (2015-2018). Baseline and delta QoL (i.e. baseline - three months) was assessed with the Happiness, EORTC QLQ-C30 and QLQ-PAN26 questionnaires. The relation between QoL and survival was assessed with Cox regression models and additional prognostic value of separate items with Nagelkerke's  $R^2$ .

**Results:** For the baseline and delta analyses, 233 and 148 patients were available. The majority had pancreatic adenocarcinoma ( $n=194$ , 83.3%), stage III disease ( $n=77$ , 33.0%), with a median overall survival of 13.6 months. Multivariate analysis using baseline scores, indicated several scales to be of prognostic value for the total cohort (i.e. happiness today, role functioning, diarrhea, pancreatic pain, body image, all  $P < 0.05$ ) and for patients without resection (i.e. satisfaction with life, physical/cognitive functioning, summary score, fatigue, pain, constipation, diarrhea, body image, all  $P < 0.05$ ). Except for diarrhea, all QoL items accounted for  $>5\%$  of the additional explained variance. Multivariate analysis using delta QoL revealed that only constipation was of prognostic value for the total cohort.

**Conclusion:** In a multicenter cohort of patients with pancreatic/periampullary carcinoma, QoL scores predicted survival, regardless of patient, tumor and treatment characteristics. QoL scores may thus be used for shared decision making regarding disease management and choice of treatment.

OP03-21

### PREVENTING DELAYED GASTRIC EMPTYING AFTER WHIPPLE'S EMPTYING AFTER WHIPPLE'S PROCEDURE - ISOLATED ROUX LOOP RECONSTRUCTION WITH PANCREATICO-GASTROSTOMY

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**Introduction:** Although delayed gastric emptying (DGE) after Whipple's pancreaticoduodenectomy is not life threatening and can be treated conservatively, it results in discomfort and significant prolongation of the hospital stay and adds on to the hospital costs. To overcome this problem, we started using the isolated loop technique of reconstruction along with pancreaticogastrostomy and we present our series using this technique.

**Methods:** All consecutive patients undergoing Whipple's pancreaticoduodenectomy in a single surgical unit from January 2009 until December 2018 were included. In the absence of hepatic and peritoneal metastasis, resection (Whipple's procedure) with curative intent was done using isolated loop technique with pancreaticogastrostomy. Delayed gastric emptying was assessed clinically and on

oral gastrograffin study. Bile reflux was also assessed on clinical parameters and evidence of beefy friable gastric mucosa on upper GI endoscopy and presence of reflux on hepatobiliary scintigraphy.

**Results:** A total of 101 patients were operated using this technique from January 2009 to December 2018. The mean operative time was  $260.8 \pm 50.3$ , and the mean operative blood loss was  $1,068.0 \pm 606.1$  ml. Mean gastric emptying time  $106.0 \pm 6.1$  min (89-258 min). 5 out of the 101 (4.9%) patients had persistent vomiting in the post-operative period requiring reinsertion of NG tube. A HIDA scan done on POD7 for all patients did not show any evidence of bile reflux in any of the patients.

**Conclusion:** Pancreatogastrostomy with isolated loop in pancreaticoduodenal resection markedly reduces the post-operative incidence of alkaline reflux gastritis and DGE

#### OP03-22

### PROGNOSTIC VALUES OF SUVMAX VALUE OF PET/CT AND CA19-9 AS BIOLOGIC MARKERS IN PATIENTS WITH PANCREATIC DUCTAL ADENOCARCINOMA

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Among various prognostic factors of pancreatic cancer, most of clinical information before surgery is obtained by imaging modality. However tumor biologic characteristics also should be considered to decide treatment plan. Purpose of this study is to evaluate clinical usefulness of preoperative standard uptake value in 18F-fluorodeoxyglucose positron emission tomography and carbohydrate antigen as biologic markers for prognosis of resectable pancreatic ductal adenocarcinoma. 189 patients with pancreatic adenocarcinoma underwent preoperative FDG-PET testing were studied. SUVmax was calculated for each primary lesion. Patients who underwent neoadjuvant chemotherapy, R2 resection, and sequential resection were excluded. Analysis about correlation between SUVmax and clinicopathologic parameters was performed. C-tree statistical method was drawn to estimated cutoff values of SUVmax and CA19-9 for survival rate. Multivariate analysis was conducted to identify prognostic factors for overall survival. Median duration of overall survival was 26 months, five-year survival rate was 22.4%. C-tree analysis revealed the optimal cutoff values for SUVmax was 5.5 and that of CA19-9 was 150 about survival rate. When subjects were divided into three groups according to combination of SUVmax and CA19-9 values from C-tree (high group,  $SUV_{max} > 5.5$  and  $CA19-9 > 150$ , intermediate group and low group,  $SUV_{max} \leq 5.5$  and  $CA19-9 \leq 150$ ), there was a significant 5YSR difference (5.6%, 24.3% and 36.5%,  $p < 0.001$ ) The multivariate analysis revealed low BMI and high SUVmax and venous invasion were prognostic factor in overall survival. As biologic markers, SUVmax and CA19-9 are prognostic factors in pancreatic cancer patients. Especially, patients with high SUVmax and CA19-9 are not indication to upfront surgery.

#### OP03-23

### CURRENT STATUS AND LONG-TERM OUTCOME OF NEOADJUVANT CHEMORADIOTHERAPY FOR RESECTABLE PANCREATIC CANCER

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**Introduction:** The progress of multidisciplinary treatment made significant improvement in survival of pancreatic cancer. However, the efficacy of neoadjuvant treatment for resectable pancreatic cancer remains to be established. We evaluated the impact of neoadjuvant chemoradiotherapy (NACRT) on perioperative and long-term outcome in resectable pancreatic cancer.

**Method:** This retrospective study enrolled 295 patients of resectable pancreatic ductal adenocarcinoma at Nara medical university hospital between 2006 and 2018. One hundred fifty-six patients who preoperatively received full-dose gemcitabine ( $1000\text{mg}/\text{m}^2$ ) with concurrent radiation of 54 Gy were analyzed. One hundred thirty-nine patients who proposed upfront surgery were served as control.

**Results:** Among 156 patients treated with NACRT, 14 (8.9%) couldn't undergo pancreatectomy after NACRT because of distant metastasis in 7, tumor progression in 4 and bad condition in 3. While among 139 patients who proposed upfront surgery, 7 (5.0%) couldn't undergo pancreatectomy at laparotomy because of distant metastasis. In overall survival of patients with resected and unresected tumor, patients treated with NACRT had better prognosis than those without (50.2 vs. 32.6M,  $P=0.017$ ). Also only for resected tumors, the rate of Grade B/C pancreatic fistula, abdominal abscess and  $\geq$  Clavien-Dindo IIIa complication were lower in NACRT than control ( $P=0.071$ ,  $P=0.085$ ,  $P=0.075$ ). Furthermore, lymph node metastasis (17.6 vs. 51.5%,  $P < 0.001$ ), and R0 resection rate (91.6 vs. 79.6%,  $P < 0.001$ ) were favorable in NACRT group. Moreover, completion of adjuvant chemotherapy was also higher in NACRT (74.7 vs. 56.1%,  $P=0.001$ ).

**Conclusions:** NACRT had a variety of favorable impact in surgical and prognostic outcomes for resectable pancreatic cancer.

#### OP03-24

### CDK5 ACTIVATION DRIVES PANCREATIC NEUROENDOCRINE TUMORIGENESIS AND IS A THERAPEUTIC TARGET

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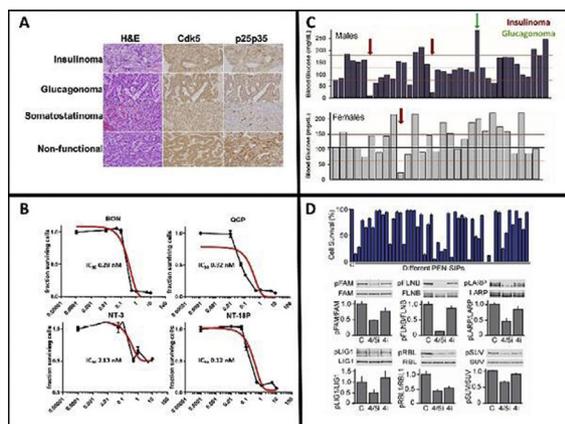
**Introduction:** Pancreatic neuroendocrine tumors(PNET) are frequently seen with significant morbidity/mortality.

Most PNET are non-functional, yet existing animal models are functional. Therefore, they do not accurately recapitulate human disease. We hypothesize that Cdk5 activity (previously shown to be important in other neuroendocrine diseases) plays a role in PNET pathogenesis and maybe a therapeutic target.

**Methods:** Cdk5 expression was quantified in human PNET(hPNET) tissues. hPNET cell lines were treated with Cdk5 inhibitors. Bi-transgenic mice were created with inducible Cdk5 activity under control of the tet-operon. Growing/arrested tumors were studied for phosphorylation sites that were upregulated in growing tumors. Short interfering peptides (SIPs) were generated to these targets to identify potential downstream signaling pathways.

**Results:** All hPNET samples tested had increased Cdk5 expression(Figure A). A Cdk4/5 inhibitor(IndolamineA) affected growth of hPNET cells in a dose-dependent manner without effecting fibroblasts(Figure B). Cdk4 inhibition(IndolamineB) did not effect these cells. All transgenic mice developed PNET with most nonfunctional. Phosphoproteomic analysis identified 50 potential Cdk5 targets upregulated in growing tumors. SIPs to 15 sites inhibited growth of BON cells but not fibroblasts(Figure D, top). Six of these sites included known proteins implicated in human tumorigenesis (but unknown in hPNET). Phosphorylation of each was reduced in BON cells with Cdk5 inhibition, implicating each in PNET formation and growth.

**Conclusion:** Aberrant Cdk5 activity is seen in all hPNET and is a potential therapeutic target. We have created the first transgenic model of PNET that behaves like human disease and have identified molecular pathways that are being activated in PNET.



A:Cdk5 in hPNET;B:Cdk5 inhibition of PNET;C:Blood sugars of mouse PNETs;D:phosphoproteomics

### OP03-25

## MORPHOLOGICAL PATTERN AND GENE EXPRESSION ANALYSIS OF PANCREATIC NEUROENDOCRINE NEOPLASMS

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**Background:** Pancreatic neuroendocrine neoplasms (PNET), a rare occurrence, have been increasing. A method for evaluating the malignant potential of PNET is needed. Thus, we investigated the predictive ability of morphological pattern using multi-detector computed tomography (MDCT), and relationship between morphological pattern and gene expression pattern of PNET.

**Methods:** Between 2010 and 2018, 64 patients underwent surgical resection for PNET. The primary tumors were classified based on MDCT into two types: simple nodular (SN) and multi-nodular (MN). Characteristics of SN and MN were compared and survival analysis was performed. Then, genome-wide gene expression analysis of 10 patients were performed to compare the gene expression differences of SN and MN.

**Results:** Of all 64 patients, 43 were SN and 21 were MN. Compared to SN, MN showed bigger tumor size (median 39mm) and higher Ki 67 index (median 3%). Recurrence-free survival (RFS) was significantly poorer in MN compared with SN ( $p < 0.001$ ). The 5-year RFS of SN and MN was 95% and 56%, respectively. Of 10 cases who were performed gene expression analysis (DNA microarray), 5 were SN and 5 were MN. Gene expression profiling revealed that 22 probes were significantly upregulated in MN. And, gene set enrichment analysis (GSEA) showed that the genes grouped to extra cellular matrix receptor interaction were significantly upregulated in MN.

**Conclusions:** Morphological pattern of PNET using MDCT was related to prognosis of PNET. MN showed significantly poorer RFS compared with SN. And, there were difference of gene expression pattern between SN and MN.

### OP04 - Pancreas: Surgical Outcomes

#### OP04-02

## LAPAROSCOPIC DISTAL PANCREATECTOMY SHORTENS HOSPITAL STAY: RESULTS FROM A SINGLE-CENTER, RANDOMIZED CONTROLLED TRIAL (LAPOP)

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**Introduction:** Nonrandomized retrospective studies have suggested that laparoscopic distal pancreatectomy (LDP) is advantageous compared to open (ODP) regarding hospital stay, blood loss and recovery. The only randomized study is available shows enhanced functional recovery after LDP.

**Methods:** Sixty patients, evaluated at a multidisciplinary tumor board and planned for standard distal pancreatectomy were prospectively randomized to LDP or ODP in a parallel group, single-center superiority trial. The primary outcome was postoperative hospital stay with the hypothesis that LDP would shorten it.

**Results:** Fifty-eight patients, 34 male and 24 female, were assigned to LDP (n=29, mean age 68 years) vs. to ODP (n=29, mean age 63 years) and included in a intention-to-treat analysis. The postoperative hospital stay was 5 (IQR

4-5) days in the LDP group vs. 6 (5-7) days in the ODP group (P=0.002). Functional recovery was reached after 4 (2-6) vs. 6 (4-7) days (P=0.007), and the operation time was 120 minutes in both groups (P=0.48). Blood loss was reduced with LDP, 50 (25-150) compared to 100 mL (100-300) (P=0.018). No difference was found in the complication rates with 4 vs. 8 patients in the LDP and ODP groups respectively experiencing complication of Clavien-Dindo grade 3 or higher. Similarly, the rate of post pancreatectomy fistula did not differ between the groups (9 vs. 11 patients).

**Conclusions:** LDP is associated with shorter hospital stay, enhanced functional recovery and less bleeding as compared to ODP, and should therefore be considered the as the treatment standard for patients in need of distal pancreatectomy.

#### OP04-03

### FACTORS ASSOCIATED WITH OVERALL SURVIVAL IN PANCREATIC CANCER TREATED WITH NEOADJUVANT THERAPY AND SURGERY

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**Introduction:** Median survival following surgical resection of pancreatic cancer (PC) has increased due to advances in chemotherapy, radiotherapy, and surgical technique. We examined clinical factors associated with overall survival (OS) in patients with PC who received neoadjuvant therapy and surgery.

**Method:** We conducted a retrospective review of a prospectively maintained PC database at high-volume referral center. Patients with non-metastatic PC who received neoadjuvant therapy and underwent surgical resection between 2009 and 2019 were included. Demographic, clinical, and pathologic variables were examined with Cox proportional hazards models to identify prognostic factors on OS.

**Results:** Neoadjuvant therapy and surgery was completed in 460 consecutive patients; 227 (49.4%) patients were female. The median age was 64 (IQR[58, 71]) years. Median OS was 40.2 (IQR[23.4, 87.3]) months. On bivariate analysis, elevated CA19-9 prior to surgery (HR 1.8 [1.4,2.3]), vein resection (HR 1.6 [1.2, 2.1]), lymphovascular invasion (HR 1.5 [1.1, 2.0]), positive superior mesenteric artery margin (HR 1.8 [1.2, 2.7]) and higher nodal stage were associated with worse OS. On multivariate analysis, shorter OS was associated with increased CA19-9 (HR 1.6 [1.2,2.2]), higher nodal stage (HR 1.5 [1.0, 2.1] for N1; HR 1.9 [1.2, 3.0] for N2), and liver as the first site of disease recurrence. Preoperative clinical stage was not a significance predictor of OS.

**Conclusions:** We report OS outcomes from one of the largest cohorts of resected PC in the era of neoadjuvant therapy. Preoperative CA19-9 after neoadjuvant therapy was associated with OS, emphasizing the impact of treatment response on OS.

#### OP04-04

### RECURRENCE FOLLOWING NEOADJUVANT THERAPY AND RESECTION FOR PANCREATIC DUCTAL ADENOCARCINOMA: A COMPREHENSIVE META-ANALYSIS AND META-REGRESSION

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**Background:** This review aims to provide a comprehensive analysis of recurrence patterns in patients undergoing neoadjuvant therapy (NAT) in comparison to those undergoing up-front surgery (US) for PDAC.

**Methods:** The EMBASE, SCOPUS, PubMed and Cochrane library databases were systematically searched to identify eligible comparative studies. The primary outcome was time to first recurrence and location of recurrence.

**Results:** Twenty-five articles were identified including 4822 patients undergoing resection. The weighted mean follow-up interval for recurrence outcomes was 40.8months (CI 33.4-48.1). The weighted mean overall recurrence rate was 63.4% (CI 51.8-73.%) for NAT, significantly lower than the 74% (CI 68.7-80%) weighted overall recurrence rate of the US cohort (OR 0.67 (CI 0.52-0.87), P=0.006). NAT was also associated with a significantly longer weighted mean time to first recurrence (NAT 18.8months US 15.7months, P=0.015). The weighted locoregional recurrence (NAT 12%, US 27%, P=0.004) and liver recurrence (NAT 19.4%, US 30.1% P=0.023) rates were markedly improved among NAT patients. Weighted lung and peritoneal recurrence rates did not differ (P=0.705 and P=0.549 respectively). NAT was further associated with a greater two- (NAT 39%, US 22% OR 1.84 (CI 1.22-2.78), P=0.007) and five-year (NAT 24%, US 13% OR 1.95 (CI 1.03-3.69), P=0.043) recurrence free survival. Borderline resectability, presence of perineural invasion and a lower N0 nodal status were positive predictors of overall recurrence in the NAT cohort.

**Conclusions:** NAT is associated with improved overall recurrence rates and longer time to first recurrence, an observation likely attributed to the improved rates of locoregional and liver recurrence.

#### OP04-05

### EFFICACY OF PERI OPERATIVE HYDROCORTISONE AND INDOMETHACIN TREATMENT IN REDUCING MAJOR COMPLICATIONS AFTER WHIPPLE'S PANCREATODUODENECTOMY, RANDOMIZED CONTROLLED CLINICAL TRIAL

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**Introduction:** Post Whipple's Pancreatico-duodenectomy (PD) the major concern is pancreaticojejunostomy (PJ) leak which leads to post operative pancreatic fistula (POPF), post pancreatectomy haemorrhage (PPH), delayed gastric emptying (DGE), sepsis, sometimes mortality. Hydrocortisone and indomethacin have been postulated to reduce post operative pancreatitis and thus PJ leak.

**Methods:** Between Jan 2018 - April 2019, 146 patients for Whipple's PD were included. Only high risk patient (n=105) with >40% of acini (marker of soft pancreas) on frozen section of transection margin were randomized to intravenous (iv) hydrocortisone, per rectal (PR) indomethacin or placebo (3 groups, 35 in each group). All patients received total 8 doses of iv treatment (8 hourly) and 6 doses of PR treatment (12 hourly). 100 ml NS and glycerin suppository were the placebo drugs. Primary end-points were overall major complications (Clavien Dindo 2-5).

**Results:** Hydrocortisone group had less major complications compared to placebo (overall 14.3% vs 40.0%; P value = 0.003). POPF (8.6% vs 20%) and DGE (14.3% vs 22.9%) were also lower in hydrocortisone group. Indomethacin group did not reduce major complications compared to placebo (overall, 37.2% vs 40%; p value = 1.00). POPF (17.1% vs 20%) and PPH (11.4% vs 14.3%) Although, DGE is significantly less in indomethacin group (14.3% vs 22.9%; p value = 0.001). 30 day mortality was zero in all the groups.

**Conclusions:** Hydrocortisone treatment significantly reduces major postoperative complications in high risk patients after Whipple's PD whereas Indomethacin treatment does not as compared to placebo.

OP04-06

### VASCULAR RESECTION IN MINIMALLY INVASIVE VS OPEN PANCREATODUODENECTOMY

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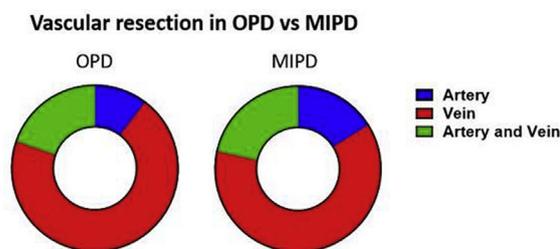
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**Introduction:** Pancreaticoduodenectomy is associated with high morbidity and the complexity of the procedure increases with vascular resection. A growing body of evidence demonstrates the equivalence or benefit of minimally invasive pancreaticoduodenectomy (MIPD) when compared to open pancreaticoduodenectomy (OPD), regarding the short term outcomes and safety. The purpose of this study is to determine the postoperative outcomes of patients undergoing vascular resection with OPD or MIPD approach using a large, multicenter-cohort.

**Methods:** All patients undergoing elective pancreaticoduodenectomy, including OPD and MIPD (robotic and laparoscopic, including open-assisted and unplanned open-conversion), with vascular resection in the ACS-NSQIP database (2014-2017) were included. Patient covariates and outcomes were compared using standard statistical methods.

**Results:** 2233 (17.8%) patients underwent OPD with vascular resection and 149 (13.8%) patients underwent MIPD with vascular resection. The frequency of artery, vein, and combined artery and vein resection was (10.3%, 69.9%, and 19.6%) in OPD and (16.1%, 62.4%, and 21.47%) in MIPD, respectively. Patients undergoing MIPD vascular resection were more likely to have BMI < 25 (4.2% vs 42.5%, p-value=0.0143). The mean OR time was significantly longer in patients undergoing MIPD and vascular resection (485.4±13.30 vs. 427±152.90, p-value < 0.0001). Patients undergoing OPD vascular resection were more likely to have postoperative sepsis (10.17% vs 4.70%, p-value=0.0299). There was a trend towards a decrease in superficial surgical site infection, organ space infection and length of stay and an increase in 30 day readmission in the MIPD vascular resection group. On multivariate analysis, postoperative sepsis was independently associated with OPD (p-value=0.0446).

**Conclusion:** MIPD with vascular resection is safe and feasible. Future studies are needed to determine the effect of MIPD with vascular resection on long term outcomes and survival.



Vascular resection in OPD vs MIPD

OP04-07

### PREOPERATIVE PREDICTION OF CLINICALLY RELEVANT POSTOPERATIVE PANCREATIC FISTULA AFTER PANCREATODUODENECTOMY

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**Introductions:** Clinically relevant postoperative pancreatic fistula (CR-POPF) after pancreaticoduodenectomy (PD) can complicate postoperative course and it is stressful for surgeons. It's ideal to predict CR-POPF preoperatively and take precautions against serious complications in advance.

The aim of this study was to clarify objective and predictive preoperative parameters of CR-POPF.

**Methods:** A consecutive cohort of PD patients from 2011 to 2017 were identified from a prospectively collected institutional database. CR-POPF was diagnosed according to the Revised 2016 ISGPS classification. Surgery-related factors (age, sex, bleeding volume and disease), morphologic and imaging parameters by CT (main pancreatic duct diameter, pancreatic parenchymal thickness, ratio of

pancreatic parenchyma diameter to main pancreatic duct diameter above portal vein in CT axial images [P/D ratio], and contrast effect of pancreatic parenchyma [CE] in various phase) and signal intensity of MRI (in T1WI, T2WI, arterial phase, portal phase, and late phase) were examined.

**Results:** 104 patients were included in the analysis. Overall, 32 (31%) patients developed a CR-POPF. Multivariate analysis was performed on significant factors by univariate analysis, the **P/D ratio** (odds ratio [OR] 3.77, 95% confidence interval 1.27 to 11.93; P=0.017) and **CE in late phase** ([OR] 4.23, 95% confidence interval 1.20 to 18.11; P=0.024) were significant factors.

**Conclusions:** **P/D ratio** and **CE in late phase** were significant factors for predicting CR-POPF preoperatively. For high-risk patients, effective measures should be considered to prevent serious complications caused by POPF preoperatively.

OP04-08  
**COMPARISON OF OUTCOMES OF MINIMALLY INVASIVE VERSUS OPEN PANCREATODUODENECTOMY AFTER NEOADJUVANT THERAPY IN A NATIONAL COHORT OF PATIENTS WITH PANCREATIC ADENOCARCINOMA**

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**Introduction:** The recently published “Miami International Evidence-based Guidelines on Minimally Invasive Pancreatic Resection”, endorsed by IHPBA, noted lack of evidence on which pancreaticoduodenectomy (PD) approach was optimal for pancreatic adenocarcinoma (PDAC) patients post-neoadjuvant therapy (NAT). We aim to compare 30-day-outcomes in PDAC patients that underwent open (OPD) versus minimally-invasive approach (MIPD) post-NAT.

**Methods:** PDAC patients that underwent NAT followed by either MIPD (laparoscopic/robotic) or OPD were identified in the U.S. Procedure-Targeted-Pancreatectomy NSQIP dataset (2014-2017). Preoperative and postoperative parameters were compared among both approaches. Subsequent analysis based on operative approach and NAT modality (chemotherapy alone or chemoradiation) was performed using multiple logistic regression models.

**Results:** Of 2428 patients with PDAC that received NAT, 2219 (91.4%) and 209 (8.6%) underwent OPD and MIPD respectively. MIPD patients were more likely to receive chemotherapy alone (70.8 vs 57.5%, P< 0.001), less likely to undergo vascular resection (21.2vs37.5%, P< 0.001), had longer OR-Time(P=0.043), and shorter Length-Of-Stay

(P< 0.001). For patients undergoing chemoradiation, MIPD was independently predictive of lower incidence of major complications (OR:0.22, P< 0.001). For patients who underwent chemotherapy alone, MIPD was independently predictive of a lower incidence of minor

complications (OR:0.76, P=0.032) and a shorter LOS (Estimate:-2days, P=< 0.001). There were no significant differences in mortality, Delayed-Gastric-Emptying (DGE), and Clinically-relevant-pancreatic-fistula(CR-POPF) among operative approaches and NAT modalities. **Conclusions:** MIPD is safe and feasible in PDAC patients undergoing NAT in centers with expertise in this approach. No differences in mortality, DGE and CR-POF were found. MIPD was associated with a lower incidence of major complications in the chemoradiation group and shorter LOS with lower incidence of minor complications in the chemotherapy-only group.

Table 1. Multivariable Analysis for Major Complications by Operative Approach and Neoadjuvant Therapy

Variables	Multivariable Analysis for Major Complications		
	Odds Ratio	95% Confidence Interval	P-value
Sex (Female)	1.757	1.160, 2.662	0.008
Vascular Resection	1.509	1.003, 2.270	0.049
<b>Approach and Neoadjuvant Therapy</b>			
OPD & Chemoradiation	Reference	Reference	Reference
MIS & Chemoradiation	0.221	0.081, 0.599	0.003
OPD & Chemotherapy alone	0.878	0.571, 1.350	0.553
MIS & Chemotherapy alone	1.739	0.699, 4.326	0.234

Abbreviations: OPD= open pancreatoduodenectomy, MIS= minimally invasive pancreatoduodenectomy

Multivariable Analysis for Major Complications by Operative Approach and Neoadjuvant Therapy

OP04-09  
**HIGH VOLUME CENTER FOR DISTAL PANCREATECTOMY**

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**Introduction:** The association between high procedural volume and improved outcomes is generally accepted for most high risk, low volume procedures, such as pancreatic or esophageal surgery, which supports the beneficial effects of the concentration of these procedures in high-volume centers. Several cutoffs have been reported to define a high-volume center for pancreatic surgery; however, the definition of high-volume center for distal pancreatectomy still needs to be determined. The purpose of this study was to evaluate the association between hospital-procedure-volume and patient mortality for patients undergoing distal pancreatectomy using a large database to determine an evidence-based threshold of hospital-volume associated with improvement in postoperative mortality.

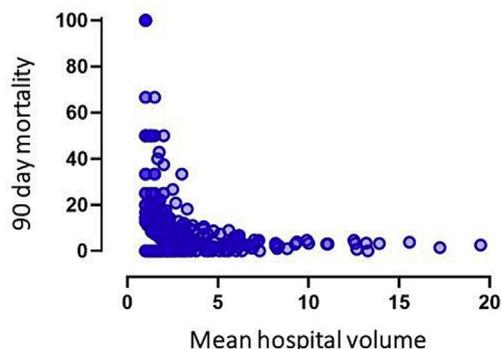
**Methods:** Patients who underwent distal pancreatectomy were identified using the National Cancer Database (2004-2015). Logistic regression analysis and restricted cubic spline regression analysis was performed to determine the linear and non-linear association between mean hospital-volume and mean 90-day mortality.

**Results:** 13307 patients underwent distal pancreatectomy at 1081 unique hospitals. 30 and 90-day mortality of the study population were 1.77% (n=236) and 4.07%(n=542), respectively. Baseline characteristics and mean annual mortality of individual hospitals were determined. A logistic regression analysis was performed, which demonstrated that institutional volume is significantly associated with decreased 90-day mortality. The maximum improvement in 90-day mortality was seen if the annual hospital volume was greater than 6 (p< 0.0001, OR=2.057(1.697-

2.493)). The non-linear association demonstrated continued improvement in 90-day mortality with an increase in average hospital-volume (Fig1).

**Conclusion:** This data suggests that hospital-volume has a direct impact on 90-day mortality after distal pancreatectomy. Based on our results, we recommend defining a high volume center as hospitals performing seven or more distal pancreatectomy cases/year.

### 90 day mortality after distal pancreatectomy decreases with increase in hospital volume



Hospital volume and mortality

#### OP04-11

### ASSESSMENT OF GLUCOSE METABOLISM ALTERATIONS AFTER PARTIAL PANCREATECTOMY USING BIOCHEMICAL MARKERS: A PROSPECTIVE OBSERVATIONAL STUDY

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**Introduction:** Most previous studies on glucose metabolism after pancreatectomy used medical records as diagnostic criteria of DM. This study aimed to evaluate the incidence and characteristics of new-onset DM (NODM) and worsened preexisting DM after pancreatectomy using serial assessment of biochemical markers in a prospective cohort.

**Method:** Data was prospectively collected for 224 patients who received PD (n=149) and DP (n=75) between 2015 and 2018. Diabetes related parameters were assessed preoperatively and postoperatively (at 3 months and 1 year): oral glucose tolerance test, HbA1c, fasting insulin, and stimulated insulin. Homeostasis model assessment (HOMA) was calculated for IR (insulin resistance) and B (beta cell function).

**Results:** The incidence of NODM (14% vs. 45%,  $P=0.001$ ) and worsened DM (21% vs. 60%,  $P<0.001$ ) was significantly higher after DP than PD at postoperative 1 year. There was more DM resolution after PD. (41% vs. 9%,

$P<0.001$ ) BMI and type of surgery (DP) were risk factors of NODM, while only type of surgery (DP) was a risk factor of worsened DM. In DP patients without preoperative DM, those who developed NODM had a significantly lower preoperative HOMA-B level compared to those who did not. ( $P=0.035$ ) PD patients who developed NODM showed a sustained decrease in HOMA-B postoperatively, whereas those who did not showed a plateau, after an initial decrease.

**Conclusions:** DP had higher risk of NODM development and DM worsening than PD. Patient education and surveillance for the development of DM after pancreatectomy should be tailored according to type of resection.

#### OP04-12

### IMPACT OF RADICAL PANCREATODUODENECTOMY WITH PORTAL VEIN RESECTION AND EXTENSIVE SURROUNDING SOFT TISSUES ON THE LONG-TERM OUTCOMES FOR PANCREATIC HEAD CANCER

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**Background:** Pancreaticoduodenectomy (PD) with portal vein PV resection (PVR) is a standard operation for pancreatic ductal adenocarcinoma (PDAC) with PV invasion; however, the positive margin rates remain high. We hypothesized that radical pancreaticoduodenectomy (RPD) in which soft tissue around the PV is resected en bloc could enhance oncological clearance. Herein, we describe our RPD and address the short- and long-term outcomes compared to standard PD with PVR.

**Method:** The study included 268 consecutive patients who underwent PD with PVR using anterior artery-first approach. While, the PV was skeletonized with the surrounding soft tissue dissected in the standard PD with PVR (n = 177), the retro-pancreatic segment of PV was resected en bloc with its surrounding soft tissue during the RPD (n = 91). The extent of lymphadenectomy was not different between the procedures.

**Results:** R0 resection was achieved in 80% of patients in the RPD group, compared with 66% in the PD group ( $P=0.011$ ), while the perioperative outcomes were comparable between groups. The median recurrence-free survival (RFS) and overall survival (OS) were 17 months and 31 months, respectively, for the RPD group, compared to 11 months and 21 months for the PD group, ( $P=0.004$  for RFS and  $P=0.003$  for OS).

**Conclusion:** We described a novel, radical operation for locally advanced PDAC. Our RPD is safe and feasible, and it enhances local disease control resulting in improved OS. Further prospective evaluation of RPD is warranted in the setting of current multidisciplinary management.

OP04-13

### NEOADJUVANT TREATMENT MITIGATES THE SURVIVAL IMPACT OF MAJOR COMPLICATIONS AFTER RESECTION OF PANCREATIC ADENOCARCINOMA

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Postoperative major complications (PMCs) may prevent multimodality therapy (MMT) for pancreatic ductal adenocarcinoma (PDAC) patients by delaying adjuvant therapy (AT) following surgery-first (SF) sequencing. We hypothesized that neoadjuvant therapy (NT) mitigates the detrimental effect of PMCs on outcomes of resected patients.

Characteristics of consecutive resected PDAC patients 7/2011-10/2018 were abstracted from a prospective database. PMCs were defined at 90-days as ACCORDION Grade  $\geq 3$ . Overall survival (OS) was compared between patients with and without PMCs.

Of 373 patients, most underwent NT (75%). PMCs occurred in 22% of SF and 20% of NT patients ( $p=0.71$ ). Most went on to receive some form of AT (90% SF vs. 70% NT,  $p<0.001$ ). Median OS for NT and SF patients was 46 vs. 36 months ( $p=0.037$ ). PMCs negatively impacted OS, with median OS 59 months for NT(-)PMC, 34 months for NT(+)PMC, 45 months for SF(-)PMC, and 20 months for SF(+)PMC ( $p<0.001$ ; Fig. 1A). There was a trend toward worse OS in NT(+)PMCs ( $p=0.06$ , Figure 1B). PMCs were not independent predictors of OS for NT patients. However, after adjustment for clinical classification, treatment sequencing, tumor size, and margin status, PMCs were independently-associated with OS (HR-1.60,  $p=0.010$ ) among all patients, along with perineural invasion (HR-1.83,  $p=0.024$ ), nodal positivity (HR-2.1,  $p<0.001$ ), and AT (HR-0.69,  $p=0.039$ ).

The deleterious effects of PMCs on OS for PDAC patients may be mitigated by NT. NT sequencing should be routinely considered given the significant risk of post-pancreatectomy morbidity.

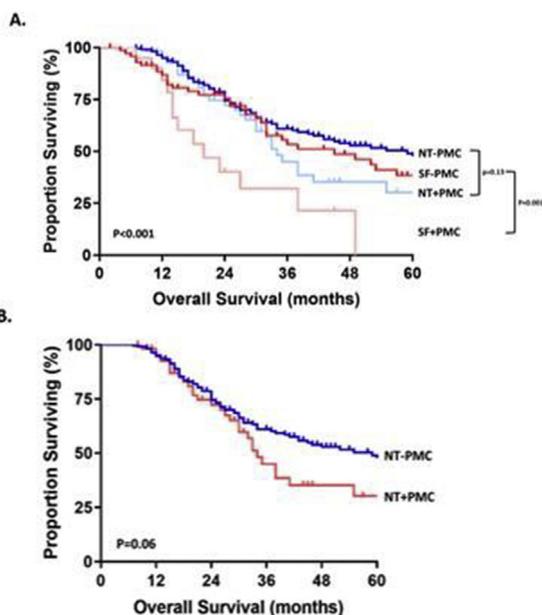


Figure 1

OP04-15

### CLINICAL RELEVANCE BETWEEN SURVIVAL OUTCOMES AND INVASION OF SPLENIC VESSELS IN PANCREATIC BODY OR TAIL ADENOCARCINOMA

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**Introduction:** Little was known about clinical impact of splenic vessels invasion (SpVI) of pancreatic body or tail adenocarcinoma in terms of survival outcomes. This study was to compare the survival outcomes between pancreatic adenocarcinomas (PDACs) with SpVI and those with no invasion, and to investigate the prognostic factors associated with adverse outcomes.

**Methods:** Between 2005 and 2018, patients who underwent distal pancreatectomy were enrolled. Patients who underwent neoadjuvant chemotherapy were excluded. Degree of SpVI was categorized with three groups (Group 1, no invasion; Group 2, 0 - 180 degree; Group 3,  $\geq 180$  degree) and formation of collateral vessels was investigated in preoperative computed tomography. Clinical variables, postoperative surgical outcomes, and survival outcomes were evaluated. Multivariate Cox-proportional analysis was performed for evaluating the prognostic factors.

**Results:** Total 249 patients were included. Operation time was longer (185 vs. 159 min,  $P=0.001$ ) and intraoperative blood loss (415 vs. 278 mL,  $P=0.003$ ) was higher in SpVI patients. Tumor size was larger (3.9 vs. 2.9cm,  $P=0.001$ ) in SpVI patients, but the number of metastatic lymph nodes were comparable (1.7 vs. 1.4,  $P=0.241$ ). 5-year overall survival rate was significantly different among three groups (Group 1, 38.4%; Group 2, 16.8%; Group 3, 9.7%,  $P<0.001$ ). In the Cox-proportional analysis, adjuvant treatment, R0 resection, SpVI, and collateral vessels formation were independent prognostic factors in survival outcome. **Conclusions:** SpVI was associated with adverse survival outcomes in PDAC. Different approach such as neoadjuvant treatment would be needed in patients with SpVI invasion.

OP04-16

### CHANGES IN THE PERIOPERATIVE AND POSTOPERATIVE LONG-TERM QUALITY OF LIFE AFTER TOTAL PANCREATECTOMY

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**Background:** Quality of Life (QoL) is widely known to be poor after total pancreatectomy. This study was designed to evaluate the short-term and long-term consequences of endocrine and exocrine insufficiency and their associated effects on QoL and nutritional status.

**Methods:** Prospective data was collected from patients who underwent total pancreatectomy at Seoul National University Hospital during an interval of 4 years and

followed up for at least 1 year. QoL, and nutritional status were assessed by administering validated questionnaires (EORTC QLQ C-30, PAN26, GIQLI, MNA), preoperatively and 3, 12 months postoperatively.

**Results:** A total of 30 patients were eligible for the study. 3 months after receiving total pancreatectomy, the global health score (GHS) showed no significant difference (preoperatively 57.2 vs. 3 months postoperatively 68.3;  $P=0.119$ ). By the 1st postoperative year, the GHS still showed no significant difference (preoperatively 57 vs. 1 year postoperatively 52.4;  $P=0.2$ ) and no significant differences in most of the QoL categories. However, poor physical function (79.2 vs. 67.6;  $P=0.01$ ), digestive difficulties (14.9 vs. 36.9;  $P=0.03$ ) and altered bowel habits (9.2 vs. 25.6;  $P=0.03$ ) continued even 1 year after surgery.

**Conclusion:** The overall QoL score after total pancreatectomy was comparable to the preoperative QoL score. Some symptoms after total pancreatectomy significantly worsen after 3 months postoperatively, but then improve to a comparable level 1 year after surgery. Because some symptoms persist even after time has passed, supportive management is needed for total pancreatectomy patients, including nutritional support with pancreatic enzyme replacement and education for diabetes and diet.

#### OP04-17

### COMPARATIVE LONG-TERM OUTCOMES FOR PANCREATIC VOLUME CHANGE, NUTRITIONAL STATUS, AND INCIDENCE OF NEW-ONSET DIABETES BETWEEN PANCREATOGASTROSTOMY AND PANCREATOJEJUNOSTOMY AFTER PANCREATOCODUODENECTOMY

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**Introduction:** The difference in volume change in a pancreatic remnant according to the type of pancreaticoenterostomy after pancreaticoduodenectomy (PD) for long-term follow-up is unknown. This study aimed to compare serial pancreatic volume changes in pancreatic remnants between pancreatogastrostomy (PG) and pancreatojejunostomy (PJ) after PD and to evaluate the difference in general nutritional status and incidence of NODM between PG and PJ.

**Methods:** This study enrolled 115 patients who had survived for more than three years after PD. They were divided into the PG group and the PJ group. Their clinicopathologic factors were collected and analyzed. We calculated serial pancreas volume and pancreatic duct size precisely from preoperative stage to five years after surgery by image-processing software. Consecutive changes of albumin and BMI as related to general nutritional status were compared. Postoperative NODM was evaluated.

**Results:** Most patient demographics were not significantly different between the PG group ( $n=45$ ) and PJ group ( $n=70$ ). There was no significant difference in volume reduction between the groups from postoperative one month to five years (PG group  $-18.21 \pm 14.66$  mL versus PJ group  $-14.43 \pm 13.05$  mL,  $P=0.209$ ). There was no significant difference in the change of total serum albumin and BMI between the groups for five years after surgery. The incidence of NODM was not significantly different between the groups ( $P=0.995$ ).

**Conclusions:** PG and PJ following PD induced similar pancreatic volume reduction during long-term follow-up. There was no difference in general nutritional status or incidence of NODM between the groups after PD.

#### OP04-18

### COMPARISONS OF SHORT-TERM AND LONG-TERM OUTCOMES BETWEEN OPEN AND LAPAROSCOPIC DISTAL PANCREATECTOMY IN PATIENTS WITH PANCREATIC DUCTAL ADENOCARCINOMA

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Safety and feasibility of laparoscopic distal pancreatectomy (LDP) in regards to the pancreatic adenocarcinoma (PDAC) were not well-known. The present study aimed to compare the short-term and long-term outcomes of LDP with those of open distal pancreatectomy (ODP).

This was a retrospective study with prospectively collected medical data. Between 2009 and 2017, patients who underwent distal pancreatectomy and pathologically confirmed as PDAC were enrolled. Clinical and pathologic variables were investigated. To reduce selection bias, 1:1 propensity score matching (PSM) was performed with T and N stage of 8<sup>th</sup> American Joint Committee on Cancer staging system. Survival outcomes and cumulative recurrence rates were calculated with Kaplan-Meier method.

Total 210 patients were enrolled. LDPs and ODPs were performed in 35 patients (16.7%) and 175 patients (83.3%), respectively. After 1:1 PSM, age, sex, underlying diseases were comparable between two groups. In terms of short-term outcomes, operation time (128 vs. 164 minute,  $P=0.001$ ) and postoperative hospital stay (11.1 vs. 16.5 days,  $P=0.011$ ) were significantly different between two groups. Tumor size (3.2 vs. 3.1 cm,  $P=0.889$ ), number of harvested lymph nodes (12.6 vs. 14.4,  $P=0.365$ ), and R0 resection rates (91.4 vs. 80.0%,  $P=0.172$ ) were comparable. 5-year overall survival rates (26.4 vs. 24.6%,  $P=0.742$ ) and cumulative recurrence rates (56.3 vs. 61.4%,  $P=0.582$ ) were comparable between two groups.

LDP has similar or better perioperative outcomes (operation time, postoperative hospital stay) and shows similar survival outcomes, and recurrence patterns in PDAC patients, compared with ODP. LDP is a safe and feasible procedure in PDAC patients.

OP04-19

**SOMATOSTATIN PREVENTS CLINICALLY RELEVANT PANCREATIC FISTULA IN INTERMEDIATE RISK PATIENTS AFTER PANCREATICODUODENECTOMY (SPEED): A MULTI-CENTER, RANDOMIZED, CONTROLLED STUDY**

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**Introduction:** Post-operative pancreatic fistula (POPF) remains the lethal complication after pancreaticoduodenectomy, and the objective of the study is evaluating the preventive effect of somatostatin on POPF in intermediate risk patients.

**Methods:** A multi-center, randomized, controlled study was conducted in six high-volume pancreas centers in China between June 2018 and April 2019. Patients undergoing pancreaticoduodenectomy with intermediate risk of POPF were enrolled. Patients were randomly assigned to somatostatin group (intravenous somatostatin of 250µg/h for 120 hours) and control group. The primary endpoint was clinically relevant POPF (CR-POPF) (according to 2016 International Study Group on Pancreatic Fistula criteria). This trial was registered with Clinical Trial (NCT03349424).

**Results:** 205 patients were enrolled and 99 in somatostatin group and 100 in control group were included for final analysis. The rate of CR-POPF in somatostatin group decreased significantly (13% vs 25%, p=0.032), both in open and laparoscopic pancreaticoduodenectomy. But the rates of overall POPF (65% vs 69%, p=0.51) and biochemical leak (52% vs 44%, p=0.29) were not significantly different. Medical costs (¥115069 vs ¥115803, p=0.92) and other complications: biliary fistula (6% vs 6%, p=0.99), abdominal infection (19% vs 18%, p=0.83), chylous fistula (5% vs 4%, p=0.75), late postoperative hemorrhage (7% vs 12%, p=0.24) had no significant difference. However, the somatostatin group had higher rate of delayed gastric emptying (33% vs 21%, p=0.0504).

**Conclusion:** In patients with intermediate risk of POPF after pancreaticoduodenectomy, prophylactic use of somatostatin can reduce the CR-POPF, but seems to increase the rate of delayed gastric emptying.

**OP04-19** The baseline characteristics of study participants

	Overall (n=199)	somatostatin group (n=99)	control group (n=100)
Age, mean (SD), yrs	58.8	57.92 (11.4)	59.18 (10.7)
Male sex	123(62%)	57 (57%)	66 (66%)
BMI, mean (SD) (kg/m <sup>2</sup> )	22.9	22.58 (3.2)	23.26 (3.2)
Hypertension in medical history	56(28%)	56(28%)	32 (32%)
Diabetes mellitus in medical history	33(17%)	16 (16%)	17 (17%)
Chronic pancreatitis in medical history	2(1%)	2 (2%)	0(0%)
Acute pancreatitis in medical history	5(3%)	0(0%)	5 (5%)

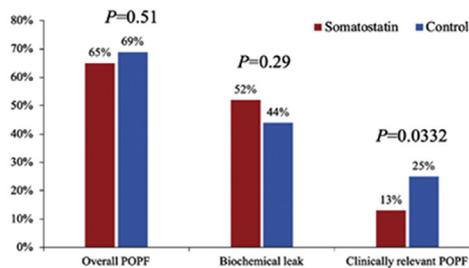


Figure 1. The rates of POPF in somatostatin and control group.

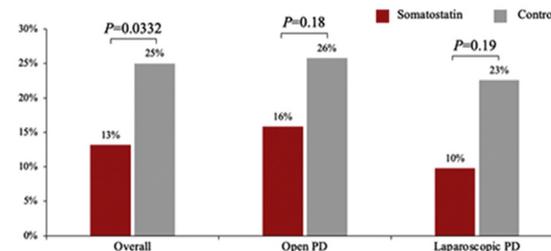


Figure 2. The rates of clinically relevant POPF in open and laparoscopic PD.

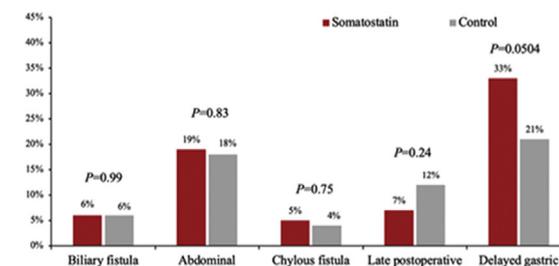


Figure 3. The rates of other complications in somatostatin and control group.

The rates of POPF and other complications in somatostatin and control group

OP04-20

**THE EUROPEAN REGISTRY FOR MINIMALLY INVASIVE PANCREATIC SURGERY (E-MIPS): FIRST YEAR EXPERIENCE**

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**Introduction:** The European-African Hepato-Pancreato-Biliary Association (E-AHPBA) has endorsed the European consortium on Minimally Invasive Pancreatic Surgery (E-MIPS) to set up a registry which aims to collect data of minimally invasive pancreatic surgery (MIPS) in all low- and high-volume centers across Europe. The aim is to monitor and report on safety and quality outcomes of MIPS in daily clinical practice.

**Methods:** This is a pan-European, multicenter prospective observational cohort study, including data of the first year (2019) of the E-MIPS registry. All patients undergoing MIPS in the participating centers are included. Main study parameters are patient demographics, perioperative- and oncological outcomes.

**Results:** A total of 398 patients from 38 centers in 15 countries were included, with a median (inter quartile range) volume of 11 (8-20) for MI-distal pancreatectomy. MI-pancreatoduodenectomy was performed in 23 centers, with a median (IQR) of 8 (2-20). There were 31 (81.6%) low volume (< 20 MIPS annually) centers and 7 (18.4%) high-volume centers. Laparoscopy was the most frequent approach (n=245, 61.3%), followed by robotic (n=134, 33.5%) and hybrid-laparoscopic (n=19, 4.8%). Overall, 240 patients (60%) were operated for a malignancy, of which 13 (5.4%) received a type of neoadjuvant treatment. The 90-day mortality rate was 2.6% (n=10). Table 1 shows summarized outcomes divided between the five procedures performed most often.

**Conclusion:** This is the first overview of collected data from all centers in the E-MIPS registry. Due to the large scale, this registry provides insight into the current MIPS practice in Europe

## OP04-21 INCREASED OPERATIVE DIFFICULTY AND POORER OUTCOMES AFTER MULTIPLE ENDOTHERAPIES FOR CHRONIC PANCREATITIS: AN ANALYSIS OF 48 CONSECUTIVE FREY'S PROCEDURES

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**Introduction:** Chronic pancreatitis (CP) is being increasingly treated by endotherapy as part of the step-up approach. Multiple sessions of endotherapy have led to shrinking indications and delayed referrals for surgery. This study analyses the impact of multiple endotherapy sessions on difficulty of Frey's procedure and outcomes of surgery.

**Material and Methods:** This prospective study included 48 consecutive Frey's procedures done for CP between 2016 and 2019 at our tertiary hepatopancreatobiliary centre. Demographic data, duration of CP, number of endotherapies [ $\geq 3$  (group A) or  $< 3$  (group B)], operative difficulty [operative time, intra-operative blood loss], pain relief [Visual Analog Scale (VAS)], and quality of life [EORTC-QLQ-C30 questionnaire (QoL score)] at 6 months were recorded.

**Results:** 28 (58.33%) out of 48 patients were in group A, and 20 (41.67%) in group B. The mean operative time was  $153.22 \pm 24.1$  minutes in group A vs  $138.33 \pm 15.29$  minutes in group B ( $p < 0.05$ ). The mean blood loss was  $156.11 \pm 43.28$  mL in group A compared to  $116.04 \pm 34.42$  mL in group B ( $p < 0.01$ ). Improvement in VAS at 6 months was  $3.22 \pm 0.83$  in group A and  $4.79 \pm 1.58$  in group B ( $p < 0.01$ ). Improvement in QoL score at 6 months was  $36.44 \pm 9.34$  in group A and  $35.62 \pm 12.42$  in group B ( $p = 0.85$ ).

**Conclusion:** Multiple endotherapy sessions increase the operative time and intra-operative blood loss, thus increasing the operative difficulty, in addition to giving

**OP04-20** Baseline characteristics and perioperative outcomes of the European minimally invasive pancreatic surgery (EMIPS) registry

	Robotic pancreatoduodenectomy (n=70)	laparoscopic pancreatoduodenectomy (n=61)	Hybrid-laparoscopic pancreatoduodenectomy (n=18)	Robotic distal pancreatectomy (n=70)	laparoscopic distal pancreatectomy (n=144)
Age, years, mean (SD)	64 (11)	63 (12)	68 (10)	60 (16)	63 (15)
Conversion, n (%)	5 (7.1)	11 (13.4)	6 (33.3)	5 (7.1)	20 (14.1)
Length of stay, med (IQR)	10 (8-16)	11 (8-16)	8 (6-12)	7 (6-10)	6 (5-10)
POPF grade B/C, n (%)	11 (15.7)	13 (15.9)	2 (11.1)	9 (15.5)	32 (22.7)
PPH grade B/C, n (%)	5 (7.1)	6 (7.3)	0 (0)	3 (5.2)	5 (3.5)
Reoperation $\leq 30$ days, n (%)	8 (11.4)	8 (9.8)	1 (5.6)	1 (1.6)	7 (4.9)
Readmission $\leq 30$ days, n (%)	5 (7.1)	10 (12.2)	4 (22.2)	7 (11.5)	23 (16.0)
R0 resection, n (%)*	39 (68.4)	59 (83.1)	10 (71.4)	29 (90.6)	65 (82.3)
90-day mortality, n (%)	2 (2.9)	7 (8.5)	0 (0)	1 (1.6)	1 (0.7)

**OP04-21** Correlation of number of endotherapies with operative difficulty and outcomes

Parameter	$\geq 3$ endotherapies (group A)	$< 3$ endotherapies (group B)	p-value
Number of patients	28 (58.33%)	20 (41.67%)	
Mean duration of surgery (minutes)	$153.22 \pm 24.1$	$138.33 \pm 15.29$	$< 0.05^*$
Mean blood loss (mL)	$156.11 \pm 43.28$	$116.04 \pm 34.42$	$< 0.01^*$
Change in VAS at 6 months	$3.22 \pm 0.83$	$4.79 \pm 1.58$	$< 0.01^*$
Change in QoL score at 6 months	$36.44 \pm 9.34$	$35.62 \pm 12.42$	0.85

poorer pain relief. Early referral for surgery without subjecting patient to multiple endotherapies would improve operative and post-operative outcomes.

#### OP04-22

### PREDICTIVE VALUE OF ELEVATED CA 19-9 FOR POSITIVE RESECTION MARGINS AFTER PANCREATODUODENECTOMY FOR PANCREATIC TUMORS

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**Introduction:** Elevated Carbohydrate antigen (CA) 19-9 levels have predicted poor prognosis and decreased survivals after pancreaticoduodenectomy for pancreatic head carcinoma. This study analyzes the predictive value of elevated CA 19-9 for positive resection margin in these cases.

**Material and methods:** Retrospective analysis of prospectively entered data from 2011 to 2019 revealed 202 cases at our specialized hepatopancreatobiliary centre. Demographic details, imaging findings, liver function tests and pre-operative tumor markers were recorded. Histopathology data regarding tumor and nodal status and resection margins were recorded as per Leeds protocol. Positive margins were considered as < 1mm from the tumor.

**Results:** 106 of 202 (52.4%) patients had CA 19-9 >100 U/mL (Normal: < 37 U/mL) in absence of jaundice. 63 (31.2%) patients had node positive disease, and 78 (38.6%) had lymphovascular/perineural invasion. Retroperitoneal (SMA) margin was positive in 16 (15.1%) patients with elevated CA 19-9 and 4 (4.1%) patients with normal CA 19-9. SMV margin was positive in 38 (35.8%) patients with elevated CA 19-9 and 11 (11.4%) patients with normal CA 19-9. Pancreatic ductal margin was positive in 3 (3.1%) patients with elevated Ca 19-9. 57 (53.7%) patients with elevated CA 19-9 and 15 (15.6%) patients with normal Ca 19-9 had positive margins. This difference is statistically significant ( $p < 0.05$ ) using student's t-test.

**Conclusion:** Elevated CA 19-9 level is a strong predictor of margin positivity after pancreaticoduodenectomy irrespective of T stage. These cases may be better suited for neoadjuvant therapy and needs evaluation in a prospective study.

#### OP04-23

### RELEVANCE OF CELIAC AXIS STENOSIS IN PANCREATODUODENECTOMY

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**Introduction:** Celiac axis stenosis (CAS) may result in enhanced risk of ischemic complications during pancreatoduodenectomy. However, the prevalence and relevance of CAS remains unknown.

**Methods:** All patients undergoing partial or total pancreatoduodenectomy from 2014 to 2017 after preoperative computed tomography (CT) with arterial phase were identified from a prospective database. Preoperative CT scans were evaluated for CAS. Postoperative complications were assessed.

**Results:** Of 998 patients 273 (27.4%) had CAS. The degree of radiological CAS was 30-50% in 7.7%, 50-80% in 8.3%, and 80-100% in 1.3% of patients. CAS (of any degree above 30%) was associated with increased morbidity including intra-abdominal collections ( $p=0.022$ ), gastric ischemia ( $p=0.001$ ), liver ischemia ( $p < 0.001$ ), pancreatic fistula ( $p=0.003$ ), sepsis ( $p=0.007$ ), as well as with longer hospital stay ( $p < 0.001$ ) and ICU stay ( $p=0.016$ ). Patients with CAS required significantly more surgical reinterventions ( $p=0.001$ ) including gastric ( $p < 0.001$ ) and pancreas reoperations ( $p=0.007$ ). Rate and severity of complications including liver ischemia and pancreatic fistula increased with higher degree of CAS. Among patients with 80-100% stenosis, both grade B/C pancreatic fistula and at least moderate liver failure occurred in 46% of patients. Multi-variable analyses confirmed CAS as independent risk factor both for liver ischemia ( $p=0.010$ ) and for pancreatic fistula ( $p=0.007$ ).

**Conclusion:** CAS is common and represents an underestimated risk for relevant complications after pancreatoduodenectomy. Already a radiological stenosis of 30-50% is associated with increased risk of morbidity. Precise radiological assessment of the celiac axis may help to identify risk, to address relevant CAS, and, thus, to avoid postoperative complications.

#### OP04-22 Histopathology and margin status in pancreaticoduodenectomy

Parameter	CA 19-9 >100 U/mL	CA 19-9 <100 U/mL	p-value
Number of patients	106 (52.4%)	96 (47.5%)	
N+ disease	63 (31.2%)	21 (10.3%)	<0.05*
Median LN ratio	0.33±0.26	0.14±0.12	<0.05*
LVI/PNI	78 (38.6%)	35 (17.3%)	<0.05*
Positive SMA margin	16 (15.1%)	4 (4.1%)	<0.05*
Positive SMV margin	38 (35.8%)	11 (11.4%)	<0.05*
Positive duct margin	3 (3.1%)	0	
Positive margin status	57 (53.7%)	15 (15.6%)	<0.05*

OP04-24

### SHORT-TERM CLINICAL OUTCOMES AFTER TOTAL PANCREATECTOMY: A PROSPECTIVE MULTICENTER EUROPEAN SNAPSHOT STUDY

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**Introduction:** Prospective multicenter studies on clinical outcomes after total pancreatectomy (TP) are not reflecting current practice due to long study periods and inclusion of mainly high-volume centers. The aim of this prospective multicenter European snapshot study is to assess short-term clinical outcomes after elective TP.

**Methods:** Patients who underwent elective TP for malignant or benign disease between June 2018 and June 2019 were prospectively included from 42 hospitals. Hospitals were divided based on annual volume (low 1-9, medium 10-19, and high  $\geq 20$  TPs). Variables associated with major postoperative complications (Clavien Dindo  $\geq 3$ ) and 90-day mortality were assessed in multivariable logistic regression.

**Results:** In total, 276 patients underwent TP, mostly for malignant disease (73%). Minimally invasive TP was performed in 11 (4%) patients. Major postoperative complications occurred in 25% and predictors were ASA score  $\geq 3$  (OR 2.41 [95%CI 1.27-4.55]  $p=0.007$ ), blood loss (OR 1.00 [95%CI 1.00-1.00]  $p=0.009$ ), and low-volume centers (OR 2.28 [95%CI 1.15-4.52],  $p=0.019$ ). Median hospital stay was 12 days (IQR 9-18) and the 90-day readmission rate was 14%. The 30-day and 90-day mortality rates were 4% and 8%, respectively. In multivariable analysis, only age (OR 1.07 [95%CI 1.02-1.13],  $p=0.008$ ), BMI (OR 1.11 [95%CI 1.01-1.23],  $p=0.039$ ) and hospitals with 1-9 patients (reference  $\geq 20$  patients, OR 4.78 [95%CI 1.56-14.71],  $p=0.006$ ) were predictors for 30-day mortality.

**Conclusion:** This prospective multicenter study found 25% major postoperative complications and 8% 90-day mortality after TP and evidence to suggest that also for TP a higher volume may reduce postoperative mortality.

OP04-25

### MINIMALLY INVASIVE PANCREATODUODENECTOMY (MIPD) AT A TERTIARY CENTRE OVER 2 DECADES- "LESSONS LEARNT & TECHNIQUES MODIFIED"

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**Introduction:** In 1998, the first totally Laparoscopic pancreaticoduodenectomy (LPD) for periampullary carcinoma was performed in our institute. 22 years since then MIPD at our institute has undergone several technical modifications, the recent addition over the last 2 years being Robotic Pancreaticoduodenectomy (RPD). Lessons learnt and techniques modified in this journey over the past 2 decades have been presented.

**Methods:** A retrospective analysis of prospectively maintained database was carried out for all MIPD cases (418 LPD & 42 RPD) done at our institute from Dec 1998 to Dec 2019. A subgroup analyses was done to compare the outcomes of LPD in the first decade versus the second decade.

**Results:** The authors observed a reduction in operative time and estimated blood loss between the first decade and the second decade. The mean number of lymph nodes removed was higher in the second decade, though not statistically significant ( $p=0.07$ ) Estimated blood loss was comparable with laparoscopic and robotic PD (203.23 $\pm$  84.37 vs 206.17  $\pm$  82.82,  $p=0.87$ ) However robotic PD took a significantly longer time compared to LPD (392  $\pm$  124.26 vs 312  $\pm$  39.62,  $p=0.02$ ) in this series.

**Conclusion:** MIPD provides several advantages like decreased length of hospitalization, reduced blood loss and need for transfusion, more meticulous oncologic dissection and higher lymph node yield. Accumulation of surgical experience, better optics, improved energy sources and adoption of robotic technology have refined the outcomes of MIPD at our institute and worldwide, in recent times.

OP04-26

### RISK FACTORS OF SERIOUS POSTOPERATIVE COMPLICATIONS AFTER LAPAROSCOPIC PANCREATODUODENECTOMY: SINGLE CENTER RETROSPECTIVE STUDY

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**Background:** Two hundred and ninety laparoscopic pancreatoduodenectomies (LPDE) were performed by single surgical team.

**Objective:** to assess the short-term and long-term outcomes of LPDE and to reveal the risk factors for having the Clavien-Dindo IIIa-V complication.

**Methods:** 290 patients underwent LPDE during last 10 years. 169 were females and 131 were males. Mean age was 60 years (range 29-82). 244 patients were operated on because of malignancies and 46 because of benign diseases. Postoperative complications were graded according Clavien-Dindo classification. 109 perioperative factors and parameters including laboratory test results were analyzed in order to reveal their influence on developing of postoperative complications.

**Results:** Mean operative time was 419min and mean blood loss was 350cc. Total Clavien-Dindo IIIa-V complications

(CRPOC) rate was 36.8% (107 patients). Among them IIIa - 16.2%, IIIb - 10.7%, IV - 3.8%, V - 6.2%. CRPOPF were diagnosed in total of 20.3% patients (15.5% grade B POPF, 4.8% grade C). DGE was diagnosed in 4.8% of patients. PPH complicates the postoperative course of 20 patients (6.9%). Sixteen of them had concomitant PF. Univariate analysis revealed that the age  $\geq 65$ , male sex, the soft pancreatic tissue, absent of pancreatic hypertension, high intraoperative blood loss ( $\geq 400$  cc), high BMI ( $\geq 30$ ), diagnosis other than pancreatic adenocarcinoma, were independent risk factors for having serious complications.

**Conclusion:** age  $\geq 65$ , male sex, the soft pancreatic tissue, absent of pancreatic hypertension, high intraoperative blood loss ( $\geq 400$  cc), high BMI ( $\geq 30$ ), diagnosis other than pancreatic adenocarcinoma were independent risk factors for having serious complications.

OP04-27

### NEOADJUVANT CHEMORADIOTHERAPY WITH S1 FOR RESECTABLE PANCREATIC CANCER

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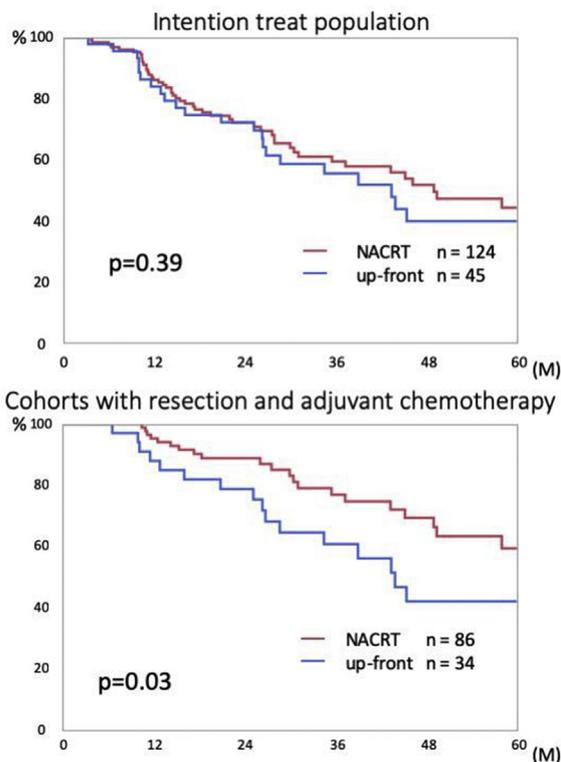
**Introduction:** The efficacy of neoadjuvant chemoradiotherapy (NACRT) with S1 for resectable pancreatic invasive ductal adenocarcinoma (R-PDAC) has not been clarified.

**Method:** Clinical data of 124 patients who underwent NACRT with S1 for R-PDAC from October 2009 to December 2018 were reviewed and compared with those of 45 patients who underwent up-front surgery for R-PDAC on the same period. The regimen of NACRT was concomitant daily 80 - 120 mg of S1 with 1.8 Gy of radiation for 28 days up to 50.4 Gy.

**Results:** Levels of CA19-9 before treatment were not different between two groups (NACRT median 82.4 U/L [IQR 18.3 - 199.4] vs. up-front surgery: 72.6 U/L [27.5 - 167.8]). Disease control rate of NACRT was 88.7%. Resection rate was 84.7% in NACRT and 93.3% in up-front surgery ( $p=0.25$ ). Morbidity of Clavien-Dindo classification  $\geq$  Grade 3a was 11.4% and 21.4% ( $p=0.13$ ). R0 resection rate was 98.1% vs. 83.3% ( $p < 0.01$ ) and percentage of patients with pathological lymph node metastases was 24.5% vs. 54.8% ( $p < 0.01$ ). Adjuvant chemotherapy was administered in 81.9% of NACRT and 81.0% of up-front surgery ( $p=0.89$ ). Overall survival (OS) of intention to treat population were significantly different between two groups (median survival time [MST]: 49.0 months vs. 43.4 months, 3 year-OS 59.0% vs. 55% [ $p=0.39$ ]). For cohorts with resection followed by adjuvant chemotherapy, NACRT has significantly better survival than up-front surgery (MST 83.7 months vs. 43.9 months, 3 year-OS 77.0% vs. 61.0% [ $p=0.03$ ]).

**Conclusions:** NACRT with S1 is feasible strategy for R-PDAC.

### Overall survival



OS of Intention to treat population and cohorts with resection and adjuvant chemotherapy

OP04-28

### IMPACT OF NEOADJUVANT THERAPY ON POSTOPERATIVE PANCREATIC FISTULA: A SYSTEMATIC REVIEW AND META-ANALYSIS

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**Introduction:** The use of neoadjuvant therapy (NAT) for pancreatic cancer is increasing, although its impact on postoperative pancreatic fistula (POPF) is variably reported. This systematic review and meta-analysis aimed to assess the impact of NAT on POPF.

**Methods:** A systematic literature search until October 2019 identified studies reporting POPF following NAT (radiotherapy, chemotherapy or chemoradiotherapy) vs. upfront resection. The primary outcome was overall POPF. Secondary outcomes included Grade B/C POPF, delayed gastric emptying (DGE), postoperative pancreatic haemorrhage (PPH), and overall and major complications.

**Results:** The search identified 24 studies: pancreaticoduodenectomy (PD), 19 studies (n=19,893); distal

pancreatectomy (DP), 5 studies (n=477). Local staging was reported in 17 studies, with borderline resectable and locally advanced disease comprising 6% (0 - 100%) and 1% (0 - 33%) of the population, respectively. For PD, any NAT was significantly associated with lower rates of overall POPF (OR: 0.57,  $p < 0.001$ ) and Grade B/C POPF (OR: 0.55,  $p < 0.001$ ). In DP, NAT was not associated with significantly lower rates of overall or Grade B/C POPF.

**Conclusion:** NAT is associated with significantly lower rates of POPF after PD but not after DP. Further studies are required to determine whether NAT should be added to POPF risk calculators.

#### OP04-29

### COMPARISON WITH SHORT- AND LONG-TERM NEOADJUVANT CHEMORADIOTHERAPY FOR RESECTABLE AND BORDERLINE RESECTABLE PANCREATIC ADENOCARCINOMA

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**Introduction:** The indications of preoperative treatment for resectable (R) borderline resectable (BR) pancreatic ductal adenocarcinoma (PDAC) are still obscure, and the protocol has not yet been standardized.

**Method:** The patients were divided into R, BR with venous involvement (BR-V) according to the 2019 NCCN guidelines. Between September 2009 and May 2016, short neoadjuvant chemoradiotherapy (NACRT) (3Gy x 10fr.+S-1) in 2 weeks was given to patients with R(n=33), BR-V(n=19). Subsequently, since June 2016, long NACRT (2Gy x 25fr.+S-1) in 5 weeks was given to patients with R(n=51) and BR-V(n=14) PDAC.

**Results:** There was no significant difference in adverse event rate and completion rate of NACRT protocol between short and long NACRT. The reduction rates of CA19-9 level and SUV max were both significantly higher in patients with long NACRT than those with short NACRT (64%vs30%:P=0.009 and 51%vs23%:P< 0.0001, respectively). There was no significant difference in operation time, R0 reduction rate, Evans grade, and induction and completion rates of postoperative adjuvant chemotherapy between the two groups. However, resection rate was significantly lower in long NACRT group (96% vs 85%, P=0.041) because distant metastasis was more frequently detected before surgery. There was no significant difference in OS and RFS between R patients with short and long NACRT (P=0.871 and P=0.743, respectively). In contrast, BR-V patients with long NACRT had significantly better OS and RFS than those with short NACRT (P=0.004 and P=0.022, respectively).

**Conclusions:** There was no significant difference between short and long NACRT in R-PDAC. Long NACRT might be more effective against BR-V PDAC.

#### OP04-30

### A NATIONAL ANALYSIS OF THE INCIDENCE AND SEQUELAE OF PANCREATOGENIC DIABETES FOLLOWING PANCREATIC RESECTION

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**Introduction:** New-onset diabetes following pancreatic resection (pancreatogenic diabetes mellitus, P-DM) is a known risk factor. However, the long-term incidence of P-DM and its clinical impact following pancreatic resection remains unknown.

**Methods:** The Medicare 100% Standard Analytic File (2013-2017) was queried for all patients who underwent partial pancreatic resection (pancreaticoduodenectomy, distal pancreatectomy). The primary outcome was the development of postoperative P-DM following surgery.

**Results:** We identified 4,255 patients who underwent a pancreaticoduodenectomy (n=2,989, 70.2%) or distal pancreatectomy (n=1,266, 29.8%). After a median follow-up of 0.9 years, the incidence of P-DM was 25.4% (n=863) and occurred at a median of 0.3 years following surgery. Risk factors for developing P-DM included undergoing a distal pancreatectomy (OR 1.98, 95%CI 1.67-2.34), having a malignant diagnosis (OR 1.66, 95%CI 1.35-2.05), and a family history of diabetes (OR 2.10, 95%CI 1.46-3.03) all ( $p < 0.001$ ). Patients who developed P-DM were more commonly readmitted within 90 days (43% vs. 33.7%) and had higher postoperative healthcare expenditures in the year following surgery (\$24,440 USD vs. \$16,130 USD) (both  $p < 0.001$ ) compared to patients who remained diabetes-free.

**Conclusion:** Approximately 1 in 4 Medicare beneficiaries who undergo a pancreatic resection develop pancreatogenic diabetes following pancreatic resection. Appropriate screening and improved patient education should be conducted for these patients, particularly those at highest risk.

#### OP04-31

### PRE-OPERATIVE PREDICTION OF OUTCOME IN PATIENTS UNDERGOING WHIPPLE'S PANCREATODUODENECTOMY: PROSPECTIVE VALIDATION OF A NOVEL RISK SCORING

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**Introduction:** Despite a high morbidity following Whipple's pancreatoduodenectomy, there is a lack of an

objective pre-operative tool, based only on clinical and biochemical parameters to predict the outcome following pancreatoduodenectomy that could be implemented on an outpatient basis.

**Methods:** Using a multivariate regression model, the significant predictors of post-operative outcome were identified in a set of retrospective database of patients (2006-2017), and a risk score developed by binary logistic regression method. This was validated in a set of prospective patients (2017-2020). The model's predictive accuracy and discriminative ability were assessed using the receiver operating characteristics (ROC) analysis and Hosmer-Lemeshow goodness of fit tests respectively.

**Results:** On multivariate analysis in the retrospective cohort (n=442), the significant predictors of post-operative outcome were identified as peak bilirubin levels, pre-operative stenting and diagnosis (benign/malignant). A risk score was derived and validated on the prospective cohort (n=185) [Table 1]. The mean risk for an unfavourable outcome was 24% for a score of <math> \leq 7</math>, 44% for a score of 8-14 and 70% for a score of >math> \geq 15</math>. This was further tested on the validation cohort for individual risk scores (AUC=0.708) and scores categorised (AUC=0.698). There was no significant difference between observed and expected risk of major complications (p=0.31).

**Conclusion:** The risk score showed a fair accuracy in predicting post-operative morbidity in the prospective cohort. Therefore, we propose this be used as a quick aid to predict the operative outcome in patients posted for pancreatoduodenectomy on an outpatient basis using simple pre-operative clinical and laboratory variables.

**OP04-31** Pre-operative risk scoring model

Variables	Categories	Beta Coefficient	P value	Risk score
Peak Bilirubin	1) <math> < 2 \text{ mg/dl}</math>; 2) 2-5 mg/dl; 3) 5-10 mg/dl; 4) 10-20 mg/dl; 5) >math> > 20 \text{ mg/dl}</math>	0.006	0.001	1) 0; 2) 1; 3) 3; 4) 7; 5) 11
Stenting	1) Stented; 2) Unstented	1.143	<math> < 0.001</math>	1) 0; 2) 9
Diagnosis	1) Benign; 2) Malignant	0.661	<math> < 0.001</math>	1) 0; 2) 5
Total				25 (max)

OP04-32

**ARTERY-FIRST PANCREATECTOMY WITH SUPERIOR MESENTERIC - PORTAL VEIN RESECTION AND RECONSTRUCTION: TWO LARGE INSTITUTIONS EXPERIENCE FROM EAST AND WEST**

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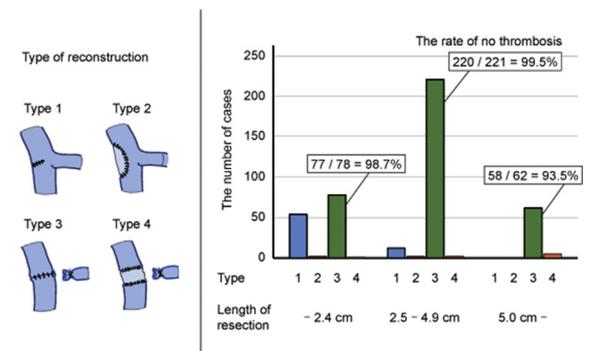
**Introduction:** Potential benefits of pancreatectomies associated to vein resection (PAVR) for pancreatic cancer are still contradictory. Although some recent papers suggested artery-first approach facilitated PAVR, evidence is sparse. The aim of this study is to analyze outcomes of artery-first approach with PAVR by using two large institutions from different regions.

**Methods:** We identified consecutive series of patients with pancreatic cancer who underwent artery-first approach with PAVR in Karolinska University Hospital (KUH) and Cancer institute hospital, Japanese foundation of cancer research (JFCR) from 2008 to 2018. We compared the short- and long-term results between two centers.

**Results:** Among total 506 patients, 211 patients were from KUH and 295 patients were from JFCR. The higher incidence of total pancreatectomy was shown in KUH (24.6% vs 0.3%,  $P < 0.001$ ). The higher incidence of primary end-to-end anastomosis was shown in JFCR (92.5% vs 62.6%,  $P = 0.017$ ). There was no significant difference in intraoperative estimated blood loss (KUH: 630ml, JFCR: 600ml), severe complications rate (8.5%, 5.1%), and mortality (2.4%, 0.7%). Primary end-to-end anastomosis was mainly performed even if the length of PV/SMV resection was 5cm or more and achieved successfully without thrombus (overall cases: 98.0%, 5cm or more: 93.5%)

**Conclusions:** We reported favorable short-term outcomes and acceptable long-term outcomes of artery-first approach with PAVR for pancreatic cancer from the two high-volume centers in the east and west. Primary end-to-end

anastomosis after artery-first pancreatectomy was safe and feasible even if the length of PV/SMV resection was 5cm or more.



The types of vein reconstruction for each length of PV/SMV resection and the rate of no thrombus

OP04-33

### IMPACT OF BORDERLINE RESECTABILITY IN PANCREATIC HEAD CANCER ON PATIENT SURVIVAL: BIOLOGY MATTERS ACCORDING TO THE NEW INTERNATIONAL CONSENSUS CRITERIA

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**Background:** International consensus criteria (ICC) have redefined borderline resectability for pancreatic ductal adenocarcinoma (PDAC) according to three dimensions: anatomical (BR-A), biological (BR-B) and conditional (BR-C). Aim of this study was to evaluate the impact of the novel consensus criteria defining BR-PDAC compared to current NCCN guidelines on patient survival after upfront pancreaticoduodenectomy.

**Methods:** Patients' tumours were retrospectively defined borderline resectable according to ICC. The study cohort was grouped into either BR-A or BR-B and compared to patients considered primarily resectable (R). Differences in postoperative complications, pathological reports, overall (OS) and disease-free survival (DFS) were assessed.

**Results:** 223 patients underwent resection for PDAC. By applying ICC in routine preoperative assessment, 20 patients were classified as stage BR-A and 36 patients as stage BR-B. 167 patients were considered resectable (R). The cohort did not contain BR-C patients. No differences in postoperative complications were detected. Median OS was significantly shorter in BR-A (12 months) and BR-B (14 months) compared to R (20 months) patients (BR-A vs. R:  $p=0.036$  and BR-B vs R:  $p=0.016$ ). CA19-9, as the determining factor of BR-B patients, turned out to be an independent prognostic risk factor for OS.

**Conclusion:** Preoperative staging defining surgical resectability in PDAC according to ICC is crucial for patient survival. Patients with PDAC BR-B should be considered for multimodal neoadjuvant therapy.

OP04-34

### LAPAROSCOPIC VERSUS OPEN PANCREATODUODENECTOMY: AN INDIVIDUAL PATIENT DATA META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

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The first randomized controlled trials (RCT) comparing LPD to OPD have been published recently with conflicting results where observational studies show less postoperative complications. An individual patient data meta-analysis (IPDMA) may give more insight in the putative differences, including in subgroups.

A systematic literature search was performed in Pubmed, Embase and the Cochrane library. Out of 1410 studies, three RCT's comparing LPD to OPD were identified. The primary outcome was major postoperative complications (Clavien-Dindo grade  $\geq$  III). Subgroup analyses were performed for high-risk groups including patients with a BMI of  $\geq 25$  kg/m<sup>2</sup>, either a BMI of  $\geq 25$  kg/m<sup>2</sup> and/or a pancreatic duct  $< 3$ mm, age  $\geq 70$  years, and malignancy were performed.

Individual patient data from 224 patients included from 6 centers were collected. After LPD, major complications occurred in 33/114 (29%) patients compared to in 34/110 (31%) patients after OPD (adjusted OR 0.62; 95%CI 0.27 - 1.41,  $p = 0.257$ ). No differences were seen for postoperative pancreatic fistula (adjusted OR 0.78; 95%CI 0.316 - 1.943,  $p = 0.599$ ), delayed gastric emptying (adjusted OR 0.56; 95%CI 0.220 - 1.418),  $p=0.220$  and 90-day mortality [8 (7%) vs 4 (4%)] (adjusted OR 0.15; 95% CI 0.02 - 1.26,  $P=0.08$ ) after LPD vs OPD. With LPD, operative time was longer (420 vs 318 minutes,  $p < 0.001$ ) and primary LOHS was shorter (mean difference -6.97 days).

This IPDMA does not show benefits nor disadvantages for LPD as compared to OPD besides a shorter LOHS. Subgroup analyses showed similar postoperative outcomes in the high-risk subgroups.

OP04-35

### TOTAL PANCREATECTOMY RISK MODEL FOR SEVERE POSTOPERATIVE COMPLICATIONS DERIVED FROM 2,167 PATIENTS RECORDED IN A NATIONWIDE CLINICAL DATABASE

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**Background:** Total pancreatectomy is required to completely clear tumors that are locally advanced or located in the center of the pancreas. However, reports describing the clinical outcomes after total pancreatectomy are rare. The aim of this retrospective observational study was to assess the clinical outcomes following total pancreatectomy using a nationwide registry and to create a risk model for severe postoperative complications.

**Method:** Patients who underwent total pancreatectomy from 2013-2017 and who were recorded in the Japan

Society for Gastroenterological Surgery and Japanese Society of Hepato-Biliary-Pancreatic Surgery database were included. Severe complications at 30 days were defined as Clavien-Dindo grade III with reoperation or grade IV/V. We modeled the occurrence of severe complications among the patients from 2013-2016 and tested the accuracy of the model among the patients from 2017 using c-statistics and a calibration plot.

**Results:** We included 2167 patients undergoing total pancreatectomy. Postoperative 30-day and in-hospital mortality occurred in 1.0 per cent (22/2167) and 2.7 per cent (58/2167) of patients, respectively, and severe complications occurred in 6.0 per cent (131/2167) of patients. Factors showing a strong positive association with outcome in this risk model were the American Society of Anesthesiologists performance status and combined arterial resection. In the testing cohort, the c-statistic of the model was 0.70 (95 per cent confidence interval: 0.59-0.81).

**Conclusion:** Our risk model for severe postoperative complications after total pancreatectomy based on a nationwide clinical database showed good calibration and may improve the quality of pancreatic surgery.

#### OP04-36

### MINIMALLY INVASIVE VERSUS OPEN DISTAL PANCREATECTOMY: AN INDIVIDUAL PATIENT DATA META-ANALYSIS OF TWO RANDOMIZED CONTROLLED TRIALS

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**Background:** Minimally invasive distal pancreatectomy (MIDP) may reduce overall complications and hospital stay as compared to open distal pancreatectomy (ODP). This study aimed to combine data of randomized controlled trials (RCTs) comparing MIDP vs. ODP and assess treatment effects in different high-risk subgroups by conducting an individual patient data meta-analysis.

**Methods:** The principal investigators of the LEOPARD trial from the Netherlands and the LAPOP trial from Sweden agreed to perform this study upon completion of the trials. After completion of both trials, individual patient data will be obtained, and data collection, definitions, and outcomes harmonized. The primary endpoint is the overall rate of major (Clavien-Dindo  $\geq$ III) complications. Secondary outcomes include length of stay and individual major complications. Sensitivity analyses will be performed in three pre-specified subgroups (i.e. BMI  $\geq$ 25 kg/m<sup>2</sup>, severe comorbidity and malignant disease).

**Results:** Results of the LAPOP trial are not yet published. These results will have been published during IHPBA 2020, and therefore, results of this individual patient data meta-analysis will become available when the congress will take place.

**Conclusions:** This is the first individual patient data meta-analysis including RCTs on MIDP vs. ODP, creating the

largest sample of randomized patients in this field. In this study, two individual trial teams, jointly working together as the International Minimally Invasive Pancreatic Resection Trialists Group, will combine individual patient data. Results of this individual patient data meta-analysis will be presented when accepted for IHPBA 2020.

#### OP04-40

### THE ROLE OF RADICAL ANTEGRADE MODULAR PANCREATOSPLENECTOMY COMPARED TO CONVENTIONAL DISTAL PANCREATOSPLENECTOMY IN PATIENTS WITH LEFT-SIDED PANCREATIC CANCER: A RETROSPECTIVE MULTICENTER PROPENSITY- SCORE MATCHING ANALYSIS

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**Introduction:** The purpose of this study aimed to evaluate the role of radical antegrade modular pancreatectomy (RAMPS) in terms of postoperative outcomes compared to conventional distal pancreatectomy (DPS) in patients with left-sided pancreatic ductal adenocarcinoma (PDAC).

**Method:** From 2005 to 2017, consecutive 316 left-sided PDAC patients who underwent RAMPS (n=236) or DPS (n=80) for curative intent in four tertiary referral hospitals in Korea were included in this study. Among these, after 1:2 Propensity score matching with age, sex, differentiation, T and N stage, 71 patients with DPS and 139 patients with RAMPS were analyzed for clinicopathological outcomes.

**Result:** There was no difference in complication rate between the two groups. RAMPS was superior than DPS in terms of R0 rate (99.3% vs 88.6%, p< 0.01) and harvested LN numbers (16.3±10.57 vs. 10.3±7.06, p< 0.01). RAMPS showed prolonged DFS (median survival 11 vs 9months), but statistically not significant (p=0.148). In a subgroup analysis with node-negative patients (n=107), RAMPS showed superior disease-free survival than DPS with statistically marginal significance (MS 15 vs 9m, p=0.05). After multivariate analysis, preoperative CA19-9 $\geq$ 37, tail cancer, poorly or undifferentiated carcinoma, R1 resection, and absence of adjuvant treatment were identified as independent risk factors for survival. Also, preoperative CA19-9 $\geq$ 37, advanced T stage, LN metastasis, poorly or undifferentiated carcinoma were independent risk.

**Conclusion:** Although we could not find an eminent survival benefit of RAMPS, it could be considered a standard

surgical method for left-sided PDAC because of the similar complication rate and several oncologic benefits.

OP04-42

### THE YONSEI EXPERIENCE OF MINIMAL INVASIVE PANCREATODUODENECTOMIES: A PROPENSITY SCORE-MATCHED ANALYSIS WITH OPEN PANCREATODUODENECTOMY

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**Introduction:** With continued technical advances in surgical instruments and growing expertise, several surgeons have performed minimal invasive pancreatoduodenectomy (MIPD) safely with good results, and the approach is being performed more frequently. We performed over 200 cases of MIPD and compared their outcomes to those of open pancreatoduodenectomy (OPD) using the large sample size. The aim of the present study was to evaluate the safety and feasibility of MIPD compared with OPD.

**Methods:** From September 2012 to December 2019, pancreatoduodenectomy was performed for 352 patients at Yonsei University Severance Hospital by a single surgeon. Patients were divided into two groups: those who underwent OPD (n=132) and those who underwent MIPD (n=220). We performed a 1:1 propensity score-matched analysis and retrospectively analyzed the demographic and surgical outcomes.

**Results:** After Propensity score matching analysis, the mean operation time for the MIPD group was similar and estimated blood loss was lower than the OPD group. The postoperative pancreatic fistula (POPF) grade B and C did not differ significantly between the 2 groups (p=0.204). There was no difference in 30-day mortality rates between the two groups (p=1.000).

**Conclusions:** MIPD can be a good alternative option for well-selected patients with periampullary lesions requiring pancreatoduodenectomy.

OP04-43

### THE OUTCOME OF LAPAROSCOPIC PANCREATODUODENECTOMY IS IMPROVED WITH THE LEARNING CURVE AND PATIENTS' SELECTION. ANALYSIS IN 130 PATIENTS

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**Introduction:** In our first experience Laparoscopic pancreatoduodenectomy (LPD) was associated with higher morbidity. Since we restrict LPD to patients at lower risk of pancreatic fistula (PF) and we ameliorate our surgical technique. We analyzed our recent results.

**Methods and patients:** Between 2011-2018, 130 pure LPD were performed, divided in 3 consecutive periods:

period 1 (n=43), period 2 (n=43) and period 3 (n=44) and were compared.

**Results:** In the third period, more females (48%, 46%, 59%, p=0.12), IPMN become the first indication of LPD (12%, 39%, 34%; p=0.037) followed by ampulloma (30%, 9%, 20%), less resection for pancreatic adenocarcinoma (35%, 16%, 16%; p=0.004), and more dilated (>3mm) wirsung duct > 3 mm (16%, 27% and 57%; p< 0.001). The third period showed less operative time (330, 345, 270; p< 0.001) and blood loss (300, 200 125; p< 0.001). Similar mortality (4%, 4%, 2%; p=0.53), decrease in all complications including mainly grades B/C PF (44%, 28%, 20%; p=0.017), bleeding (28% ,21%, 14%, p=0.26), re-intervention (19%, 14%, 9%; p=0.43) and hospital stay (26, 19, 18; p=0.045). In patients with adenocarcinoma (n=69), similar tumor size but more harvested lymph nodes (21, 19, 25; p=0.031) and R0 resection (70%, 79%, 84%; p=0.5). On multivariate analysis protective factors against grades B/C PF were female gender, pancreatic adenocarcinoma, BMI < 22.5 and the third period.

**Conclusion:** With patient selection and the learning curve, the results of LPD are improved. These results are important for the safe implementation of this technique.

OP04-44

### PERIPANCREATIC BACTERIAL CONTAMINATION CAN LEAD TO THE DEVELOPMENT OF POSTOPERATIVE PANCREATIC FISTULA AFTER PANCREATODUODENECTOMY

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**Introduction:** The aim of this study was to analyze the relationship between Peripancreatic bacterial contamination (PPBC) and postoperative pancreatic fistula (POPF) after pancreatoduodenectomy (PD) and to investigate the bacterial species in the peripancreatic fluid and identify useful antibiotics to prevent POPF.

**Methods:** Three hundred twenty consecutive patients underwent PD between May 2012 and December 2019. Amylase (D-AMY) and microbial culture have been routinely obtained from the peripancreatic drain on postoperative day (POD) 1, 3, and 6 since May 2012 and Modified Blumgart pancreaticojejunostomy (MBPJ) (N=158) has been adopted since May 2016. POPF was defined as grade B/C according to the international definition.

**Results:** POPF occurred in 26 (16.5%) of 158 patients with MBPJ. In univariate analysis, non-pancreatic disease (P=0.026), body mass index (BMI) >25 kg/m<sup>2</sup> (P=0.016), soft pancreas (P=0.009), D-AMY on POD1 >5000 U/L (P< 0.001), and PPBC on POD1 or 3 (P< 0.001) were significantly associated with POPF. In multivariate analysis, BMI >25kg/m<sup>2</sup> (Odds ratio [OR]=3.61; P=0.022), D-AMY on POD1 >5000 U/L (OR=5.28; P=0.004) and PPBC on POD1 or 3 (OR=4.96; P=0.003) were independent risk factors of POPF. Of all 320 patients, PPBC gradually increased from POD1 to 6. The most commonly isolated bacteria on POD1 or 3 were *Enterococcus sp.*

(10.9%), *Pseudomonas sp.* (2.5%), and *Enterobacter sp.* (1.9%) which were sensitive to piperacillin, imipenem, meropenem, and levofloxacin.

**Conclusions:** Early PPBC after PD can cause the development of POPF. The patients suspected of PPBC should receive more sensitive antibiotics in the early postoperative period to prevent severe POPF.

#### OP04-45

### DELAYED GASTRIC EMPTYING IN DIABETIC PATIENTS UNDERGOING PANCREATODUODENCTOMY: A PROCEDURE-TARGETED NSQP ANALYSIS

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**Introduction:** Delayed gastric emptying (DGE) is a major source of morbidity after pancreaticoduodenectomy (PD). Patients with diabetes mellitus (DM) have a propensity for gastric dysmotility, however the relationship between DGE and DM is not clearly established. The aim of this study was to determine the incidence of DGE in patients with and without DM after PD.

**Methods:** The American College of Surgeons National Quality Improvement Project procedure-targeted pancreatotomy database was queried from 2014-2017 for patients undergoing PD and combined with the main database. Variables were compared by DM status. The primary outcome was DGE.

**Results:** 14,735 patients met inclusion criteria, including 10,930 non-DM (74.2%) and 3805 DM patients (25.8%). DGE occurred in 17.1% (n=2519); 17.2% in non-DM and 16.8% in DM patients (p=0.60). DM patients had increased rates of hypertension and pancreatic adenocarcinoma, larger duct size, harder gland texture, and required more vascular resections (p< 0.001). DM patients had equivalent rates of postoperative infections compared to non-DM patients. IDDM had better outcomes compared to non-IDDM patients in organ space infections (8.8 vs 14.2%;p< 0.001) and pancreatic fistula (11.7 vs 18.3%;p< 0.001). Rates of DGE were 18.0% (n=337) in non-IDDM and 15.7% in IDDM patients (p=0.162). On multivariate regression, male sex, advanced age, smoking, pancreatic fistula, and organ space infection were associated with DGE.

**Conclusion:** No differences in rates of DGE between DM and non-DM patients after PD were found. IDDM patients demonstrated better postsurgical outcomes compared to non-IDDM patients, suggesting a potential role of monitored insulin or hyperglycemia regulation.

#### OP04-46

### LAPAROSCOPIC CENTRAL PANCREATECTOMY: RESULTS IN 81 PATIENTS

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**Introduction:** Central pancreatectomy (CP) is a good indication to the laparoscopic approach related to the absence of oncological or vascular contraindications. The aim of this study was to analyze our monocentric experience.

**Methods:** Between 2008-2018, were performed 540 laparoscopic pancreatic resections and 81 laparoscopic CP. CP was indicated if enucleation was not feasible, in non-diabetic patients and if the distal pancreas was > 5 cm. One layer pancreato-gastric anastomosis. All clinical, operative and postoperative data were recorded prospectively and were analyzed.

**Results:** The mean age was 50 (17-77), including 55 female (68%), with a mean BMI at 25 (16-36). Indications for resection were for neuroendocrine tumor (24; 30%), IPMN (16; 20%), solid pseudopapillary tumor (12; 15%), mucinous cystadenoma (11; 14%), pancreatitis with disconnected duct syndrome (5; 6%), and other (13; 15%). The mean operative time was 183 (90-285), the mean blood loss 107 (0-800), and one conversion (1%). No 90 days mortality and the overall morbidity was observed in 58 patients (72%) including grade B/C pancreatic fistula (21; 26%), bleeding (10; 12%), drained collection (2; 3%), delayed gastric emptying (2; 3%), re-intervention (5; 6%). the mean hospital stay was 22 days (5-54) with readmission in 2 (2%). The mean number of harvested lymph nodes was 3 (0-19) and R0 resection in 71 (88%) patients.

**Conclusion:** The applicability of laparoscopic central pancreatectomy is high and the morbidity is acceptable. There is a real advantage on the preservation of the pancreatic function and abdominal wall in these young patients with no malignancy.

#### OP04-48

### SURGICAL COMPLICATIONS AFTER PREOPERATIVE CHEMORADIOTHERAPY IN PATIENTS WITH RESECTABLE AND BORDERLINE RESECTABLE PANCREATIC CANCER IN A MULTICENTRE, RANDOMISED CONTROLLED CLINICAL TRIAL (PREOPANC-1)

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**Background:** Preoperative chemoradiotherapy is increasingly being used in patients with (borderline-)resectable pancreatic cancer. However, randomised studies investigating the effect of preoperative therapy on the surgical complication rate after pancreatic resection are lacking.

**Objectives:** To investigate the effect of preoperative chemoradiotherapy on surgical complications in patients after pancreatic resection for (borderline-)resectable pancreatic cancer.

**Methods:** In this prospective, multicentre, randomised controlled trial, patients with (borderline-)resectable

pancreatic cancer were randomly assigned (1:1) to upfront surgery, followed by adjuvant therapy or to preoperative chemoradiotherapy followed by surgery and adjuvant chemotherapy. The endpoints of our study were the rate of postoperative pancreatic fistula (POPF), post pancreatectomy haemorrhage (PPH), delayed gastric emptying (DGE), bile leakage, intra-abdominal infections, major complications and mortality.

**Results:** This study included 218 patients, of which 84 underwent curative resection in the upfront surgery group (75%) and 60 in the preoperative therapy group (57.1%). There was a higher incidence of POPF in the group who underwent upfront surgery compared to preoperative chemoradiotherapy (10.7% vs. 0%,  $p = 0.011$ ). The incidence of PPH did not differ significantly between the two treatment groups (7.6% vs. 10.7%,  $p=0.553$ , respectively), but a different etiology was observed. The upfront surgery group included five (6.0%) patients with late extra-luminal PPH, compared to zero in the preoperative chemoradiotherapy group ( $p=0.076$ ). No significant differences were found regarding other surgical complications.

**Conclusion:** Preoperative chemoradiotherapy does not increase the incidence of surgical complications or mortality. In contrast, it was associated with a reduced POPF rate.

## OP05 - Pancreas: Technical Outcomes

### OP05-01

#### SHARING LANDMARKS FOR SETTING A CUTTING LINE LEADS TO SAFE LAPAROSCOPIC PANCREATODUODENECTOMY

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**Introduction:** Since laparoscopic pancreaticoduodenectomy (LPD) combines various surgical procedures, securing the appropriate surgical field at each surgical site is required for safe dissection. Identification of the anatomical landmarks is also essential to set an appropriate cutting line. We developed effective retraction methods and anatomical landmarks for safe LPD that have been shared by all in our surgical team.

**Methods:** For each of the twenty-four different surgical sites, retraction method was developed in the surgical team. At each surgical site, the dissecting device was aligned with the axis of cutting line using 'three-way retraction' that needs both hands of the assistant and left hand of the operator. Anatomical landmarks to set a cutting line around the superior mesenteric artery (SMA) were shared in our surgical team; the proximal dorsal jejunal vein (PDJV), the inferior pancreaticoduodenal vein (IPDV), the uncinate process ligament which fixes the pancreatic uncinate process to the dorsal side of the jejunal, the SMA nerve plexus without spreading of the nerve fibers (SMA bundle region), and the ligament of Treitz.

**Results:** Surgical outcomes of 1st-47th cases (hybrid LPD); operation time 551.6 minutes, blood loss 315.4 ml. 48th-70th cases (pure LPD); operation time 465.5 minutes, blood loss 164.5 ml. 71th-90th cases (pure LPD); operation time 401.8 minutes, blood loss 122.4 ml. 91th-111th cases (pure LPD, young surgeons participated in the surgery); operation time 483.0 minutes, blood loss 120.0 ml.

**Conclusions:** Sharing the retraction methods and anatomical landmarks in the surgical team to determine the cutting line leads to safe LPD.

### OP05-02

#### COMPARISON OF SURGICAL OUTCOMES OF LAPAROSCOPIC AND ROBOTIC PANCREATICOJEJUNOSTOMY AFTER PANCREATODUODENECTOMY IN PATIENT WITH A SOFT PANCREAS

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**Objective(s):** A soft pancreas remains a potent risk factor of postoperative pancreatic fistula (POPF) following pancreaticoduodenectomy (PD). Recently, minimally invasive PDs have been gradually expanding its application. This study aims to evaluate the effect of anastomotic technique of laparoscopic versus robotic pancreaticojejunostomy on POPF among patients with soft pancreas in multi-institutional database.

**Methods:** From January 2014 to December 2019, 155 patients with soft pancreas and small pancreatic duct less than 3 mm diameter underwent laparoscopic or hybrid PD (laparoscopic resection and robotic reconstruction) at two institutions. All patients underwent duct-to-mucosa anastomosis for pancreaticojejunostomy. Surgical outcomes of 123 patients who underwent totally laparoscopic PD and 32 patients who underwent hybrid PD were compared.

**Results:** General demographics were comparable between laparoscopic and hybrid group. Proportion of periampullary malignancies were similar in both group (74.8 % vs. 75.0 %,  $p=0.981$ ). Mean diameter of pancreatic duct was almost identical ( $1.98 \pm 0.69$  mm vs.  $1.84 \pm 0.63$  mm,  $p=0.326$ ). Mean pancreatic duct size was also comparable ( $1.98 \pm 0.69$  vs.  $2.08 \pm 0.96$ ,  $p=0.475$ ). Mean operative time and estimated blood loss were similar. POPF, delayed gastric emptying, and overall postoperative complication rates were not different in both group. Clinically relevant POPF rates higher than grade B were also comparable (8.8% vs. 9.4%). Length of hospital stay was also comparable ( $12.0 \pm 9.1$  vs.  $12.0 \pm 8.3$  days,  $p=0.985$ ).

**Conclusion:** Our study showed similar POPF and overall complication rates in both laparoscopic and hybrid PD group. Future higher volume study is needed to figure out real advantage of robot surgical system in PD.

OP05-03

### THE FRENCH RECONNECTION: A CONSERVATIVE SURGICAL TREATMENT OF DISCONNECTED PANCREATIC DUCT SYNDROME

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**Background:** Disconnected pancreatic duct syndrome (DPDS), a severe complication of acute necrotizing pancreatitis (ANP) can require surgery, usually by distal pancreatectomy, but frequently exposing to diabetes. We describe a new technique reconnecting the distal pancreas to the digestive tract.

**Methods:** This technique was proposed for DPDS in non-diabetic or non-insulin dependent diabetic patients with a distal pancreas exceeding 5 cm. The ruptured zone was identified and the distal side was anastomosed to the stomach or the jejunum.

**Results:** From 2013 to June 2019, 36 patients (median=49 years), underwent the "French reconnection", indicated for chronic pain/recurrent pancreatitis (35;97%), persistent pancreatic fistula (33; 92%), or digestive compression/fistulisation (9; 25%). Preoperatively, median weight loss was 10 kg (4-27), median number of hospitalisation per patient was 5(1-8) and 24(67%) patients received endoscopic/percutaneous treatment. Surgery was performed after a median delay of 279(90-2000) days after ANP, through laparoscopy in 9 (25%) patients. The remnant pancreas (median length=70mm; 50-130) was anastomosed to the stomach (n=30) or the jejunum (n=6). Post-operatively, there were 13(39%) grade B/C pancreatic fistulas and 3 (10%) bleedings including one lethal (mortality=3%). Median hospital stay was 18(7-121) days. With a median follow up of 24(4-53) months, all pancreatic fistulas healed and the clinical success rate was 91%. Median BMI increased from 22 to 25 kg/m<sup>2</sup>. Postoperative endocrine and severe exocrine insufficiencies were observed in 4 (15%) and 7(32%) patients, respectively.

**Conclusions:** The "French reconnection" is a good alternative to distal pancreatectomy for DPDS, allowing excellent control of symptoms and preserving pancreatic function.

OP05-04

### SUB-ADVENTITIAL DIVESTMENT TECHNIQUE FOR ARTERY-INVOLVED PANCREATIC CANCER: TECHNICAL FEASIBILITY AND SAFETY PROFILE

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**Introduction:** Artery involvement is the major obstacle of curative operation for non-metastatic pancreatic cancer patients. Here we present the sub-adventitial divestment technique (SADIT) in therapeutic surgery of artery involved pancreatic cancer(ai-PC).

**Methods:** From April 2014 to June 2016, a total of 73 consecutive ai-PC patients identified with contrast-enhanced CT and surgical exploration received curative pancreatectomy with SADIT served as the study group (SADIT). To evaluate safety of SADIT, 247 concurrent pancreatic cancer patients without artery involvement who received curative pancreatectomy were enrolled as control (CTRL). Retrospective Analysis of peri-operative morbidity and mortality profile was performed to test the technical feasibility and safety.

**Results:** Gender, age, preoperative CA19-9 and serum albumin showed no difference between two groups. SADIT group tend to have more major vein resection and reconstruction, combined organ resection and extended lymph node dissection. Longer operation time was needed in SADIT group (SADIT vs CTRL: 265.4±101.4 min vs 228.7±90.2 min, p=0.003) without significant increase in surgical blood loss(SADIT vs CTRL: 347±323 mL vs 283±315 mL, p=0.131). Over-all morbidity, and the incidence of ISGPS post-operative pancreatic fistula, delayed gastric emptying and re-operation rate were of no difference between two groups, while SADIT group had more post-operative hemorrhage(SADIT vs CTRL: 52.1% vs 49.0%, 20.5% vs 19.0%, 17.8% vs 15.8%, 1.4% vs 1.6% and 16.4% vs 6.5%, p= 0.743, 0.904, 0.817, 1.000 and 0.015, respectively).

**Conclusion:** Sub-adventitial divestment technique is safe in surgery of artery involved pancreatic cancer. Valid prediction method for tumor biology is warranted to provide more beneficial therapeutic strategy.

### OP06 - Pancreas: Miscellaneous

OP06-01

### LAPAROSCOPIC FREY PROCEDURE - MULTICENTER PROSPECTIVE RANDOMIZED TRIAL

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**Indication:** To compare the efficiency, advantages and selection criteria of laparoscopic Frey procedure.

**Materials and methods:** The primary point of the trial: the frequency of complications in the early postoperative period after laparoscopic and open procedure (Clavien-Dindo classification (from grade II and above). From October 2018 to December 2019 Frey procedure were performed in 18 patients with chronic pancreatitis type C (classification of M.Buchler). All patients were divided for 2 group: I group - laparoscopic approach (n-9), II group - open approach (n-9). The age of the patients was 42 (25-69) years in I group and 44 (36-52) years in II group (p 0,8). The median size of the pancreatic head was 30 (23-38) mm in I group and 42 (31-73) mm in II group (p 0,6), the

median diameter of the main pancreatic duct was 7 (4-10) mm and 8 (4-10) mm (p 0.16), respectively.

**Results:** All operations in I group were performed laparoscopic. The operating time was 375 (320-501) minutes in I group and 240 (179-280) minutes in II group (p 0.08). Blood loss was 70 (30-200) and 100 (50-450) ml (p 0.5), respectively. The postoperative stay period was 4 (4-8) days in I group and 7 (5-14) days in II group (p 0.45). There was 1 (11.15%) complications in II group. The follow-up was 4 (3-8) months in I group and 4 (3-7) months in II group. Pain relief was complete in all groups.

**Conclusions:** A prospective randomized trial demonstrates advantages of laparoscopic Frey procedure.

#### OP06-02

### ASSOCIATION OF PRE-EXISTING MENTAL ILLNESS WITH ALL-CAUSE AND CANCER-SPECIFIC MORTALITY IN MEDICARE BENEFICIARIES WITH PANCREATIC CANCER

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**Introduction:** Among patients with pancreatic cancer, the association of mental illness with long-term outcomes remains unknown. We sought to analyze how preexisting mental illness before a pancreatic cancer diagnosis was associated with all-cause and cancer-specific mortality.

**Methods:** Individuals diagnosed with pancreatic adenocarcinoma were identified in the linked Surveillance, Epidemiology, and End-Results-Medicare database from 2004-2016. Patients were classified as having mental illness if an ICD9/10-CM code for anxiety, depression, bipolar disorder, schizophrenia or other psychotic disorder was recorded in at least one inpatient or two outpatient claims during the 3 years before cancer diagnosis.

**Results:** A total of 3,020 (6.9%) out of 43,576 patients were diagnosed with a mental illness prior to pancreatic cancer diagnosis. Among individuals with pre-existing mental illness, 21.9% were diagnosed with anxiety only, 44.3% with depression only and 15.9% with depression and anxiety; a smaller subset (18.0%) was diagnosed with severe mental illness (schizophrenia or other psychotic disorder). There was a 33% increase in all-cause mortality among patients with versus without pre-existing mental illness after adjusting for age, race, gender, stage, and surgical intervention (adjusted HR:1.33; 95% CI:1.28-1.38)(p< 0.001). In addition, patients with mental illness had a 30% increase in cancer-specific mortality (adjusted HR: 1.30, 95%CI:1.25-1.36) (p< 0.001).

**Conclusion:** Roughly 7% of patients with pancreatic adenocarcinoma had a pre-existing mental illness diagnosis. Individuals with mental illness were more likely to have worse overall and cancer-specific long-term outcomes. Surgeons and cancer caregivers need to be aware of mental illness to address mental health concerns among cancer patients as part of their care coordination.

#### OP06-05

### USE OF CHAPLAINCY SERVICES AMONG PATIENTS WITH HEPATOPANCREATIC CANCER

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**Introduction:** Hepatopancreatic (HP) can be extremely stressful, yet the supportive care needs of patients with these diagnoses are unknown. We sought to define overall utilization of chaplaincy services among patients with HP cancers at a large comprehensive cancer center.

**Methods:** Patients with HP cancer were identified; data on patients with breast or prostate cancer were also collected for comparison purposes. Details on demographic, as well as chaplaincy services were obtained and compared.

**Results:** Among 8,961 individuals (HP, n=1,419; breast or prostate, n=7,542), a sub-set of patients utilized chaplaincy services (HP, 51.7% vs. breast or prostate, 19.8%; p< 0.001). While patient sex and race were not associated with chaplaincy utilization (both p>0.05), married patients were less likely to use these services (OR 0.83, 95% CI 0.75-0.93). In contrast, patients who self-reported being "religious" (OR 2.05, 95% CI 1.78-2.36), as well as patients with an active DNR (OR 5.25, 95%CI 4.52-6.11) were more likely to use chaplaincy services. On multivariable analysis, patients with HP versus breast or prostate cancer were almost 3-fold more likely to use chaplaincy services (OR 2.80, 95% CI 2.45-3.21). Compared with breast or prostate cancer, individuals with HP cancer were more likely to use chaplaincy services to reduce distress (79.2% vs. 84.3%) and increase understanding of their medical condition (15.3% vs. 28.9%)(both p< 0.05).

**Conclusion:** Up to 1 in 2 patients with HP cancer utilized chaplaincy services. The availability of chaplaincy services may help address distress, as well as psychological and spiritual needs of patients with HP cancers.

#### OP06-06

### SURGICAL DECISION MAKING IN PANCREATIC AND DUODENAL TRAUMA

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**Introduction:** Pancreatic and duodenal injuries occur uncommonly but may cause significant morbidity and mortality. This study focuses on factors that may influence surgical decision making in this patient group.

**Method:** A retrospective review of patients admitted with pancreatic and/or duodenal injuries from 2000 - 2017 to a level 1 trauma service was undertaken. Demographic, injury and management data were collected.

The grade of pancreatic or duodenal injury was considered to be low (AIS 1-2) or high (AIS 3-5). Patients were analysed in two groups according to whether they were managed operatively or non-operatively. The operative

group was then divided into patients managed with damage control versus those who had definitive surgery. Univariate and multivariate analysis were performed to identify factors which differentiated between these groups.

**Results:** 148 patients sustained pancreatic and/or duodenal injuries. Non-operative management was undertaken in 119 patients (80.4%). On multivariate analysis, injury to four or more abdominal organs was the only factor associated with requiring operative management (OR 1.87 (95%CI 1.29-2.71, p=0.01).

45 of the 119 patients (37.8%) required damage control surgery. On multivariate analysis, shock (OR 17.57 (95% CI 3.58-86.15, p=0.0000)) and major vessel injury (OR 3.14 (95%CI 1.25-7.92, p=0.02)) were associated with requiring a damage control approach.

**Conclusion:** Pancreatic and duodenal injuries are uncommon. Injury to multiple abdominal organs is associated with operative treatment of the pancreatic or duodenal injury. In patients with shock or major vessel injury, damage control surgery is likely to be required.

Variables	Overall	Signet Ring Carcinoma of Pancreas	Pancreatic Adenocarcinoma	p-value
N (%)	103,341	621 (0.6)	102,720 (99.4)	
Age, (Mean ± SD)	68.2±11.7	67.5±12	68.2±11.7	0.134
Mean Overall Survival (years)	0.85±0.01	0.47±0.09	0.85±0.01	*0.012
Gender				
Male	52,867 (51.2)	336 (54.1)	52,531 (51.1)	0.076
Female	50,474 (48.8)	285 (45.9)	50,189 (48.9)	0.147
Race, N(%)				
Caucasian	77,078 (74.7)	457 (74.1)	76,621 (74.7)	
African American	12,007 (11.6)	55 (9.1)	11,951 (11.7)	*0.005
Hispanic	7,728 (7.5)	67 (10.9)	7,661 (7.5)	
Other	6,361 (6.2)	37 (6.0)	6,324 (6.2)	
Location				
Head of pancreas	52,546 (50.8)	303 (48.8)	52,243 (50.9)	
Body of pancreas	10,303 (10.0)	48 (7.7)	10,255 (10.0)	
Tail of pancreas	10,658 (10.3)	63 (9.8)	10,597 (10.3)	*0.002
Pancreatic Duct: Ilets	668 (0.6)	5 (0.8)	663 (0.6)	
Pancreas, unspecified	29,166 (28.2)	204 (32.9)	28,962 (28.2)	
Stage, N(%)				
Localized	7,447 (7.7)	22 (3.7)	7,425 (7.8)	
Regional	29,015 (30.2)	166 (28.1)	28,849 (30.2)	*<0.001
Distant	59,731 (62.1)	402 (68.1)	59,329 (62.1)	
Tumor Size, N(%)				
Microscopic	338 (0.6)	2 (0.6)	336 (0.6)	0.961
Under 2 cm	2826 (5.2)	16 (5.1)	2810 (5.2)	0.667
2 to 4 cm	28030 (51.8)	159 (50.5)	27871 (51.8)	0.670
Over 4 cm	23883 (42.3)	138 (43.8)	23745 (42.3)	0.960
Lymph Node Status				
Positive	24,096 (42.5)	179 (50.4)	23,917 (42.4)	*0.001
Negative	32,632 (57.5)	176 (49.6)	32,456 (57.6)	
Treatment, N(%)				
No treatment	70,641 (71.8)	424 (70.0)	70,217 (71.8)	
Surgery only	9,514 (9.7)	85 (14.0)	9,429 (9.6)	*0.001
Radiation only	13,200 (13.4)	63 (10.4)	13,137 (13.4)	
Both surgery and radiation	5,032 (5.1)	34 (5.6)	4,998 (5.1)	
Survival by treatment (years±SD)				
No treatment		0.11±0.03	0.50±0.01	
Surgery only		2.13±0.07	2.21±0.5	*<0.001
Radiation only		1.05±0.17	0.93±0.02	
Both surgery and radiation		2.25±0.48	2.99±0.09	
Cancer Specific Mortality				
Alive	6,348 (7.6)	41 (8.4)	6,307 (7.6)	0.280
Dead	77,148 (92.4)	447 (91.6)	76,701 (92.4)	0.498

Abbreviations: N = number; SD = standard deviation; Diff = Differentiated \*p value: statistical significance, < 0.05.

OP06-07

**SIGNET RING CARCINOMA OF THE PANCREAS: A RARE AND DEADLY DISEASE**

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**Introduction:** Compared to pancreatic ductal adenocarcinoma (PDAC), signet ring carcinoma of the pancreas (SRC) is a rare mucin-producing exocrine malignancy, comprising less than 1% of all cases. Clinical information regarding this disease is scant.

**Method:** Data on 103,341 patients with pancreatic cancer from the Surveillance Epidemiology and End Result (SEER) database (1973-2017) was analyzed.

**Results:** SRC comprised 0.6% of all pancreatic cancers (621 cases). Both SRC and PDAC were more common in men, Caucasians and in the pancreatic head. SRC was more often poorly differentiated (81.3%) and had metastatic disease (68.1%). The majority of SRC were untreated (70%), while 14% had surgery and chemotherapy. Mean survival for SRC was significantly lower (0.47 years vs. 0.85 years), even with resection. However, SRC patients benefited more from primary radiotherapy than PDAC (1.05 vs. 0.93 years, p< 0.001). Multivariate analysis identified SRC size >4cm (OR 1.4), distant disease (OR 1.8), and poor differentiation (OR 1.6) as independent risk factors for mortality, p< 0.005. Survival advantage was seen with pancreatic body (OR 0.7) or tail location (OR 0.7), and radiation therapy (OR 0.36), p< 0.005

**Conclusions:** SRC presents with larger size, poor differentiation, and a higher rate of metastatic disease than PDAC, resulting in worse survival. Despite this, SRC patients amenable to radiation therapy derive greater survival advantage than PDAC. Resection was associated with the longest survival compared to other treatment modalities for SRC. These results suggest that combination surgery and radiotherapy may have an important role in improving survival for SRC patients.

Data On 103,341 Patients With Pancreatic Cancer from the SEER Database (1973-2017)

OP06-08

**IMPACT OF TIMING OF CHEMOTHERAPY FOR PANCREATIC CANCER IN THE ELDERLY: A NATIONAL CANCER DATABASE STUDY**

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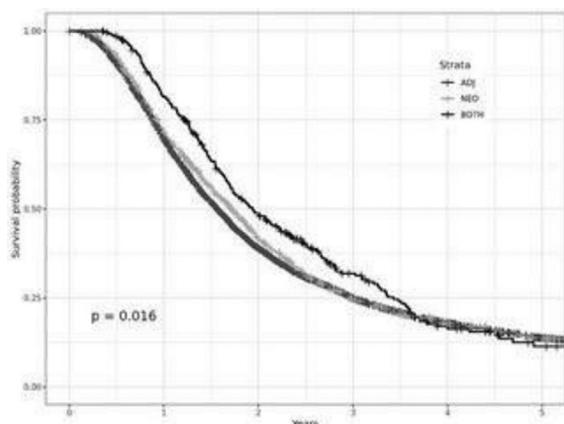
**Background:** Recent data favor neoadjuvant chemotherapy for pancreatic adenocarcinoma (PDAC). The aim of this study is to evaluate the effect of timing of chemotherapy on overall survival of elderly patients undergoing pancreatic surgery for PDAC.

**Methods:** The NCDB was reviewed from 2004 to 2016. The effect of chemotherapy in elderly patients (≥75) was studied. Three major groups were analysed: adjuvant (ADJ), neoadjuvant (NEO) and neoadjuvant with adjuvant (BOTH).

**Results:** A total of 380,524 patients were diagnosed with PDAC. Of these, 130,039 were ≥75 years of age, and 18,291 patients (7.1%) underwent surgery. Chemotherapy was provided as follows: 5,640 underwent ADJ, 888 NEO and 345 BOTH. A majority being diagnosed at stage II patients in NEO (48%) and BOTH (53%) . The 3 year survival was 31.9% in BOTH (95% CI: 26.4 - 38.6), 24.7% in NEO (95% CI: 21.6 - 28.3) and 25.0% in ADJ (95% CI: 23.8-26.3). Univariate Cox regression shows a significantly improved survival in BOTH in comparison to ADJ (p=0.0081) and a trend in improvement in comparison to NEO (p=0.079). There was a tendency to improved survival when elderly patients that received only neoadjuvant vs those receiving adjuvant chemotherapy (p=0.23). On multivariate analysis comorbidities were identified as an independent factor negatively impacting survival. Chemotherapy given as BOTH was independently associated with improved survival (figure 1).

**Conclusion:** Elderly surgical patients undergoing BOTH neoadjuvant and adjuvant chemotherapy had improved

survival. Therefore, BOTH should be given elderly patients if tolerated.



Survival Curve for Elderly with receiving Adjuvant, Neoadjuvant and Both Chemotherapy

## OB01 - Biliary: Cholangiocarcinoma

### OB01-01

#### PROPOSED MODIFICATION OF STAGING FOR DISTAL CHOLANGIOCARCINOMA ON THE BASIS OF THE 8TH EDITION OF THE AMERICAN JOINT COMMITTEE ON CANCER STAGING SYSTEM

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**Introduction:** We validated 7th and 8th AJCC staging system. Second, we tried to find the optimal value for T category, total lymph node count (TLNC), positive lymph node count (PLNC) and lymph node ratio (LNR). Finally, comparison of performance by various staging models was performed.

**Method:** We retrospectively reviewed 251 patients who underwent surgery for DCC at 4 centers. To determine optimal cutoff value, univariate and multivariate Cox regression analyses were used and  $\chi^2$  score of each values were compared. To compare the predictive superiority of various staging models, Akaike information criterion (AIC), Bayesian information criterion (BIC), AIC correction (AICc), and Harrell's C-statistic were calculated.

**Results:** When applying the optimal cut off value for T category, the categories are classified as follows and referred to as 'revised T category': T1 (< 5mm), T2 (5-10mm) and T3 (>10mm). As to N category, PLNC is divided into N (0), N (1-2) and N ( $\geq$  3). LNR were divided into 3 groups

(0, >0 to < 0.1 and  $\geq$ 0.1). In multivariate analysis, age (P = 0.003), TLNC (P = 0.033), revised T(LNR)M staging (P < 0.001) were identified as independent factor for OSR. The predictive performance of revised T (LNR) M staging (AIC:1288.925, BIC 1303.377, AICc 1291.52 and Harrell's C statistics 0.667) was superior to other staging system.

**Conclusions:** A modified staging system consisting of revised T category and LNR predicted better overall survival of DCC than AJCC 7th and AJCC 8th editions.

### OB01-02

#### EVALUATION OF CLINICOPATHOLOGICAL FEATURES OF INTRADUCTAL BILIARY NEOPLESM OF THE BILE DUCT BASED ON NEW CLASSIFICATION: A JAPAN-KOREA COLLABORATIVE STUDY

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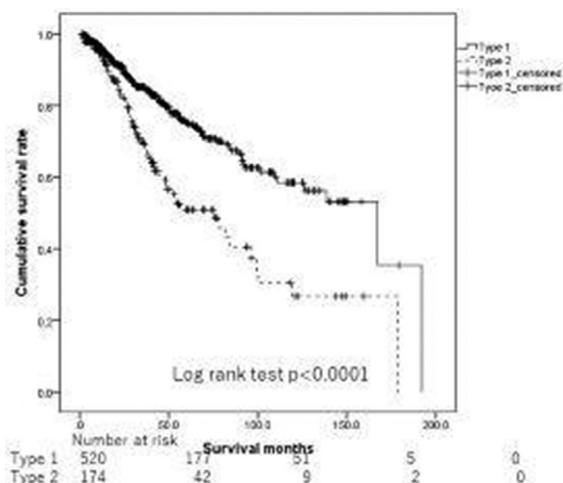
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**Introduction:** The prevalent location and incidence of intraductal papillary neoplasm of the bile duct (IPNB) and invasive carcinoma associated with them have varied markedly among studies due to differences in diagnostic criteria and tumor location. To clarify the clinicopathological features of IPNB, a collaborative study of IPNB based on the new classification was performed by the Japan Biliary Association and the Korean Association of Hepato-Biliary-Pancreatic Surgery.

**Methods:** IPNBs were classified into two types: Type 1 IPNB, being histologically similar to intraductal papillary-mucinous neoplasm of the pancreas, and Type 2 IPNB, having a more complex histological architecture with irregular papillary branching or foci of solid-tubular components. Medical data, pathological findings and long-term outcomes for the two types were evaluated.

**Results:** Among 694 IPNB patients, 520 and 174 had Type 1 and Type 2, respectively. The levels of AST, ALT, ALP,  $\gamma$ -GTP, T. Bil, CEA and CA19-9 were significantly higher in patients with Type 2 than in those with Type 1. Type 1 IPNB was more frequently located in the intrahepatic bile duct than Type 2, whereas Type 2 was more frequently located in the distal bile duct than Type 1 IPNB (P < 0.001). There were significant differences in 5-year cumulative survival rates (75.2% vs 50.9%; P < 0.0001) and 5-year cumulative disease-free survival rates (64.1% vs 35.3%; P < 0.0001) between the two groups.

**Conclusion:** Type 1 and Type 2 IPNBs differ in their clinicopathological features and prognosis. IPNB should not be discussed as a single-entity disease but as heterogeneous disease.



Cumulative survival rates of patients with Type 1 and 2 IPNB (n=694).

### OB01-03 CLINICAL SIGNIFICANCE OF NOVEL ITEM-BASED PATHOLOGICAL REPORT FOR HILAR CHOLANGIOCARCINOMA

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**Introduction:** The en bloc cancer resection was performed using no touch, vascular resection and reconstruction techniques, which preserves the anatomical integrity of the hilar tumor and peripheral vessels and tissues.

**Methods:** Novel item-based pathological reports for 10 patients with en bloc resection of hilar cholangiocarcinoma were adopted. The longitudinal bile duct margin, ventral bile duct margin(hilar plate) and dorsal bile duct margin(-portal bifurcation and RHA) were analyzed by three dimensional pathology.

**Results:** The longitudinal evaluation of bile duct margin showed that only 10% positive rate of distal CBD margin was found, and then hepatopancreaticoduodenectomy was performed. The infiltration rate of Calot's triangle was 30%, the positive margin rate of right/left hepatic duct was 10%, without infiltration of adjacent liver parenchyma over 10mm and without intrahepatic metastases. The hilar plate (ventral margin of bile duct confluence) in 90% cases showed cancer infiltration. The distance from tumor to visceral peritoneum of hilar plate was only 0.1mm to 5mm depending on the Bismuth-Corlette type. By analyzing the tissue around the dorsal margin of bile duct confluence, it was found that if no variation in HA, infiltration of RHA adventitia/intima was 22%, and distance between cancer and adventitia of RHA was 0.15-2mm. The adventitia of portal bifurcation had no cancer infiltration, but it was closely related to RHA, which made it difficult to separate.

**Conclusions:** The item-based pathological report can evaluate the degree of cancer invasion in three-dimension and evaluate the margins of vessels and bile duct sufficiently.

### OB01-05 CLINICAL SIGNIFICANCE OF BILIARY INTRAEPITHELIAL NEOPLASIA-3 (BILIN-3) IN RESECTION MARGIN OF BILE DUCT FOR PERIHILAR CHOLANGIOCARCINOMA

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**Introduction:** As R0 resection is the most critical concern for the surgery of perihilar cholangiocarcinoma (PHCC), it is still controversial as to whether additional resection of the bile duct is needed on biliary intraepithelial neoplasia-3 (BilIN-3) margin. We aimed to investigate the clinical significance of BilIN-3.

**Methods:** Patients who underwent surgery for PHCC with curative intent between 2000 and 2015 were included in the study and were analyzed retrospectively. We stratified the patients by resection margin status (R0, BilIN-3, R1) and compared the clinical outcomes

**Results:** Overall survival rates for each group at 5 years were 34.5% in the R0 group, 44.4% in the BilIN-3 group, and 21.0% in R1 group, whereas the rates at 10 years were 18.0%, 15.2%, and 11.4% respectively. The recurrence rates at 5 years were 76.4% in the R0 group, 51.7% in the BilIN-3 group, and 88.0% in the R1 group, respectively, while those at 10 years were 83.7%, 83.9%, and 92.8%.

**Conclusions:** The BilIN-3 group showed more similar survival and recurrence patterns to those of the R0 group than in comparison with the R1 group, but, considering its malignant potential in the late period, BilIN-3 margins should be avoided if technically possible during perihilar cholangiocarcinoma PHCC surgery.

### OB01-06 PREOPERATIVE C-REACTIVE PROTEIN-ALBUMIN RATIO IS PREDICTING PROGNOSTIC LONG- TERM OUTCOMES BUT CANNOT PREDICT LYMPH NODE METASTASIS AND CA19-9 CAN PREDICT IN PATIENTS WITH EXTRAHEPATIC CHOLANGIOCARCINOMA

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**Background:** Systemic inflammation has prognostic value in some malignancies and could be related to the lymph node metastasis. The aim of this study was to evaluate the impact of systematic inflammatory biomarkers on long-term and oncological outcomes and to assess the association of serum markers with lymph node metastasis.

**Method:** We enrolled 355 consecutive patients who underwent surgical resection for extrahepatic cholangiocarcinoma. Poor prognostic factors including

systematic inflammatory biomarkers were compared to identify the biomarker most associated with overall survival (OS) and disease free survival (DFS) using receiver operating characteristic (ROC) curves and multivariable analysis. Furthermore, we evaluated the relationship between biomarkers including tumor markers and lymph node metastasis.

**Results:** Six and three biomarkers were predictive for OS and DFS, respectively, among which C-reactive protein-to-albumin ratio (CAR) was the highest area under the curve value (OS: 0.598; DFS: 0.605). In Multivariable analysis, high CAR status was independent prognostic factor for both OS and DFS ( $P = 0.002$ ,  $P = 0.007$ , respectively). Although high CAR was not significant correlation with lymph node metastasis ( $P = 0.645$ ), CA19-9 was significant correlation ( $P < 0.001$ ).

**Conclusion:** Preoperative CAR is the most predicting factor for OS and DFS in patients with extrahepatic cholangiocarcinoma, however it cannot predict the lymph node metastasis. CA19-9 value may predict preoperative lymph node metastasis.

#### OB01-07

### PROGNOSTIC PREDICTABILITY OF AMERICAN JOINT COMMITTEE ON CANCER 8TH STAGING SYSTEM FOR PERIHILAR CHOLANGIOCARCINOMA: LIMITED IMPROVEMENT COMPARED WITH THE 7TH STAGING SYSTEM

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**Introduction:** This study was conducted to evaluate the prognostic values of the 7th and 8th American Joint Committee on Cancer (AJCC) staging systems for patients with curative intent resected perihilar cholangiocarcinoma (PHCC).

**Methods:** A total of 348 patients who underwent major hepatectomy for PHCC between 2008 and 2015 were identified from a single center. Overall survival (OS) was estimated using the Kaplan-Meier method and compared across stage groups with the log-rank test. The concordance index was used to evaluate the prognostic predictability of the 8th AJCC staging system compared with that of the 7th.

**Results:** In the 8th edition, the stratification of each group of T classification improved compared to that in the 7th, as the survival rate of T4 decreased (T2, 31.2%; T3, 13.9%; T4, 15.1%; T1-T2,  $p=0.260$ ; T2-T3,  $p=0.001$ ; T3-T4,  $p=0.996$ ). Both editions showed significant survival differences between each N stage, except between N1 and N2 ( $p=0.063$ ) in 7th edition. Differences of point estimates between the 8th and 7th T and N classification and overall stages were +0.026, +0.006 and +0.039, respectively (T,  $p=0.010$ ; N,  $p=0.115$ ; overall stage,  $p=0.008$ ). In multivariable analysis, posthepatectomy liver failure, T stage, N stage, distant metastasis, histologic differentiation,

intraoperative transfusion, and resection margin status were associated with OS.

**Conclusions:** The prognostic predictability of 8th AJCC staging for PHCC improved, with statistical significance, compared to the 7th edition, but its overall performance is still unsatisfactory.

#### OB01-09

### OUTCOME AFTER RESECTION FOR PERIHILAR CHOLANGIOCARCINOMA IN PRIMARY SCLEROSING CHOLANGITIS - AN INTERNATIONAL MULTICENTER STUDY FROM THE PERIHILAR CHOLANGIOCARCINOMA COLLABORATION GROUP

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**Introduction:** Resection remains the only therapeutic option for PSC patients that present with resectable perihilar cholangiocarcinoma (PHCC) in stages where transplantation is precluded.

Data on PSC-specific outcomes after resection for PHCC is sparse. The aim of this study was to compare outcomes after resection for PSC-PHCC and non-PSC PHCC in a large international multicenter cohort.

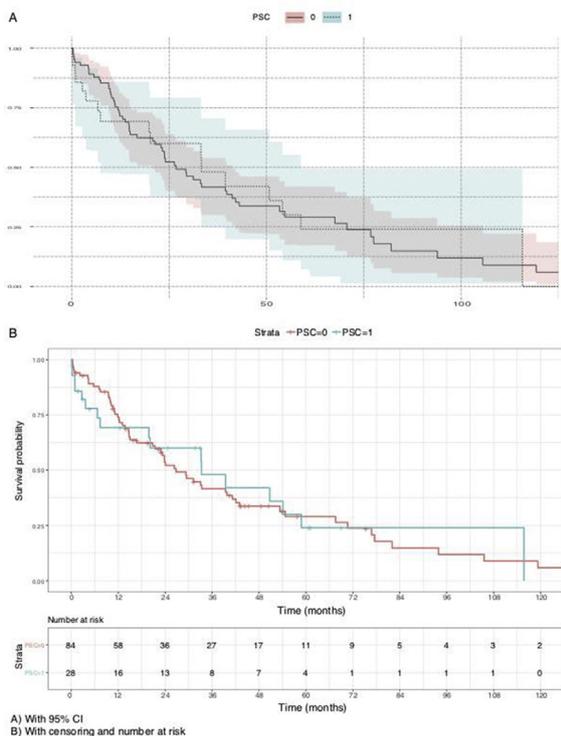
**Method:** Retrospective multicenter cohort of patients resected for PHCC from 20 European and American centers (1996-2018). Primary outcome was overall survival (OS), secondary outcome complications Clavien-Dindo grade 3 and higher. PSC patients and non-PSC controls were matched 1:3 by propensity score (PS) including covariates age, ASA-class, T-stage and N-status. Covariate balance of matching was evaluated by standardized mean difference  $< 0.1$ . Kaplan-Meier survival analysis was performed.

**Results:** 1054 patients were included for analysis, with PHCC verified by pathology and known PSC-status (all PHCC  $n=1461$ ). 28 patients (2.7%) had PSC-PHCC, 1026 (97.3%) non-PSC PHCC.

3- and 5-year OS (95% CI) was 48% (25-71%) and 24% (7-49%) in PSC-PHCC, compared to 42% (30-54%) and 29% (17-42%) in matched controls (Fig. 1), and 42% (38-46%) and 26% (23-30%) in unmatched controls. Frequency of complications  $CD \geq 3$  was 68% in PSC-PHCC compared to 37% in matched controls ( $p=0.004$ ), and 40% in unmatched controls ( $p=0.003$ ).

**Conclusions:** Although postoperative complications were significantly increased after resection for PSC-PHCC, 3-year OS was similar compared to controls matched with age, ASA-class, T-stage and N-status. Survival data for 5 years and over was limited, and PSC-specific survival  $\geq 5$  years could be decreased (Fig. 1).

Figure 1: Survival curves PSC (PSC=1) and matched controls (PSC=0)



## OB01-10

### PERIHILAR CHOLANGIOCARCINOMA: ARE WE READY TO STEP TOWARDS MINIMALLY-INVASIVENESS?

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**Introduction:** The endpoint of this study is to evaluate the potential advantages of laparoscopic approach over the open counterpart in a comparative study within an analysis based on the propensity score matching.

**Materials and methods:** From January 2004 to June 2019, 261 procedures with curative intent for PHC were performed. From March 2018 a Mils program for PHC was undertaken: 16 patients constituted the study group that was compared with a group of patients operated by open technique (control group) from 2014 to March 2018 through a propensity score matching with a 1: 2 ratio.

**Results:** There were no statistically significant differences in terms of preoperative characteristics between the two groups. Laparoscopic resections resulted in statistically significant longer procedures (360 vs 275 minutes,  $p=0.048$ ). Conversion rate was 18.8%, being oncological concerns the most frequent reason for conversion (3/3 cases). Laparoscopic series resulted in a statistically significant lower blood loss (380 vs 470,  $p=0.048$ ) and minor intraoperative blood transfusions (12.5% vs 21.9%,

$p=0.032$ ). Number of retrieved nodes was 9 vs 8 ( $p=ns$ ) and the rate of R0 resections was similar between the two groups. Patients in the MILS group had a significantly shorter length of postoperative stay (median 10; range: 7-15) compared with the open group (median: 14; range: 12-29),  $p=0.048$ .

**Conclusion:** The laparoscopic approach in phc, so far maintained in an exploratory phase, demonstrates adequate feasibility and safety standards when conducted in carefully selected patients and in centers with expertise.

## OB01-11

### OUTCOMES IN HILAR CHOLANGIOCARCINOMA MANAGEMENT THROUGH A CLINICAL PATHWAY IMPLEMENTATION: A 30-YEAR SINGLE CENTRE EXPERIENCE

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**Introduction:** Multidisciplinary team assessment and clinical pathways improve the outcomes of cancer treatments. Perihilar-cholangiocarcinoma is a rare disease, and surgical resection remains the only possibility of curative treatment. The present study aimed to investigate patient outcomes after the introduction of an institutional Perihilar cholangiocarcinoma clinical pathway.

**Methods:** All patients with a diagnosis of Perihilar-cholangiocarcinoma, between 1988 and 2018 were identified from a prospectively collected database. Outcomes from a historical control group of 508 (83%) patients were compared with patients after the implementation of the Perihilar-cholangiocarcinoma clinical pathway ( $n=107$ ; 17%).

**Results:** Median Charlson Comorbidities Index (CCI) was 5 (IQ 4-6) in the Perihilar-cholangiocarcinoma clinical pathway and 4 (IQ 3-5) before the Clinical pathway ( $p<0.0001$ ). The overall number of patient defined as localized without vascular involvement, vascular involvement, and with metastatic diseases were 28% ( $n=28$ ), 49% ( $n=50$ ), and 24% ( $n=24$ ) within the Perihilar-cholangiocarcinoma clinical pathway and 42% ( $n=101$ ), 40% ( $n=94$ ), and 17% ( $n=41$ ) before introduction of the Clinical Pathway ( $p=0.02$ ). The non-surgical candidates were 369 (73%) and 60 (58%), and the exploratory laparotomies without resections were 49 (10%) and 15 (14%), respectively ( $p=0.01$ ). One-year survival was 61% vs. 67% (HR: 2.664 CI: 1.056 to 6.639,  $p=0.032$ ) in the no clinical pathway and in the Perihilar-cholangiocarcinoma clinical pathway.

**Conclusion:** The introduction of the Perihilar-cholangiocarcinoma clinical pathway significantly increased the resection rate through a significant number of patients with vascular involvement deemed resectable within the pathway. Such results are consistent with the standard approach of other high volume international centres.

OB01-12

## RESECTION OR HAIP CHEMOTHERAPY FOR MULTIFOCAL INTRAHEPATIC CHOLANGIOCARCINOMA

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**Introduction:** Intrahepatic cholangiocarcinoma (iCCA) is often multifocal (i.e. satellites or intrahepatic metastases) at presentation. We compared survival of patients with multifocal iCCA after resection and after hepatic arterial infusion pump (HAIP) chemotherapy.

**Methods:** The resection group consisted of consecutive patients from 12 centers who underwent a curative-intent resection of multifocal iCCA. The HAIP group consisted of consecutive patients from a single center who underwent HAIP chemotherapy for multifocal iCCA. Patients with extrahepatic metastatic disease were excluded. Overall survival (OS) was measured from the date of surgery. OS rates were compared between the two treatments using the Kaplan Meier methods and logrank test.

**Results:** In total, 311 patients with multifocal iCCA were included; 178 in the resection group and 133 in the HAIP group. The HAIP group was characterized by a higher percentage of bilobar disease (90.2% vs. 35.9%), higher percentage of prior systemic chemotherapy (34.6% vs. 7.9%) and larger tumors (median 9.0 vs. 7.8 cm). The median age was comparable between the two groups. The median OS for resection was 15.4 months versus 18.6 months for HAIP ( $p = 0.74$ ). 5-years OS for resection was 8.4% (95% CI 5.2-13.7) versus 3.8% (95% CI 1.2-12.6) for HAIP.

**Conclusion:** Patients with multifocal iCCA had similar OS after resection or HAIP chemotherapy.

OB01-13

## IMPACT OF VASCULAR RESECTION ON SHORT-TERM AND LONG-TERMS OUTCOMES DURING CURATIVE INTENT HEPATECTOMY FOR INTRAHEPATIC CHOLANGIOCARCINOMA

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**Background and aims:** We aimed to investigate the impact of vascular resection (VR) on postoperative

outcomes and survival of patients undergoing curative-intent surgery for intrahepatic cholangiocarcinoma (ICC). **Methods:** A retrospective analysis of a multi-institutional series of 270 patients with resected ICC was carried out. Patients were divided in cava VR (CVR), portal VR (PVR) and no VR (NVR). Univariate and multivariate analysis were used to determine the impact of VR (CVR and PVR) on postoperative outcomes and survival.

**Results:** Thirty-one patients (11.5%) underwent VR: 15 (5.6%) to PVR and 16 (5.9%) to CVR. R0 resection rates were 73.6% in NVR, 73.3% of PVR and 68.8% in CVR,  $p=0.694$ . Postoperative mortality rate was 3.3% ( $n=9$ ) in the entire cohort, 2.5% in NVR, 6.7% in PVR and 12.5% in CVR. The 5-years overall survival (OS) rates were 38.4% in NVR, 22.2% in PVR and 30.1% in CVR,  $p = 0.030$ . Multivariate analysis identified the following independent prognostic factors: Pattern of nodules distribution ( $p < 0.001$ ), size  $\geq 50$  mm ( $p = 0.009$ ), lymph-node metastases (N1) ( $p < 0.001$ ) and R1 resections ( $p = 0.002$ ). The 5-years OS rate for patients submitted to VR (CVR or PVR) associated with R0 resection and N0 was 44.4%.

**Conclusion:** Vascular resection (CVR and PVR) seem to be related with worse postoperative outcomes but seem to be justified by the good survival results in particular in patients without other prognostic (N0 and R0). Aggressive surgery with vascular resection should be recommended in selected ICC patients undergoing hepatectomy.

## OB02 - Biliary: Gallbladder Cancer

OB02-01

### PROGNOSTIC SIGNIFICANCE OF TUMOR LOCATION IN T2 GALLBLADDER CANCER: A KOREA TUMOR REGISTRY SYSTEM- BILIARYPANCREAS (KOTUS-BP) DATABASE ANALYSIS

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**Objective:** The aims of this study were to investigate the clinical features and clinical outcomes of T2 gallbladder cancer (GBC) according to tumor location and determine the prognostic significance of tumor location and an appropriate surgical strategy for T2 GBC.

**Methods:** Using Korea tumor registry system- biliarypancreas (KOTUS-BP) database, between 2000 and 2014, a total 707 patients with T2 GBC who underwent curative resection were enrolled.

**Results:** 309 patients were T2a, and 398 patients were T2b. The incidence of lymph node metastasis in T2b tumor group was 37.5% and significantly higher than that of T2a tumor group (29.5%). After a median follow-up period of 43 (range 3-189) months, the 5-year disease-specific survival (76% vs. 69%,  $p=0.019$ ) and disease-free survival of the T2a group were better than those of the T2b group (69% vs. 57%,  $p=0.002$ ). However, there was no significant difference in survival between Stage IIa (T2aN0) and Stage IIb (T2bN0) (83% vs.74%,  $p=0.149$ ). There were no significant survival differences between T2a and T2b groups according to whether hepatic resection was performed or not. Multivariate analysis revealed that lymph node metastasis was the only significant poor prognostic factor

(hazard ratio 2.966, 95% confidence interval 1.960-4.489,  $p < 0.001$ ).

**Conclusion:** In T2 GBC, simple cholecystectomy and lymph node dissection for staging work-up could be recommended irrespective of tumor location. Postoperative adjuvant therapy should be considered, because lymph node metastasis was a significant poor prognostic factor, systemic recurrence was more common, and recurrence occurred more frequently among patients with lymph node metastasis.

OB02-02

**STAGING LAPAROSCOPY IN GALLBLADDER CANCER IS INFREQUENTLY USED DESPITE HIGH RATES OF PEROPERATIVELY DIAGNOSED DISSEMINATED DISEASE**

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**Introduction:** Staging laparoscopy (SL) is recommended before attempting resection in patients with gallbladder cancer (GBC). The aim of this study was to assess the yield of SL in terms of reducing unnecessary surgical exploration and to delineate factors associated with disseminated disease (DD).

**Material and methods:** Data were collected from all GBC patients undergoing SL and/or surgical exploration in eight Dutch academic hospitals from 2000-2019. Outcomes after laparotomy with or without SL were assessed and factors predictive for DD were identified.

**Results:** A total of 210 patients was included; SL was performed in 43 (20%). SL was more frequently performed in patients with tumor invasion in the liver on pre-operative imaging (53% vs 30%,  $p=0.014$ ). DD was detected by SL in 8/43 patients (19%). Of the 35 patients with SL that underwent surgical exploration, 25(72%) were resected and in 10 patients (28%) DD was diagnosed during laparotomy. Accuracy of SL for detecting DD was 44%(8/18). Of 167 patients without SL, resection was performed in 125(75%) and in 44(25%) DD was found. DD was most frequently detected at the hepatic hilum (16/44, 36%) and the peritoneum (10/44, 23%). In total, 62 (30%) patients had DD. Liver invasion on imaging was associated with high rates of DD (50/76, 66%) and predictive for DD in multivariate analysis (OR 12.5,  $P=0.021$ ).

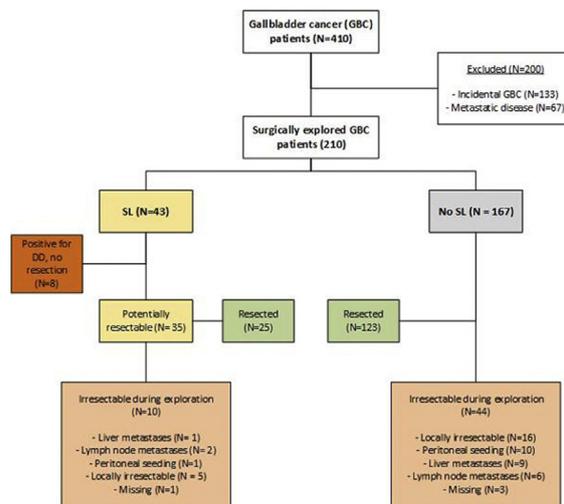
**Conclusion:** SL in GBC is infrequently used despite a 30% chance of occult metastatic disease. In patients with liver invasion on imaging risk of DD is 66% and SL be recommended.

**Baseline characteristics of patients with and without SL**

Characteristic	SL (N=43)	No SL (N=167)	P-value
Age (mean/range)	64 (45-86)	66 (33-81)	0.391
ASA >2	9 (21%)	41 (25%)	0.690
Cholecystitis	0 (0%)	10 (6%)	0.220
	3 (7%)	6 (4%)	0.394

(continued)

Characteristic	SL (N=43)	No SL (N=167)	P-value
Primary Sclerosing Cholangitis			
Gallbladder polyp	3 (7%)	8 (5%)	0.700
N1 disease (imaging)	8 (35%)	28 (36%)	0.906
<b>Liver invasion (imaging)</b>	<b>21 (53%)</b>	<b>45 (30%)</b>	<b>0.014</b>
Pre-operative jaundice	18 (42%)	54 (32%)	0.160
Pre-operative biliary drainage	21 (49%)	56 (34%)	0.063



Patient flow and surgical outcomes

OB02-03

**CLINICAL IMPLICATION OF PD-L1 EXPRESSION IN GALLBLADDER CANCER**

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**Introduction:** Programmed death ligand-1 (PD-L1) expression has been established as a prognostic factor for various solid tumors, but is not well understood in gallbladder cancer (GBC). This study was designed to evaluate PD-L1 expression in GBC and investigate its association with clinicopathological factors, tumor-infiltrating immune cells and survival outcomes.

**Methods:** The expression of PD-L1 was detected by immunohistochemistry from 94 GBC patients who underwent R0/R1 resection at our institution between 2003 and 2016. Tumor-infiltrating CD8+ T cells or CD163+ positive macrophages were assessed at invasive front of tumor, tumor stroma and intraepithelial, respectively. To evaluate the cytotoxic activity of CD8+ T cell, the expression of Perforin and Granzyme B was also assessed using immunohistochemistry.

**Results:** The expression of PD-L1, Perforin and Granzyme B was identified in 38 patients (40.4%), 29 patients (30.9%) and 20 patients (21.3%), respectively. High PD-L1 expression was associated with male gender, high

preoperative CA19-9 level, lymphatic invasion, venous invasion, lymph node metastasis and liver metastasis. High PD-L1 expression was related to poorer OS ( $p=0.0046$ ) and DFS ( $p=0.0011$ ). In addition, CD163+ macrophage infiltration of tumor was positively correlated with PD-L1 expression. Moreover, high CD8+ TIL group at invasive front of tumor had better OS ( $p=0.011$ ) compared to low CD8+ TIL group. However, high PD-L1 was also related to poor prognosis in this subgroup.

**Conclusions:** PD-L1 expression is a useful biomarker for advanced GBC. The subgroup of high PD-L1 with high CD8+ TIL at invasive front of tumor would be potential therapeutic target for PD-1/PD-L1 checkpoint inhibitors.

#### OB02-04

### IMPACT OF PRE-OPERATIVE POSITRON EMISSION TOMOGRAPHY - COMPUTED TOMOGRAPHY FOR MANAGEMENT OF GALLBLADDER CANCER

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**Background:** Prognosis of gallbladder carcinoma is poor; surgery with R0 resection remains the only chance for long-term survival for these patients. Extensive evaluation is mandatory to accurately define the tumor stage, regional lymph nodes and distant metastases to identify those patients who may benefit from surgery. The purpose of this study was to assess the diagnostic value of PET-CT in relation to a conventional imaging modality, CECT for patients with gallbladder cancer.

**Methods:** This study was prospective observational study conducted at tertiary care institute. Seventy patients with suspected gallbladder cancer who underwent both PET-CT and MDCT for initial staging were included in our study. Results of these two imaging modalities for evaluating primary tumors, regional lymph nodes and distant metastases were compared with the final diagnoses based on histopathological examination.

**Results:** PET-CT demonstrated no significant advantage over MDCT for the diagnosis of a primary tumor. PET-CT showed a significantly higher accuracy (90.8 vs. 80.0%,  $P=0.04$ ) than MDCT for diagnosis of regional lymph node metastasis. PET-CT showed significantly higher sensitivity (92.3 vs. 61.5%,  $P=0.04$ ) than MDCT in the diagnosis of distant metastasis. Addition of PET-CT changed management in 10 patients (14.3%). In seven patients, radical resection was avoided due to presence of distant lymph nodal disease or distant metastases diagnosed on PET-CT. In three patients with suspicious CT finding, PET was negative for malignancy.

**Conclusions:** In patients with potentially resectable gallbladder carcinoma on primary imaging, PET-CT may be helpful in detecting distant nodal metastasis and unsuspected metastatic disease that may preclude patients from surgical resection. Addition of preoperative PET-CT in staging of gallbladder carcinoma, also result in change of management in significant number of patient.

#### OB02-06

### IS THERE A ROLE FOR SELECTIVE HISTOLOGICAL EXAMINATION OF GALLBLADDERS FOLLOWING CHOLECYSTECTOMY FOR BENIGN GALLBLADDER DISEASE? RESULTS OF S-GALLOP STUDY

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**Introduction:** Considering the shortage of number of Pathologists working in the National Health Service (NHS), and the low incidence of incidentally detected gallbladder cancers (IGBC) in the UK, selective gall bladder histology could potentially save money and time. This study evaluates the histopathologic assessment of patients that underwent elective cholecystectomies for benign gallbladder disease over 10-year period.

**Methods:** This is a retrospective study of 8043 patients who underwent elective cholecystectomies at University Hospital Plymouth NHS trust (UHPNT) between January 2009 to December 2018. Clinical details and histopathologic data were evaluated to identify patients with IGBC, including a cost analysis.

**Results:** There were 32 cases [1 in 250 (0.4%), 23 females] IGBC during the study period. Seventeen (53.1%) patients had abnormal gall bladder wall thickening on gross morphology. In the UK, approximately 70,000 cholecystectomies are performed annually for benign disease. Extrapolating our institution rate to the rest of the UK, a total of 280 cholecystectomy specimens would have had IGBC. Which means, 69,720 gall bladder specimens potentially would not require histopathologic processing. The cost of processing a gallbladder specimen is £74.94, and NHS could potentially save £5.224 million per year. Based on this, the hepatobiliary and pathology units in UHPNT are researching the development of a prospective protocol for selective gall bladder histology.

**Conclusion:** The outcome shows that to identify one case of IGBC about 250 specimens would have to be analysed by the histopathology team. The potential time and cost savings of a prospective protocol would be future breakthrough.

#### OB02-07

### NEOADJUVANT CHEMOTHERAPY IN LOCALLY ADVANCED UNRESECTABLE CARCINOMA GALLBLADDER (ENACT TRIAL): A NOVEL BEGINNING IN A TERTIARY CENTRE IN NORTH INDIA

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**Introduction:** Locally advanced Gall Bladder Cancer (LAGBC) is usually unresectable and presents with dismal prognosis. The role of neoadjuvant chemotherapy (NACT) in LAGBC is still not fully established. In our study we look for effect of NACT in LAGBC in terms of response and survival.

**Methods:** All patients of Carcinoma GB (CaGB) admitted in department of Surgery over one year period were included. Patients with LAGBC given 4 cycles of Gemcitabine and Cisplatin based NACT after histopathological confirmation. Response was assessed using RECIST criteria and patients with complete/partial response were subjected to surgery. Perioperative morbidity and mortality was noted. Patients with successful surgery received further adjuvant chemotherapy. Patients' survival was noted in follow up.

**Results:** 45 patients of CaGB were analysed. 8 patients (17.7%) received NACT after histopathological confirmation. None of the patients had serious adverse events during NACT. 6 patients (75%) showed partial/complete response. During surgery, 1 patient had metastatic disease, 3 patients underwent extended cholecystectomy (EC), 1 underwent EC with hepaticojejunostomy and 1 required multivisceral resection. Major morbidity (Clavien Dindo 3 or more) was seen in only 1 patient in terms of bile leak. There was no mortality. On median follow up of 15 months, 4 patients were alive while one had recurrence and later died due to cardiac arrest.

**Conclusions:** Neoadjuvant chemotherapy provides hope to patients of LAGBC and should be used in patients with good functional status. Larger multicenter studies should be done to establish a defined role of NACT in this dreaded disease.

### OB03 - Biliary: Gallstones

#### OB03-02

#### SPHINCTER OF ODDI LAXITY ALTERS BILE DUCT MICROBIOTA AND CONTRIBUTES TO THE RECURRENCE OF CHELODOCHOLITHIASIS

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**Background:** Chelodocholithiasis is closely associated with bacterial infection and inflammation in the bile ducts. Our previous studies showed that sphincter of Oddi laxity (SOL) significantly altered the bile microbiota and might contribute to biliary stone recurrence. However, the direct association among SOL, bile microbiota, and chelodocholithiasis recurrence has not been well investigated.

**Methods:** We recruited 202 patients with chelodocholithiasis, and obtained the bile samples from the common bile duct. We performed 16S rRNA gene analysis to characterize the bile microbiota, and analyzed the risk factors of chelodocholithiasis.

**Results:** Distinct bile microbial communities were identified in patients with and without SOL with a significantly greater abundance of *Rhizobiaceae* in SOL patients. SOL

patients had a higher risk of biliary stone recurrence with a considerably shorter recurrence time. The abundance of *Clostridium* was significantly higher in recurrent patients. SOL ( $P = 0.045$ , HR = 8.563) and pre-operative gamma-glutamyl transferase level ( $P = 0.037$ , HR = 1.002) were two independent risk factors of chelodocholithiasis recurrence.

**Conclusions:** Chelodocholithiasis patients with and without SOL demonstrated significant differences in their microbial communities. SOL is a critical risk factor of chelodocholithiasis recurrence after surgery. The presence of *Clostridium* is potentially associated with SOL-induced chelodocholithiasis recurrence.

#### OB03-03

#### NATURAL HISTORY OF RETAINED COMMON BILE DUCT CALCULI NOTED ON INTRA-OPERATIVE CHOLANGIOGRAPHY

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**Introduction:** Incidental common bile duct (CBD) calculi is found in approximately 11% of routine intra-operative cholangiograms (IOC) during laparoscopic cholecystectomy (LC). An uncertain proportion of these may remain asymptomatic or pass spontaneously, and therefore not require invasive intervention.

We aim to explore the natural history of retained CBD calculi in asymptomatic patients to guide management for this common incidental operative finding.

**Methods:** Retrospective analysis of LC performed at an Australian tertiary hospital from 2014 to 2018 was undertaken. Records of patients with filling defects noted on IOC were reviewed. Incidental patients were defined by preoperative bilirubin < 40 μmol/L and gamma-glutamyl transferase < 500 U/L. The main endpoint was the passage of CBD calculus, determined by the absence of chelodocholithiasis on postoperative magnetic resonance cholangiopancreatography (MRCP) or endoscopic retrograde cholangiopancreatography (ERCP).

**Results:** 1453 (87%) patients underwent IOC with LC and filling defects were noted in 116 (8%) of these. 75 incidental patients underwent postoperative cholangiography within 30 days at a median of 3 (IQR=2-6) days following LC. 32 (43%) patients had no residual chelodocholithiasis. The median time to stone passage was estimated at 10 (95%CI 5.6-14.3) days. Retained chelodocholithiasis was detected in 72% of patients where no contrast passed into the duodenum and 48% with duodenal contrast passage but filling defects on IOC ( $p=0.049$ ).

**Conclusion:** A significant proportion of incidental CBD calculi pass spontaneously within 14 days from LC. Expectant management with follow-up non-invasive imaging may reduce unnecessary ERCP and minimise its associated complications. However, failure of contrast passage into the duodenum on IOC may predict non-passage of chelodocholithiasis.

OB03-04

### THE PREVALENCE OF FUNCTIONAL GASTROINTESTINAL DISORDERS IN PATIENTS WITH UNCOMPLICATED CHOLECYSTOLITHIASIS (PERFECT): A PROSPECTIVE, MULTICENTER OBSERVATIONAL STUDY

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**Background:** Symptomatic gallstones, functional dyspepsia(FD), and irritable bowel syndrome(IFS) have similar symptom pattern. This study determined the prevalence of FD/IFS in patients with gallstones and assessed the outcome of a cholecystectomy in terms of resolution of biliary colics and abdominal pain.

**Methods:** A multicentre, prospective observational study was conducted. Adult patients with abdominal pain and ultrasonically confirmed gallstones were included. The presence of FD/IFS was assessed with the validated ROME-IV questionnaire. A biliary colic was defined by the ROME-III criteria. Pain-free was defined as an Izbicki Pain Score  $\leq 10$ . Patients with and without FD/IFS at baseline were compared.

**Results:** Between January 2018-April 2019, 401 patients (51.7 years, 76.3% females) were included. In total, 34.9% (140/401) of the patients with gallstones fulfilled the ROME-IV criteria for FD/IFS, and 64.1% (257/401) fulfilled the ROME-III criteria for biliary colic. Cholecystectomy rate was similar between the groups (73.8% in FD/IFS-group vs. 75.5% in patients without FD/IFS,  $p=0.720$ ). After follow-up of 24 weeks the biliary colic was resolved in 93.9% of patients with surgery (91.4% in FD/IFS-group vs. 95.1% in patients without FD/IFS,  $p=0.220$ ). Pain-free after surgery was achieved in 56.8% of patients (40.7% in FD/IFS-group vs. 64.4% in patients without FD/IFS,  $p<0.001$ ).

**Conclusion:** One-third of the patients with gallstones fulfil criteria for FD and/or IFS. Cholecystectomy resolves biliary colics in 94% of patients, with similar outcome between patients with and without FD/IFS. However, pain-free after surgery is significantly less in patients with FD/IFS. This study partially explains the poor pain reduction after cholecystectomy.

OB03-05

### SHOULD COMMON BILE DUCT EXPLORATION BE A SPECIALIST ONLY PROCEDURE? A 10 YEAR REVIEW OF 551 CONSECUTIVE PATIENTS

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**Introduction:** Common bile duct (CBD) exploration is not commonly performed, despite evidence that it may be superior to ERCP in the treatment of choledocholithiasis. Issues surrounding its uptake in the laparoscopic era include perceived difficulty and lack of training. We aim to determine whether CBD exploration should be performed by 'specialist' CBD surgeons.

**Methods:** A 10-year retrospective audit was performed of patients undergoing CBD exploration for choledocholithiasis at Northern Health, Australia. CBD exploration was performed almost exclusively using choledochoscopy. Northern Health maintains an on-call available 'specialist' CBD surgeon should the operating surgeon choose to utilise their service.

**Results:** 551 patients were identified, of which 489/551 (88.7%) patients had stones successfully cleared. 413 (75.0%) of operations were done by a 'specialist'. Specialists had a higher success rate (90.8% vs 82.6%), possibly as they were more persistent with a longer surgical time (186 min vs 161 min). Method (transcystic or transductal), approach (laparoscopic or open), pre-operative markers, and indication for operation were not different between groups. In addition, there was no significant difference in complication rates. When caseload was evaluated, to be confident of a surgeon having a minimum 80% success rate, approximately 70 procedures over 10 years were required.

**Discussion:** Specialist CBD exploration surgeons have improved success rates compared with non-specialist general surgeons. However non-specialist general surgeons also have a high success rate and, with similar complication rates and to avoid a high learning curve requirement, they should be encouraged to perform CBD exploration in centres without specialist CBD exploration support.

OB03-06

### LONG TERM OUTCOMES OF TRANSCYSTIC BILE DUCT EXPLORATION

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**Introduction:** Laparoscopic transcystic common bile duct exploration (LTCBDE) at the time of cholecystectomy for choledocholithiasis negates the need for endoscopic retrograde cholangiopancreatography (ERCP), along with its associated complications and cost. The aim of this study was to assess the long-term outcomes associated with TCBDE.

**Methods:** Patients undergoing LTCBDE at the Royal Brisbane Hospital between 1995 and 2019 were retrospectively analysed. LTCBDE was performed using a 5.5-Fr wire basket kit (Cook Australia) under fluoroscopic guidance. Satisfactory completion of the CBD exploration was confirmed by completion cholangiography. Patients had clinical follow up post discharge. Data were analysed using R statistics with a  $p<0.05$  considered significant.

**Results:** 397 patients underwent LTCBDE, with 262 females. The median age was 52 years old (range 16-88). Median follow up was 5.4 years, and the median length of hospital stay was 1 day (range 0 - 28). 28 patients

(7.1%) required postoperative ERCP for failure of complete stone clearance at LTCBDE. Two patients developed mild acute pancreatitis postoperatively after successful duct clearance. Four patients (1%) required ERCP following discharge post LTCBDE, after representing with symptomatic choledocholithiasis. Overall, 91.9% of patients had successful bile duct clearance with LTCBDE. Cost analysis comparing LTCBDE with the average cost of patients undergoing ERCP followed by laparoscopic cholecystectomy showed LTCBDE to be significantly less ( $p < 0.05$ ).

**Conclusion:** Upfront laparoscopic CBDE is now a well-established practice at this unit. This study reports a high rate of bile duct stone clearance with LTCBDE, with minimal complications and obvious cost benefits.

#### OB03-07

### THE OUTCOMES OF LAPAROSCOPIC COMMON BILE DUCT EXPLORATION AND CHOLECYSTECTOMY: RESULTS FROM A PROSPECTIVE MULTI-CENTRE COHORT STUDY (THE CHOLE S STUDY)

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**Background:** The aim of this study is to analyse the results of laparoscopic common bile duct exploration (LCBDE) and cholecystectomy (LC) performed across the UK and Ireland during Chole S trial period.

**Methods:** We analysed the data on LCBDEs that were performed during the two-month CholeS Study trial period.

**Results:** During the trial period, 256 patients (2.9%, 173 females, Median age: 59 years) out of 8820 LC underwent LCBDEs. During the same time period, 932 (10.6%) patients underwent endoscopic retrograde cholangio-pancreatography (ERCP) +and sphincterotomy (ES). Eighty percent of patients were either overweight or obese. 73 (28.5%) patients had ERCP and 112 (43.8%) patients had Magnetic resonance cholangio-pancreatography (MRCP), prior to LCBDE. The overall conversion rate was 13%. Two-thirds of patients had intra-operative cholangiogram prior to LCBDE. Median length of operation was 111 min (range: 75-155). Median length of hospital stay was 6 days (range: 4-11) for LCBDEs performed acutely (90/256, 35%) compared to 1 day (range: 1-4) for elective cases. The post-operative complication rate was 22.7%, and the bile leak rate was 5.3%. The all cause 30-day re-admission rate was 11.9% and 30-day mortality was 0.4%.

**Conclusions:** LCBDE is still not commonly used treatment option for CBDS across the UK and Ireland. Nearly half of patients had pre-op MRCP and one fourth of patients had ERCP prior to surgery. Patients that had LCBDE in an acute situation had longer hospital stay compared to elective patients. Further studies are required to find out the reasons for low utilisation of LCBDE.

#### OB04 - Biliary: Surgical Outcomes

##### OB04-01

### FEASIBILITY AND EFFICACY OF STENT PLACEMENT ABOVE THE PAPILLA (INSIDE-STENT) AS A BRIDGING TREATMENT FOR PERIHILAR BILIARY MALIGNANCY: A SINGLE-CENTER PROSPECTIVE STUDY

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**Introduction:** Few studies have reported the outcome of stent placement above the Oddi (inside-stent) for preoperative biliary drainage in patients with hilar malignant biliary obstruction (HMBO). Herein, we conducted this single-center, prospective study which evaluated the safety and efficacy of inside-stent as a bridging treatment (UMIN000025463).

**Methods:** Patients with resectable HMBO, which located at the distance of 3cm or greater from the biliary stricture to the sphincter of Oddi, were enrolled. First, endoscopic-naso biliary drainage (ENBD) catheter was placed as an initial drainage. ENBD was then replaced with an inside-stent when their serum total bilirubin decreased  $< 5$  mg/dL. Primary endpoint was a time to recurrent biliary obstruction (TRBO), and secondary endpoints included technical success rate, adverse event, the incidence of recurrent biliary obstruction (RBO), and postoperative severe complication rate.

**Results:** A total of 32 patients were enrolled and the most of them (27 [84%]) had cholangiocarcinoma. Three patients (9%) developed RBO and non-RBO rate at 30 days were 87%. The stent was successfully placed for 97% with acceptable adverse event (9%). Among the patients who developed RBO, the cause of RBO included cholangitis (3%), stent occlusion (3%) and stent dislocation (3%). Twenty-nine patients (92%) underwent resection median 27.5 days after inside-stent was placed. Major hepatectomy with bile duct resection was the operation for all but one who underwent bile duct resection only. Their postoperative severe complication rate was 17% and there was no mortality.

**Conclusions:** Inside-stent is safe and useful as a bridging treatment for patients with HMBO.

##### OB04-02

### COMPARISON OF LAPAROSCOPIC COMMON BILE DUCT EXPLORATION COMBINE WITH CHOLECYSTECTOMY AND LAPAROSCOPIC CHOLECYSTECTOMY WITH PREOPERATIVE ENDOSCOPIC SPHINCTEROTOMY: IN TERMS OF SURGICAL OUTCOMES AND RECURRENCES

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**Introduction:** It is controversial whether Laparoscopic common bile duct exploration (LCBDE) combine with laparoscopic cholecystectomy(LC) is better than LC with preoperative endoscopic sphincterotomy (pre-EST) for management of choledocholithiasis.

**Methods:** 157 patients who underwent LCBDE+LC and 278 patients who underwent pre-EST+LC from January 2010 to December 2018 in single institution were retrospectively reviewed the preoperative characteristics, surgical outcomes, and recurrence of choledocholithiasis.

**Results:** The maximum CBD diameter (13.2 vs 9.5mm,  $p < 0.001$ ) and the maximum stone size (11.4 vs 6.3mm,  $p < 0.001$ ) was significantly larger in patients who underwent LCBDE+LC than pre-EST+LC. Multiple stones were also frequently found in LCBDE group (54.8 vs 43.0%,  $p=0.017$ ). The operative time (111.4 vs 55.6 minutes,  $p < 0.001$ ) was significantly longer in LCBDE group, while duration of hospital stays after first procedure (6.2 vs 9.8days,  $p < 0.001$ ) was significantly shorter in LCBDE group. There is no statistical significance in conversion to open surgery (1.9 vs 0.4%,  $p=0.104$ ), retained stones rate (3.2 vs 1.4%,  $p=0.219$ ), and recurrence rate of choledocholithiasis (8.3 vs 9.4%,  $p=0.707$ ) between the two groups. In multivariate analysis, old age (over 70years) and CBD dilatation (over 8mm) were risk factor for recurrence of choledocholithiasis.

**Conclusion:** In our experience, LCBDE+LC can be a safe and feasible management for choledocholithiasis, if appropriate experience and when expertise is available. High risk group of recurrence of CBD stone with old age and dilated CBD should carefully follow-up.

#### OB04-03

### EARLY PREDICTOR USING COMPREHENSIVE COMPLICATION INDEX OF LETHAL SURGICAL OUTCOME IN PERIHILAR CHOLANGIOCARCINOMA

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**Background:** Patients who underwent resection for perihilar cholangiocarcinoma often have lethal postoperative course. The present study attempted to seek early predictor to trace life-threatening course.

**Methods:** Consecutive 377 patients who underwent hepatectomy for perihilar cholangiocarcinoma from 2010 to 2017 were reviewed. Predicting ability of daily cumulative comprehensive complication index (CCI) for Clavien-Dindo classification (CDC) grade IV/V was assessed using receiver operating characteristics curve analysis.

**Results:** Twenty-five (6.6%) patients finally had CDC grade IV and V ( $n=8$ , 2.1%); the causes of death were liver failure ( $n=6$ ), pneumonia ( $n=1$ ), and intraabdominal bleeding ( $n=1$ ). In the 25 patients, a total of 29 complica-

tions  $\geq$  CDC grade III occurred until day 5 after surgery, represented by liver failure ( $n=13$ ), pleural effusion ( $n=4$ ), atelectasis ( $n=3$ ), cholangitis ( $n=3$ ) and bleeding ( $n=3$ ) etc. Cumulative CCI increased day by day: 8.7 on day 1, 15.0 on day 3, 17.3 on day 5, 29.8 on day 7, and 38.7 on day 14, in median. CCI on day 5 (CCI-5) was 17.3 in patients with CDC I-III and 43.2 in those with CDC IV/V ( $P < 0.001$ ). Divided by CCI-5 with cut-off value of 30.2, 19 (29.2%) of 65 patients with higher CCI-5 and 6 (1.9%) of 312 patients with lower CCI-5 had conclusive CDC grade IV/V ( $P < 0.001$ ). Mortality was 10.8% versus 0.3%, respectively ( $P < 0.001$ ).

**Conclusion:** CCI score on day 5  $>30.2$  worked as an early predictor to lethal complications including surgical death.

#### OB04-04

### SURGICAL OUTCOMES OF PERIHILAR CHOLANGIOCARCINOMA - ESPECIALLY ON POSTOPERATIVE PORTAL VEIN THROMBOSIS

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**Background:** There are limited reports of portal venous thrombosis (PVT) following hepatectomy for perihilar cholangiocarcinoma (PHC)

**Methods:** 263 patients with PHC undergoing hepatectomy at our institution between 2002 and 2018 were retrospectively studied

**Results:** Median age was 70 years and 69% of patients was male. Bismuth types 1,2,3a,3b and 4 were seen in 6%,8%,27%,23% and 36%, respectively. The right hepatectomy, left hepatectomy, right trisectionectomy and left trisectionectomy and central bisegmentectomy were performed in 42%,38%,4%,4%,and 3%, respectively. PV and hepatic artery (HA) resection were performed in 27% and 7%. The mortality rate was 3.4%, the complication rate of CD3 or more was 35%. 6 patients developed PVT(2.3%). Multivariate analysis revealed that right hepatectomy (OR 6.46; $p=0.09$ ) and PVR (OR 13.7; $p=0.017$ ) are independent risk factors for postoperative PVT. PVT was diagnosed on postoperative day 6,7,6,0,7,22. Thrombectomy with PV reconstruction were performed in 4 patients, in which 3 patients with markedly stenosis of the left PV, thrombus extension to SMV, twisting of the PV; 1 patient combined with the internal hernia of the Y loop. Other 2 patients were successfully treated with anti-coagulation drugs. The mortality resulting from PVT did not occur, all 6 patients subsequently recovered and discharged on POD25 to POD70.

**Conclusion:** Right hepatectomy and PVR are independent risk factors for postoperative PVT. Early detection with US and CT is pivotal in the management of PVT. Thrombectomy and PV re-reconstruction should be considered in case of early diagnosis with markedly stenosis of remnant PV or clearly evidence of bending or twisting

OB04-05  
**SAFETY AND ONCOLOGICAL BENEFIT OF HEPATOPANCREATODUODENECTOMY FOR ADVANCED BILE DUCT CANCER WITH HORIZONTAL TUMOR SPREAD: SHINSHU UNIVERSITY EXPERIENCE**

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**Introduction:** Although hepatopancreatoduodenectomy (HPD) is the only option to achieve R0 resection for widespread bile duct cancer (BDC), its safety and oncological benefit remains controversial due to its inherent high risk of mortality and morbidity. The aim of this study is to retrospectively analyze short- and long-term outcomes and evaluate the safety and oncological benefit of this advanced procedure.

**Method:** Consecutive 36 patients who underwent HPD were included. Portal vein embolization was applied before surgery in 19 (53%) patients with the future remnant liver volume < 35%.

**Results:** The median operative time and blood loss were 868 min and 1,025 ml, respectively. Concomitant vascular resection was performed in 5 patients (14%). The overall morbidity and mortality rates were 100% and 5.6% (n=2), respectively, where 18 patients (50%) had major (Grade III≤) complications. The most common complications were post-hepatectomy liver failure (83%, grade B/C:33%/6%) and intra-abdominal infection (44%), followed by postoperative pancreatic fistula (25%, grade B/C) and surgical site infection (22%). R0 resection was achieved in 29 patients (81%). The 1-, 3-, and 5-year over all survival (OS) were 83%, 45% and 34%, respectively. In patients who achieved R0 resection, 5-year OS were comparable between patients who underwent HPD and major hepatectomy alone (38% vs. 40%, p=NS).

**Conclusion:** HPD for extensive BDC is a valid option which can offer a long-term survival benefit at the cost of a relatively high but acceptable morbidity and mortality rates.

HPD in selected patients should be advocated provided that R0 resection is to be achieved.

OB04-06  
**SPECTRUM OF LAPAROSCOPY IN COMMON BILE DUCT PATHOLOGIES - A SINGLE CENTRE EXPERIENCE**

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**Introduction:** In the era of minimally invasive surgery, laparoscopic CBD exploration is the best choice for addressing different difficult CBD pathologies.

Laparoscopic CBD exploration is needed when:

- failed ERCP for CBD calculi
- retained stent
- CBD injuries.

Approach may be transcystic /transductal (rendezvous, milking, Fogarty balloon trawl, choledochoscopic/ureteroscopic extraction, laser lithotripsy)

The successful CBD exploration requires:

- surgical expertise
- knowledge over biliary anatomy
- adequate equipment

With the available technology, laparoscopic biliary surgery has become safe, efficient and cost effective in experienced hands.

**Method:** We report a series of different approaches for LAP CBD exploration done at our institute with difficult CBD pathologies.

A prototype of each case has been explained in detail.

Results are compared to other studies on lap/open CBD explorations.

**Results:** 10 cases have been included in the study with different CBD pathologies.

Out of ten cases 8 are difficult CBD calculi failed on ERCP extraction, 1 is retained stent, other is CBD injury.

Different approaches were done like rendezvous, milking, ureteroscopic extraction and laser lithotripsy.

## OB04-06

AGE AND SEX	CBD PATHOLOGY	METHOD OF REMOVAL	OT TIME	CBD STENT	DRAIN	PAIN SCORE	TOTAL HOSPITAL STAY	BILE LEAK	WOUND INFECTION
65/M	IMPACTED DISTAL CBD CALCULI	LASER RIGID URETEROSCOPIC GUIDED LITHOTRIPSY	90 MIN	YES	YES	3	2	NO	NO
45/M	RETAINED STENT	URETEROSCOPIC GUIDED REMOVAL STENT	100 MIN	YES	YES	3	3	NO	NO
55/F	CBD CALCULI	LAP CBD EXPLORATION (RENDEZVOUS PROCEDURE FAILED UNDERWENT FOGARTY).	120 MIN	YES	YES	2	2	NO	NO
33/F	CBD CALCULI	LAP CBD EXPLORATION (IMPACTED CALCULI EXTRACTION)	90 MIN	YES	YES	2	4	NO	NO
45/M	CBD CALCULI	LAP CBD EXPLORATION (RENDEZVOUS PROCEDURE, BALLOON SPHINCTEROPLASTY).	120 MIN	YES	YES	2	2	NO	NO
39/F	IMPACTED DISTAL CBD CALCULI	LASER RIGID URETEROSCOPIC GUIDED LITHOTRIPSY	78 MIN	YES	YES	3	2	NO	NO
45/F	CBD INJURY	LAPAROSCOPIC RENDEZVOUS	90 MIN	YES	YES	3	3	NO	NO
32/F	CBD CALCULI	LAP CBD EXPLORATION (IMPACTED CALCULI EXTRACTION)	125 MIN	YES	YES	2	2	NO	NO
47/F 49/F	CBD CALCULI	LAP CBD EXPLORATION (FAILED RENDEZVOUS PROCEDURE UNDERWENT FOGARTY). LAP CBD EXPLORATION (RENDEZVOUS PROCEDURE).	80 MIN 110 MIN	YES	YES	2	4	NO	NO

results



LAP CBD EXPLORATION SHOWING PASSING RIGID URETEROSCOPE INTO CBD FOR REMOVAL OF RETAINED STENT

All our cases are closed over stent.

Intraop/post op cholangiogram was not done in any of our cases. Complete CBD clearance achieved in all of our cases.

Length of stay, pain score was minimal with nil post op complications.

**Conclusion:** Laparoscopic CBD exploration is a standard method with high efficacy and low morbidity and mortality in experienced hands.

We recommend that even in failed ERCP cases first laparoscopic approach is RENDEZVOUS which can avoid choledochotomy.

In the absence of CHOLEDOCHOSCOPE which is expensive URETEROSCOPE is considered for addressing difficult CBD pathologies.

## OB04-07

### PRIMARY CLOSURE AFTER LAPAROSCOPIC CBD EXPLORATION- EXPERIENCE OF MORE THAN 400 CASES OVER 12 YEARS AT A TERTIARY CARE CENTER

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**Introduction:** T tube placement after common bile duct (CBD) exploration has been the standard since the era of open CBD exploration. We hereby report our experience and long term outcomes of over 400 cases of laparoscopic CBD exploration where in primary closure of CBD was done without T -Tube placement.

**Methods:** All patients with CBD stones undergoing laparoscopic common bile duct exploration (LCBDE) in a single surgical unit at a tertiary care center were studied from April 2007 to October 2019. MRCP served as a road map and patients were taken up for LCBDE if the CBD diameter was more than 10 mm. Intraoperative details including the mode of closure of bile duct (primary, T Tube or endobiliary stent) were noted. The post-operative recovery, complications, hospital stay, antibiotic usage and post-operative intervention if any were also recorded.

**Results:** 414 patients underwent LCBDE during this period. The mean age was  $50 \pm 15.2$  years and majority were females (68.8%). 180 (43.47%) patients had failed ERCP. CBD was closed primarily in 97.58% (n=404) cases. Endobiliary stent was placed in 90 (21.73%) patients and only primary closure in 314 cases. T tube was used in 5 cases with a total of 34 conversion to open CBD exploration. Successful laparoscopic CBD clearance was achieved in 380 patients (success rate 91.80%).

**Conclusion:** Primary closure of CBD following laparoscopic CBD exploration is safe and associated with minimal complications. The routine use of primary CBD closure after laparoscopic CBD exploration is recommended based on our experience.

#### OB04-08

### LAPAROSCOPIC INTRA-ABDOMINAL PRESSURE STUDY: A DOUBLE BLINDED RANDOMISED CONTROL TRIAL

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**Background:** Laparoscopic surgery is regarded as the gold standard for the surgical management of cholelithiasis. To improve patient post-operative pain (POP), low pressure laparoscopic cholecystectomies (LPLC) have been trialled. A recent systematic review found that LPLC reduced POP, however many of the randomised control trials were at a high risk of bias and the overall quality of evidence was low.

**Methods:** 100 patients undergoing elective laparoscopic cholecystectomy were randomised to a LPLC (8mmHg) or a standard pressure laparoscopic cholecystectomy (12mmHg) (SPLC) with surgeons and anaesthetists blinded to the pressure. Primary outcomes were POP and shoulder tip pain (STP) at 4-6hours and 24hours, as recorded by a blinded assessor. Secondary outcomes included length of operation, post-operative complications and intra-operative visibility.

**Results:** 51 patients were randomised to LPLC. Although pain scores were comparable, post-operative opiate requirements were greater in the SPLC when compared to

LPLC (total fentanyl in recovery 10µg vs 60µg, p=0.016), suggesting that LPLC reduces POP. Intra-operative visibility was significantly reduced in LPLC (p< 0.001) resulting in a higher number of operations requiring the pressure to be increased (34.0% vs 8.2%, p< 0.01), however there were no differences in length of operation or post-operative outcomes. Interestingly, when surgeons guessed the operating pressure, they were right in only 69% of cases.

**Conclusion:** LPLC reduced post-operative pain as evidenced by reduced analgesia requirements. Although LPLC compromised intra-operative visibility there was no difference in complications, suggesting LPLC is safe. Surgeons were not reliably able to guess the operating pressure.

#### OB05 - Biliary: Technical Outcomes

##### OB05-01

### TRANSHEPATIC DIRECT APPROACH TO THE “LIMIT OF DIVISION OF THE HEPATIC DUCTS” LEADS TO A HIGH R0 RESECTION RATE IN PERIHILAR CHOLANGIOCARCINOMA

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**Objective:** To describe a technique of transhepatic direct approach and resection on the limit of division of hepatic ducts, investigate its short-term surgical outcome, and validate whether the radial margin (RM) would have a clinical impact on long-term survival of perihilar cholangiocarcinoma (PHCC) patients.

**Summary Background Data:** Previous studies have shown that curative resection (R0 resection) was among the most crucial factors for long-term survival of patients with PHCC. To achieve R0 resection, we performed the transhepatic direct approach and resection on the limits of division of the hepatic ducts. Although a recent report showed that the RM status impacted the survival of PHCC patients, it is still unclear whether RM is an important clinical factor.

**Methods:** Consecutive PHCC patients (n=211) who had undergone major hepatectomy with extrahepatic bile duct resection, without pancreaticoduodenectomy, in our department were retrospectively evaluated.

**Result:** We excluded 11 patients who died within 90 days. R0 resection rate was 93% and 86% for invasive cancer-free and both invasive cancer and high-grade dysplasia free resection, respectively. Overall 5-year survival rate was 48.5%. Univariate analysis showed that patients with RM-R1 had poor prognosis, but it was not an independent risk factor for survival.

**Conclusion:** The transhepatic direct approach to the limits of division of the bile ducts leads to a high R0 resection rate in the horizontal margin of PHCC. RM would have a clinical impact on long-term survival of PHCC patients. However, further examination will be needed to determine the adjuvant therapy for PHCC to improve patient survival.

**OB06 - Biliary: Miscellaneous**

OB06-01

**IMPACT OF IATROGENIC BILIARY INJURY DURING LAPAROSCOPIC CHOLECYSTECTOMY ON SURGEON'S MENTAL DISTRESS: A NATIONWIDE SURVEY FROM CHINA**

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**Background:** Iatrogenic biliary injury (IBI) following laparoscopic cholecystectomy (LC) is the most common and recognized iatrogenic complications. Little is known whether LC-IBI would lead to surgeon's mental distress. This study reports the incidence of surgeon's mental distress who have caused LC-IBI and risk factors of surgeon's severe mental distress (SMD).

**Methods:** A cross-sectional survey in the form of electronic questionnaire was conducted among Chinese general surgeons who have caused LC-IBI. The six collected clinical features relating to mental distress included:

- 1) feeling burnout, anxiety, or depression,
- 2) avoiding performing LC,
- 3) having physical reactions when recalling the incidence,
- 4) having the urge to quit surgery,
- 5) taking psychiatric medications, and
- 6) seeking professional psychological counseling.

Univariable and multivariable analyses were performed to identify risk factors of SMD, which was defined as meeting  $\geq 3$  of the above-mentioned clinical features.

**Results:** Among 1,466 surveyed surgeons, 1,236(84.3%) experienced mental distress following LC-IBI, and nearly half (49.7%, 614/1236) had SMD. Multivariable analyses demonstrated that surgeons from non-university affiliated hospitals (OR:1.873), patients who required multiple repair operations (OR:4.075), patients who required hepaticojejunostomy/partial hepatectomy (OR:1.859), existing lawsuit litigation (OR:10.491), existing violent doctor-patient conflicts (OR:4.995), needing surgeons' personal compensation (OR:2.531), and additional administrative punishment by hospitals (OR:2.324) were independent risk factors of surgeon's SMD.

**Conclusion:** Four out of five surgeons experienced mental distress following LC-IBI, and nearly half had SMD. Several independent risk factors of SMD were identified, which could help to make strategies to improve mental well-being of these surgeons.

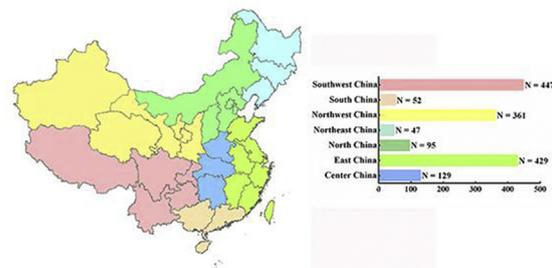


Figure. Numbers of valid questionnaires from different districts in China

## OB06-02

**THE UPPER GASTROINTESTINAL CANCER REGISTRY: BILIARY CANCER CLINICAL QUALITY REGISTRY PILOT RESULTS**

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**Introduction:** The Upper Gastrointestinal Cancer Registry (UGICR) is a multi-modular clinical quality registry established to measure and report on the quality of care provided to people with newly diagnosed cancer arising from the pancreas, oesophagus, stomach, liver and biliary system. The aim of the biliary module pilot was to trial data collection for a quality indicator (QI) set; analyse pilot data and use results to review and refine the QIs.

**Methods:** The UGICR's hepatopancreatobiliary (HPB) working party reviewed the existing literature and clinical practice guidelines, to develop a provisional set of QIs. Participants with hilar cholangiocarcinoma, intrahepatic cholangiocarcinoma or gallbladder cancer were recruited from Victorian UGICR participating sites. Pilot data were abstracted from medical records and preliminary data analysis conducted. Pilot data collection is due for completion mid-2020.

**Results:** A set of 19 QIs covering the patient care pathway from referral through to end-of-life care were developed. Data collection for over 150 participants recruited to the pilot is nearly complete. Mid-pilot results for three QIs show: 35% of patients had documented disease specific gold standard imaging prior to treatment; 74% of patients had disease management discussed at multi-disciplinary team meeting; and 92% of patients were referred to palliative care.

**Conclusion:** The UGICR biliary module pilot data will be used to inform the selection of a final set of QIs. Once sufficiently mature, risk-adjusted benchmarked QI reports will be provided to participating sites, with the intention of reducing unwarranted variation in the quality of care received by patients with biliary cancer.

OB06-04

**WHAT ARE THE LONG-TERM CLINICAL AND ECONOMIC CONSEQUENCES OF DELAYED BILIARY STRICTURES AFTER CHOLECYSTECTOMY?**

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**Introduction:** Delayed biliary stricture after cholecystectomy is a rare complication for which little is known of the aetiology or long-term clinical and economic consequences. The aims of this study were to investigate the risk factors, clinical outcomes and economic impact of this rare but serious complication.

**Method:** Patients who developed a delayed biliary stricture after cholecystectomy were identified from a prospectively collected and maintained database. Risk factors for stricture development, long-term biliary complication rates, quality of life and complete treatment and follow-up costs were investigated for each patient.

**Results:** Some 44 patients were identified, of whom N=17,12 and 3 developed hilar, subhilar, and sectoral biliary strictures respectively. Patients were commonly treated with Roux-en-Y hepaticojejunostomy (90%) and followed up for a median of 8.9 years (IQR5.8-14.8) during which time 16 (36%) developed biliary complications and 5 (11%) patients died. Costs of all operations, interventional radiology and diagnostic imaging were assimilated and the mean cost of treatment and follow-up was £14,309.26 per patient, similar to previously reported costs for major bile duct injury. Both general and disease-specific quality of life were assessed using the SF-36 tool and EORTC QLQ-C30 with Bil21 add-on. Scores were statistically similar for patients with delayed biliary stricture and those with bile duct injury.

**Conclusions:** Delayed biliary strictures may develop after uneventful cholecystectomy and are typically managed with biliary reconstruction. They are serious complications that lead to considerable long-term morbidity and costs to the health service, similar to those previously reported for major bile duct injury.

**OG01 - General HPB: Endoscopy**

OG01-01

**RISK FACTORS FOR ENDOSCOPIC BILIARY TRACT INTERVENTIONS FOLLOWING ORTHOTOPIC LIVER TRANSPLANTATION: AN ANALYSIS OF 10,252 PATIENTS OVER 15 YEARS ACROSS THE UNITED STATES**

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**Introduction:** Endoscopic biliary tract interventions following orthotopic liver transplantation (OLT) are being

utilized more commonly now with advancements in endoscopic technique and technology. This study assesses the risk factors for endoscopic procedures following OLT. **Method:** Data on 10,252 OLT patients from the National Inpatient Sample database who underwent post-transplant endoscopic biliary procedures (EBP) was analyzed over a 15-year period (2001-2016).

**Results:** 581 patients who had EBP were identified. Of these, 467 (80.4%) had ERCP, sphincterotomy and stenting. The remainder had ERCP alone. EBP and non-EBP patients had a similar demographic and comorbidity profile. The strongest risk factors for EBP post-OLT on multivariate analysis were biliary anastomotic stricture (OR 6.1), bile leak/fistula (OR 5.4), choledocholithiasis (OR 5.0), cholangitis (OR 4.2), age>60 (OR 2.1), living donor graft (OR 1.9), and emergency admission status (OR 1.1), p< 0.05. Conversely, roux-en-y hepaticojejunostomy and age< 20 were associated with fewer EBP, p< 0.05. EBP was associated with a significantly longer length of stay (98.3% stayed over 1 week), and higher risk of post-procedure biliary sepsis (23.2% vs 11.8%), graft abscess (11.4% vs 6%), acute graft rejection (46.1% vs 18.4%), and inpatient mortality (7.2% vs 5.3%), p< 0.05.

**Conclusions:** OLT recipients who develop postoperative biliary complications (especially anastomotic strictures), older than 60, have living donor grafts and have non-elective admissions are at highest risk of undergoing EBP. Although unavoidable in many situations, EBP is associated with significantly greater morbidity and mortality post-OLT. Clinicians must be cognizant of these risks when considering EBP in OLT recipients.

Variables	No Endoscopic Intervention	Endoscopic Intervention
Total, N	9,671	581
<b>Age distribution (years)</b>		
Median Age on Admission	49	52
Age Under 20	897 (9.3%)	15 (2.6%)
Age 20 to 60	6,536 (67.6%)	428 (73.7%)
Age Over 60	2,239 (23.1%)	138 (23.8%)
<b>Gender</b>		
Male	6,291 (65.1%)	375 (64.5%)
Female	3,380 (34.9%)	206 (35.5%)
<b>Race</b>		
Caucasian	5,136 (53.1%)	328 (56.5%)
African American	612 (6.3%)	33 (5.7%)
Hispanic	1,288 (13.3%)	71 (12.2%)
Asian or Pacific Islander	412 (4.3%)	16 (2.8%)
Native American	56 (0.6%)	2 (0.4%)
Other	298 (3.1%)	20 (3.4%)
<b>Donor Source</b>		
Live Related	205 (2.1%)	10 (1.7%)
Live Unrelated	168 (1.7%)	16 (2.8%)
Cadaveric	4,784 (49.5%)	288 (49.7%)
<b>APR-DRG Severity of Illness Score</b>		
I - Minor Loss of Function	385 (4.0%)	10 (1.7%)
II - Moderate Loss of Function	2,101 (21.8%)	65 (11.2%)
III - Major Loss of Function	3,036 (31.4%)	175 (30.1%)
IV - Extreme Loss of Function	3,850 (39.8%)	373 (64.4%)
<b>Admission Type</b>		
Emergency	2,998 (31.0%)	808 (139.1%)
Urgent	6,516 (67.5%)	1,772 (304.7%)
Elective	11,156 (115.3%)	2,184 (375.8%)
<b>Interventions</b>		
Choledochostentomy	1,030 (10.6%)	44 (7.6%)
ERCP, Sphincterotomy and stenting	0 (0.0%)	467 (80.4%)
<b>Findings</b>		
Choledocholithiasis	923 (9.5%)	109 (18.8%)
Cholangitis with biliary obstruction	721 (7.4%)	213 (36.7%)
Biliary Stricture	370 (3.8%)	213 (36.7%)
Biliary Leak/Fistula	5 (0.1%)	4 (0.7%)
<b>Comorbidities</b>		
Alcohol abuse	1,165 (12.0%)	82 (14.1%)
Anemia	1,512 (15.6%)	106 (18.3%)
Liver cirrhosis	7,439 (76.9%)	452 (77.8%)
Hepatitis	4,867 (50.3%)	292 (50.3%)
Congestive Heart Failure	222 (2.3%)	22 (3.8%)
Chronic Pulmonary Disease	499 (5.2%)	27 (4.6%)
HIV	2,485 (25.7%)	172 (29.6%)
Diabetes, uncomplicated	1,918 (19.8%)	112 (19.3%)
HIV	56 (0.6%)	1 (0.2%)
Diabetes w/ chronic complications	276 (2.9%)	28 (4.8%)
Drug abuse	242 (2.5%)	16 (2.8%)
Nutritional deficiency	970 (10.0%)	68 (11.7%)
Obesity	379 (3.9%)	23 (3.9%)

Clinical Profile of 10,252 Liver Transplant Patients from the NIS Database (2001-2016)

**OG02 - General HPB: Imaging**

## OG02-01

**DEVELOPMENT AND IMPROVEMENT OF REAL-TIME NAVIGATION SYSTEM FOR LAPAROSCOPIC HEPATECTOMY**

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**Introduction:** We are going to try development of real-time navigation system for laparoscopic hepatectomy, which resembles a car navigation system. We report our real-time navigation system and surgical procedure.

**Methods:** Virtual images are reconstructed using “New-VES” system developed by Nagoya University Graduate School of Information Science. These images correspond to maps of car navigation system. Some of patient’s body parts are registered in virtual images using a magnetic position sensor. Patient’s body after registration corresponds to The Earth. A transmitter for magnetic position sensor, which corresponds to an artificial satellite, is placed about 30cm above patient’s body. A micro magnetic sensor, which corresponds to GPS antenna, fixes on the handling part of laparoscope. Fiducial registration error (FRE) is utilized to evaluate accuracy of real-time navigation system.

**Results:** We performed laparoscopic hepatectomy using this system in 21 patients. Mean FRE of initial 5 patients was 17.7mm. First improvement was that MDCT were taken using radiological markers for registration of body parts. Mean FRE of the 8 patients who utilized first improvement was 10.2mm and decreased ( $p = 0.014$ ). Second improvement was that a micro magnetic sensor as an intraoperative body position sensor was fixed on the right-sided chest wall and meant that pre- and post-operative FRE was similar due to an intraoperatively automatic correction of gap of body position. Preoperative and post-operative mean FRE of the 8 patients who utilized second improvement were 11.1mm and 10.1mm ( $p = 0.250$ ).

**Conclusions:** Our real-time navigation system can assist laparoscopic hepatectomy.

## OG02-03

**18FLUORODEOXYGLUCOSE UPTAKE PORTENDS POORER PROGNOSIS IN GRADE 2 GASTROENTEROPANCREATIC NEUROENDOCRINE NEOPLASMS: TIME TO RETHINK IMAGING STRATEGIES?**

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**Introduction:** Grade-2 neuroendocrine neoplasms (G2 NENs) (Ki-67 index 3-20%) are diverse entities with diagnostic and therapeutic challenges. 18fluorodeoxyglucose (18FDG) uptake in these lesions is a marker of proliferation irrespective of the Ki-67 index. This study analyses survival patterns in G2 NENs with 18FDG positive lesions.

**Methods:** Retrospective analysis of prospectively entered data of NENs revealed 64 cases of G2 NENs at our

specialized hepatopancreatobiliary centre. These were divided into 2 groups, those with 18FDG-avid lesions (group A) and those without (group B).

**Results:** 37 (57.8%) out of 64 patients were in group A. 21 (32.8%) of these presented with metastatic disease, and liver was the most common metastatic site (16 patients, 25%) followed by lymph nodes (12 patients, 18.75%). 10 (15.6%) out of 27 patients in group B had metastatic disease, and lymph nodes (8 patients, 12.5%) were the commonest site followed by liver (4 patients, 6.25%). 17 (26.5%) patients in group A underwent curative or debulking surgery, compared to 21 (32.8%) of group B. Median recurrence-free and overall survival in group A was 14.7 months and 31.4 months, and that in group B was 29.2 months and 108.1 months, respectively. Mortality was 9 patients (14.06%) in group A, and 3 (4.6%) in group B.

**Conclusion:** 18FDG-avid G2 NENs more commonly present with metastatic disease, are less frequent surgical candidates with poorer survival. Adding 18FDG-PET scan to the diagnostic algorithm of G2 NENs in addition to Somatostatin receptor-based imaging may improve outcomes by selecting patients for aggressive Cisplatin-based chemotherapy.

Parameter	Group A (18-FDG positive)	Group B (18-FDG negative)
Number of patients	37 (57.8%)	27 (42.1%)
DOTA positive (dual positive)	16 (25%)	27 (42.1%)
Liver metastases at presentation	16 (25%)	4 (6.25%)
Curative/debulking resection	17 (26.5%)	21 (32.8%)
Everolimus {First line for G2}	24 (37.5%)	10 (15.6%)
Eto-Cis {First line for high grade G2/G3}	8 (12.5%)	0
Cap-Tem {Second line G2/G3}	12 (18.75%)	8 (12.5%)
Recurrence free/ Overall survival	14.7/31.4 months	29.2/108.1 months
Mortality	9 (14.06%)	3 (4.6%)

Comparison of the two groups of Grade 2 NENs

## OG02-04

**SYSTEMATIC SCOPING REVIEW OF THE RELATIONSHIP BETWEEN MOLECULAR PROFILE AND RADIOMICS OF COLORECTAL LIVER METASTASES (CRLM)**

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**Introduction:** Radiomics is an emerging field in medical research, with the main purpose to aid decision-making and outcome prediction for clinicians. We present a systematic scoping review of the relationship between molecular profile and radiomics of CRLM.

**Methods:** The search was performed in PubMed and Embase. Screening of identified articles was undertaken according to PRISMA flow chart. Inclusion criteria were

colorectal liver metastases, imaging feature, molecular profile, radiomics/radiogenomics.

**Results:** The search identified 966 articles of which 960 were excluded. Additional two articles were included from chain search (table 1).

The findings of this review suggests a correlation between CRLM molecular profile and radiomics. Most of the studies identified were looking at FDG PET (four articles), followed by CT (three articles) and MRI (one article). The most frequently investigated molecular profile was RAS mutation. Statistically significant correlations between molecular profile and imaging features were found for all three mentioned imaging modalities.

Regarding FDG PET, statistically significant correlations were found between SUV and KRAS, GLUT1, Ki67, p53, PKM2 and HIF1- $\alpha$ .

Regarding CT, statistically significant correlations were found between MICA A 5.1 and a better tumour morphology as well as between RAS and optimal morphologic response.

Regarding MRI, statistically significant correlations were found between ADC and BCL-2, Ki67 and VEGF-A.

**Conclusion:** This systematic review presents eight studies that show correlations between CRLMs imaging features and molecular profile, suggesting that CRLM molecular profile seem to influence radiomic findings, which has the potential to facilitate decision making and care of patients by clinicians.

### OG03 - General HPB: Education

OG03-02

#### HIDDEN IN PLAIN SIGHT: NON-OPERATIVE WORK IS NOW CORE BUSINESS FOR HEPATOPANCREATICOBILIARY UNIT

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**Introduction:** Increasing use is now made of modalities other than surgery in the care of patients with hepatopancreaticobiliary (HPB) conditions. This includes endoscopy and interventional radiology, as well as admission for complex diagnostic workup, symptom control and palliative care. In spite of this change in practice the care of, and responsibility for, patients managed non-operatively continues to reside with surgical services.

**Methods:** Using a prospectively maintained database all admissions for the 2019 calendar year were reviewed and classified on acuity, patient demographics, diagnosis, hospital stay and whether operative intervention was performed. Standard tariffs set by our hospital's independent coding and costing committee, which adhere to national standards, were used to calculate cost of care.

**Results:** For 2019, 1098 patients were admitted to our HPB unit with 426 (38%) undergoing one or more operative procedures and 672 (62%) managed without operation. Patients admitted electively were more likely to undergo operation (318/617 elective admissions (51%)) than those admitted acutely (108/481 of acute admissions (22%)) and the likelihood of non-operative management increased with patient age at admission (45-64 years: RR 1.0; 85 + years

1.7 P< 0.05). Principle admission reason, hospital stay and costs for non-operated patients are summarised in table 1.

**Conclusion:** Non-operative work comprises over half of the work and half the budget of the contemporary HPB unit and reflects the growing use of technologies other than surgery to manage patients. This has important implications for surgical training, unit benchmarking and accreditation which have historically emphasized surgical metrics.

Diagnosis	Patient Number	Hospital Stay (Median: Range)	Median Cost per Patient Admission (\$NZ)
Interventional Radiology: Biopsy/ Ablation	67	2.4 days (1-4.7 days)	\$29427
Interventional radiology: Drainage	99	3.8 days (2-18.8 days)	\$25899
Endoscopy: Diagnostic	144	4.6 days (3.1-8.4 days)	\$19594
Endoscopy: Therapeutic	153	4.3 days (2.5-7.5 days)	\$27439
Palliative Care	78	8.9 days (4.1 - 29 days)	\$12678
Symptom Management	106	8.9 days (3.7- 10.6 days)	\$14523
Other	25	3.3 days (1- 5.9 days)	\$6372

Admission reason, hospital daystay and cost in patients managed with surgery

### OG05 - General HPB: Cost Effectiveness

OG05-02

#### COST-EFFECTIVENESS OF RESTRICTIVE STRATEGY VERSUS USUAL CARE FOR CHOLECYSTECTOMY IN PATIENTS WITH GALLSTONES AND ABDOMINAL PAIN (SECURE-TRIAL)

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**Background:** A restrictive selection strategy for surgery in patients with abdominal pain and uncomplicated gallstone disease significantly reduces cholecystectomies, but the impact on overall costs is unknown. The aim of this study was to perform a cost-effectiveness analysis (CEA) of restrictive strategy versus usual care.

**Methods:** Data of a multicentre, randomized-controlled trial (SECURE-trial) were used. Restrictive strategy for

patients with gallstones was economically evaluated against usual care as best alternative from a societal perspective. Hospital-use of resources was gathered with case-report forms and out-of-hospital consultations, out-of-pocket expenses, and productivity loss were collected with questionnaires. National unit costing was applied. The primary outcome was the cost per pain-free patient at 12 months post-randomization.

**Results:** All 1067 randomized patients (49.0 years, 73.7% females) were included, 537 patients in usual care and 530 in restrictive strategy. After 12 months, 56.2% of patients were pain-free in restrictive strategy versus 59.8% after usual care. The restrictive strategy significantly reduced the cholecystectomy rate with 7.7% and reduced surgical costs by €160 ( $P=0.003$ ) per patient, €162 was saved from a societal perspective. The cost-effectiveness plane showed that restrictive strategy was cost saving in 89.1% of all samples and less effective in 88.5%. Overall, costs savings of the restrictive strategy did not sufficiently compensate for the accompanying loss in pain-free patients.

**Conclusion:** This CEA shows that restrictive strategy for treatment of uncomplicated cholecystolithiasis saved €162 compared to usual care from a societal perspective. However, savings by restrictive strategy could not compensate for the lower proportion of pain-free patients.

#### OG05-03

### HEALTH ECONOMIC EVALUATION OF PATIENTS WITH COLORECTAL LIVER METASTASES RANDOMIZED TO ALPPS OR TSH - ANALYSIS FROM THE LIGRO TRIAL

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**Introduction:** Two-staged hepatectomy (TSH), is an established method in advanced colorectal liver metastases (CRLM). Associating liver partition and portal vein ligation for staged hepatectomy (ALPPS) has emerged providing improved resection rate and survival.

The health care costs and health outcomes, combining health related quality of life (HRQoL) and survival into quality-adjusted life years (QALYs), of ALPPS and TSH have not previously been evaluated and compared.

**Methods:** This is a pre-planned, health economic evaluation from the LIGRO trial. One hundred patients with CRLM and standardized FLR < 30 % were randomized to ALPPS or TSH.

Costs and QALYs were compared from treatment start up to 2 years. Costs are estimated from resource use, including all surgical interventions, length of stay after

interventions, diagnostic procedures and chemotherapy and applying Swedish unit costs. QALYs were estimated by combining survival and HRQoL data, the latter being assessed with EQ-5D 3L. Estimated costs and QALYs for each treatment strategy were combined into an incremental cost-effectiveness ratio (ICER). Non-parametric bootstrapping was used to assess the joint distribution of incremental costs and QALYs.

**Results:** The mean cost difference between ALPPS and TSH was 12662€, (95% CI -10728-36051,  $p=0.283$ ). Corresponding mean difference in life years and QALYs was 0.1296 (95% CI -0.12-0.38,  $p=0.314$ ) and 0.1285 (95% CI -0.11-0.36,  $p=0.28$ ), respectively. The ICER was 93186 and 92414 for QALYs and life-years as outcomes, respectively.

**Conclusion:** Based on the two-year data, the cost-effectiveness of ALPPS is uncertain. Further research, exploring cost and health outcomes beyond 2 year is needed.

#### OT01 - Transplantation: Liver

##### OT01-02

### AN IN VITRO 3D MODEL OF FUNCTIONAL HUMAN LIVER ORGANOIDS

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**Introduction:** The development of adequate model systems to investigate human liver function and metabolism in health and disease has proved challenging. Three-dimensional (3D) liver tissues reconstituted from liver cells, termed liver organoids, have enormous potential for investigating aspects of liver disorders and drug toxicity. The aim of our study is by integration of multiple novel surgical techniques, engineering of growth factors and morphogens bound to extracellular matrix, direct cell reprogramming to produce functional 3D liver organoids.

**Methods:** Tissue from 20 liver resections were used for hepatocyte isolations. Tissue underwent a two-step EDTA/collagenase digestion. Cell viability was determined by ATP luminescence and 7AAD. qPCR, FACS, Western blot, immunofluorescence analysis and biochemical assays were undertaken to ascertain cellular phenotype and function in 3D cultures. Additionally, liver development-associated signaling pathways were tested.

**Results:** We demonstrate that there is direct correlation between liver status, the number and viability of isolated hepatocytes and their functional properties in 2D and 3D environment. FACS analysis indicated that prolonged cultivation in 2D leads to changes in cell populations. We also generated functional liver 3D organoids that maintained viability up to three weeks, produced albumin and expressed liver specific genes HNF4, CK19, AAT, CYP3A4.

**Conclusions:** We have successfully established a method for the culture of human liver organoids in novel engineered 3D environments that can be used for biomarker discovery, drug toxicity studies and liver transplantation.

OT01-04

### PREOPERATIVE SPLENOMEGALY IS A RISK FACTOR FOR PROLONGED SPLENOMEGALY AFTER LIVER TRANSPLANTATION AND CAN RESULT IN HYPERSPLENISM AND GRAFT FIBROSIS

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**Background:** Splenomegaly (SM) often persists after liver transplantation (LT), however, its predictors and clinical significance are unknown.

**Methods:** We analyzed 415 LT recipients in our institution to clarify this issue. First, predictors and clinical consequences of persistent SM three years after LT were analyzed among spleen-preserved recipients. Second, the clinical data of surviving recipients three years after LT were compared between splenectomized and spleen-preserved recipients using propensity score matching (PSM). Third, survival outcomes were compared between splenectomized and spleen-preserved recipients after PSM. SM was determined as a splenic volume (SV)/body surface area (BSA) > 152 ml/m<sup>2</sup> based on the CT splenic volumetry data of 140 donors.

**Results:** In the first analysis, among 119 recipients with preoperative SM, 86 (73.6%) recipients had persistent SM 3 years after LT. Preoperative SV/BSA was the only independent predictor for the persistent SM and it was associated with lower platelet (PLT) and white blood cell (WBC) counts and significant graft fibrosis ( $\geq$  Metavir F2) (21.4% vs. 2.8%,  $p = 0.01$ ). In the second analysis, spleen preservation was related to lower PLT and WBC counts and a higher proportion of significant graft fibrosis (26.7% vs. 7.1%,  $p = 0.022$ ) three years after LT. In the third analysis, spleen-preserved recipients showed worse survival than splenectomized recipients (73.3% vs. 84.5% at 3 years after LT,  $p = 0.04$ ).

**Conclusions:** Preoperative SM frequently persists more than three years after LT and is associated with subclinical hypersplenism, graft fibrosis and even death.

OT01-05

### USEFULNESS OF MAC-2 BINDING PROTEIN GLYCOSYLATION ISOMER (M2BPGI) FOR EVALUATING GRAFT STATUS AFTER LIVER TRANSPLANTATION

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**Introduction:** Mac-2 binding protein glycosylation isomer (M2BPGi) is a novel serum biomarker for liver fibrosis, but studies have suggested that its values can be influenced by some other factors. Studies on M2BPGi in liver transplant (LT) patients are scarce. This study aimed to evaluate the usefulness of M2BPGi measurement in LT recipients.

**Methods:** We collected clinicopathological data of 233 LT recipients who underwent liver biopsy in Kyoto University Hospital between August 2015 and June 2019.

**Results:** The median value of M2BPGi in patients with Metavir F0, F1, F2 and  $\geq$  F3 were 0.61, 0.76, 1.16, and 1.47, respectively. The median value of M2BPGi in patients with Metavir A0, A1, and  $\geq$  A2 were 0.53, 1.145, and 2.24, respectively. Spearman correlation analysis indicated a significant positive correlation between F factor and M2BPGi value ( $r=0.25$   $p < 0.001$ ) and between A factor and M2BPGi value ( $r=0.46$   $p < 0.001$ ). The difference calculated by subtracting Spearman's rank correlation coefficient between A factor and M2BPGi value from that between F factor and M2BPGi value was 0.21 (95% confidence interval was 0.095-0.39), indicating necroinflammatory activity had a stronger impact on M2BPGi value than fibrosis stage. The area under the receiver operating characteristic curve of M2BPGi for predicting  $\geq$  A1 were 0.75, which was significantly higher than other liver fibrosis and inflammation markers.

**Conclusion:** M2BPGi values are more strongly influenced by necroinflammatory activity than by fibrosis stage. M2BPGi may be useful to detect early stage of liver inflammation that cannot be detected by the routine blood examination in LT recipients.

OT01-06

### THE DEVELOPMENT OF A TISSUE METHYLATION-SPECIFIC CELL FREE DNA BIOMARKER FOR ORGAN REJECTION FOLLOWING LIVER TRANSPLANTATION

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**Introduction:** Graft-derived cell-free DNA (gdcfDNA) quantification is an emerging, minimally-invasive tool for monitoring organ health and detecting acute cellular rejection following liver transplantation (LT). Issues with the scalability of laboratory workflows, which usually require genotyping of the donor/recipient, have slowed its translation into clinical use. Recent work has illustrated that patterns of DNA methylation are unique to the tissue of origin. We describe the development of a hepatocyte methylation-specific cfDNA (MS-cfDNA) biomarker to quantify gdcfDNA without the requirement for donor/recipient genotyping. We report a pilot study of the biomarker in two cohorts of LT patients.

**Methods:** Cohort 1: blood was collected from 10 patients post-LT, at 8 time-points. cfDNA was extracted from plasma and underwent bisulfite modification. Droplet-digital PCR was used to quantify gdcfDNA using the MS-cfDNA biomarker. A gdcfDNA assay employing donor/

recipient genotyping was used to cross-validate results. Cohort 2: blood was collected from 50 patients undergoing liver biopsy for suspected rejection. The MS-cfDNA biomarker was used to quantify gdcfDNA at the time of biopsy.

**Results:** The MS-cfDNA biomarker was successful in quantifying gdcfDNA post-LT and mapping trends of organ injury. The MS-cfDNA biomarker produced significant linear correlation in values to a gdcfDNA assay utilising genotyping. gdcfDNA quantification at the time of biopsy was used with the aim of establishing diagnostic thresholds for rejection.

**Conclusions:** A MS-cfDNA biomarker is effective for monitoring gdcfDNA following LT. It has a major advantage over previous gdcfDNA quantification techniques; it does not require genotyping, giving it greater feasibility for translation into transplantation care.

#### OT01-08

### IS MELD SCORE THE BEST METHOD OF PREDICTING WAITING LIST MORTALITY IN THE AUSTRALIAN AND NEW ZEALAND LIVER TRANSPLANT POPULATION?

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**Introduction:** Model for end-stage liver disease (MELD) score is a reproducible, validated and widely accepted method for prioritisation of patients for liver transplantation, although there are some limitations. The aim was to create an Australian and New Zealand (ANZ) population-derived waiting list mortality score, and to compare the discriminative ability of this score to MELD and MELD-Na scores.

**Method:** All transplants from January 1998 to May 2019 were included, using data from the ANZ Liver Transplant Registry. The outcome considered was patient death prior to transplantation. The ANZ-derived waiting list mortality score was created by randomly splitting the data into training and test datasets (70:30). Elastic net regularisation was used to select variables to create the multivariable Cox model. Discrimination of MELD, MELD-Na and the ANZ scores was compared using the c-statistic.

**Results:** 4886 listings were included, with a total of 534 waiting list deaths. 30 of 39 variables were selected for the ANZ score Cox model, with the highest hazard ratios for patients who were ventilated at time of listing (HR 4.4, 95% CI 2.22-8.68) and patients listed from 2006 to 2011 (HR 2.54, CI 1.69-3.82). The c-statistic for MELD and MELD-Na score was 0.76 and 0.77 respectively. The c-statistic for the ANZ score was 0.8.

**Conclusion:** The discriminative ability of all 3 scores was similar, despite a large number of variables included in the ANZ score. Both MELD and MELD-Na are simple to calculate and performed well in predicting waiting list mortality in the ANZ transplant population.

#### OT01-09

### LONG TERM OUTCOMES OF HEPATIC RESECTION FOLLOWING ORTHOTOPIC LIVER TRANSPLANT

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Liver resection is sometimes used as a graft saving procedure following orthotopic liver transplantation. In this single centre retrospective cohort study, 12 adult patients underwent resection over a 20 year period, including recipients of split livers and second grafts. Indications for resection were ischemic cholangiopathy, hepatic artery thrombus, chronic biliary obstruction, biliary-vascular fistula, bile leak, recurrent PSC and recurrent HCC. There was no perioperative mortality. Median follow up was 89 months. At the completion of the study 40% of patients had functioning grafts. One third required retransplantation with a median 1 year 6 months post resection. 3 patients were deceased (recurrent HCC  $n=1$ , PSC  $n=1$  and unspecified causes  $n=1$ ). Total graft survival was 91.7% at 1 year, 73.3% at 5 years and 64.2% at 10 years. Liver resection following liver transplant in select patients may salvage the graft or delay the need for retransplantation.

#### OT01-10

### LIVER TRANSPLANTATION IN THE ELDERLY: AN UPDATED REVIEW OF 55,267 PATIENTS IN THE UNITED STATES

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**Introduction:** Liver transplantation in the elderly is regarded with caution due to increased morbidity. This study assesses the postoperative outcomes of orthotopic liver transplantation (OLT) in elderly patients.

**Method:** Data on 55,267 OLT recipients from the Scientific Registry of Transplant Recipients over a 10 year period (2007-2017) was analyzed. Three age-based subgroups were created: elderly (age 70 and over), middle-age (age 50-69), and young (age 18-49).

**Results:** There were 1,622 elderly OLT patients, 40,271 middle-age patients and 13,374 young patients. Median MELD-Na score of elderly patients was significantly lower, with 63.8% elderly patients having MELD < 20. Most elderly patients received OLT for hepatocellular carcinoma. Elderly patients spend a longer time on the waitlist, and received more marginal organs (older age, DCD, ECD, history of malignancy, more macrosteatosis). Elderly patients had lower post-transplant survival (66.15% vs. 71.4% and 71.7%) and lower graft survival (68.4% vs. 73.9% and 75.7%),  $p < 0.01$ . They had more graft complications (hepatic artery thrombosis, infection, primary non-function),  $p > 0.05$ , but lower 6-month and 1-year rejection rates. Kaplan-Meier 5-year graft survival was 3.98 years in the elderly vs. 4.03 years and 4.76 years in other groups,  $p < 0.001$ .

**Conclusions:** Elderly recipients tended to be relatively healthy at the time of transplant, but tended to wait longer

for donor organs with more marginal characteristics. Despite having a lower overall and graft survival rate, this difference (less than 5%) was not clinically significant. These results suggest that OLT is safe and viable in the elderly, even using marginal donor organs.

Outcome	Recipient Age Group						Total n	
	Age 70 and over		Age 50-69		Age 18-49			
	n	%	n	%	n	%		
Overall Recipient Status	Alive	1071	66.15%	28719	71.43%	9574	71.72%	39364
	Deceased	490	30.27%	9167	22.80%	2399	17.97%	12056
	Lost to Followup	35	2.16%	1008	2.51%	537	4.02%	1580
	Retransplanted	23	1.42%	1311	3.26%	840	6.29%	2174
Recipient 1-Year Survival	1089	82.19%	29127	85.80%	9909	86.87%	40135	
Recipient 3-Year Survival	676	70.64%	18982	75.00%	6831	77.38%	26489	
Recipient 5-Year Survival	361	61.85%	10542	67.82%	4128	70.03%	15031	
Overall Graft Status	Graft Survived	1109	68.37%	29755	73.91%	10124	75.70%	40998
	Graft Failed	513	31.63%	10506	26.05%	3250	24.30%	14269
30-Day Graft Survival	1492	92.16%	37327	92.85%	12383	92.76%	51202	
1-Year Graft Survival	1362	84.13%	35050	87.19%	11756	88.07%	48168	
3-Year Graft Survival	1244	76.84%	32380	80.55%	10963	82.13%	44587	
5-Year Graft Survival	1178	72.76%	31001	77.14%	10523	78.83%	42702	
Cause of Graft Loss	Ischemic Cholangiopathy	4	3.95%	290	9.40%	126	8.88%	420
	Hepatic Artery Thrombosis	7	6.73%	154	4.99%	65	4.56%	226
	Infection	11	10.58%	276	8.95%	117	8.20%	404
	Malignancy	1	0.96%	16	0.52%	10	0.70%	27
	Primary Graft Failure	31	29.81%	820	26.58%	356	24.95%	1207
	Primary Non-Function	3	2.88%	118	3.82%	43	3.01%	164
	Recurrent Disease	22	21.15%	765	24.80%	306	21.44%	1093
	Graft Rejection	4	3.85%	163	5.28%	140	9.81%	307
	Vascular Complication/Thrombosis	13	12.50%	284	9.21%	167	11.70%	464
	Other	6	5.77%	125	4.05%	50	3.50%	181
6-Month Rejection Rate	80	6.88%	2801	9.44%	1517	15.42%	4398	
1-Year Rejection Rate	88	8.65%	2947	11.01%	1628	18.30%	4663	

Clinical Outcomes for 55,267 Orthotopic Liver Transplantation Recipients from the SRTR (2007-2017)

### OT01-11 DEVELOPMENT OF AN EX-VIVO NORMOTHERMIC PERFUSION MACHINE IN LATIN AMERICA, IMPLEMENTATION AND RESULTS IN A PORCINE ANIMAL LIVER TRANSPLANT EXPERIMENT

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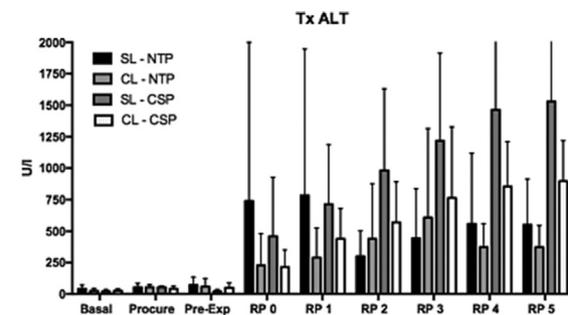
<sup>1</sup>Digestive Surgery, Pontificia Universidad Católica de Chile, Chile, <sup>2</sup>Digestive Surgery, Pontificia Universidad Católica de Chile, <sup>3</sup>Veterinary Medicine Anesthesiology, Universidad de Chile, <sup>4</sup>Intensive Medicine, and <sup>5</sup>Experimental Surgery UC, Pontificia Universidad Católica de Chile, Chile

**Introduction:** Donation in Chile and Latin America has been historically low. In order to increase the graft pool and recuperate low quality grafts, our design a normothermic perfusion machine developed in Chile.

**Methods:** Experimental study of porcine liver transplant (N=20) comparing cold static preservation (CSP) and normothermic perfusion (NTP), in two types of grafts; shock liver (SL) and control liver (CL), creating 4 experimental groups: CSP-CL (N=5), CSP-SL (N=5), NTP-CL (N=6) and NTP-SL (N=4). Each experiment have three phases: procurement, preservation and transplantation. We compare variables on NTP phase for 3 hours and 5-hours follow-up after portal reperfusion between 4 groups. Statistical analysis with ANOVA test.

**Results:** During the preservation of the NTP-SL group were no differences related to the NTP-CL group in portal flow, arterial flow, portal pH, lactate, bile production, AST, ALT, PA and LDH (pNS). During the transplant the average time was 174 min, 31 min anhepatic time, survived surgery 90% and survived at 5 hours of follow-up 80%, without differences between the four groups (pNS). When comparing NTP-SL with PEF-SL results a significant decrease in AST, ALT and PA in favor of NTP (p< 0.05).

**Conclusion:** Our local NTP machine model shows safety when compared to CSP and a decrease in markers of post-reperfusion injury in short-term follow-up.



ALT results in hourly monitoring from portal reperfusion

### OT01-12 INCORPORATION OF VON WILLEBRAND FACTOR IMPROVES MELD-NA BASED PREDICTION OF EARLY MORTALITY ON THE WAITING LIST FOR LIVER TRANSPLANTATION

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**Introduction:** Today, Model of End-Stage Liver Disease (MELD) is commonly used for decision making and organ allocation in orthotopic liver transplantation (OLT). Still, recent reports suggest that MELD may underestimate complications arising from portal hypertension or infection. In this context, von Willebrand factor antigen (vWF-Ag) - previously introduced as a robust surrogate parameter for portal venous pressure - was shown to be associated to adverse outcome in patients with cirrhosis while being independent from portal hypertension. Accordingly, this study aimed to evaluate the value of vWF-Ag as an auxiliary marker for risk stratification on the waitlist for OLT.

**Methods:** MELD and vWF-Ag at time of listing were assessed in 269 patients. Patients were followed up for mortality on the waitlist and overall survival.

**Results:** Patients dying within three months on the waitlist displayed elevated levels of vWF-Ag (p< 0.001). Interestingly, MELD and vWF-Ag showed a similar predictive potential for three-month mortality (AUC:vWF-Ag=0.739;MELD=0.770). Yet, a cut-off for vWF-Ag at 413% was found to harbor a higher risk for patients when compared to the previously used cut-off for MELD at 15 points (vWF-Ag:OR=10.873,95%-confidence interval:3.160-36.084, p< 0.001; MELD:OR=6.527,95%-confidence interval:2.216-19.227, p=0.001). Ultimately, combination of vWF-Ag and MELD significantly improved prediction of three-month waitlist mortality (AUC: vWF-Ag+MELD=0.836).

**Conclusion:** A single measurement of vWF-Ag at listing for OLT was found to increase the predictive potential for early mortality on the waitlist. Thus, introduction of vWF-Ag evaluation into the allocation process for patients listed for OLT might lead to a decrease in waitlist mortality.

OT01-13

### HYPOXIA-INDUCED ANGIOGENESIS RESCUES SURVIVAL FROM SMALL FOR SIZE SYNDROME (SFSS)

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After extended hepatectomy, hepatocyte proliferation proceeds sinusoidal endothelial cell (SEC) remodeling causing a transient perturbation of the lobular architecture with proliferating hepatocytes forming avascular, hypoxic, clusters. Hypoxia is, thus, considered at the origin of liver dysfunction in SFSS-hepatectomy. Recently, we showed that activation of hypoxia sensors in an upfront SFSS-hepatectomy surged an early angiogenic switch and preserved the sinusoidal architecture with a favorable impact on survival.

**Aim:** to decipher the role hypoxia-induced angiogenesis in SFSS-setting hepatectomy.

**Methods:** we developed a mouse model of SFSS-hepatectomy (PHx-80%) and used PHx-70% as controls. SFSS-hepatectomy mice were submitted to normoxia (inspired oxygen fraction-FiO<sub>2</sub>: 21%), local hypoxia (hepatic artery ligation (PHx-HAL)), and systemic hypoxia by placing the animals in hypoxic chambers (FiO<sub>2</sub>: 11%, PHx-HC). We assessed mortality, hepatocyte and liver SEC proliferation.

**Results:** Compared to PHx-70%, PHx-80% showed high mortality rates (68% on postoperative day (POD) 7 (p=0,002)). Hepatocyte proliferation on POD 3 was higher in PHx-80% (p=0,03), while SEC proliferation did not differ, suggesting an amplified disorganization of the regenerating lobule in SFSS-hepatectomy. Compared to normoxic PHx-80%, PHx-HAL tended to have a favorable impact on survival (75% on POD3), while animals subjected to SFSS- hepatectomy and placed into hypoxic chambers showed improved survival (p=0,0007). Hepatocyte proliferation was similar between the hypoxic and normoxic SFSS-liver remnants. However, local and systemic hypoxia significantly triggered early angiogenesis.

**Conclusions:** The current data suggest that hypoxia rescues survival from SFSS. By balancing angiogenesis with hepatocyte proliferation, hypoxia restores the lobular liver architecture allowing an efficient regeneration after major hepatectomy.

OT01-14

### RADIOEMBOLIZATION DOES NOT APPEAR TO RESULT IN SUPERIOR RESULTS COMPARED WITH TACE FOR HCC

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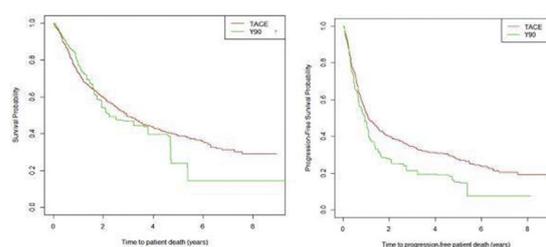
University School of Medicine, and <sup>4</sup>Department of Surgery, Washington University School of Medicine, United States

**Introduction:**TACE and Radioembolization with Y-90 are used as alternative treatment strategies for patients with HCC. We assessed whether Y-90 resulted in superior results, performing statistical adjustment to control for HCC disease status.

**Methods:** All patients receiving neo-adjuvant loco-regional therapy (LRT) for HCC after January 2010 to January, 2018 were assessed using a prospective database. Patients were stratified by LRT: transarterial chemoembolization (TACE) and radioembolization of yttrium-90 (Y90), while patients receiving both were excluded. Survival analyses assessed patient overall survival (OS) and progression-free survival (PFS). All analyses were conducted using inverse probability of treatment weighting (IPTW), where propensity scores were used to generate weights with covariates including patients' demographics and tumor characteristics, to balance the distributions across the treatment groups. All tests were two-sided; statistical significance was determined using  $\alpha=0.05$ .

**Results:** A total of 787 HCC patients receiving TACE (n=681, 87%) or Y90 (n=106, 13%) from 2010-2018. The two groups were statistically significant different in size (4.5 + 3.1 cm vs 8.3 + 4.8, p< 0.001), > 3 tumors (12.5% vs 36.7%, p< 0.001) and bilobar disease 17.3% vs 44.6%). Patient IPTW-adjusted OS and PFS (Figure 1) were statistically significantly different between the two groups (log-rank test p-value < 0.0001 for both). Patients receiving Y90 were less likely to receive LT (odds ratio: 0.49, 95% confidence interval, CI: 0.38-0.63).

**Conclusion:**Using IPTW to control for differences in HCC status, we were unable to demonstrate superiority of Y-90 over standard TACE treatment. These results have lead us to re-assess selection of regional therapy strategies.



TACE versus Radioembolization

OT01-15

### IMPACT OF BILIARY COMPLICATIONS ON OUTCOMES AFTER PEDIATRIC LIVER TRANSPLANT

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**Introduction:** Biliary complications (BCs) are seen in up to 50% of pediatric liver transplant (PLT) recipients and contribute to considerable post-procedural morbidity.

**Methods:** Retrospective review of all patients developing BC's after PLT at tertiary care hospital from 2002-2019. Outcomes of BC patients were compared with PLT recipients who did not develop BCs (control) and risk factors were identified.

**Results:** BC's were seen in 39 (18%) of the 221 PLT's performed during the study-period: 8 leaks, 26 strictures, 5 leaks+strictures. There was no difference between BC and control groups in recipient age, gender, weight, etiology, type of biliary reconstruction, and cold and warm ischemia times. Univariate and multivariate analysis identified Caucasian race, use of living donor and/or partial grafts, use of T-tubes and/or internal stents, operative time >7hrs, acute cellular rejection (ACR), PLT before 2010 and donor age >10 kg as independent risk factors of BC's ( $P < 0.05$ ), while use of T-tubes/internal stents was independently associated with decreased survival. The 39 BC patients required 10 surgeries, 23 ERCs and 223 PTC procedures for definitive repair, and demonstrated higher rates of 30- and 90- day readmission ( $p < 0.05$ ). There was no difference in overall patient and graft survival between the two groups.

**Conclusions:** T-tubes/internal stents, partial grafts, prolonged operative-time and ACR in post-transplant period are risk factors for BC's and add considerable morbidity and cost through frequent readmissions and need for multiple procedures. Timely and effective intervention strategies based on multidisciplinary approach can help successfully treat BC's without impacting patient and graft survival.

## OT02 - Transplantation: Living Donor

### OT02-01

#### IMPACT OF MIDDLEHEPATIC ARTERY RECONSTRUCTION AFTER LIVINGDONOR LIVER TRANSPLANTATION USING THE LEFT LOBE

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**Introduction:** The aim of this study was to clarify the impact of middle hepatic artery reconstruction on the outcomes of duct-to-duct biliary anastomosis after living-donor liver transplantation (LDLT) using left lobe.

**Materials and methods:** Among two hundred and fifty eight LDLTs using the left lobe, 216 LDLT patients which underwent hepatic artery reconstruction and one hepatic duct reconstruction with duct-to-duct interrupted anastomosis were divided into three groups: Group A (n= 123), one stump with left hepatic artery reconstruction; Group B (n = 32), 2 stumps with only left hepatic artery reconstruction; Group C (n = 61), 2 stumps with left and middle hepatic arteries reconstruction. We compared the outcomes among three groups after LDLT using left lobe.

**Results:** Hepatic artery complications did not occur in our study. There were no differences of graft survivals between the three groups. The Group B patients had a significantly

greater incidence of anastomotic biliary stricture than that of Group C. A multivariate analysis with Cox regression revealed that Group B (the presence of a nonreconstructed MHA) was the only significant independent risk factor for postoperative anastomotic biliary stricture after LDLT. The percentage of early anastomotic BS in the Group B (15.6%) was significantly higher than that in the Group C (5.0%).

**Conclusions:** We performed middle and left hepatic artery reconstruction safely ever and may have the merit of preventing biliary stricture by dual hepatic artery reconstruction when the recipient has left and middle hepatic artery stumps.

### OT02-02

#### CIRCULATING CANCER STEM CELLS IN HEPATOCELLULAR CARCINOMA: A PILOT STUDY OF PREDICTION FOR TUMOR RECURRENCE AFTER LIVING DONOR LIVER TRANSPLANTATION

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<sup>1</sup>Division of HBP Surgery, Department of General Surgery, <sup>2</sup>Department of Pathology and Integrated Genomic Research Center for Metabolic Regulation, and <sup>3</sup>Division of Transplantation, Department of General Surgery, Yonsei University College of Medicine, Republic of Korea

**Introduction:** The optimal indication of LT in HCC patients has evolved from Milan criteria to morphologic criteria with biologic markers. The role of circulating cancer stem cells has not been reported in patients who underwent LT for HCC.

**Method:** From April 2014 to March 2017, 25 patients who underwent LDLT for HCC were prospectively enrolled. EpCAM, CD90 and EpCAM/CD90 were sorted by FACS and mRNA expression of EPCAM, KRT19, THY1 were analyzed by RT-PCR in peripheral blood at preoperative, postoperative day 1 and 7, respectively. The median follow-up duration was 40 months.

**Results:** The mean age was 55.9 years, and HBV was the most common underlying liver disease (88%). 10 patients were above Milan criteria at diagnosis. HCC recurred in 4 patients. The detected numbers of EpCAM (+) cells and CD90 (+) cells were well correlated with mRNA expression levels in the peripheral blood ( $P < 0.05$ ). EpCAM protein in HCC tissue was highly expressed in patients with recurrence (66% vs. 20%). ( $p=0.172$ ). HCCs with EpCAM (+) protein expression showed more detection of EpCAM (+) circulating cells than EpCAM (-). The detection of EpCAM (+) or EpCAM(+)/CD90(+) cells before surgery and at postoperative day 1 were significantly associated with HCC recurrence after LT ( $p < 0.05$  for all).

**Conclusion:** Detection of EpCAM (+) or EpCAM(+)/CD90(+) cells in the peripheral blood before surgery and at postoperative day 1 was the only variable significantly associated with HCC recurrence after LDLT but should be validated in a large-scale prospective study.

## OT02-04

### OUTCOMES OF ROBOTIC LIVING DONOR RIGHT HEPATECTOMY FROM 52 CONSECUTIVE CASES: COMPARISON WITH OPEN AND LAPAROSCOPY-ASSISTED DONOR HEPATECTOMY

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**Objective:** To investigate the feasibility and safety of an alternative robotic living-donor right hepatectomy (RLDRH) technique.

**Background data:** Data for minimally invasive living-donor right hepatectomy, especially RLDRH, in a relatively large donor cohort have not been reported yet.

**Methods:** From March 2016 to March 2019, 52 liver donors underwent RLDRH. The clinical and perioperative outcomes of RLDRH were compared with those of conventional open donor right hepatectomy (CODRH; n=62) and laparoscopy-assisted donor right hepatectomy (LADRH; n=118). Donor satisfaction with cosmetic results was compared between RLDRH and LADRH using a body image questionnaire.

**Results:** Although RLDRH had a longer operative time (RLDRH, 493.6 min; CODRH, 404.4 min; LADRH, 355.9 min,  $p < 0.001$ ), its mean estimated blood loss was significantly lower (RLDRH, 109.8 mL; CODRH, 287.1 mL; LADRH, 265.5 mL;  $p < 0.001$ ). The postoperative complication rates were similar among the three groups (RLDRH, 23.1%; CODRH, 35.5%; LADRH, 28.0%;  $p=0.420$ ). Regarding donor

satisfaction, the body image and cosmetic appearance scores were significantly higher in RLDRH than in LADRH. There was no significant difference in hospital stay among the three groups ( $p=0.105$ ). After propensity score matching, RLDRH showed a shorter hospital stay and similar complication rate than CODRH.

**Conclusions:** RLDRH resulted in a similar postoperative complication rate and shorter length of hospital stay compared with those of CODRH and provided better body image and cosmetic results compared with those of LADRH. RLDRH is feasible and can be safely performed by expert surgeons in both robotic systems and open hepatectomy.

## OT02-05

### DEMARCATING THE EXACT MIDPLANE OF THE LIVER USING INDOCYANINE GREEN NEAR-INFRARED FLUORESCENCE IMAGING DURING LAPAROSCOPIC DONOR HEPATECTOMY

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**Introduction:** Indocyanine green (ICG) near-infrared fluoroscopy has been widely implemented in laparoscopic donor hepatectomy for precise demarcation of the liver midplane. This study aims to show the effectiveness of ICG fluoroscopy and to determine that a single injection of ICG is adequate for both midplane dissection and bile duct division.

**Method:** Retrospective analysis was done with recordings of 46 laparoscopic living donor hepatectomies performed between June 2016 and May 2017. Intraoperatively, vascular inflow of the targeted hemiliver was temporarily clamped so that the ischemic line dividing the two lobes would become visible, and ICG was injected intravenously (0.025mg/kg). Images were captured in the natural, black-and-white, and fluorescent views, and the color values of the clamped vs non-clamped regions were quantitated. Additionally, the time from ICG injection to bile duct illumination and then to fluoroscopy termination were measured.

**Results:** The color differences between the clamped vs non-clamped regions in the natural, black-and-white, and fluorescent views were  $39.7 \pm 36.2$ ,  $89.6 \pm 46.9$ , and  $19.1 \pm 36.8$  ( $P < 0.001$ ), respectively, demonstrating that ICG visualized in the black-and-white view is most effective for midplane demarcation. Furthermore, the time from ICG injection to bile duct illumination and that from bile duct illumination to fluoroscopy termination were  $85.6 \pm 25.8$  mins and  $8.7 \pm 4.8$  mins, respectively, indicating that a single injection of ICG is adequate for midplane dissection followed by bile duct division.

**Conclusion:** ICG injection visualized in black-and-white is most effective for demarcating the liver midplane during laparoscopic donor hepatectomy. Also, a single injection of ICG is sufficient for midplane dissection and bile duct division.

## OT02-04 Comparison of clinical characteristics and operative outcome

Variables (Mean $\pm$ SD)	RLDRH 1 (N=52)	CODRH 2 (N=62)	LADRH 3 (N=118)	p	P (1-2)	P(2-3)	P(1-3)
Age (yrs)	28.6 $\pm$ 8.7	28.7 $\pm$ 8.3	36.9 $\pm$ 12.1	<0.001	0.937	<0.001	<0.001
Body mass index (kg/m <sup>2</sup> )	22.4 $\pm$ 2.1	22.1 $\pm$ 2.4	23.3 $\pm$ 2.5	0.013	0.388	0.046	0.046
Total liver volume (ml)	1178.2 $\pm$ 172.4	1175.0 $\pm$ 181.1	1253.4 $\pm$ 216.2	0.009	0.924	0.016	0.028
Graft volume (ml)	718.9 $\pm$ 104.3	731.3 $\pm$ 124.2	785.1 $\pm$ 144.2	0.001	0.569	0.014	0.001
Remnant liver volume (%)	38.7 $\pm$ 4.0	37.2 $\pm$ 3.8	36.9 $\pm$ 8.3	0.127	0.046	0.762	0.064
GRWR (%)	1.1 $\pm$ 0.2	1.1 $\pm$ 0.2	1.2 $\pm$ 0.3	0.002	0.227	0.038	0.002
Total operative time(min)	493.6 $\pm$ 91.5	404.4 $\pm$ 47.4	355.9 $\pm$ 95.7	<0.001	<0.001	<0.001	<0.001
Estimated blood loss(ml)	109.8 $\pm$ 101.5	287.1 $\pm$ 168.4	265.5 $\pm$ 288.4	0.001	<0.001	0.527	<0.001
Comprehensive complication index	22.7 $\pm$ 25.6	15.2 $\pm$ 7.5	17.0 $\pm$ 7.5	0.327	0.338	0.382	0.460

## OT02-06

### **BILIARY RECONSTRUCTION USING HIGH BILIARY RADICAL IS SAFE OPTION FOR MULTIPLE GRAFT BILE DUCTS IN RIGHT LOBE LIVING DONOR LIVER TRANSPLANTATION**

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Multiple small size donor bile ducts (BDs) are related to higher incidence of biliary complications (BCs) and biliary reconstruction for multiple BDs still remains a technical challenge during living donor liver transplantation (LDLT). Especially biliary reconstructions using high biliary radicals (right or left hepatic duct) on the recipient for multiple BDs are associated with very high probability of BCs secondary to devascularization and ischemia. Therefore, hepaticojejunostomy has been preferred in cases with multiple BDs which are not close each other although duct to duct anastomosis (DDA) has more physiological advantages. Herein, we analyzed clinical outcomes through retrospective reviews 227 patients receiving DDA for right lobe grafts LDLT from January 2013 to September 2018. 87 LDLT using grafts with multiple BDs have been performed and among them, 39 patients received DDA using high biliary radicals as recipient's BD using minimal hilar dissection, external biliary stents and mucosal eversion technique. We compared clinical outcomes with those in group using common hepatic duct as recipient's BD for multiple BD (CHD group). The incidence of biliary leakage and stricture were 10.3% and 12.8% and these results were not different to those in CHD group. Moreover, these results were comparable to those in group with single graft BD during the same periods. In conclusion, the choice high biliary radicals as the recipient's BD for multiple graft BDs was not associated with more BCs and could be safe option for biliary reconstruction with multiple BDs under our strategies.

## OT02-07

### **TOTALLY LAPAROSCOPIC AND CONVENTIONAL OPEN LIVING DONOR RIGHT HEPATECTOMY: A COMPARATIVE STUDY OF OUTCOMES**

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Although laparoscopic liver resection has progressively developed with increased surgical experience and the improvement of laparoscopes and specialized instruments, only a limited number of centers have performed laparoscopic living donor hepatectomy (LDRH). We describe the experiences and outcomes associated with LDRH in adult-to-adult LDLT in order to assess the safety of the totally laparoscopic technique in donors.

Between December 2014 and October 2018, we performed 97 cases of living donor right hepatectomy. Among them, 50 donors underwent totally laparoscopic

living donor right hepatectomy and 47 donors underwent conventional open living donor right hepatectomy. We retrospectively reviewed the medical records to ascertain donor safety and the reproducibility of LDRH.

The total operation time was longer ( $367.0 \pm 74.3$  vs  $323.5 \pm 62.5$ ;  $P = .002$ ) and the warm ischemic time was also longer ( $9.2 \pm 4.6$  vs  $1.8 \pm 1.6$ ;  $P < .002$ ) in LDRH group. However, the length of postoperative hospital stay was similar in both groups and no donors in LDRH group required blood transfusion, conversion to open surgery, or reoperation. There was no postoperative mortality. Postoperative complication of Clavien-Dindo classification III or more was identified in only one donor who had a minor bile leakage from the cutting edge of the right hepatic duct stump requiring endoscopic biliary stent insertion. All the liver function tests returned to normal ranges within 2 weeks.

In conclusion, our study reveals LDRH seems to be a safe and feasible procedure with acceptable outcomes. However, LDRH can be initially attempted after attaining sufficient experience in laparoscopic hepatectomy and LDLT techniques.

## OT02-08

### **DONOR BILIARY ANATOMY: NOT A DETERMINANT OF BILIARY COMPLICATIONS AFTER RIGHT LOBE LIVING DONOR LIVER TRANSPLANTATION**

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**Background:** Donor biliary anatomy may contribute to postoperative biliary complications in donors and recipients following right lobe living-donor liver transplantation (RL-LDLT).

**Methods:** Retrospective analysis of medical records of 1105 consecutive (12/ 2011 - 06/2019) donors and recipients who underwent RL-LDLT at our center. The donors and recipients were divided into 2 groups (with and without postoperative biliary complications) and were compared. The primary endpoints were donor biliary anatomy type and postoperative biliary complication incidence; the secondary endpoints were 1-, 3- and 5-year graft and patient survival rates.

**Results:** Based on intraoperative cholangiogram among donors, 855 (77.3%) had type A, 141 (12.8%) had type B, 71 (6.4%) had type C, 25 (2.2%) had type D, and 13 (1.2%) had type E biliary anatomy.

Biliary complications occurred in 37 donors (3.3%): bile leakage in 33, intraoperative bile duct injury in 2, and biliary stricture in 2. The most common reason for biliary complications among donors was missed caudate duct(s). Seventy-four (6.7%) recipients developed biliary complications: 20 had bile leak, 43 had biliary stricture, and 11 developed bile leak + stricture. Sarcopenia was the only significant factor for biliary complications in recipients.

None of the donor had long-term sequelae. Recipients with biliary complications had inferior graft and patient survival.

**Conclusions:** The incidence of biliary complications in donors or recipients after RLDLT was not related to donor

biliary anatomy type. With standardized surgical technique, biliary complications can be minimized and donor biliary anatomy should not be considered a contraindication to right lobe liver donation.

## OT02-09

### LIVING DONOR VS DECEASED DONOR LIVER TRANSPLANTATION IN ADULTS: CLINICAL RESULTS AND SURVIVAL ANALYSIS IN A LATIN AMERICAN TRANSPLANT CENTER

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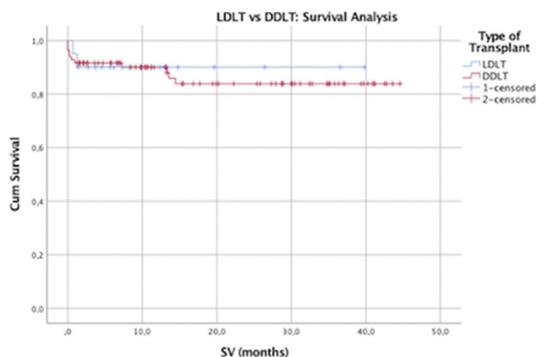
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**Introduction:** Latin America faces a critical situation due to very low donation rates. In Chile, the annual dropout rate from the list for liver transplantation (LT) is 37.6%. In 2016, our center started an adult-to-adult living donor liver transplantation (LDLT) program. We compared the first 20 LDLT cases with deceased donor liver transplants (DDLT) during the same period.

**Method:** Prospective single center cohort of 129 LT from April 2016-November 2019, excluding 26 patients who didn't meet criteria for LDLT candidacy (acute liver failure, combined or re-transplant). We compared 20 LDLT vs 83 DDLT pre-transplant clinical conditions, outcomes and survival rate using non-parametric and Fisher's exact tests, and Kaplan Meier curves.

**Results:** LDLT patients had lower MELD (20 vs 26 p< 0.05). LDLTs had shorter time on the wait-list compared to all DDLT (12.1 vs 20.9 weeks, p=NS), which became significant when compared to the group of DDLT with MELD < 30 (12.1 vs 40.0 weeks, p< 0.05). Both had similar overall complications (65% vs 60% p=NS), Clavien-Dindo >IIIa (45% vs 49.4% p=NS) and reoperations (40% vs 37.3% p=NS). LDLT had lower rejection and re-transplant rates, but had more biliary complications (50% vs 15.7% p< 0.05), mostly bile leaks (45% vs 6% p< 0.05). Overall and graft survival were similar (log-rank p=0.995).

**Conclusions:** LDLT is a good alternative in a Latin American country with low donation rates. Compared to DDLT, LDLT increases access to LT by decreasing time on the wait-list, reaching transplant with lower MELD scores, maintaining similar overall complications and survival rates.



LDLT vs DDLT: Survival Analysis

## OT02-10

### PURE LAPAROSCOPIC VERSUS OPEN RIGHT HEPATECTOMY IN LIVE LIVER DONORS: A PROPENSITY SCORE MATCHED ANALYSIS

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**Background:** Although PLDRH is gradually spreading worldwide, their outcomes including long-term outcomes of both donor and recipient have not yet been evaluated in a large comparative study. The aim of this study is to present the safety and feasibility of pure laparoscopic donor right hepatectomy (PLDRH) compared with that of conventional donor right hepatectomy (CDRH).

**Methods:** We retrospectively reviewed the medical records of 894 donors who underwent LDLT between January 2010 to September 2018 at Seoul National University Hospital were reviewed. We performed 1:1 propensity score matching between the PLDRH and CDRH groups. Subsequently, 198 donor and counter recipients were included in each group.

**Results:** The total operation time (P< 0.001), time to remove the liver (P< 0.001), and warm ischemic time (P< 0.001) were longer in the PLDRH group. The length of postoperative hospital stay was significantly shorter in the PLDRH group (P< 0.001). Although the rate of complication in donor was similar between the two groups, the rates of early (P=0.019) and late (P< 0.001) biliary complication in recipient were higher in PLDRH group. There was no significant difference in overall survival and graft survival between the two groups.

**Conclusion:** PLDRH is feasible when performed at an experienced LDLT center. Further studies on long-term recipient outcomes including biliary complications are needed to confirm the safety.

## OT02-11

### RANDOMIZED TRIAL BETWEEN HISTIDINE-TRYPTOPHAN-KETOGLUTARATE [HTK] AND INSTITUTE OF GEORGES LOPEZ [IGL-1] PERFUSION SOLUTIONS IN LIVING DONOR LIVER TRANSPLANTATION [LDLT]

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**Aim:** In DDLT, there has been recent evidence for superiority of IGL-1 solution over HTK in terms of graft survival. Here we aim to compare Early Allograft Dysfunction [EAD] and recipient outcomes in Living-donor-liver-transplantation[LDLT] grafts perfused with either HTK or IGL-1 solution on the bench.

**Materials and methods:** From Feb2018 to Nov2019, 156(138M:18F) adult patients undergoing LDLT[after excluding ABOincompatible(n=1), pediatric(n=19), APOLT(n=1) and DDLT(n=5)], were randomized to two

groups by computerized block randomization. Early graft dysfunction[defined by Olthoff criteria], peak postop transaminases, incidence of biliary complications, hepatic artery thrombosis[HAT] and 6 month graft survival were compared between two groups.

**Results:** Both groups were matched in terms of baseline characters and intraoperative parameters. The early deaths(-within 5days of transplant) are comparable in both groups (IGL1:n=3; HTK:n=3). There is no statistically significant difference in incidence of EAD[IGL-1 - 9(11.54%) vs HTK - 13(18.06%), p=0.26]. However peak transaminase levels in first week and day1 transaminases are significantly lower in the IGL-1 group [peak alanine transaminase(pALT): IGL-1(397.08±350.75) vs HTK(604.23±652.54); p=0.015, peak aspartate transaminase(pAST): IGL-1(383.55±329.46) vs HTK(555.85±460.50); p=0.0089 and day1 ALT: IGL-1(317.37±245.51) vs HTK(442.95±498.79); p=0.049; day1 AST: IGL-1(348.65±301.30) vs HTK(458.62±351.62); p=0.041]. Day 3 and 5 transaminase levels are also lower in IGL-1 group but without statistical significance. There is no significant difference in incidence of ACR, HAT and biliary complications between two groups.

**Conclusions:** Recipients of grafts perfused with IGL-1 have significantly lower peak and day 1 transaminase levels compared to HTK. However there is no difference in EAD, biliary complications, rejections or HAT between two groups.

#### OT02-13

### OUTCOME OF PORTAL VEIN RECONSTRUCTION USING BRANCH PATCH ANASTOMOSIS IN PEDIATRIC LIVING RELATED LIVER TRANSPLANT RECIPIENTS WEIGHING LESS THAN 10 KG

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Pediatric living related liver transplantation (PLRLT) in children less than 10 Kg of weight with Portal vein (PV) reconstruction in atretic and hypoplastic portal vein is challenging. Portal venoplasty using branch patch anastomosis is one of the techniques that are being advocated for these groups of patients.

This is a consecutive cohort study of 67 PLRLT patients with weight less than 10kg in the department from January 2015-September 2019. 21 patients underwent portal vein reconstruction with an interposition vein graft (IPVG) and 46 patients underwent branch patch anastomosis (BPA). Clinical characteristics, incidence of portal vein complications and mortality of both groups were compared using chi-square test with p-value < 0.05 is considered significant.

6 out of 46( 13 %) patients in branch patch anastomosis group and 3 out of 21(14.3 %) in interposition vein graft group developed portal vein thrombosis (p = 0.8). All patients (8/67=11.9%) who developed Portal vein thrombosis were managed surgically. Among the patients who developed PVT, 2/6 in BPA group and 2/3 in IPVG group died (p= 0.8).

Branch patch anastomosis (BPA) for portal vein size enlargement is acceptable surgical technique compared to

interposition vein graft for portal vein reconstruction. Portal vein complications and mortality for both the groups are comparable in pediatric living related liver transplantation (PLRLT) in children less than 10 Kg of weight.

#### OT03 - Transplantation: Science (Immunology) OT03-01

### INVOLVEMENT OF PDL1 AND FOXP3 EXPRESSION IN HUMAN LIVER TRANSPLANTATION TOLERANCE

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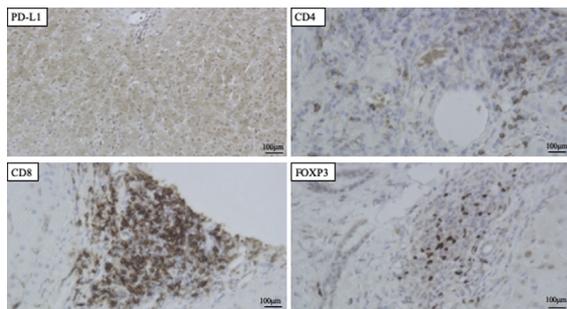
<sup>1</sup>Division of Hepato-Biliary-Pancreatic Surgery and Transplantation, Department of Surgery, Graduate School of Medicine, Kyoto University, <sup>2</sup>Department of Pediatric Surgery, Kyoto University Hospital, <sup>3</sup>Department of Transplantation Surgery, Nagoya University School of Medicine, <sup>4</sup>Department of Medical Life Systems, Faculty of Life and Medical Sciences, Doshisha University, and <sup>5</sup>Department of Diagnostic Pathology, Kyoto University, Japan

**Background:** Operational tolerance after liver transplantation (LT) characterized by successful immunosuppression withdrawal (ISW) without rejection has been reported but its underlying mechanisms are unknown. Programmed cell death protein 1 (PD-1)/its ligand PD-L1 pathway, concomitant with forkhead box protein P3 (Foxp3), may play a specific role in operational tolerance after LT.

**Methods:** Tolerance and control recipients are defined as recipients maintained without and with standard dose of immunosuppression (IS) without episodes of rejection for at least one year. Liver biopsies from 38 tolerant, 35 non-tolerant (including 16 samples that triggered reintroduction of IS and 19 samples after IS reintroduction) and 38 control LT patients were studied. Expression of PD-1, PD-L1, Foxp3, CD4 and CD8 were determined by immunohistochemical staining.

**Results:** PD-1 was hardly detectable while PD-L1 was expressed in the cytoplasm of hepatocytes and Foxp3 was localized in the nucleus. CD4 and CD8 were expressed in the periportal area. Tolerant and control patients exhibited a higher PD-L1 level (median[interquartile]: 20.8[16.2-26] relative units (RU) and 19.8[11.2-30.8]RU vs. 13.3[8-19.3] RU; p=0.0008 and p=0.0036) and higher Foxp3/CD8 ratio (4[0.8-11.8] and 3[1-11.8] vs. 0[0-2.5]; p=0.0001 and p=0.0013) in compared to non-tolerant patients at the moment of triggering IS reintroduction; whereas CD4 expression was comparable between the three groups. A weak but significant correlation between PDL1 and Foxp3 was identified (r=0.2401, p=0.0211).

**Conclusion:** PD-L1 and Foxp3 might concomitantly contribute to the regulation of immune-tolerant in LT patients. Further studies regarding PD-1/PD-L1 pathway may shed light on the mechanisms for operational tolerance after LT.



Immunohistochemical staining of PD-L1, CD4, CD8, and Foxp3 in human liver graft biopsy

## OTT01 - Tricks of the Trade: Oral

### OTT-02

#### FLIP THE LIVER FOR SEGMENT 7 RESECTION

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The hepatic segment 7 is considered the most difficult segment to treat due to its anatomical location close to the diaphragm and adjacent to the ribs making it difficult to expose and access during laparoscopic liver surgery (Figure 1). Some authors proposed a transthoracic and transdiaphragmatic approach or intercostal port placement.

For a transabdominal approach to Segment 7, we herein describe the “Flip the Liver” maneuver. Four steps are mandatory for success of this trick:

i) Thorough mobilization of the right hemiliver including division of the round ligament and dissection of the retroperitoneal reflection

ii) followed by pulling the liver caudally towards the patients left leg grasping the falciform ligament or the gallbladder.

iii) Ensure anticlockwise rotation and caudalisation of segment 7 and

iv) finally check that the Pringle tape exits the abdominal wall through a port at a location permitting to pull the liver in the same caudal direction on the left side.

The resulting localisation of segment 7 towards former segment 6 facilitates any liver resection in this segment. “Topographically” segment 7 becomes segment 6, “a posterior segment becomes an anterior segment” (Figure 1). Moreover, the posterior part of segment 7 becomes more accessible for the subxyphoidal port and a resection, preferably using the diamond technique, can be applied safely.

### OTT-03

#### TIPS AND TRICKS DURING THE PERFORMANCE OF TOTAL LAPAROSCOPIC PERICHYSTECTOMY FOR HYDATID CYST OF ALL LIVER LOCATIONS

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Total laparoscopic perichystectomy (TLP) for hydatid cyst has been debated and poorly developed due to the risk of parasite dissemination during surgery. In the last 5 years, we have systematically performed TLP for cysts < 15 cm located in all segments of the liver. During the development and perfection of the technique we have implemented some perioperative protocols and learned some tricks that facilitate surgery by reducing the risks of dissemination. Our goal is to present the clinical study protocol, the technique used and some tricks developed during the performance of TLP in liver hydatidosis of any location. It is presented through videos: the preoperative study, the positioning of the patient to address the different lesions located in all the segments, the treatment of the parasite in the intraoperative in the open and closed TLP, as well as the treatment of some complications occurred during the surgery. In more than 30 patients who underwent surgery using these principles, we have not had Clavien morbidity > III in the postoperative period. During the systematic and standardized postoperative follow-up, we have not had cases of recurrence nor the complications derived from the residual cavity that exists in other less radical techniques. TLP is an implementable and reproducible technique with low recurrence risks, without the morbidity of the residual cavity that exists in conservative techniques and with the benefits of minimally invasive surgery.

### OTT-04

#### ULTRASOUND-GUIDED INGUINAL INTRANODAL LYMPHANGIOGRAPHY (INLA) TO TREAT POSTOPERATIVE REFRACTORY ASCITES AFTER MAJOR HPB SURGERY AS A LESS INVASIVE MODALITY

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Refractory ascites occasionally occurs after major HPB surgery as a result of damage to the intraabdominal lymphatic vessels. Treatment of low-fat diet, octreotide, or surgical ligation of the site of lymphatic leak may not be effective. Reliable less invasive treatment should be needed to control refractory ascites. Our group preliminary reported the utility of minimal invasive therapy using inguinal intranodal lymphangiography (INLA) in order to treat uncontrollable ascites (Hirata M, et al. Cardiovasc Intervent Radiol 40:1281;2017). We here report three cases with refractory ascites after major HPB surgery who were dramatically treated with ultrasound-guided inguinal INLA. The first patient underwent left hepatectomy with caudate lobe resection plus pancreaticoduodenectomy due to widespread cholangiocarcinoma. The second patient underwent right hepatectomy, caudate lobectomy, and extrahepatic bile duct resection due to gall bladder carcinoma. The third patient underwent right hepatectomy due to huge hepatocellular carcinoma. Abdominal drains were not able to remove because of uncontrollable ascites more than one month after surgery in these three patients. Ultrasound-guided inguinal INLA using Lipiodol was performed in these patients. In the second patient, two series of bilateral inguinal INLA was needed, but the other

two patients were treated by only once right inguinal INLA. Refractory ascites was dramatically treated in these patients, and they immediately discharged. The INLA using Lipiodol can act as an embolic agent within the leaking lymphatic vessel and induce a local inflammatory reaction to seal the leak. The ultrasound-guided inguinal INLA is less invasive treatment for postoperative refractory ascites after major HPB surgery.

#### OTT-05

### CHOLANGIOSCOPIC HOLMIUM LASER LITHOTRIPSY (CHOLI): NOVEL SURGICAL TECHNIQUE FOR COMPLETE CLEARANCE OF INTRAHEPATIC STONES IN HEPATOLITHIASIS

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**Background:** In Hepatolithiasis without liver atrophy, abscess or cholangiocarcinoma (hepatectomy not indicated) complete stone clearance is essential for recurrence free long term outcome.

For this purpose we used CHOLI using flexible ureterorenoscope (versatile, easy availability) instead of choledochoscope (limited utility).

#### CHOLI: Key Steps

1. Right Kocher's incision
2. Cholecystectomy
3. Choledochotomy and choledocholithotomy
4. Flexible ureterorenoscope (Karl Storz Flex 2, external diameter 7 F) introduced through choledochotomy.
5. Systematic biliary endoscopy and CHOLI for left and right hepatic ducts and segmental ducts and beyond. For this 200 micron holmium laser fiber was introduced through ureterorenoscope and stones pulverized. (Video)
6. Larger stone fragments removed with basket (Ngage nitinol stone extractor, size 1.7 F, length 115 cm; Cook Medical), while smaller stones were flushed out.
7. Choledochoscopy (ureterorenoscope) for residual stones in distal CBD.
8. Choledochocojejunostomy (Roux loop 60 cm)

#### Outcomes:

- Ø Setting: Tertiary care hospital in non endemic area
- Ø Patients: 4 (2 males, 2 female; age 51-59 years)
- Ø Extent: Left lobe + CBD (1), Bilobar + CBD (3)
- Ø Operating time: 360-420 minutes
- Ø Complete stone clearance: All patients
- Ø Complications (Clavien-Dindo  $\geq 3$ ): None
- Ø Follow up: 7-84 months
- Ø Recurrence: None

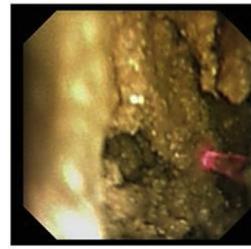
#### Advantages:

- Complete clearance of biliary system with single intervention (cf. endoscopic/percutaneous techniques)
- Flexible ureterorenoscope can access most peripheral ducts
- Holmium laser results in complete pulverization of stones

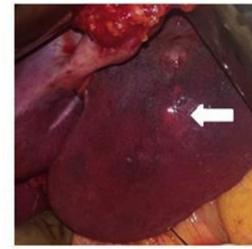
- Technically simple, parenchyma preserving (cf. hepatectomy)
- Lesions suspicious of concomitant cholangiocarcinoma can be biopsied

#### Conclusions:

CHOLI achieves complete stone clearance in hepatolithiasis.



Ho Laser targets bile duct stone



Ureteroscope reaches liver surface



MRCP: Intra & Extra-hepatic biliary stones



T tube cholangiogram No residual stones

CHOLI: Technique and outcome

#### OTT-06

### TEMPORARY MESENTERIC-PORTAL SHUNT USING PROSTHETIC GRAFT TOGETHER WITH INTERMITTENT SUPERIOR MESENTERIC ARTERY CLAMPING (PRINGLE-LIKE) DURING COMPLEX VENOUS RESECTION/ RECONSTRUCTION IN PANCREATODUODENCTOMY FOR LOCALLY ADVANCED PANCREATIC TUMOURS

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**Introduction:** Portal and superior mesenteric vein resection and reconstruction during pancreatic surgery for locally advanced tumors poses a challenging surgical scenario. Potential problems are; major bleeding, prolonged clamping with hepatic ischemia, venous congestion of the gut, and using the more difficult artery first approach. This potentially may increase morbidity and mortality of the procedure. To obviate these potential problems, we propose a pre-emptive temporary SMV-portal venous shunt with

intermittent SMA clamping (pringle-like). This would allow for extensive dissection of the pancreatic head mass without interruption of portal venous flow.

**Method:** Exposure of infrapancreatic SMV and supra-pancreatic portal vein is achieved preserving splenic and inferior mesenteric vein. A 10mm ringed Gore-Tex graft is anastomosed end to end to the SMV and end to side to the portal vein allowing extensive pancreatic resection and separation of the tumour from SMA. This was done in combination with intermittent clamping of the SMA to farther decrease venous congestion of the midgut and provide good haemostasis. After the tumour is resected, the Gore-Tex graft was then replaced with a cryo-preserved cadaveric vein graft used for reconstruction end-to-end anastomosis for both ends, and closing the side portal veinotomy.

**Results and conclusion:** The combined use of intermittent SMV/PV shunt and intermittent arterial clamping of SMA facilitates a complex pancreaticoduodenal resection. This was done avoiding serious potential complications and no time pressure. Also the SMA was appropriately and carefully assessed giving the opportunity to do an arterial resection re-construction if needed. The patient had an uneventful postoperative stay.

#### OTT-07

### MESOCAVAL SHUNT TO DECOMPRESS CAVERNOUS TRANSFORMATION IN PANCREATIC SURGERY

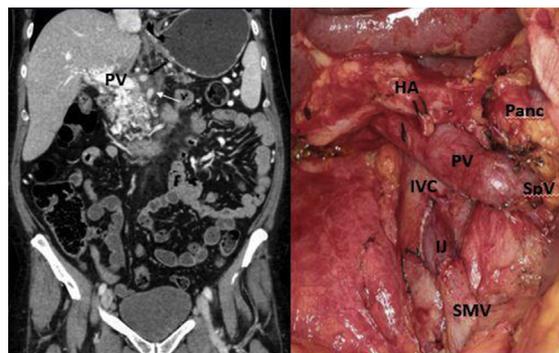
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Cavernous transformation of the portal vein (PV) due to obstruction or severe narrowing of the spleno-portomesenteric confluence in pancreatic diseases often renders surgical removal of the pancreatic head impossible. A mesocaval shunt (MCS) allows for decompression of the porta hepatis and peripancreatic varices necessary for safe dissection in patients who would otherwise be considered inoperable.

We utilize the left internal jugular (IJ) vein as the vascular conduit as it offers the best size match. An IJ vein-to-inferior vena cava(IVC) end-to-side anastomosis is created caudal to the left renal vein junction with a running 6-0 polypropylene suture. The superior mesenteric vein (SMV) is then divided just cephalad to its bifurcation into the jejunal and ileal branches. An end-to-end SMV-to-IJ vein anastomosis is created with 6-0 polypropylene interrupted suture. When combined with a splenorenal bypass, all mesenteric venous return is temporarily diverted to the systemic circulation. After removal of the pancreatic head, the IVC anastomosis is disconnected and hepatopetal flow in the portal vein is restored with an end-to-end anastomosis of the IJ graft to the PV. Occasionally, we have left a MCS bypass intact as a permanent shunt when the splenoportal confluence can be preserved.

A MCS allows for resection of the pancreatic head in the setting of profound porta hepatis varices in patients with cavernous transformation of the PV.



Preoperative imaging and intraoperative photo. *Left* Coronal CT image demonstrating cavernous transformation with varices around the portal vein (PV). Black arrow is the common hepatic artery. White arrow is the superior mesenteric artery. *Right* Intraoperative photo demonstrating mesocaval shunt with internal jugular (IJ) vein interposition graft between the superior mesenteric vein (SMV) and inferior vena cava (IVC). HA: hepatic artery; Panc: cut edge of pancreas; PV: portal vein; SpV: splenic vein.

Preoperative imaging and intraoperative photo

#### OTT-08

### ANTERIOR SECTOR OUTFLOW RECONSTRUCTION USING POLYTETRAFLUOROETHYLENE (PTFE) GRAFT IN RIGHT LOBE LIVING DONOR LIVER TRANSPLANTATION: A STEP TOWARDS DONOR SAFETY AND OPTIMISING RECIPIENT OUTCOMES

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Outflow reconstruction in right lobe living donor liver transplantation (RL-LDLT) is critical; especially in liver allografts without middle hepatic vein (MHV). Preserving the MHV with the donors add to donor safety but leads to multiple segmental veins in the graft, which have impact on segmental regeneration of allograft and can cause graft dysfunction. As an institutional policy, we routinely preserve the MHV with donor and reconstruct the anterior sector venous tributaries in recipient. We have been using expanded polytetrafluoroethylene (ePTFE) vascular graft to reconstruct the anterior sector tributaries in RL-LDLT. On bench, we created a “Neo-MHV” using ePTFE graft and anastomosing to segment 5/8 veins in an end-to-end/end-to-side fashion. In past, graft right hepatic vein (RHV) and Neo-MHV were anastomosed at separate sites on inferior vena cava (IVC) (Separate Drainage). Since February 2016, the end of Neo-MHV was anastomosed with end of graft RHV in side-to-side fashion to create a common ostium. A single Neo-MHV-RHV (common ostium) to caval RHV orifice anastomosis was performed (Single Composite Drainage). At six months, 15.6% patients had occluded interposition conduits. Considering that graft regeneration occurs mainly during the first month, long-term patency of the interposition grafts for V5/8 drainage is not a major concern. All these patients remained asymptomatic and had normal liver functions. None of these patients underwent any intervention. In centers with limited access to deceased donor vascular grafts, use of ePTFE graft is a viable option with excellent patency and patient outcomes.



Outflow Reconstruction in LDLT (Right Lobe without MHV)

## OTT-09

### TIPS AND TRICKS FOR THE UNCINATE DISSECTION DURING LAPAROSCOPIC PANCREATODUODENECTOMY

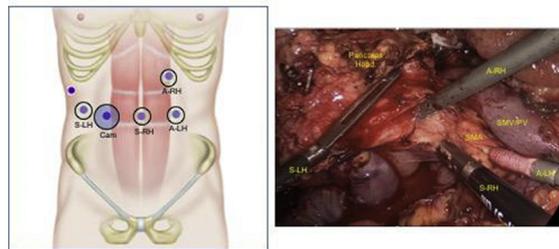
D. Sanford<sup>1</sup>, C. Hammill<sup>1</sup>, W. Hawkins<sup>1</sup> and H. Asbun<sup>2</sup>  
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**Background:** Laparoscopic pancreaticoduodenectomy (LPD) is a complex operation, and the uncinata dissection is perhaps the most difficult step in the resection phase of this procedure. The purpose of this presentation is to demonstrate our technique (using videos) for uncinata dissection during LPD along with a few commonly encountered scenarios.

**Technique:** The setup is extremely important to the success of this challenging step. Specifically, camera port location (Cam) as well as surgeon and assistant instrument choice and port site usage can greatly affect the difficulty of this phase of the operation (see Figure). We routinely use a port to the right of midline for the camera. The surgeon stands to the right of the patient with his/her right hand (S-RH) in the midline port with a vessel sealing device, while a large grasper in the left hand (S-LH) serves to retract the entire specimen to the patient's right. The assistant stands on the patient's left side using a suction in the right hand (A-RH) to keep the operative field dry and a laparoscopic kitner in the left hand (A-LH) to retract the superior mesenteric (SMV)/portal vein (PV) to the patient's left thereby exposing the superior mesenteric artery (SMA). The dissection proceeds from caudad to cephalad taking care to ligate the inferior pancreaticoduodenal artery as well as large venous branches from the SMV/PV.

**Conclusion:** This technique is a safe and reproducible method for removing the pancreatic head from the SMV/PV and SMA.

Figure. Laparoscopic Uncinate Dissection



Laparoscopic Uncinate Dissection Setup. Surgeon left hand (S-LH) and right hand (S-RH), Assistant left hand (A-LH) and right hand (A-RH), Camera (Cam)

## OTT-10

### LAPAROSCOPIC PARTIAL SPLENECTOMY WITH DISTAL PANCREATECTOMY PRESERVES SPLENIC FUNCTION

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**Introduction:** Distal Pancreatectomy often requires splenectomy, for oncologic reasons, or because splenic vessels are involved. The immune function of the spleen is increasingly recognized, and many national guidelines suggest long term antibiotics following splenectomy.

**Method:** In many patients planned for distal pancreatectomy and splenectomy, it may be possible to preserve the upper pole of the spleen, with blood supply from the short gastric vessels.

**Results:** This technique is demonstrated laparoscopically in a 58 yo female with an enlarging cystic lesion in the tail of the pancreas. The spleen is divided using an energy device with topical haemostatic agents.

Follow up imaging demonstrates hypertrophy of this splenic remnant, and blood analysis suggests competent splenic function.

**Conclusions:** In selected patients undergoing (laparoscopic) distal pancreatectomy, preservation of a portion of the spleen, may avoid sacrificing immunocompetence.

**PL01 - Liver: Metastases**

PL01-02

**HEPATIC RESECTION FOR  
NEUROENDOCRINE LIVER  
METASTASES: CONTEMPORARY  
INDICATIONS AND OUTCOMES FROM  
A POPULATION-BASED COHORT**

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**Introduction:** Surgical resection is associated with favorable long-term outcomes among patients with neuroendocrine liver metastases (NELM), however, the current indications for and outcomes of liver resection (LR) for NELM from a population-based perspective are not well understood.

**Methods:** A retrospective review of the 2014-2017 ACS-NSQIP and targeted hepatectomy databases was performed to identify patients who underwent LR for NELM. Perioperative characteristics and 30-day morbidity and mortality were analyzed.

**Results:** Among 669 patients who underwent LR for NELM, the median age was 60 (IQR 51-67) and 51% were male. The most common number of metastases resected was 1 (45%) but ranged from 1 to 9 while most (68%) had tumors < 5cm. Most patients underwent partial hepatectomy (71%) while fewer underwent a right or left hepatectomy or trisectionectomy. The majority of operations were open (82%) compared to laparoscopic (17%) or robotic (1%). In addition, 30% of patients received intraoperative ablation (IA) while 45% had another concomitant operation including cholecystectomy (28.8%), bowel resection (20.2%), or partial pancreatectomy (3.4%). Overall 30-day morbidity and mortality was 29% and 1.3%, respectively. On multivariate analysis, ASA class  $\geq 3$  (OR 2.089, 95%CI: 1.197-3.645), open approach (OR 1.867, 95%CI: 1.148-3.036), right hepatectomy (OR 1.618, 95%CI: 1.014-2.582), and prolonged operative time >230 minutes (OR 1.731, 95%CI: 1.168-2.565) were associated with higher 30-day morbidity while IA and concomitant procedures were not.

**Conclusions:** LR for NELM is performed with relatively low postoperative morbidity and mortality. Concomitant procedures performed at the time of LR did not increase morbidity.

PL01-04

**META-ANALYSIS OF SURVIVAL  
FOLLOWING PULMONARY  
RESECTION FOR COLORECTAL  
CANCER METASTASES**

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**Background:** Controversy exists regarding the optimal management of colorectal lung metastases (CRLM). This meta-analysis compared surgical (Surg) vs interventional (Chemotherapy and/or Radiotherapy) and observational non-surgical (NSurg) management of CRLM.

**Methods:** A systematic review of the major databases including Medline, Embase, SCOPUS, and the Cochrane library was performed.

**Results:** Ten studies including 2232 patients; 1551 (69%) comprised the Surg cohort, 521 (23%) the interventional NSurg group and 160 (7%), the observational NSurg group. A significantly higher overall survival was observed when Surg was compared to interventional NSurg at one-year (Surg 89%, 359/402 interventional NSurg 70%, 343/625, OR 2.76 (CI 2.10-3.63), P< 0.001), at three-years (Surg 59%, 857/1444 interventional NSurg 26%, 138/521, OR 2.61 (CI 1.65-4.15), P=0.002), at five years (Surg 47%, 533/1144 interventional NSurg 23%, 45/196, OR 3.24 (CI 1.42-7.39), P=0.009) and at ten-years (Surg 27%, 306/1122 interventional NSurg 1%, 2/168, OR 15.64 (CI 1.87-130.76), P=0.031). In contrast however, Surg was associated with a greater overall survival than observational NSurg at only one-year (Surg 89%, 1009/1132 observational NSurg 67%, 93/138, OR 4.49 (CI 1.16-17.40), P=0.041) and was similar to observational NSurg at all other overall survival time points. Comparable survival was observed among Surg and overall NSurg cohorts at three- and five-year survival in articles published within the last three years.

**Conclusions:** Recent evidence suggests comparable survival with Surg and NSurg modalities for CRLM, contrasting to early evidence where Surg had an improved survival. Significant selection bias.

PL01-05

**IDENTIFICATION OF GLISSON'S  
CAPSULE INVASION DURING  
HEPATECTOMY FOR COLORECTAL  
LIVER METASTASIS BY CONTRAST-  
ENHANCED ULTRASONOGRAPHY  
USING PERFLUBUTANE**

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**Background:** The aim of this study was to evaluate efficacy of contrast-enhanced intraoperative ultrasonography (IOUS) in diagnosis of Glisson invasion in hepatectomy for colorectal liver metastasis (CLM).

**Methods:** Subject consisted of 50 consecutive patients undergoing hepatectomy for CLM. Intraoperatively, presence or absence of Glisson invasion was estimated by IOUS with Perflubutane, based on the following

four key findings on Glisson's capsule adjacent to the tumor:

- [Pattern-1] tumor thrombus,
- [2] border irregularity,
- [3] caliber change, and
- [4] peripheral dilatation.

These findings were compared with results of pathological examinations.

**Results:** Among 187 CLMs resected, Glisson invasion was proved in 24 tumors (13%; 7 tumors with macroscopically-obvious Glisson invasion and 17 tumors with microscopic Glisson invasion). Sensitivity/specificity of contrast-enhanced IOUS for diagnosis of macroscopic Glisson invasion was 43%/98% for the [Pattern-1], 14%/97% for [2], 86%/97% for [3], and 43%/98% for [4]. If presence of one or more key findings by IOUS were determined as a predictor of Glisson invasion, its sensitivity and specificity reached up to 100% and 90%, respectively. In contrast, sensitivity and specificity of preoperative contrast-enhanced MRI for Glisson invasion were respectively 29% and 97%. The proportion of R1 resection was not significantly different between CLM patients with Glisson invasion (82%) and those without Glisson invasion (85%).

**Conclusions:** Evaluation of Glisson capsule adjacent to CLM by contrast-enhanced IOUS may be effective for estimation of Glisson invasion, which enables surgeons to divide Glisson capsule at the site free from the invasion, leading to avoid unexpected R1/R2 resection.

#### PL01-06

### GOLD NANOPARTICLES INHIBIT COLORECTAL CANCER LIVER METASTASIS THROUGH INHIBITING THE TGF- $\beta$ PATHWAY

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**Introduction:** The application of gold nanoparticles (AuNPs) to the management of cancer is currently the new breakthrough in cancer research. However, the role of AuNPs on tumor growth and metastasis in colon cancer and the mechanism by which AuNPs regulate tumor growth and liver metastasis in colorectal cancer (CRCLM) are unclear. **Method:** We established two TGF- $\beta$  inducible luciferase colon cancer cell line and orthotopic colon cancer and liver metastasis animal models. We also overexpressed or knockdown Smad4, an important transduction factor of the TGF- $\beta$  signaling pathway, to explore the molecular mechanism by which AuNPs regulate CRCLM.

**Results:** AuNPs inhibited TGF- $\beta$  secretion of colon cancer, and downregulated the downstream reporter genes of TGF- $\beta$  signaling pathway. AuNPs inhibited cell proliferation, migration and invasion in vitro, and reduced tumor growth and liver metastasis in vivo. ERK, P38 MAPK and AKT was inactivated by AuNPs, leading to down-regulation of VEGF secretion and Vimentin while up-regulation of E-Cadherin. When Smad4 was knockdown, cells were significantly more sensitive to AuNPs treatment. The TGF- $\beta$  inducible luciferase cell line were established, and used for liver metastasis animal models. Mice were treated with

the TGF- $\beta$  receptor inhibitors, and the results showed that this model could observe the activation of TGF- $\beta$  signaling pathway as well as tumor progression in vivo.

**Conclusions:** These results provided evidences that AuNPs inhibit CRCLM through inhibiting the TGF- $\beta$  pathway. This research provided theoretical evidences for the clinical use of AuNPs for the treatment of colon cancer or CRCLM.

#### PL01-07

### PARENCHYMAL-SPARING HEPATECTOMIES FOR COLORECTAL LIVER METASTASES

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**Introduction:** Parenchymal-sparing hepatectomies (PSH) have been performed widely for the patients of colorectal liver metastases (CLM) to preserve much liver parenchyma and allow for future re-resection. Herein, we divide PSH into 3 types of hepatectomies,

- i) limited anatomical resection,
- ii) tumor-vessel detachment resection, and
- iii) tumor enucleation locating at the deep part of liver parenchyma from the parenchymal slit.

In this presentation, we show each case, and evaluate the feasibility.

Case1: In this case, the tumor was located at the boundary of S1 and S4. The tumor was 2cm in size, and involving the main trunk of middle hepatic vein (MHV). To preserve lateral section and left hepatic vein, we selected anatomical S1/S4 resection concomitant with MHV resection.

Case2: The second patient had a tumor in S7, which was adjacent to the right hepatic vein (RHV). To preserve the venous return from the posterior section, we performed partial resection by detaching the tumor from the RHV.

Case3: The last patient had multiple CLMs in bilateral lobe. Most tumors were located in the shallow part of liver parenchyma and dissected by partial resections. However, one tumor in S8 was located at the deep part of liver. Hence, we made parenchymal slit and enucleated the tumor.

**Results:** We archived R0 resection in all cases. Post-operative mortality and morbidity were nil.

**Conclusions:** PSH can be classified into 3 types. All types of PSH are feasible and can be performed safely.

#### PL01-08

### NATIONWIDE POPULATION-BASED STUDY ON PREOPERATIVE IMAGING FOR COLORECTAL LIVER METASTASES

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**Background:** In patients with colorectal liver metastases (CRLM) preoperative may include contrast-enhanced(ce) MRI and 18F-FDG-PET-CT. This study assessed trends and variation between hospitals and oncological networks in the use of preoperative imaging in the Netherlands.

**Methods:** All patients who underwent liver resection for CRLM in the Netherlands between 2014 and 2018 were retrieved from a nationwide auditing database. Multivariable logistic regression analysis was used to assess use of ceMRI, 18F-FDG-PET-CT and combined ceMRI and 18F-FDG-PET-CT and trends in preoperative imaging and hospital and oncological network variation.

**Results:** In total 4510 patients were included of whom 1562 underwent ceMRI, 872 underwent 18F-FDG-PET-CT and 1293 underwent combined ceMRI and 18F-FDG-PET-CT. Use of ceMRI increased over time from 9.6% to 26.2% ( $p < 0.01$ ), use of 18F-FDG-PET-CT decreased (25% to 6.0%,  $p < 0.01$ ) and use of ceMRI and 18F-FDG-PET-CT (17%) remained stable. Unadjusted variation in use of ceMRI, 18F-FDG-PET-CT and combined ceMRI and 18F-FDG-PET-CT ranged from 5% to 100% between hospitals. After case-mix correction, hospital and oncological network variation was present regarding all imaging.

**Discussion:** Significant variation exists concerning use of preoperative imaging for CRLM between hospitals and oncological networks in the Netherlands. The use of MRI is increasing whereas use of 18F-FDG-PET-CT is decreasing.

#### PL01-11

### COMPLETE REMISSION OF LUNG METASTASES IN HEPATOCELLULAR CARCINOMA TREATED WITH THALIDOMIDE

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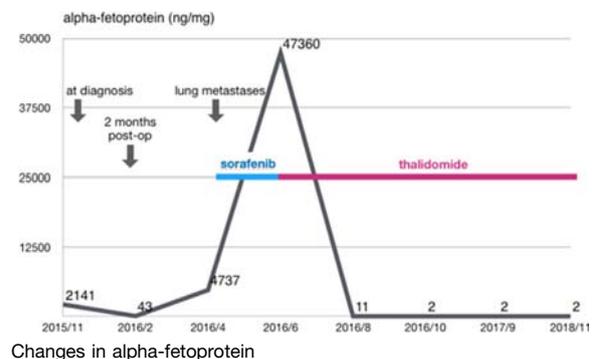
**Introduction:** Advanced-stage hepatocellular carcinoma (HCC) has poor prognosis mainly because of the underlying liver disease and lack of effective therapeutic options. Pulmonary metastases is the most common site of extra-hepatic spread.

**Methods:** We report the case of complete response with thalidomide for multiple pulmonary metastases from HCC.

**Results:** A 63-year old female, who was a carrier of hepatitis C virus, was preoperatively diagnosed with double primary malignancies of the liver and ampulla. Pancreaticoduodenectomy with synchronous liver resection was performed. Pathology revealed a 4cm moderately differentiated HCC classified as stage IIIB (pT3bN0) with LHV tumor thrombus and a 1cm moderately differentiated adenocarcinoma at the papilla of Vater classified as stage IA (pT1N0). Four months later, AFP levels elevated markedly and chest radiograph demonstrated multiple variable sized nodules in both lungs. She was started on sorafenib. However, a tenfold increase in AFP levels and progressive disease on chest radiograph were found after 6 weeks. We changed the regimen to thalidomide at a daily dose of 100mg. Within a month, AFP levels declined rapidly and the number and size of the metastatic lung nodules

decreased. After two months, chest radiograph showed complete response of the lung metastases. The patient has received thalidomide for the past three years, and no signs of recurrence of lung metastases have been observed.

**Conclusions:** The role of systemic chemotherapy for metastatic HCC has not yet been clarified. Our findings suggest that treatment with thalidomide may be a promising method for patients with metastatic lung cancer from HCC.



#### PL01-13

### LONG-TERM OUTCOME AND PROGNOSTIC FACTORS OF SYNCHRONOUS COLORECTAL LIVER METASTASES

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**Introduction:** The prognosis of patients with multiple colorectal liver metastases (CRLM) has been reported to be poor. An appropriate treatment strategy should be planned based on tumor load and biology of each patients.

**Method:** One hundred and twenty three patients underwent initial hepatectomy for synchronous CRLM between 2001 and 2018. Long-term outcome and clinicopathological data were analyzed retrospectively.

**Results:** Five-year OS and MST after initial hepatectomy for synchronous CRLM were 46.8% and 53 months. Three-year DFS were 20.9%. KRAS status was assessed in 101 patients during the study period. KRAS mutation was identified in 37 patients (36.6%). Univariate analysis demonstrated that bilobar distribution, number of tumors, major hepatectomy (>3 segments), early recurrence (< 12 months after hepatectomy) and KRAS mutation were significantly associated with poor prognosis. Multivariate analysis demonstrated that KRAS mutation and early recurrence were independent prognostic factors. Repeat resection rate was significantly low in patients with KRAS mutation compared with that in KRAS wild type.

OS was significantly better in patients with adjuvant chemotherapy for synchronous and multiple CRLM compared with patients without adjuvant chemotherapy.

Simultaneous resection of primary tumors and CRLM was performed in 20 patients. OS after simultaneous resection was comparable to that after two-staged resection. **Conclusions:** KRAS mutation is an independent prognostic factor in patients with synchronous CRLM. One of the reasons for poor prognosis might be significantly frequent unresectable recurrences after initial hepatectomy.

In terms of perioperative chemotherapy, adjuvant chemotherapy might improve OS of patients with synchronous and multiple CRLM.

#### PL01-14

### INDICATION FOR SURGICAL RESECTION OF LIVER METASTASES FROM PANCREATIC CANCER

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**Introduction:** Resection of liver metastases in pancreatic cancer has been considered as contraindication because of poor outcomes. In contrast, recent progress in adjuvant chemotherapy and resection for recurrent site allowed longer survival in patients with pancreatic cancer. In this study, we examined cases of long-term survival after surgical resection for liver metastasis of pancreatic cancer.

**Method:** Between 2005 and 2015, data was collected from the patients who underwent curative surgical resection for pancreatic cancer. The solitary metachronous liver recurrence and absence of any other local or distant metastasis were the indication for liver resection.

**Results:** A total of five patients were included in 72 patients who underwent R0 resection for pancreatic cancer. Two patients were further performed twice liver resection for metachronous liver recurrence. The median disease-free interval (DFI) was 21 (3-44) months. The median of second DFI was 12 (2-39) months. The median follow-up time after primary surgical resection was 72 (24-100) months. In particular, the median follow-up time after reoperation for recurrence was 39(10-63) months. Two patients who underwent twice liver resections, they survived more than 7 years from the primary surgery.

**Conclusions:** The patients with solitary liver metastasis after prolonged DFI (>12 months) may be a good indication for liver resection.

#### PL01-19

### RENIN-ANGIOTENSIN INHIBITION ATTENUATES TUMOUR PROGRESSION IN THE FUTURE LIVER REMNANT AND MODULATES ANTI-TUMOUR IMMUNITY

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**Introduction:** Experimental and clinical data demonstrates that liver regeneration after hepatectomy drives tumour progression in the future liver remnant. The aim of this study is to assess the efficacy of renin-angiotensin inhibition (RASi) at reducing CRLM growth within the regenerating liver following partial hepatectomy.

**Methods:** Male CBA mice underwent induction of colorectal liver metastases (CRLM) in conjunction with 70% partial hepatectomy. Mice were treated with either control or RASi, captopril 250mg/kg. Fresh tissues were processed for flow cytometrical analysis of T cell subsets.

**Results:** RASi significantly reduced tumour burden within the regenerating liver ( $p < 0.01$ ). RASi was associated with a significant upregulation of CD8 and double negative T cells ( $p=0.01$  and  $p < 0.01$  respectively). RASi also led to a significant increase in the PD1 expression of CD8 and double negative T cells ( $p=0.01$  and  $p < 0.01$  respectively).

Furthermore, analysis of the CD8+/PD1+ T cell subpopulation revealed the majority co-express CD44 and CD69 (tissue resident T cell markers). 75% of CD8/PD1+ T cells in the liver of captopril treated mice were both CD44+ and CD69+. In liver, captopril treatment was also associated with a significant upregulation of CD69 expression ( $p < 0.01$ ) compared to control.

**Conclusions:** RASi are immunomodulatory and re-direct the immune response in favour of immune destruction of tumour cells. RASi significantly increases the proportion of PD1+ CD8 and double negative T cells. We have shown that the vast majority of CD8+/PD1+ T cells are tissue resident and this may explain why these cells appear to maintain their anti-tumour effects.

#### PL01-21

### INDETERMINATE LIVER LESIONS - A VIRTUAL EPIDEMIC: A COHORT STUDY OVER 8 YEARS

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**Background:** Within the last decade, advances and availability in radiologic imaging have led to an increase in the detection of incidental liver lesions (ILL) in the asymptomatic patient population. This poses a diagnostic conundrum. This study was undertaken to review the outcome of liver lesions labelled as "indeterminate" in asymptomatic patients without a biopsy-proven concomitant primary tumour. The secondary aim was to assess the impact on health care resources and cost-effectiveness with regards to the frequency and modality of radiological scans, MDT discussions and clinic reviews.

**Methods:** The study consisted of a retrospective analysis of prospectively collected data from the University Hospitals of Leicester MDT database. The study period ranged from 2010-2015. All patients were followed-up for 3 years to ensure no late re-occurrences with malignancy.

**Result:** Ninety two patients with ILL were identified. The median age was 72. The median size of these ILLs was 10mm. Eighty seven patients required supplementary imaging and 42 required a third imaging. Ninety one patients had benign lesions. Only one case was biopsy proven to be malignant.

**Conclusion:** Small (< 15 mm) hepatic lesions discovered incidentally in patients with no known primary malignancy and risk factors are virtually always benign, with a 1% risk of malignancy. There is a need for a classification system, which stratifies ILLs by malignant potential based on a standardized and evidence-based approach. This is important to prevent unnecessary investigations. A multidisciplinary approach in an experienced HPB centre is recommended until such a classification exists.

PL01-22

### IMPACT OF SEPTIC COMPLICATIONS AFTER LIVER RESECTION FOR COLORECTAL METASTASES

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**Introduction:** Liver metastases will appear approximately in 40% of patients with colorectal carcinoma, surgery remains the only option for curative radical treatment. Complications occur in about 20% of cases and most are mild. Severe complications that are specific to liver resection include bile leak or fistula, bleeding, liver failure, respiratory complications (fluid collection) and perihepatic abscess.

Aim of our study was to describe postoperative complications and to evaluate their impact on disease free interval.

**Materials and methods:** There were 311 liver resections in 253 patients operated for CRLM from 1996 to 2018 at our surgery.

We identified minor complications (Clavien-Dindo classification I, II) in 13 % of patients, moderate complications (Clavien-Dindo III) in 6% of patients), and severe in 3,5% of patients.

**Results:** Median follow up was 38 months. Overall five year survival was 41%. Postoperative complications occurs in 22,5% of resections. Postoperative mortality was 2%. Overall five year disease free survival is 30%. Significantly worse disease-free interval was found in patients with severe septic complications. Other, less serious complications also increase the risk of recurrence, but not statistically significantly.

**Conclusion:** Severe septic complications has an adverse effect on the further course of the disease in terms of relapse. In addition, serious complications increases postoperative mortality, prolong hospitalization, increase the cost of treatment.

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PL01-23

### INDICATION OF NEOADJUVANT CHEMOTHERAPY FOR PATIENTS WITH COLORECTAL CANCER LIVER METASTASES IN OUR HOSPITAL

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**Background:** Whether neoadjuvant chemotherapy (NAC) is appropriate for the patients with initially resectable colorectal cancer liver metastases (CRLM) remains controversial. The indication of NAC was examined at the surgical meeting in our hospital. The aim of this study is to retrospectively validate our indication of NAC.

**Patients and Methods:** From 2009 to 2019, 84 patients underwent hepatectomy for CRLM. They were divided into two groups: synchronous CRLM (SM-group n=56) and

metachronous CRLM (MM-group n=28) and the indication of NAC was validated. Additionally, long-term outcomes were compared between patients who received NAC (NAC(+)-patients) and those didn't receive NAC (NAC(-)-patients).

**Results:** NAC was performed in 41 patients (73.3%) in SM-group and 12 patients (42.9%) in MM-group. In SM-group (28 single metastasis (sgl-Met) and 28 multiple metastases (multi-Met)), the patients with multi-Met significantly received NAC (57.1% in sgl-Met vs. 89.3% in multi-Met, p=0.01). In MM-group (15 sgl-Met and 13 multi-Met), the period from excision of the primary cancer to the development of liver metastasis was tended to be shorter in NAC(+)-patients than NAC(-)-patients (NAC (+) 309 days vs. NAC (-) 656 days, median, p=0.09). In SM-group, there was no significant difference of 5-year OS between NAC(+)-patients and NAC(-)-patients (NAC (+) 63.6% vs. NAC (-) 74.6%, p=0.93). In MM-group, there was no significant difference between NAC(+)-patients and NAC(-)-patients (90.9% vs. 82.1%, p=0.40).

**Conclusion:** NAC for CRLM tended to be performed to the patients with multiple- synchronous-metastasis and metachronous-metastases developing within 1 year after excision of the primary cancer. According to our strategy, long-term outcomes were favorable.

PL01-28

### TREATMENT STRATEGY FOR SYNCHRONOUS LIVER METASTASES FROM COLORECTAL CANCER

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**Background:** Our surgical indication for CRLM as follows: i) curative resection and ii) future remnant liver volume over 35%, and positively introduced conversion surgery for unresectable CRLM. Based on our experience, we have established treatment strategy for synchronous CRLM.

**Methods:** Among 280 CRLM patients, 72 initially curative resection of synchronous CRLM and 51 unresectable, received current chemotherapy such as FOLFOX, FOLFILI IRIS, XEROX and FOLFOXIRI, were included.

**Results:**

- 1) Initially resectable: Multivariate analysis revealed MDN (Maximum Diameter x Number) index over 20 of metastatic tumor (HR5.171, p=0.0230) and poor differentiation of primary tumor (HR10.982, p=0.0009). Also, postoperative adjuvant chemotherapy consisted of FOLFOX, XELOX and IRIS enhanced the better surgical outcomes.
- 2) Unresectable for conversion surgery: Among 51 unresectable synchronous CRLM, Conversion surgery introduced in 28 cases (54.9%). Conversion group significantly highly indicated MDN under 70, without remote organ metastasis and induction of FOLFOXIRI regimen compared to non-Conversion group. Also

FOLFOXIRI regimen was applied to 18 patients. The Conversion rate in FOLFOXIRI group and other regimen group were 71.4% and 43.3% ( $p=0.0472$ ), and Overall survival in FOLFOXIRI group has been better than that in other regimen group and 3-years survival rates were 77.4% and 47.0%, respectively ( $p=0.0008$ ).

**Conclusion:** In synchronous CRLM with MDN $>20/<70$ , even if unresectable, FOLFOXIRI plus molecular target drug could introduce the chance for conversion surgery.

#### PL01-29

### EMERGENCY RIGHT HEMIHEPATECTOMY AND RESECTION OF RETROPERITONEAL MASSES TO CONTROL REFRACTORY HYPOGLYCEMIA FROM METASTATIC INSULINOMA PRESENTING 14 YEARS AFTER RESECTION OF NON-FUNCTIONING PANCREATIC NEUROENDOCRINE TUMOUR

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**Introduction:** Insulinoma is rare and only 5-15% are malignant. Transformation of nonfunctioning pancreatic neuroendocrine tumour (pNET) into insulinoma has only been reported in 6 cases and all happened early. We present the **first case** of metastatic insulinoma that presented as an emergency, 14 years after previous distal pancreatectomy for non-functioning pNET, and was refractory to medical treatment. A right hemihepatectomy and resection of retroperitoneal masses was curative.

#### Methods:

##### Case report:

**Results:** A 59 year old woman was found unconscious at home. Paramedics found the blood glucose at 1.1 mmol/L and initiated a dextrose infusion. She regained consciousness. Further investigations showed an insulin of  $>1000$   $\mu\text{u/L}$ , C-peptide of 2953 pmol/L and a negative sulfonyleurea screen. A CT scan showed (pic1) multiple masses in segments 5,6,7,8 of liver, the largest being 11.3 cm and large masses in left retroperitoneum. She was treated with 20% dextrose, diazoxide and Octreotide and referred to our unit.

She underwent right hepatic artery embolisation which allowed transient rise in the blood glucose which then fell to 2.4 mmol/L. She developed extensive rash and pyrexia from allergy to diazoxide and hence stopped. It was difficult to maintain blood glucose and hence she underwent an uneventful emergency right hepatectomy and resection of the large retroperitoneal masses. She came off dextrose infusion and discharged 10 days later with no medications and normoglycemia.

**Conclusion:** A first report of successful emergency right hepatectomy and resection of large retroperitoneal masses for metastatic insulinoma leading to normoglycemia.



CT scan showing one of the large liver metastases and a left retroperitoneal mass

#### PL01-30

### PERI-OPERATIVE EPIDURAL ANALGESIA OFFERS NO ONCOLOGICAL BENEFIT FOLLOWING OPEN RESECTION OF COLORECTAL LIVER METASTASES: LONG TERM FOLLOW UP OF TWO RANDOMIZED CONTROLLED TRIALS

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**Introduction:** The use of epidural analgesia (EA) for liver surgery remains controversial. Reports suggest EA offers a positive impact on survival following liver resection for cancer when compared to systemic opiates. No study has compared the oncological benefit of epidural analgesia compared to local anaesthetic wound infiltration (WI). This study aimed to assess the effect of analgesic modality on survival following liver resection for colorectal liver metastases (CRLM).

**Method:** The survival outcomes of patients who participated in two RCTs were obtained. The included patients had been randomised to receive either EA or WI as peri-operative analgesia following open liver resection for CRLM in two UK centres. Baseline data were obtained. Median and five year overall (OS) and disease free survival (DFS) outcomes were compared by Kaplan-Meier survival curves.

**Results:** 96 (EA=49, WI=47) patients were identified from two RCTs as having undergone resection of CRLM. The median follow up time was 61.1 (IQR 30.5-69) months. No differences between the groups' baseline and oncological characteristics were identified. Median OS for EA was 56.6 months and 71.6 months for WI. Median DFS was 18.8 months for EA and 31.2 months for WI. Five year OS was 50.8% for EA and 61.2% for WI ( $p=0.57$ ). Five year DFS was 38.6% for EA and 46.1% for WI ( $p=0.39$ ).

**Conclusions:** In contrast to previous reports, EA did not offer a survival advantage following liver resection for

CRLM when, on this occasion, compared with WI. Both EA and WI could be considered appropriate for oncological liver surgery.

PL01-31

### RESULTS OF ALPPS PROCEDURE FOR COLORECTAL CANCER LIVER METASTASIS

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**Objectives:** The aim of this study was to assess the effectiveness of ALPPS in the treatment of primary unresectable liver metastasis of colorectal cancer.

**Materials and methods:** 29 patients with colorectal cancer liver metastasis, which seemed to be unresectable with standard liver resection, were considered for ALPPS. ALPPS was performed in patients with insufficient volume and / or quality of the future remnant. The study included 16 men, and 13 women. The average age of the patients was 64.8 years. 7-9 days after first stage of ALPPS CT-volumetry was performed, then the second stage of the surgical procedure was made.

**Results:** The preoperative mean volume of the remnant was 468 cm<sup>3</sup>. The average postoperative volume of the remnant after first stage of ALPPS was 810 cm<sup>3</sup>. The average difference between the pre- and postoperative volume of the remnant was 342 cm<sup>3</sup>; the average volume of the remnant is increased by 73%. We haven't observed any cases of liver failure. In 17 patients we had postoperative complications Grade II-IIIa Clavien-Dindo. 2 patients died - thromboembolism of pulmonary artery and multiple organ failure. The median follow-up was 56.6 (4.5-74.0) months, the 1-, 3- and 5-years overall survival rates were 72.4%, 44.8%, and 10.3% respectively.

**Conclusion:** ALPPS makes it possible to avoid the development of postresectional hepatic failure and to perform the liver resection in patients that earlier seemed to be unresectable, improving survival.

PL01-32

### HIGH MOBILITY GROUP BOX 1 LEVEL IS ASSOCIATED WITH LONG TERM SURVIVAL FOLLOWING LIVER RESECTION FOR COLORECTAL LIVER METASTASES

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**Introduction:** High mobility group box-1 (HMGB1) is a biomarker associated with cancer survival in a number of malignancies. The impact of HMGB1 production on survival after surgery for colorectal liver metastases (CRLM) has not been investigated. This study aimed to determine if perioperative HMGB1 is associated with survival following liver resection for CRLM.

**Method:** The survival outcomes of patients enrolled in a previous RCT who had undergone liver resection for

CRLM were reviewed. Serum HMGB1 levels were obtained on post-operative day (POD) one by ELISA. Demographic, perioperative and oncological data were recorded. Date of death or censor were obtained. Patients were allocated to groups according to level of HMGB1 recorded on POD 1. Univariate and multivariate analyses were performed.

**Results:** 51 patients underwent open liver resection for CRLM between December 2012 and June 2014. The median follow up period was 63 (IQR 36.5-69.2) months. Two matched groups of 25 patients with low level of HMGB1 on POD 1 (mean 3±1ng/mL) and 26 with high levels (mean 9.7±5.9ng/mL) were compared. Median overall survival was significantly reduced in the high HMGB1 group (53.7 months) and was not reached in the low HMGB1 group. 5 year survival was 50% versus 76% in the high HMGB1 versus low HMGB1 groups respectively (p=0.03). No independent predictors of survival were identified on multivariate analysis.

**Conclusion:** High POD1 HMGB1 level is associated with survival following liver resection for colorectal liver metastases. This could provide an early indicator of higher risk of recurrence during the follow up period.

PL01-33

### LIVER-FIRST VERSUS CLASSICAL STRATEGY FOR SYNCHRONOUS COLORECTAL LIVER METASTASES: AN UPDATED META-ANALYSIS

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**Introduction:** The aim of the present study was to compare the clinical outcomes of liver-first (LFS) versus classical (CS) strategy for the management of synchronous colorectal liver metastases (sCRLM).

**Methods:** A thorough literature search was performed in PubMed, Scopus and Cochrane databases, in accordance with the PRISMA guidelines. The Odds Ratio, Weighted Mean Difference and 95% Confidence Interval were evaluated by means of the Random-Effects model.

**Results:** Ten articles met the inclusion criteria, incorporating 3,656 patients. Patients in the LFS group reported increased size of sCRLM and a higher rate of major hepatectomies. This study reveals comparable overall survival and disease-free survival at 1, 3 and 5 years postoperatively between the two strategies. Moreover, the mean operative time, length of hospital stay, the incidence of severe complications, the 30-day and 90-day mortality were similar between the two groups. The mean intraoperative blood loss was significantly increased in the LFS group.

**Conclusion:** These outcomes suggest that both approaches are feasible and safe. Since there are no randomized clinical trials currently available, this meta-analysis represents the best currently available evidence. Nonetheless, the results should be treated with caution given the small number of the included studies. Randomized trials comparing LFS to CS are necessary to further evaluate their outcomes.

PL01-34

### THE EFFECTIVENESS OF TRANSCATHETER ARTERIAL CHEMOEMBOLIZATION IN THE TREATMENT OF UNRESECTABLE HEPATIC METASTASES

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**Introduction:** This study investigated the effectiveness of transcatheter arterial chemoembolization using drug-eluting beads (DEB-TACE) in the treatment of unresectable hepatic metastases.

**Methods:** 40 patients with unresectable hepatic metastases treated with DEB-TACE in an institutional review board approved protocol from 2011 to 2019 were studied retrospectively. The time to progression (TTP) was estimated by CT and MRI according to RECIST 1.1. Primary tumors were: colorectal region (40%), lung (15%), uterus and cervix (15%), prostate (10%), ovaries (5%), pancreas (5%), liver (5%), breast (5%).

**Results:** We distinguished 2 groups of patients. Group 1 consisted of 13 patients who underwent DEB-TACE after 21-42 months from the detection of metastases after previous therapy failure. Mortality during the first 12 months after DEB-TACE was 5 %, mortality after 13 months - 42%. TTP was 10-24 months, which required second DEB-TACE in 6 patients with TTP 10-14 months.

Group 2 consisted of 27 patients who underwent DEB-TACE after 1-11 months from the detection of metastases in combination with systemic chemotherapy.

Mortality during the first 12 months after DEB-TACE was 5%, mortality after 13 months - 41%. TTP was 9-24 months, which required second DEB-TACE in 2 patients with TTP over to 10 months.

**Conclusion:** 1) Mortality and TTP were similar in both groups; 2) the number of repeated DEB-TACE in group 1 was higher than in group 2; 3) DEB-TACE is effective both in the initial and in the later stages of treatment of unresectable hepatic metastases.

PL01-35

### SPLenic ENLARGEMENT INDUCED BY PREOPERATIVE CHEMOTHERAPY IS AN USEFUL INDICATOR FOR PREDICTING LIVER REGENERATION AFTER RESECTION FOR COLORECTAL LIVER METASTASES

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**Introduction:** Conversion chemotherapy may downsize unresectable colorectal liver metastases (CRLMs), but may cause liver injury and splenic enlargement. The effect of preoperative chemotherapy on liver regeneration after liver resection remains undetermined. The aim of this study was to examine whether splenic enlargement induced by preoperative chemotherapy is an indicator to identify high-risk patients for impaired liver regeneration and liver dysfunction after resection.

**Methods:** We retrospectively reviewed 118 Japanese patients with CRLMs. Fifty one patients had conversion chemotherapy. The other 67 patients underwent upfront liver resection. We clarified effects of conversion chemotherapy on splenic volume, liver function, and postoperative liver regeneration. Perioperative outcome was also analyzed.

**Results:** A ratio of the splenic volume before and after chemotherapy (SP index) in the oxaliplatin-based chemotherapy group was significantly greater than other chemotherapy groups after 9 or more chemotherapy cycles. Patients whose SP index was 1.2 or more had significantly higher indocyanine green retention rate at 15 min (ICG-R15) than patients without chemotherapy. Analyses of covariance showed liver regeneration rate after resection was decreased in patients whose SP index was 1.2 or more. The incidence of postoperative liver dysfunction in patients whose SP index was 1.2 or more was significantly greater than patients without chemotherapy. Multivariate analysis showed SP index was a significant predictive factor of impaired liver regeneration.

**Conclusion:** Splenic enlargement induced by preoperative chemotherapy was a useful evaluation indicator for impaired liver regeneration after resection and a decision-making tool for treatment strategy for unresectable CRLMs.

PL01-37

### A CASE OF FOCAL HEPATIC SINUSOIDAL OBSTRUCTION MIMICKING COLORECTAL LIVER METASTASES

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**Introduction:** Oxaliplatin is a platinum-based antineoplastic agent, and it is common for the treatment of colorectal cancer. Oxaliplatin-induced hepatic sinusoidal obstruction syndrome (HSOS) has been reported, and it may present as reticular hypointensity on hepatobiliary phase images of gadoxetic acid-enhanced magnetic resonance images (EOB-MRI). We experienced that HSOS presented focal lesions, and we could not distinguish between HSOS and metastatic lesion in the liver.

**Method:** A case report.

**Result:** A 51-year old female underwent high anterior resection for rectal cancer, and the pathological diagnosis was advanced rectal cancer, pT4aN2aM0 pStageIIIC. The patient received six cycles of oxaliplatin-based

chemotherapy with capecitabine as postoperative adjuvant chemotherapy. Eight months after the operation, the contrast enhanced computed tomography revealed two low density lesions in the liver. The hepatobiliary phase of the EOB-MRI demonstrated three lesions in the liver as hypointense tumors relative to the surrounding hepatic parenchyma. These findings of the preoperative images were compatible to metastatic liver tumors from the rectal cancer, and we performed limited resection of the liver. Histopathological findings of three lesions which were recognized preoperatively revealed that sinusoid within lobules dilated and space of Disse bled. It indicated sinusoidal obstruction injury. There was no malignant lesion. The patient recovered completely and discharged from our hospital on 7th postoperative day.

**Conclusions:** Focal HSOS mimicking metastatic liver tumors is very rare, and it is difficult to discriminate between focal HSOS and liver metastases in the patients who undergo oxaliplatin-based chemotherapy.

#### PL01-38

### A SURVEY OF THE INTERNATIONAL MANAGEMENT OF DISAPPEARING COLORECTAL LIVER METASTASES

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**Introduction:** Chemotherapy response rates have markedly improved leading to the occurrence of “disappearing” colorectal liver metastases (dCRLM). The aim of this work is to assess the management of dCRLM as determined by a survey of an international body of hepatobiliary surgeons.

**Methods:** A survey was designed and tested for item relevance and readability, and a content validity index (CVI) was determined based on review by 10 content experts. IRB exemption was obtained and the survey was distributed to the AHPBA, IHPBA and ANZHPBA.

**Results:** The majority of 226 respondents were  $\leq 15$  years of training (156,69%), practiced in academics (183,82%) and devoted more than 50% of their practice to hepatobiliary (169,75%). Most had completed fellowship training (Hepatobiliary-74%, Surgical Oncology-39% and Transplant-39%). Surgeons utilize CT (45%) or MRI (47%) for preoperative planning with recent imaging ( $< 6$  weeks) prior to surgery. Nearly all surgeons have experienced dCRLM (99%) and 63%(143) of surgeons have waited a few months to assess for a durable response prior to definitive surgical/ablative therapy. Interestingly, 24% of surgeons surveyed place fiducials for lesions  $< 1$ -cm prior to neoadjuvant chemotherapy. Intraoperatively, 97% of surgeons perform ultrasound, and 71% ablation. When a tumor has “disappeared,” 49% elect for observation and 31% resect if the dCRLM is superficial. Of those electing observation, 87% believe there is effective treatment possible with progression on surveillance imaging.

**Conclusion:** While nearly all surgeons experienced dCRLM, half elect for observation with the belief that there remains an opportunity to re-address these lesions in the future.

#### PL01-39

### TUMOR PROGRESSION MOLECULAR PATHWAYS AFTER ALPPS AND CONVENTIONAL TWO-STAGE HEPATECTOMY IN PATIENTS WITH COLORECTAL LIVER METASTASES

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In multiple and bilobar colorectal liver metastases (CRLM), ALPPS achieves faster liver regeneration than Two-Stage hepatectomy (THS) with a lower drop-out for tumor progression. It is currently unknown if the inflammatory phenomena related to very accelerated regeneration lead to an increase of oncogenesis. The aim was to analyze the gene expression profiles of CRLM tumor progression in patients undergoing both techniques.

Between 2011 and 2019, tumor progression was analyzed in biopsies of the removed liver metastases by T-ALPPS (n=22) and compared with those by TSH between 2000 and 2011 (n=21). Samples were stained with specific antibodies to establish several tumoral progression and immunity factors.

Between stage 1 and 2 there were no significant differences in any of the tumor progression factors in the T-ALPPS, while in TSH there was a significant increase of Ki 67 (p=0.003) and FOXP3i (p=0.003) and a decrease of T-CD8i (p=0.021). In stage 1 of both techniques, T-ALPPS had a higher Ki 67 (p<0.001), CD68i (p<0.001) and FOXP3i (p = 0.007) while TSH had a higher CD 44 (p<0.001). In stage 2, T-ALPPS had a higher Ki 67 (p<0.001), CD68i (p<0.001), T -CD8i (p= 0.035) and FOXP3i (p = 0.001) while TSH had a higher CD 44 (p = 0.001) and (p<0.001).

The proliferative stimulus induced by the T-ALPPS technique, despite the proliferation of subpopulation intratumoral stem cells that could explain the tumor progression in some cases, does not seem to significantly influence tumor progression in itself, unlike what does occur in TSH.

#### PL01-40

### A COMPOSITE SCORE TO PREDICT SURVIVAL IN PATIENTS UNDERGOING RESECTION BECAUSE OF COLORECTAL LIVER METASTASES (CRLM)

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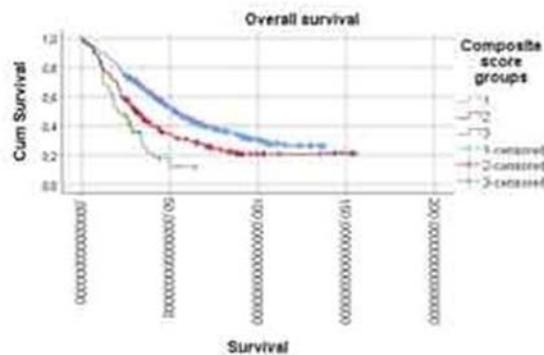
**Introduction:** Several scoring systems exist to predict survival in patients with CRLM. Many of these, however, are cumbersome, and do not take into account the role of inflammation and recent treatment strategies. Thus there is

a need for an up-to-date robust prognostic model to predict overall survival in these patients.

**Method:** Data on patients that underwent liver resection for the first time because of CRLM between 2005 and 2015 at two hepatobiliary centers were included. Univariable and multivariable analyses were performed, and a Cox regression model was developed.

**Results:** In total 849 patients were included. Predictive factors included age > 70 years, per-operative ablation, extended and two-stage resections, as well as a high Glasgow Prognostic Score (GPS), and a Tumour Burden Score (TBS). No correlation between GPS and TBS was observed (Spearman,  $r=0.168$ ). Based on the predictive factors, GPS and TBS a Composite Score was developed, which classified patients into separate cohorts. Survival differences between the cohorts were significant, and outperformed both GPS and TBS. Median overall survival according to the Composite Score was: 1 = 53 months, 2 = 31 months and 3 = 20 months.

**Conclusion:** The Composite Score offers a good prognostic tool in the assessment of overall survival in patients undergoing resection after CRLM. Notably, the model identifies a group (Composite score 3), which may not benefit from surgery since it performs worse than the median estimated survival in palliative patients with CRLM. The model is currently undergoing external validation.



Overall Survival

#### PL01-41

### LONG-TERM SURVIVAL AFTER LIVER RESECTION FOR COLORECTAL LIVER METASTASES: A RETROSPECTIVE SINGLE-CENTRE STUDY WITH 10-YEAR FOLLOW-UP

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**Introduction:** Hepatic resection is the curative treatment for colorectal liver metastases (CRLM). The reporting of 10-year survival data is important for assessment of cure rates, frequency and outcomes of late recurrences. The aim of this study was to assess ten-year survival of patients undergoing liver resection at a single centre.

**Methods:** Liver resections for CRLM performed between 1995 and 2008 with follow-up to 2018 were retrospectively reviewed. Demographic, clinicopathological and survival data were analysed. The Fong clinical risk score was dichotomised into low (0-2) and high (3-5) risk and ten-year survival was the primary outcome measure. Kaplan Meier curves and Cox regression were used to analyse factors associated with 10-year survival.

**Results:** A total of 1120 patients underwent liver resection for CRLM. The median age was 68 (range 23-91) years. Synchronous disease was present in 50%, with 56% of patients having adjuvant chemotherapy after primary colorectal cancer resection. 29.4% had a high Fong score (3-5) with 15.4% of patients having repeat liver resections for recurrent metastases. The median post-operative survival was 2 years. Overall ten-year survival was 12.3%. Fong risk classification had a statistically significant association ( $p=0.006$ , 95% CI 0.706 - 0.943) with ten-year survival. 2.6% ( $n=29$ ) of patients with Fong score 3-5 were alive at 10 years.

**Conclusion:** In this single center analysis the ten-year survival rate for resection in CRLM was 12.3%. Patients with high Fong clinical risk score have poorer long-term outcomes. Therefore, further trials are required to assess the benefit of additional treatment such as chemotherapy.

#### PL01-42

### FRAILTY AS A PREDICTOR OF POSTOPERATIVE MORBIDITY AND MORTALITY FOLLOWING LIVER RESECTION

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**Background:** Frailty, defined as a state of decreased physiologic reserve, characterized by a loss of resiliency in the face of acute stress is a condition frequently encountered by liver surgeons. We sought to evaluate frailty as a predictor of postoperative complications following liver resection using the modified frailty index (mFI).

**Methods:** This retrospective cohort study follows consecutive adult patients undergoing liver resection between 2011 and 2018 at a single academic institution. An mFI consisting of 11 variables adapted for the NSQIP database from the Canadian Study of Health and Aging Frailty Index was used. Patients were stratified as high mFI ( $\geq 0.27$ ) and low mFI ( $< 0.27$ ).

**Results:** Among 409 liver resections, 58/409(14%) patients had a high mFI. Low mFI patients were significantly younger (63vs.70 years,  $p<0.001$ ) and more likely to meet  $>4$  METS(90%vs.60%,  $p<0.001$ ). Median length of hospital stay was significantly longer for the high mFI group (9.5 vs. 5days,  $p<0.001$ ). Patients with a high mFI had a significantly higher proportion of postoperative complications (79%vs.46%,  $p<0.001$ ). This was true for minor complications, major complications and 90-day postoperative mortality. Longer operating time, per 30-minute increase (OR=1.15, 95%CI[1.03 to 1.27]), higher number of liver segments resected (OR=1.43, 95%CI 1.12 to 1.82), and high mFI, per unit increase (OR=6.74, 95%CI

[2.76 to 16.51]) were independent predictors for the development of major complications and 90-day mortality. **Conclusion:** The mFI predicts postoperative outcomes following liver resection and can be used as a risk stratification tool for patients being considered for surgery.

PL01-43

### EARLY RESULTS OF LIVER RESECTION AND ROLE OF EXTENDED HISTOLOGY (LIRECH) STUDY

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**Introduction:** Positive margin of the resected colorectal liver metastases (CRLM) is an independent negative prognostic factor. However, liver resection involves an unaccounted 5-6mm tissue loss due to the use of energy devices or CUSA. The aim of this study is to assess the correlation between the margin status on the specimen side (R1s) and that from the patient side (base of resection) (R1p) and its influence on the outcomes.

**Methods:** In this prospective study, patients over 18 years undergoing resection of CRLM (< 5cm), with suspected close resection margins were included. Sample from resection base was collected using CUSA for the evaluation of R1p. Primary outcome was the correlation of R1s and R1p. Secondary endpoints were the rates of local recurrence, liver specific recurrence, overall morbidity, and post-operative hospital stay.

**Results:** 45 specimens and the corresponding CUSA samples from the base from 26 patients were analysed. 82% patients received neo-adjuvant chemotherapy. RAS mutation was positive in 14% of patients. Among the 45 specimens, 28(62%) had margin clearance of < 1mm, 1-4mm in 15%, 5-6mm in 13%, >9mm in 20%. However, only 5/28(17%) had tumour cells on the patient side (R1p). Overall, one patient had liver specific recurrence at 8 months. None of the others had local recurrence. Median post-operative hospital stay was 6.4 days.

**Conclusion:** Early results of this on-going study suggest poor correlation between R1s and R1p. Confirmation of the results from larger cohort might help in patient counselling, surveillance, and in pre-operative planning of the resection of bilobar metastases.

PL01-44

### SURGERY FOR SYNCHRONOUS COLORECTAL LIVER METASTASES IN 233 CONSECUTIVE PATIENTS: WHICH ONE OF THE THREE DIFFERENT STRATEGIES?

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**Introduction:** This study aimed to investigate the surgical management and outcome of patients with primary colorectal cancer (CRC) and synchronous colorectal liver metastases (SCLM).

**Method:** Consecutive patients undergoing surgical treatment of CRC and SCLM between 2000 and 2019 were identified retrospectively from a prospectively collected database. Three surgical strategies were followed: the simultaneous resection (SR), the colorectal-first (CRF) and the liver-first (LF) approach.

**Results:** Of 233 patients, SRs were performed in 83 (35.6%) patients. CRF was used in 136 (58.4%) patients and 14 (6.0%) patients underwent LF.

Overall morbidity was present in 102 (43.75%) patients and did not reach statistical significance among approaches.

Bleeding grade B/C was observed in 30 (12.9%) patients. The difference among approaches ((9.6%), 17 (12.5%) and 5 (35.7%)) reached statistical significance (P=0.026). Liver failure grade B/C was observed in 24 (10.3%) patients. The difference among approaches (5 (6.0%), 14 (10.3%) and 5 (35.7%)) was statistically significant (P=0.003).

Mortality included 8 (3.4%) patients; 1 (1.2%) in SR, 3 (3.7%) in CRF and 2 (14.3%) in LF (P=0.044).

On the overall survival analysis, the SR approach has statistically significantly (P=0.006) longer survival (48.5 months vs. 32.7 months in CRF or 23.8 months in LF).

**Conclusions:** treatment strategy should be patient-tailored. SR is feasible when both diseases require limited surgical procedures. CRF is recommended when concurrent major hepatectomy and colorectal resections may increase post-operative morbidity and mortality. LF approach diminishes the risk of metastatic progression during the treatment of the CRC.

PL01-45

### CONCURRENT HEPATIC AND RENAL METASTASES OF A MENINGEAL HEMANGIOPERICYTOMA: A CASE REPORT AND REVIEW OF THE LITERATURE

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**Introduction:** Hemangiopericytoma (HPC) is a rare phenotype of solitary fibrous tumors. While local recurrence and metastasis is common, concurrent renal and hepatic lesions have seldom been reported. We present the rare case of a patient with both renal and hepatic metastatic HPC, 14-years following successful meningeal HPC resection.

**Case Presentation:** A 65-year-old female with history of a meningeal HPC resected in 2005, presented to her PCP in 2019 with complaints of persistent epigastric pain. Abdominal CT demonstrated a large hypervascular mass in both the left kidney and left lobe of the liver. Biopsy of the liver mass was consistent with metastatic HPC. Left hepatectomy and left nephrectomy were performed. Final pathology demonstrated a 7.5 x 7 x 6 cm well-circumscribed mass in the left kidney and an 18 x 15 x 10.5 cm well-circumscribed mass with central necrosis and hemorrhage

of the left liver. Immunohistochemistry for STAT6 was performed on both lesions and confirmed the diagnosis of HPC.

**Conclusion:** This case was unique due to the simultaneous extramedullary metastases involving both the kidney and the liver. To our knowledge, there have only been two other reported cases of HPC presenting with simultaneous hepatic and renal metastases. This case highlights the importance of ongoing research regarding optimal treatment strategies and effective surveillance of patients with HPC, given the potentially metastatic, complex, and recurrent nature of the disease.

#### PL01-46

### UTILIZATION AND IMPACT OF SURGICAL TREATMENT OF STAGE IV PANCREATIC DUCTAL ADENOCARCINOMA: AN ANALYSIS OF THE NATIONAL CANCER DATABASE

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**Introduction:** Patients with liver-only metastatic pancreatic adenocarcinoma (PDAC) have traditionally been offered palliative chemotherapy alone. Recent institutional studies have explored the role of surgical resection among patients with limited metastatic disease. National practice patterns and the impact of surgery among these patients remains unknown.

**Methods:** The National Cancer Database was queried for all patients with PDAC between 2010-2015. The primary outcome was overall survival from the time of diagnosis.

**Results:** We identified 312,426 patients who met the study criteria. One-half of patients (n=140,043, 50.4%) had stage IV disease. Patients with stage IV disease were more likely to be younger (OR 1.31, 95%CI: 1.29-1.33; P< 0.001) and have poorly (OR 2.16, 95%CI: 2.07-2.27; P< 0.001) or undifferentiated (OR: 2.20, 95%CI: 1.99-2.44; P< 0.001) tumors. Among stage IV patients with liver-only metastatic disease (n=46,542, 14.9%), 891 patients (1.9%) underwent pancreatic resection. Patients who underwent resection were more likely to be younger (OR 1.87, 95%CI: 1.57-2.22; P< 0.001) and treated at an academic/research center (OR 1.81, 95%CI: 1.34-2.45; P< 0.001). Median OS among patients who underwent resection was 10.74 months versus 3.4 months among patients who did not undergo resection. Patients who underwent surgical resection had a lower risk of death than those who did not undergo surgery (HR: 0.57, 95% CI: 0.50-0.64; P< 0.001).

**Conclusion:** Surgical resection in patients with liver-only metastatic PDAC is associated with improved overall survival. Further studies are needed to identify which patients benefit the most from surgical resection for liver-only stage IV PDAC.

#### PL01-47

### IS A R0 RESECTION ALWAYS THE AIM IN RESECTION OF COLORECTAL LIVER METASTASIS?

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**Introduction:** Colorectal cancer is the 3<sup>rd</sup> most common cancer in the UK, with up to 50% developing colorectal liver metastases (CRLM). When suitable, surgical resection of CRLM offers a five year survival of 35%-58%. Evidence remains equivocal regarding a superior surgical technique for resection or if synchronous colon and liver resections show more favourable results. Resection margin status is important, with recent evidence suggesting that an R1 resection often reflects more aggressive tumour biology.

**Methods:** A retrospective review of a prospectively maintained database of a single UK regional HPB centre, plus electronic patient records, for a two year period between 2014-2015 was undertaken. Reported outcomes included surgical approach, resection margin status and survival.

**Results:** Four consultants undertook 86 resections. 76% were men with a mean age of 66 years. 48% received neoadjuvant and 49% received adjuvant chemotherapy. 43% were laparoscopic. 13% were synchronous resections with the colorectal primary. 65% were parenchymal sparing resections. 17% were R1 resections: 57% of open, 36% of laparoscopic, 33% of synchronous. Overall five year survival 42%. R1 resections mean survival was 859 days versus 1733 days for R0.

**Conclusion:** Despite small numbers, outcomes show a comparable overall five year survival rate to the literature. The majority of resections were open, with the highest R1 resection rate which probably reflects more complex disease. However, there appears to be a survival benefit of 2.4 years despite R1 resection. More data is required prior to commenting on the benefit of synchronous colon and liver resections.

#### PL01-48

### IGFBP7 AND POSTN ARE PROGNOSTIC BIOMARKERS IN THE CANCER ASSOCIATED STROMA OF COLORECTAL LIVER METASTASES

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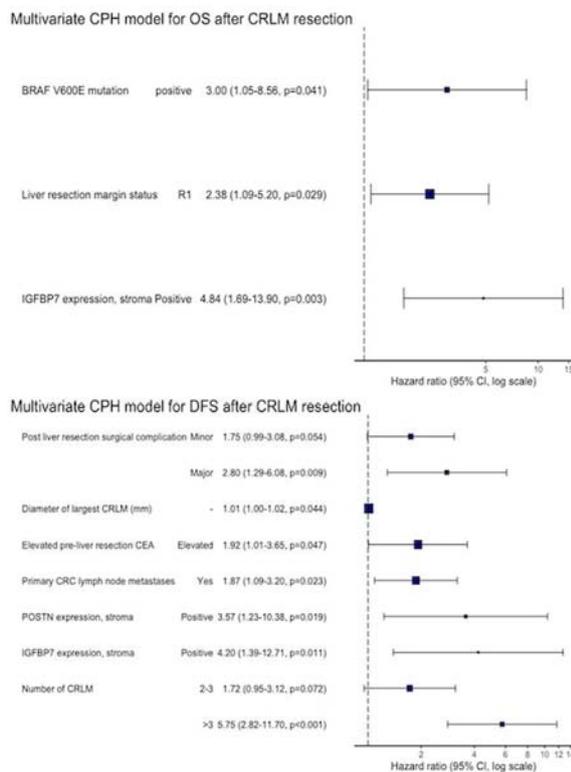
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**Introduction:** Cancer associated stroma (CAS) is emerging as a key determinant of metastasis in colorectal cancer (CRC). A handful of proteins including CALD1, IGFBP7, POSTN, FAP, TGF- $\beta$  and pSMAD2 from stromal gene signatures have been purported as prognostic after resection of primary CRC, however very little is known about the role of CAS in colorectal liver metastases (CRLM). This study aimed to assess the prognostic significance of the above stromal biomarker panel in CRLM.

**Method:** A retrospective analysis of a prospectively maintained database was performed. Epithelial and stromal CALD1, IGFBP7, POSTN, FAP, TGF- $\beta$  and pSMAD2 expression was assessed by immunohistochemistry (IHC) on tissue microarrays. Multivariate Cox proportional hazards models were used to determine the prognostic value of the IHC stromal biomarker panel for predicting overall (OS) and disease-free survival (DFS) following CRLM resection.

**Results:** 124 CRLMs included in the IHC analysis. Median follow up in months was 45 months. Median and 5-year survival were 101 months and 65%, and 23 months and 34%, for OS and DFS, respectively. Multivariate hazards ratio plots for DFS and OS are shown below. After CRLM resection, stromal IGFBP7 was an independent predictor of poorer DFS and stromal IGFBP7 and POSTN were independent predictors of poorer OS.

**Conclusions:** This study has identified two novel prognostic stromal IHC biomarkers in CRLM that may be easily translated to the clinic. Furthermore, as POSTN has a number of inhibitors in pre-clinical evaluation, further studies are warranted investigating POSTN as a putative therapeutic target in CRLM.



Hazard ratio plots for multivariate models of OS and DFS following CRLM resection

## PL01-49 SURVIVAL BENEFITS AND MARGIN OF LIVER METASTASECTOMY IN COLORECTAL LIVER METASTASIS

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**Background:** Association between resection margin of hepatic resection for colorectal liver metastasis and survival outcome remains controversial. While a margin of 10mm had been the traditional standard, several studies had been published in the past with conflicting results.

**Method:** This is a retrospective review of 385 patients who underwent liver resection for colorectal liver metastasis in a single centre from 2000-2017. Survival data were correlated with demographics, liver resection margin, KRAS status, CEA levels and analysed for statistical significance using long-rank test and cox regression with multivariate analysis.

**Result:** There is statistically significant association between the width of liver resection margin and both overall and disease free survival. Microscopic margin of greater than 10 mm is associated with significant benefit in both disease free (9.8 vs 15.8 months  $P=0.001$ ) & overall survival (43.9 vs 58.9 months  $P=0.012$ ). Cutoff for free resection margin beyond 14mm did not correlate with significant difference in survival. The other factors associated with survival benefits was CEA less than 5 on admission (95%CI 0.53-0.92  $p=0.01$ ).

**Conclusion:** Liver resection margin of greater than 1mm is an independent predictor of increased disease free survival. There is clinically and statistically significant improved survival if liver resection margin of greater than 10mm can be achieved.

## PL01-50 EFFECT OF QUEMOTHERAPY AND TUMOR CLEARANCE IN HEPATIC RESECTIONS FOR COLORECTAL LIVER METASTASES

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**Background:** Colorectal cancer is the third most common cancer, and the second leading cause of cancer-related deaths. Up to 50% of patients with CRC will develop synchronous (10-20%) or metachronous (20-30%) CRLM. Currently, liver resection is the gold standard treatment for CRLM improving the prognosis significantly. Despite this, more than 50% of patients undergo recurrences after liver resections, most of them within the first 24 months after surgery.

**Objective:** To describe rates and patterns of recurrence following liver resections for CRLM at The Queen Elizabeth Hospital, Adelaide as well as characterize clinical, pathological and treatment-related factors that could work as predictors of recurrence and survival.

**Methods:** Retrospective analysis of a prospectively collected data base of 170 patients who underwent liver resections for CRLM at The Queen Elizabeth Hospital (Adelaide, Australia) between 2004 and 2017.

**Results:** The incidence rate was 49,4% (84 of 170 patients), and the recurrences occurred mainly during the first year after the resective procedure (average 359 days). The interrecurrence of perioperative chemotherapy was

associated with a higher recurrence rate and a lower survival time in the univariate and multivariate analysis. The benefit of a margin resection greater or equal to 1mm was established. The other studied variables showed no statistical association.

**Conclusion:** Despite the development of better diagnostic and therapeutic techniques for CRC and CRLM, its recurrence rate continues to be high and the survival time low. The role and impact of perioperative chemotherapy must continue to be studied in order to improve therapeutic outcomes for CRLM.

#### PL01-51

### IMMUNE PROFILING OF HISTOLOGIC GROWTH PATTERNS OF COLORECTAL LIVER METASTASES: SPATIAL DISTRIBUTION AND PHENOTYPING OF T LYMPHOCYTES, CYTOTOXIC T CELLS AND TISSUE-RESIDENT MEMORY T CELLS

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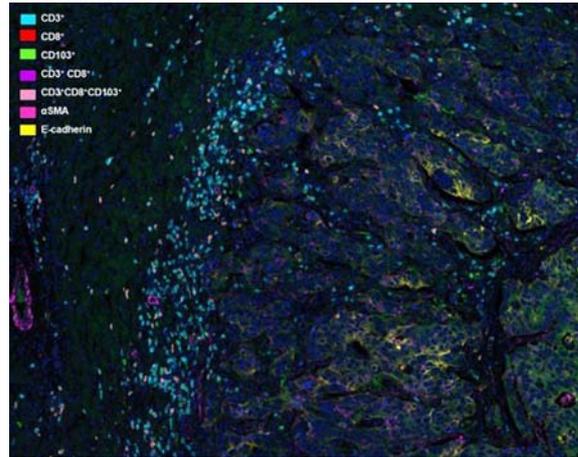
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**Introduction:** The nature of the of Colorectal Liver Metastases (CRCLM) display mainly three distinct histologic growths patterns that impact on disease progression and patient outcome after surgical resection. However limited studies indicate that immune cell infiltration is dictated by the CRCLM growth pattern.

**Methods:** 22 CRCLM specimens were assessed by histological evaluation, and Multiplex Immunohistochemistry (OPAL<sup>TM</sup>) was used to examine density and distribution of T lymphocytes (CD3<sup>+</sup>), cytotoxic T cells (CD3<sup>+</sup>CD8<sup>+</sup>), resident memory T cells (CD3<sup>+</sup>CD8<sup>+</sup>CD103<sup>+</sup>)(T<sub>RM</sub>). Cell phenotyping algorithm was performed using inForm® software v3.5. The tissue segmentation algorithm determined the adjacent liver parenchyma (LP), invasive tumor margin (IM) and tumor core (TC) regions.

**Results:** Histological evaluation of the 22 CRCLM specimens defined 7 desmoplastic, 8 replacement and 7 pushing growth patterns. The evaluation of the entire cohort of CRCLM showed that the spatial distribution total T lymphocytes as well as cytotoxic and T<sub>RM</sub> were found in significantly higher levels at the IM when compared with LP or TC. There was no significant difference between the IM and TC in the T lymphocytes cell count displayed by replacement pattern, whereas the desmoplastic and pushing pattern showed higher accumulation in the IM compared to the TC. The highest cell count of cytotoxic T cells occurred in the IM for all three growth patterns but only significantly different from the TC in the desmoplastic and pushing pattern.

**Conclusion:** This study unveiled the spatial variation of immune profiles according to histologic growth patterns of CRCLM using a powerful systematic imaging approach.



Multiplex Immunohistochemistry defines immune profile of histologic growth patterns of CRCLM

#### PL01-52

### ROLE OF TUMOR BORDEN SCORE TO PREDICT THE PROGNOSIS IN PATIENTS RESECTED FOR COLORECTAL LIVER METASTASES AFTER PREOPERATIVE CHEMOTHERAPY

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**Background:** Response of colorectal liver metastasis (CRLM) on preoperative chemotherapy (PreopChT) has been associated with a worse prognosis compared with patients who have responsive disease. Defining response can be challenging as traditional criteria largely assess only tumor size.

**Methods:** Patients who underwent hepatectomy after PreopChT for CRLM in a single institution between 2006 and 2018 were considered. This study aimed to define the role of initial tumor burden score (TBS) and its variations after chemotherapy on long-term outcomes.

**Results:** One-hundred and ninety-nine patients were included in the study. The PreopChT regimen were oxaliplatin (44.3%), irinotecan-based (43.2%) or both (12.5%). Target therapy were used in 61.1% of the patients. The median TBS at diagnosis and after PreopChT were 4.8 (3.2-8.4) and 4.4 (2.9-6.8), respectively. The 5-year OS rate of patients with TBS < 6 and TBS ≥ 6 at diagnosis were 57.8% and 38.7% (p=0.011), respectively. The 5-year OS rate of patients with TBS < 6 and TBS ≥ 6 after PreopChT were 60.1% and 31.5% (p < 0.001), respectively. The 5-year OS rate of patients with Δ-TBS < -20% and Δ-TBS ≥ -20% were 64.3% and 42.8% (p=0.009), respectively. At the multivariate analysis the independent prognostic factors resulted TBS ≥ 6 at diagnosis (HR 1.3, 95%CI 1.1-2.1, p=0.003), Δ-TBS < -20% (HR 1.7, 95%CI 1.4-3.3, p=0.009) and gene mutation of KRAS/RAS (HR 1.9, 95%CI 1.1-3.3, p=0.020).

**Conclusions:** Tumor burden at the diagnosis, variations in tumor burden due to chemotherapy, and tumor molecular profile seems to be the important factors prognostic for stratification of patients with CRLM receiving preoperative chemotherapy.

PL01-54

### CYSTIC LIVER METASTASIS FROM A PANCREATIC ADENOCARCINOMA; A CASE REPORT

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A 75-year-old female was presented to our hospital due to obstructive jaundice. Computed tomography demonstrated a pancreatic head mass that causing common bile duct and intrahepatic duct dilatation without evidence of advanced disease. She was underwent pyloric-preserving pancreatoduodenectomy and they discharge without complication. In operative finding, we found the 1-cm liver cyst at segment 5 and excisional biopsy was done. The pathological report revealed well-differentiated adenocarcinoma of head of pancreas without nodal metastasis and cystic metastasis well-differentiated adenocarcinoma of liver. Then we reviewed the imaging study, it showed a small cystic lesion without enhancing portion at liver segment 5 that mimics intrahepatic duct dilatation and a cystic lesion at segment 6 that previously seen in preoperative imaging study. The patient underwent chemotherapy with Gemcitabine. Six months after surgery, the computed tomography revealed increase sized of cystic lesion at segment 6 and development of ascites. Ten months after surgery, the patient was dead due to severe septicemia from urinary tract infection. The previous study show a range of spectrum of hepatic cystic liver metastasis with histopathologic confirmation of diagnosis.

Although the incidence of hepatic cystic liver metastasis from pancreatic cancer is extremely rare, care should be taken to when a cystic liver lesion was detected with pancreatic cancer.

PL01-55

### SYSTEMATIC REVIEW COMPARING THE EFFECTIVENESS OF ROBOTIC VERSUS LAPAROSCOPIC LIVER SURGERY IN COLORECTAL LIVER METASTASIS (CRLM)

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**Introduction:** Colorectal cancer (CRC) is the third most common cancer in the world. According to Cancer Research UK, 42,000 new cases are diagnosed in the UK every year. The liver is the most common site of metastasis with 15 to 25% of patients presenting with synchronous colorectal liver metastasis (CRLM) at the time of diagnosis. Modern chemotherapy has resulted in improved survival rates. Patients with resectable disease, surgical resection

remain the only potentially curative treatment. This study aimed to evaluate the short and long-term outcomes and directly comparing the effectiveness of laparoscopic and robotic CRLM surgery.

**Methodology:** A literature search was performed and all studies that reported on operative characteristics, oncological outcomes for CRLM, morbidity or mortality and cost effectiveness on robotic or laparoscopic surgery were included. Present study was designed according to the PRISMA guidelines.

**Results:** From the initial 575 manuscripts identified, 17 studies (9 laparoscopic & 8 robotic) were included in the final qualitative synthesis. Our study shows that robotic surgery can be used safely for colorectal liver resections with a limited conversion rate, blood loss, and post-operative morbidity. However, robotic and laparoscopic liver resection displays similar safety and feasibility for CRLM.

**Conclusion:** Experienced Hepatobiliary surgeons can safely perform robotic surgery. Long-term oncological outcomes are unclear, but short-term perioperative results are comparable to those of laparoscopic liver resection. The main drawback of advanced robotic surgery is the associated cost and further studies are needed to clarify the exact role of robotics in liver surgery.

PL01-56

### FOLLOW UP AFTER LIVER RESECTION FOR COLORECTAL LIVER METASTASES - HOW LONG IS LONG ENOUGH?

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**Introduction:** Liver resection for colorectal liver metastases (CRLM) is the most common operation in most liver units in the western world. There is no evidence based guidance on the length of follow up. Like many units, we follow patients for 10 years with yearly CT scans. As recurrences were uncommon after 5 years we analysed our data on timing of recurrence to decide on future follow up protocol.

**Methods:** We performed a retrospective review of a prospectively held database on all patients undergoing liver resection for CRLM at the Cardiff Liver Unit from January 2003 to December 2018 and censored at 30 June 2019 or death. Data on follow up was obtained from electronic databases in Wales and contacting the General Practitioners. We excluded patients who died perioperatively or did not complete a two stage liver resection. In case of recurrence in liver that was resected, time from the last resection was considered.

**Results:** We performed liver resections in 503 patients for CRLM. After the above exclusions there were 486 patients in the study. Male female ratio 324:162, median age 67 (21-93), median hospital stay 7 days (2-216), perioperative mortality 2%. The overall survival at 1,3,5 and 10 years was 93%,69%, 50% and 34%. The median follow up was 3 years (1 month-15 years). No patient developed recurrence at any site after 5 years of follow up.

**Conclusion:** Follow up after liver resection for CRLM for 5 years is adequate and longer follow up may not be cost effective.

PL01-57

### LIVER FIRST APPROACH - COMPARATIVE ANALYSIS OF SURGICAL AND ONCOLOGICAL OUTCOMES USING PROPENSITY SCORE MATCHING

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**Introduction:** Contrary to conventional approach (CA), the liver first approach (L1) to synchronous colorectal liver metastases (sCLRM) warrants hepatic resection prior to removal of the primary source. Such approach facilitates early introduction of systemic therapy and prevent the further spread of the disease. However, there are limited data comparing the outcomes of both approaches.

**Method:** From January 2015 to December 2018, patients who underwent liver resection for sCLRM were screened. Propensity score matching was performed with a 1:1 matching protocol. Log-rank test and Cox proportional hazards model were used in survival analyses, including at least one year follow-up.

**Results:** A total of 223 patients (L1, n= 30; CA, n=193) met the eligibility criteria and finished the follow-up. After matching, 60 patients were included (30 patients for each treatment group). Patient chosen by matching has higher primary disease burden (T3-T4, N1-2) and median of 3 liver metastases (range 1-7). No differences in rates of postoperative complications and mortality were observed. The L1 approach was completed in 22 patients (overall = 80%; 14/16 with unilobar and 8/14 with bilobar presentation). No significant difference was found between the L1 and CA in overall survival (p=0.76) and disease free survival (p=0.42). In 20% (n=6) of patients in L1 and 27% (n=8) in CA who completed the treatment recurrent disease was observed at the time of the last follow-up.

**Conclusions:** Comparable in oncologic outcomes to conventional approach, liver first is beneficial in a subgroup of patients with advanced primary disease and unilobar presentation of sCLRM.

PL01-58

### SOCIOECONOMIC DEPRIVATION DOES NOT AFFECT SHORT OR LONG TERM OUTCOMES AFTER LIVER RESECTION FOR COLORECTAL LIVER METASTASES

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**Introduction:** Socioeconomic deprivation (SED) is a well documented factor in poor outcomes following treatment

for many primary cancers. We sought to examine if this is true for liver resections for colorectal liver metastases (CRLM).

**Methods:** We did a retrospective study on a prospectively held database at Cardiff Liver unit on all patients having liver resections for CRLM between January 2013 and December 2018. Data was censored at 30 June 2019 or death. Demography, ASA status, length of stay, morbidity, mortality, margin status, vascular and bile duct invasion, tumour burden score and deprivation status (using Welsh Index of Multiple Deprivation (WIMD) recorded. WIMD 1 is most deprived and 5 least deprived. We combined the quintiles 1&2 and 3&4 to compare deprived vs non deprived patients.

**Results:** 337 resections were performed in 275 patients. Males 66%. Median age 66(21-93), median hospital stay 7 days (2-216) and 90 day mortality of 2.4%. The overall survival(OS) was 90%, 70% and 52%. There was no difference in the baseline characteristics between the most (Q1&2) and least(Q3&4) deprived patients. The OS at 1,3,5 years for most and least deprived were 90%, 69%, 45% and 96%,72% and 60% respectively (P=0.26). There was no difference in the hospital stay, morbidity and mortality between the two groups. Only tumour burden and two stage procedure led to significantly poorer long term outcome.

**Conclusion:** SED does not appear to affect OS after liver resection for CRLM. However, this needs to be confirmed in a larger cohort to avoid Type II error.

PL01-59

### PERIOPERATIVE AND LONG-TERM OUTCOMES OF LAPAROSCOPIC LIVER RESECTIONS FOR NON-COLORECTAL LIVER METASTASES

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**Introduction:** The aim of this study was to analyze the outcomes of patients undergoing laparoscopic liver resection (LLR) for non-colorectal liver metastases (NCRLMs).

**Method:** From a prospectively maintained database between 2000 and 2018, patients undergoing LLR for colorectal liver metastases (CRLMs) and NCRLMs were selected. Clinicopathologic, operative, short and long-term outcome data were collected, analyzed and compared among patients with CRLMs and NCRLMs.

**Results:** The primary tumor was colorectal in 354 (82.1%), neuroendocrine in 21 (4.9%) and non-colorectal, non-neuroendocrine in the remaining 56 (13%) patients. Major postoperative morbidity was 12.7%, 19% and 3.6 %, respectively (p=0.001), whereas the mortality was 0.6% for patients with CRLMs and zero for patients with NCRLMs. According to the survival analysis, 3- and 5-year recurrence-free survival (RFS) rates were 76.1% and 64.3% in CRLMs group, 57.1% and 42.3% in neuroendocrine liver metastases (NELMs) group, 33% and 20.8% in non-colorectal, non-neuroendocrine liver metastases (NCRNELMs) group

( $p=0.001$ ), respectively. Three and 5-year overall survival (OS) were 88.3% and 82.7% in CRLMs group, 85.7% and 70.6% in NELMs group, 71.4% and 52.9% in NCRNNELMs group ( $p=0.001$ ), respectively. In total, 31.9% of patients with CRLMs, 9.5% with NELMs and 14.3% of patients with NCRNNELMs underwent repeat LLR for recurrent metastatic tumors. **Conclusions:** LLR is safe and feasible in the context of a multimodal management where an aggressive surgical approach, necessitating even complex procedures for bilobar multifocal metastases and repeat hepatectomy for recurrences, is the mainstay and may be of benefit in the long-term survival, in selected patients with NCRNNELMs.

#### PL01-60

### FAILURE TO CURE COLORECTAL LIVER METASTASES PATIENTS QUANTIFIED - THE IMPACT OF THE LIVER SURGICAL SPECIALIST

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**Background:** Lack of Liver surgical specialist (LSS) may lead to a failure-to-cure in patients with possibly resectable CRLM. This study aimed to quantify the failure to cure rate due to non-inclusion of LSS.

**Patients and methods:** All patients who underwent chemotherapy with palliative intent for CRLM at a community oncology network between 2014-2018 were identified from a prospectively maintained cancer registry. Two LSS blinded towards patient management and outcome, reviewed pretreatment imaging and assigned each scan a newly developed resectability score. Nominal Group Technique and independent scores were combined to determine feasibility of curative intent resection. Inter-observer agreement was calculated using Kappa testing.

**Results:** This study included 49 palliative CRLM patients. Demographic factors were: 29 (59%) male, median age 68 (IQR 58-75), 9 (18%) rectal primary, 22 (70%) receiving oxaliplatin-base chemotherapy. Of 45 (91%) with CRLM, 3 had left-sided metastases only. The median number of CRLM was 8 (IQR 2-8). Agreement on resectability was 21 patients (45%). A lower median number of CRLM was found in the group considered to be resectable by LSS (2 vs 8;  $p=0.001$ ). Of those, 6 had lung metastases and 1 peritoneal carcinomatosis. Of the unresectable patients, 10 had unresectable lung metastases with associated other metastases. Substantial agreements was found between liver surgeons (Kappa=0.814).

**Conclusion:** 45% of patients with tumors deemed unresectable by non-LSS providers were considered potentially resectable upon independent liver surgeon review. Despite the rapid evolution of the systemic treatment for CRLM, inclusion of a LSS may result in the highest immediate impact on cure rate.

#### PL01-62

### REVERSE ALPPS ON MAKUUCHI VEIN AFTER COMBINED SYSTEMIC AND LOCAL CHEMOTHERAPY: COMPOUND EXISTING CRLM MANAGEMENT TECHNIQUES TO ACHIEVE SURGICAL RESECTABILITY

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**Aims:** The main aim of this report to show how incorporation of different techniques in CRLM management has created an opportunity for the resection of locally advanced hepatic tumors formerly considered unresectable.

**Materials and methods:** The current study reports the case of a 38 year-old patient with synchronous CRLM involving all three hepatic veins initially deemed unresectable. The patient developed systemic chemotherapy with molecularly targeted therapy and selective transarterial chemo-embolization during 12 months. Subsequent imaging demonstrated a decrease in tumor size with unchanged involvement of the major hepatic veins. However, a right accessory hepatic vein (Makuuchi vein) remained free of disease. Left trisectionectomy by reverse-ALPPS technique with right accessory hepatic vein preservation has been performed.

**Results:** The patient was discharged on POD 14. At the most recent follow-up (23 months), he had presented without evidence of disease.

**Conclusions:** Isolated CRLM where surgical resection is first-line treatment, technical advances and surgical innovations can expand the spectrum of curative interventions. Meantime in patients as was presented only the combination of cross-disciplinary techniques may transform primary irresectability. In this report, the simultaneous utilization of non surgical therapies and advanced surgical skills enabled resection for patients with complex tumors.

#### PL01-64

### INTRA-ARTERIAL LIVER ISOLATION CHEMOTHERAPY VIA AN IMPLANTABLE VASCULAR ACCESS DEVICE TO FACILITATE REPEATED VASCULAR ACCESS FOR PATIENTS WITH HEPATIC METASTASES FROM COLORECTAL CANCER (THE SYS-CAPLIOX TRIAL)

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**Introduction:** The SYS-CAPLIOX trial uses an implantable vascular access device (AVAS®) for repeated liver

isolation intra-arterial oxaliplatin (LIOX) for patients with inoperable colorectal cancer with liver metastases (CRCLM). Similar to selective internal radiation therapy (SIRT), transarterial chemoembolization (TACE) and hepatic arterial infusion (HAI), the LIOX technique negates repeated vascular puncture and has reduced surgical morbidity and systemic leak.

**Methods:** Using standard endovascular techniques with balloon catheters, the AVAS allows simultaneous multi-catheter access into the arteries to administer intra-arterial infusion with the blood supply to the liver temporarily obstructed. The portal flow is indirectly obstructed via the coeliac axis and superior mesenteric arterial balloons while the venous outflow via positive-end-expiratory-pressure.

**Results:** The technique has previously been shown to be safe and feasible in a pilot study treating 10 patients in a salvage setting, with progressive disease, stable disease, and partial response seen in 4,3, and 3 patients respectively. With EU and TGA regulatory approval, the device has been implanted off-trial in a patient with inoperable CRCLM with no adverse device effect, malfunction or use error. The patient received 5 LIOX infusions after which the device was successfully explanted.

**Conclusion:** SIRT, TACE, and HAI lack of control of the portal flow can lead to significant washout of the infused agents into the pulmonary and systemic system. The LIOX treatment allows for the full absorption of anti-cancer agents that may be thwarted by intravenous administration.

The device is currently available for trial and off-trial use. The trial is registered (ACTRN12617001268336) and commenced recruitment in November 2019.

## PL02 - Liver: Primary Tumours

### PL02-02

#### ASPARTATE TRANSAMINASE TO PLATELET RATIO INDEX (APRI) AND ALBUMIN-BILIRUBIN GRADE (ALBI) PREDICT POSTOPERATIVE MORBIDITY FOLLOWING HEPATECTOMY FOR HEPATOCELLULAR CARCINOMA: A MULTICENTER COHORT STUDY

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**Background and aims:** Postoperative morbidity following hepatectomy remains high, and understanding its risk factors is important to improve perioperative outcomes. We aimed to identify the role of two non-invasive markers - albumin-bilirubin (ALBI) and aspartate transaminase to platelet ratio index (APRI) - in predicting postoperative morbidity following hepatectomy for hepatocellular carcinoma (HCC).

**Methods:** A multicenter data of patients undergoing hepatectomy for HCC at 8 centers were retrospectively analyzed. These patients were divided into normal and high groups according to preoperative ALBI and APRI scores. ALBI and APRI's predictive accuracy of postoperative 30-day overall and major morbidity were evaluated by the area under the receiver operating characteristic curve (AUC) and compared with two conventional scores: Child-Pugh grade and model for end-stage liver disease (MELD).

**Results:** In 2,301 patients, 866 (37.6%) and 400 (17.4%) were in the high ALBI and APRI groups, respectively. There were significant differences of postoperative overall morbidity between the normal and high ALBI groups (26.2% vs. 40.1%,  $P < 0.001$ ), as well as between the normal and high APRI groups (29.2% vs. 42.4%,  $P < 0.001$ ). The AUCs of the ALBI and APRI scores for predicting overall morbidity are greater than those of Child-Pugh grade and MELD score. Multivariable analyses revealed that ALBI and APRI were independent predictors of overall morbidity in both preoperative and postoperative prediction models. Similar results existed in predicting postoperative major morbidity.

**Conclusion:** Preoperative ALBI and APRI could predict postoperative 30-day overall and major morbidity following hepatectomy for HCC before or after surgery.

Figure. Receiver operating characteristic (ROC) curves of ALBI, APRI, Child-Pugh grade and MELD score for predicting postoperative 30-day major morbidity after hepatectomy for hepatocellular carcinoma. (AUC, Area under the curve of ROC; CI, Confidence interval)

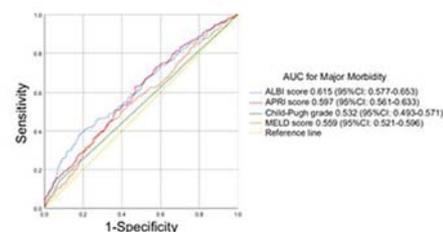


Figure. AUC for Major Morbidity

### PL02-03

#### SYSTEMATIC REVIEW OF THE ROLE OF HIGH INTENSITY FOCUSED ULTRASOUND (HIFU) IN TREATING CANCEROUS LESIONS OF THE HEPATOBIILIARY SYSTEM

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**Introduction:** High intensity focused ultrasound (HIFU) is an emerging minimally invasive, targeted treatment of malignancy. This review aims to explore the efficacy, safety and optimal technical parameters of HIFU to treat cancerous lesions of the hepatobiliary system.

**Methods:** A systematic search of the English literature was performed until December 2018, interrogating Pubmed, Embase and Cochrane Library databases. The following key-words were input in various combinations: 'HIFU',

'High intensity focussed ultrasound', 'Hepatobiliary', 'Liver', 'Cancer' and 'Carcinoma'. Two reviewers independently screened the abstracts and reviewed full texts of appropriate articles. Extracted content included: Application type, Exposure parameters, Patient demographics, and Treatment outcomes.

**Results:** Twenty-two articles reported on the clinical use of HIFU in 845 individuals to treat cancerous liver lesions. Nineteen series detailed the use of HIFU to treat hepatocellular carcinoma, whilst three covered other hepatobiliary cancers (cholangiocarcinoma, hepatoblastoma). Mean tumour size was 5.1cm. Across all studies HIFU resulted in complete tumour ablation in 51.68%. Data on technical parameters, and procedural structure was very heterogeneous. Eight studies described the use of HIFU alongside other modalities including TACE, RFA and PEI; 58.72% of which resulted in complete tumour ablation. Most common complications were skin burns(17.16%), local pain(5.56%) and fever(1.42%).

**Conclusions:** HIFU is a safe and well-tolerated treatment modality for cancerous lesions of the hepatobiliary system. Combining HIFU with other ablative therapies, particularly TACE, increases the efficacy without increasing complications. Future human clinical studies are required to determine the optimal treatment parameters, better define outcomes and explore the risks and benefits of combination therapies.

PL02-06

### RIGHT HEPATECTOMY EXTENDED TO SEGMENT I WITH PROSTHETIC REPLACEMENT OF THE INFERIOR VENA CAVA DUE TO HEPATOCARCINOMA INVASION

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**Introduction:** Invasion of the inferior vena cava (IVCI) due to hepatocellular carcinoma (HCC) is considered an advanced stage and the proposed treatment is chemotherapy. However, recent studies support radical surgery so their results show longer survivals without major surgical complications.

**Methods:** Case - 62-year-old male with personal history of resection of a malignant melanoma and hepatitis B infection in the past. During the follow-up of the melanoma, a liver mass of 8cm is detected by abdominal ultrasound with normal tumor markers levels. Magnetic resonance verifies a 10cm hepatic mass in segments V, VI, VII and IVCI (Figure A). A liver biopsy reveals HCC.

**Results:** Right hepatectomy extended to segment I, exeresis of retrohepatic IVC and a 22mm Dacron prosthesis replacement was performed in 350minutes. (Figures B,C).

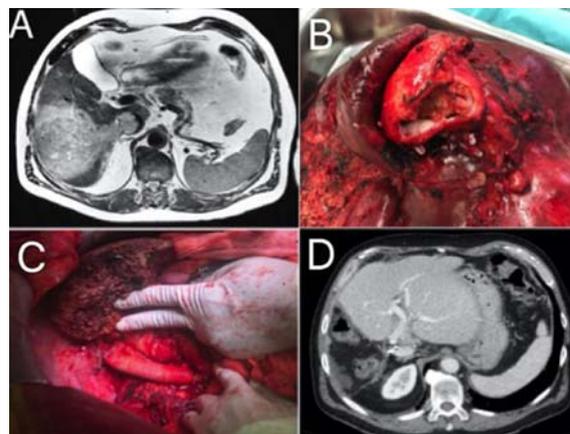
The patient was discharged after 15 days. Ascites was the only postoperative complication. Histopathology: HCC of 13cm and thrombosis of IVC with free margins (>1cm)(pT4).

The disease-free survival and the mean survival to this day were 10.7 and 21 months (Figure D).

**Conclusions:** There is no global consensus about the treatment of HCC with IVCI. The staging system of the Barcelona Clinic Liver Cancer (BCLC) recommends

sorafenib with a survival time < 1 year. In the last published series, mortality of patients with hepatic resection with concomitant IVC replacement is < 10% and most of the complications are managed by medical treatment. Some Japanese series observe a mean survival of 1.48 years, and a 1 and 3 year survival rates of 63.2% and 33.1%, respectively.

In conclusion, surgery with complex vascular resections due to IVCI by HCC can be a therapeutic option in hospitals with high volume of hepatobiliary surgeries.



PL02-08

### CHANGES IN THE PERIPHERAL TREG CELL PROPORTION AND IMMUNE FUNCTION IN HEPATOCELLULAR CARCINOMA PATIENTS AFTER TRANSARTERIAL CHEMOEMBOLIZATION WITH GELATIN SPONGE MICROPARTICLES

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**Object:** Observe the effect of gelatin sponge microparticles-transarterial chemoembolization (GSMs-TACE) on the immune function of patients with liver cancer by detecting the proportion of Treg cells in the peripheral blood.

**Methods:** 28 HCC patients treated with GSMs-TACE were enrolled. Functions of liver and kidney, blood test, alpha-fetoprotein (AFP) and upper abdominal CT plain were examined. Flow cytometry was used to determine the Treg cell proportion in peripheral blood.

**Results:** The efficacy of the GSMs-TACE was confirmed by imaging scan. The Treg cell proportion in the peripheral blood of patients with BCLC stage C was  $11.61 \pm 1.03\%$ , higher than that of stage B patients ( $10.71 \pm 1.52\%$ ;  $P < 0.05$ ); The Treg cell proportion in the AFP positive HCC patients ( $\geq 20$  ng/ml) was  $11.92 \pm 0.80\%$ , which was higher than that in the AFP negative patients ( $9.77 \pm 0.99$ ;  $P < 0.05$ ). We also found that the larger the tumor diameter ( $\geq 8$ cm), the higher the Treg cell proportion in peripheral blood ( $P < 0.05$ ). The Treg proportion of the patients without tumor encapsulation ( $11.77 \pm 1.04$ ) was higher than that of the patients with tumor encapsulation ( $10.51 \pm 1.32$ ;  $P < 0.05$ ). The Treg cell

proportion at 10 days postoperatively was  $8.85 \pm 1.23\%$ , which was significantly lower than that before the GSMs-TACE.

**Conclusion:** These results indicated that the peripheral Treg cell proportion in HCC patients was associated with tumor stage, AFP, tumor size and tumor encapsulation. GSMs-TACE could exert a positive regulatory effect on the anticancer immune function of HCC patients.

#### PL02-10

### STAGING SEVERITY OF LIVER CIRRHOSIS IMPROVES THE STRATEGICAL RATIONALITY OF SURGICAL TREATMENT FOR HEPATOCELLULAR CARCINOMA

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Hepatocellular carcinoma (HCC) commonly occurs in hepatitis-B or C related cirrhotic liver, and cirrhotic severity in term of pathological alternation varies greatly in different individuals even with a compensated liver function. Studies suggested that severe cirrhosis significantly decreased hepatic function reserve and increased tumor occurrence. Unfortunately, there is no staging consideration on cirrhotic severity in all HCC treatment guidelines. In the past decade, we focused on exploring surgical staging of cirrhotic severity and evaluating the long-term survivals of the patients with varied degrees of cirrhosis undergoing various surgical treatment modalities, and proposed a preliminary surgical staging algorithm for cirrhosis. It was found that the cirrhotic severity staging was helpful in selecting suitable surgical modalities (transplant, hepatectomy or ablation) and determining the safe extent of hepatectomy (anatomic or non-anatomic resection). For those with severe cirrhosis, liver transplant is the best choice of treatment for HCC who meets the transplant criteria, however, comparable survivals could also be achieved by hepatectomy in non- or mild-cirrhotic patients. There is a long-standing argument between anatomic and non-anatomic resection in term of effectiveness, if the severity of liver cirrhosis is staged, the argument could be easily settled. For those with severe cirrhosis, if hepatectomy has to be the choice, non-anatomic resection is a rational strategy. Anatomic resection is appropriate in the patients with non- or mild cirrhosis. Taking together, severity of cirrhosis is closely correlated with liver functional reserve and HCC occurrence, severity stages therefore determines the rationality of surgical strategy for HCC.

#### PL02-12

### CLINICAL STUDY ON EFFICACY AND TREG CELL CHANGES IN PERIPHERAL BLOOD OF MASSIVE LIVER CANCER TREATED WITH GELFOAM MICROPARTICLES (GSMs) TACE COMBINED WITH SURGICAL RESECTION

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**Objective:** Observe the clinical efficacy and safety of using absorbable GSMs embolization agent to embolize massive liver cancer, and to observe the changes in the changes of Treg cells in peripheral blood.

**Methods:** During 2018-2019 GSMs-TACE combined with conventional resection of liver cancer treatment of 7 cases of massive liver cancer. GSMs particle of 150-350, mixed with 50 mg doxorubicin, 30 days later underwent conventional surgery. Flow cytometry is used to test the content of Treg cells in peripheral blood before, 10 days after GSMs-TACE and before conventional surgical.

**Results:** The average resection month after GSMs-TACE (14-48 days) was one month in 7 patients, and the volume of tumor necrosis after GSMs-TACE was more than 50%, among which 5 cases were more than 90%. After embolization, the tumor volume decreased by 20.2%, and the right hemihepatic resection was performed in 6 cases and the middle hepatic resection was performed in 1 case. There were no severe complications. The survival rates at 6 months and 12 months after resection were 100% (7/7) and 100% (5/5). The Treg cells in peripheral blood was  $11.72 \pm 0.91\%$ ,  $8.62 \pm 1.43\%$ , and  $10.34 \pm 1.12\%$ , before, 10 days and 30 days after GSMs-TACE.

**Conclusions:** GSMs-TACE combined with surgical resection in the treatment of massive liver cancer has a good safety and clinical efficacy, GSMs-TACE has a positive regulatory effect on the body's immune function. GSMs-TACE 15 to 30 days after surgery is the best time for surgical resection.

#### PL02-16

### SURGICAL TREATMENT OF PATIENTS WITH HYPOGLYCEMIA AS PARANEOPLASTIC SYNDROME ASSOCIATED TO HEPATOCELLULAR CARCINOMA AT THE NATIONAL INSTITUTE OF NEOPLASTIC DISEASES IN LIMA-PERU

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Hypoglycemia associated to hepatocellular cancer is a rare entity. We analyzed the institutional data base of patients with hepatocellular carcinoma with surgical treatment and paraneoplastic hypoglycemia in the department of abdominal surgery of the National Institute of Neoplastic Diseases in Lima-Peru, from January 2001 to December 2018.

The patients' selection was related to hypoglycemia associated to hepatocellular carcinoma and surgical treatment. We collect their clinical (sex, age, glycemia value, severity of hypoglycemia, alpha-fetoprotein level, post-operative glycemia value) and surgical characteristics (tumor size, clinical stage, resection approach, adjuvant treatment, follow up and outcome), 10 cases with paraneoplastic hypoglycemia associated to hepatocellular carcinoma in a period of 17 years, 60% were female, the median age was 32 years, 100% of cases present symptoms of

hypoglycemia, 60% of them had severity grade 3 of hypoglycemia, 20% grade 2 and 20 % grade 1. The median value of alpha-fetoprotein was 126,382 IU / ml. Median tumor size was 18 cm, 60% in clinical stage IIIa, 10% IIIb, 10% IVa and 20% IVb. Adjuvant treatment in 50% and surgical management in 50%. The survival ranges of the first group was 6 to 27 months and the second one less than 6 months. In all the cases presented we saw normalization of glycemic values at the first week after surgery.

**Conclusions:** Patients have a better glycemic control when performing total or partial surgical exeresis of the tumor and the overall survive increase despite the poor prognosis that confers the association of hepatocellular cancer and paraneoplastic syndromes.

#### PL02-18

### PRIMARY HEPATIC NEUROENDOCRINE TUMOR: A CASE REPORT

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**Background:** Liver is the most frequent site of neuroendocrine tumor metastasis but primary hepatic neuroendocrine tumors (PHNT) are rare, with fewer than 200 described in the literature.

The low number of recorded cases means that diagnosis, treatment and follow-up remain challenging and are not fully defined. We report a case of PHNT.

**Case report:** 76-year-old man who suffered acute pancreatitis during admission for trauma surgery, probably related to NSAIDs. CT is performed finding a 22x20mm focal lesion in hepatic segment III. The study was completed with MRI, confirming a nodular lesion of 2cm in segment III, slightly hyperintense in T2, hypointense in T1. Ultrasound-guided fine needle aspiration showed a well-differentiated neuroendocrine tumor.

Laboratory: Chromogranin A 331.9, without other analytical alterations. Gastroscopy, colonoscopy and thoracic CT were normal. Octreoscan showed a hepatic lesion with overexpression of somatostatin receptors without other pathological findings.

Treatment consisted on exploratory laparoscopy with intraoperative ultrasound, in which a single hepatic lesion is confirmed in segment III, and wedge resection of segment III was performed. Discharge after 48h (Clavien 0). Definitive histology showed a neuroendocrine tumor G2, 1.5cm, Ki67 3.47%. Currently under follow-up by endocrinology and surgery with no data on recurrence or primary lesions at 6 months.

**Discussion:** PHNT are rare but can occur, when a solitary and hypervascular tumor is detected in the liver, should be considered. Their diagnosis should be linked to the exclusion of primary lesions in other locations and sometimes this is only achieved with close monitoring of the patient postoperatively.

#### PL02-19

### GENERATION OF PATIENT-SPECIFIC AUTOLOGOUS LIVER AND HEPATOCELLULAR CARCINOMA FOR DEVELOPMENT OF CANCER THERAPIES

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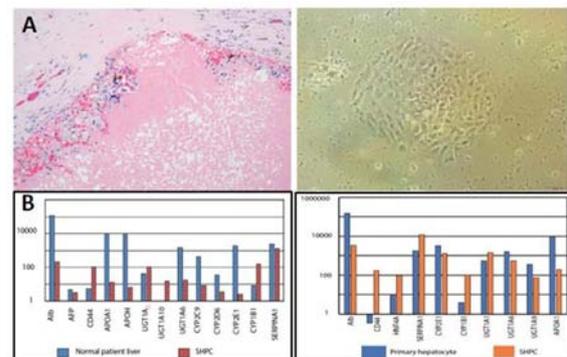
**Introduction:** The dire prognosis for patients with advanced Hepatocellular Carcinoma (HCC) is due to paucity of therapeutic options. For optimal patient care, it is critical to develop novel therapies tailored in a patient-specific fashion. This personalized approach requires preclinical models that faithfully recapitulate a patient's cancer and its microenvironment. For accurate evaluation of HCC therapies, we have developed conditions that allow us to grow HCC and non-cancerous hepatocytes in culture in a patient-specific fashion.

**Hypothesis:** Patient-derived proliferating normal hepatocytes and HCC cell lines will retain the genomic landscapes of the patient's liver and tumor, respectively.

**Methods:** Cancer and surrounding non-cancerous tissue from clinical HCC resections were collected. From these tissues, we isolated and expanded cancerous and non-cancerous cells. We developed culture methods to induce proliferation of primary human hepatocytes via generation of small hepatocyte proliferating cells (SHPCs). During cellular expansion, the SHPCs underwent gene expression profiling via RNA-sequencing at passages 0 and 3.

**Results:** We isolated cancerous (Fig.1A) and non-cancerous hepatocytes from HCC resection specimens and cultured these cells to grow HCC and SHPCs. After *in vitro* expansion, SHPCs maintained expression of hepatocyte specific genes after passaging (Fig.1B).

**Conclusions:** Expansion of human hepatocytes is an innovative technology to generate a proliferating hepatocyte population that maintains its gene expression profile over passages. Our goal is to humanize mouse livers with these non-cancerous hepatocytes followed by transplantation of tumor cells, from the same patient, to recreate HCC and tumor microenvironment to develop personalized therapies.



**Figure 1.A.** Cancerous portion of the resected liver specimen, H&E of the HCC (left). HCC clone derived from these cells (right). **B.** SHPCs maintained expression of hepatocyte specific genes at passages 0 (left) and 3 (right).

PL02-21

### DIAPHRAGMATIC HERNIA DEVELOPED AFTER RADIOFREQUENCY ABLATION FOR TREATMENT OF HEPATOCELLULAR CARCINOMA: REPORTS OF THREE CASES

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**Introduction:** Radiofrequency ablation (RFA) has been widely accepted treatment for hepatocellular carcinoma (HCC) as primary choice for small HCC or alternative for unresectable cases. Because of the safety and effectiveness of procedure with a low mortality rate and a low major complication rate, the popularity of RFA has gradually increased. As one of rare complication of RFA, diaphragmatic hernia can occur after the procedure. There have been only ten case reports of diaphragmatic hernia developed after RFA for HCC in the literature.

**Methods:** We experienced and reviewed the three cases of diaphragmatic hernia following RFA for HCC.

**Results:** The patients presented abdominal pain and vomiting, and computed tomography and chest PA revealed diaphragmatic hernia showing colonic loops in the thoracic cavity. Duration from RFA to development of symptoms was 19 months, 23 months and 38 months, respectively. The location of HCC were hepatic dome, namely at the segment 7 in two cases and segment 4a in one case. One case were suspected diaphragmatic thermal injury at the time of RFA on post-RFA CT, however follow-up CT after 3 months shows no diaphragmatic injury or bowel herniation. For the treatment of diaphragmatic hernia, we performed emergency operation of diaphragmatic repair in two cases. However one case was tried to repair diaphragmatic defect, but the operative repair was not possible due to severe adhesion.

**Conclusions:** Patients who have undergone RFA for HCC adjacent to the diaphragm should be carefully followed up for possible development of diaphragmatic hernia.

PL02-22

### THE ROLE OF UP-REGULATION OF MIR-128 IN THE PATHOGENESIS OF HEPATOCELLULAR CARCINOMA

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**Introduction:** microRNAs(miRNAs) are endogenous non-coding 21-23 nucleotide RNAs that are involved in post-transcriptional regulation and they control various cellular processes, one of which is tumorigenesis. miRNAs has been suggested to be implicated in the pathogenesis of hepatocellular carcinoma(HCC).

**Methods:** To find yet-to-be-identified miRNAs associated with HCC tumorigenesis, we carried out miRNA microarray analysis with miRNAs extracted from normal and HCC liver tissues resected from the same patients. Of the miRNAs showing significantly different expression levels between normal and HCC liver tissues, we focused on miR-

128. The difference in expression levels of miR-128 was verified by real-time PCR. In addition, the target gene of miR-128, axin1, was determined by bioinformatics study, luciferase assay and Western blotting.

**Results:** Four pairs of liver tissues were selected for RNA extraction. miRNA microarray and FDR calculation were performed and four genes were selected due to the previous report on their correlation with HCC. The results of luciferase assay and transfection of HepG2 cells indicated that miRNA-128 indeed binds to the 3' UTR of Axin1. In Western blotting study miR-128 indeed decreased Axin1 protein levels, demonstrating that Axin1 is indeed a target of miR-128 in HepG2 cells.

**Conclusions:** In this study we report that miR-128 is up-regulated in clinical HCC tissues and that miR-128 binds to 3' UTR of Axin1. The identification of miR-128 as onco-mir and determination of its target gene Axin 1 will shed light on the pathogenesis of HCC.

PL02-24

### THE 99MTC-MEBROFENIN HEPATOBILIARY SCINTIGRAPHY IN FUTURE LIVER REMNANT FUNCTION EXAMINATION IN PEDIATRIC LIVER SURGERY

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**Introduction:** 76% of children suffering from liver tumors require extensive liver resection. 25% of future liver remnant volume (FLR-V) is considered as an allowable in children. In cases of less

FLR-V the ALPPS is recommended as a procedure of choice. Existing cut-off value of future liver remnant function (FLR-F) evaluated by means of <sup>99m</sup>Tc-Mebrofenin hepatobiliary scintigraphy (HBS) for adults is 2.7%/min/m<sup>2</sup>. However there is no data considering the FLR-F in children.

The initial experience of FLR-F evaluation is described below followed by reassessment of the indications for two-staged hepatectomies in pediatric patients.

**Methods:** All children underwent the CT-volumetry and HBS before surgery. The hepatic resection volume was discussed on the basis of obtained values. All consecutive patients considered to major hepatectomy were retrospectively analyzed. Posthepatectomy liver failure (PHLF) was defined according to the International Study Group of Liver Surgery criteria.

**Results:** 32 patients (mean age 21 mo (2-199mo)) were submitted to major hepatectomy.

The median FLR-V came to 43.5% (16.5-67.8%). The median FLR-F remained 7.82%/min/m<sup>2</sup>

(1.8-25.98%/min/m<sup>2</sup>). 2 patients had insufficient FLR-V but appropriate FLR-F and PHLF did not develop. On the other hand PHLF grade B developed in 1 patient with FLR-V 43% but low FLR-F 1.8%/min/m<sup>2</sup>.

**Conclusion:** The FLR-F value is crucial before major hepatectomy even in cases with FLR-V less than 25%. The HBS seems to be an important tool estimating remnant liver

function. No patients in presenting series required two-staged hepatectomy. The farther investigation is warranted to define new indications for two-staged hepatectomies in children.

PL02-25

### CLINICOPATHOLOGIC FEATURES AND OUTCOMES OF PRIMARY HEPATIC ANGIOSARCOMA: ONE SINGLE CENTER EXPERIENCE

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**Introduction:** Primary hepatic angiosarcoma is an extremely rare and aggressive malignancy.

At present, little is known about the disease. Clinicopathologic features and outcomes of hepatic angiosarcoma in our medical center were analyzed, aiming to accumulate the experience of management of hepatic angiosarcoma.

**Method:** The comprehensive data of nine patients with hepatic angiosarcoma confirmed by histopathological examination, from 2004 to 2019, was pooled and analyzed.

**Results:** The patients aged from 22 to 69 years (average 48.9 years), including three males and six females, whose performance status were 0~2. Four showed epigastralgia or abdominal distention, four were found liver mass accidentally and one identified as hepatic angiosarcoma outside was admitted for regular postoperative check. Although AFP and CA19-9 were normal, combining with ultrasonography, CT or MRI appearances, seven were initially diagnosed as HCC and one as liver cyst with bleeding. Seven underwent partial hepatectomy, one of which died of respiratory failure 49 days after the operation. One patient accepted needle biopsy of liver tumor because of intrahepatic and spleen metastasis. One received biopsy of bone metastasis in iliac crest. All the tumor cells expressed vimentin and CD31. Desmin, hepatocyte, and CKs including CK5/6/7/8/18/19/20 and PCK, were negative. The tumor recurred or progressed rapidly even with radical resection. Only one patient had the chance to received chemotherapy. Overall survival ranged from 49 to 1211 days (median survival 338 days).

**Conclusions:** Prognosis of primary hepatic angiosarcoma is very poor. Complete resection of the tumor and subsequent comprehensive treatment including chemotherapy might improve the survival.

PL02-26

### DEVELOPMENT OF NOMOGRAM PREDICTING 10-YEAR SURVIVORS AFTER CURATIVE HEPATECTOMY FOR HEPATOCELLULAR CARCINOMA

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**Background:** Although hepatectomy is a curative treatment modality for hepatocellular carcinoma (HCC), clinical

outcome and predictive factors of 10-year long-term survivors are rarely reported in the literature.

**Aim of study:** To analyze the clinico-pathological factors of 10-year long-term survivors following curative hepatectomy for HCC and to develop a predictive nomogram for 10-year survivors.

**Methods:** From 2004 to 2009, 325 patients with HCC underwent curative hepatectomy. There were 95 patients (29.2%) surviving 10 years or more (group 1), whereas 230 patients (70.8%) surviving < 10 years (group 2). Comparison of clinic-pathological data was made between two groups. Good prognostic factors identified by multivariate analysis were used to construct a nomogram predicting 10-year survivors. Internal validation using bootstrap sampling was also performed.

**Results:** Group 1 was younger, had more asymptomatic tumor, had more hepatitis B carriers, better functional status, better preoperative liver function, and higher albumin level, compared with group 2. Group 1 had smaller tumor, more solitary tumor, more tumor with microvascular invasion and rupture than Group 2. Independent good prognostic factors predicting 10-year survivor were young age, ASA status ( $\leq 2$ ), high albumin, solitary tumor and no microvascular tumor invasion. A nomogram is constructed (Figure 1) with C-index of 0.801. Internal validation using bootstrap sampling reveals C-index of 0.792.

**Conclusion:** There are 29.2% patients with curative hepatectomy for HCC can survive up to or more than 10 years. Nomogram using age, ASA status, preoperative albumin, solitary tumor and microvascular tumor invasion can accurately predict 10-year survivor.

Figure 1

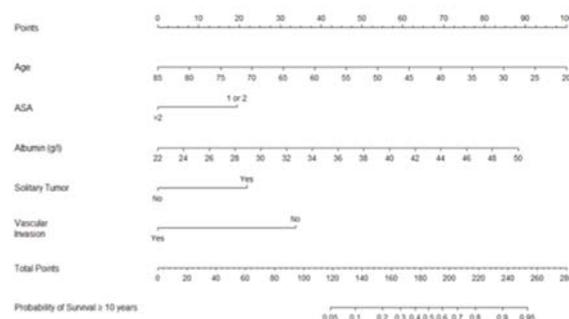


Figure 1. Nomogram predicting 10-year survivor of HCC after curative hepatectomy

PL02-29

### IDENTIFICATION OF ITIH4 AS A NOVEL BIOMARKER FOR HEPATOCELLULAR CARCINOMA WITH NONALCOHOLIC FATTY LIVER DISEASE: FROM PIG MODEL TO HUMAN

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**Introduction:** Noninvasive biomarkers are urgently needed for an optimal management of nonalcoholic fatty liver disease (NAFLD). Using a proteomics-based technology, we developed serum biomarkers from a pig model of hepatocellular carcinoma (HCC) associated with NAFLD and validated the clinical utility using human samples.

**Methods:** Microminipigs were fed a high-fat diet to induce NAFLD and a normal diet as the control. Diethylnitrosamine was intraperitoneally administered to induce HCC. Pathologists assessed biopsied liver samples every 12 weeks. Serum proteins were separated by two-dimensional gel electrophoresis, and proteins of interest were identified by MALDI-TOF MS/MS. Human serum samples were analyzed to validate the candidate protein using antibody-mediated characterization.

**Results:** In the NAFLD pigs, nonalcoholic steatohepatitis (NASH) was histologically confirmed at 36 weeks, and HCC developed at 60 weeks. Serum inter-alpha-trypsin inhibitor heavy chain 4 (ITIH4) was identified as the most characteristic protein in the NAFLD pigs. Elevated serum ITIH4 levels corresponding with NAFLD progression and HCC development were confirmed via immunoassay. Furthermore, immunohistochemistry showed that hepatic ITIH4 expression also increased in both cancer and non-cancer lesions as NAFLD progressed. Serum ITIH4 levels in NAFLD with HCC patients were significantly higher than those in NAFLD, NASH without HCC, and virus-related HCC patients. We also determined that NAFLD with HCC patients who had preoperatively higher serum ITIH4 levels exhibited poorer prognoses after hepatectomy. **Conclusions:** We established a NAFLD-associated HCC pig model, and serum ITIH4 was identified as a novel biomarker reflecting NAFLD activity and the subsequent HCC development.

#### PL02-30

### ROLE OF CENTRAL HYPO-ENHANCEMENT IN THE HEPATIC ARTERIAL PHASE OF DYNAMIC COMPUTED TOMOGRAPHY IN PATIENTS WITH MASS-FORMING INTRAHEPATIC CHOLANGIOCARCINOMA

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**Introduction:** The enhancement pattern in the hepatic arterial phase (HAP) of dynamic computed tomography (CT) is reportedly a prognostic marker in patients with intrahepatic cholangiocarcinoma (IHCC). This study was performed to elucidate the role of central hypo-enhancement in the HAP in patients with mass-forming IHCC.

**Methods:** Forty patients who underwent initial hepatic resection for mass-forming IHCC were enrolled. The HAP was scanned 40 seconds after contrast agent injection. A radiologist classified the patients into three groups based on the vascular pattern: the hyper-enhancement group (Hyper

group), rim-enhancement group (Rim group), and hypo-enhancement group (Hypo group). Hypoxia-inducible factor-1 (HIF-1) expression in the surgical specimen was evaluated by immunohistochemistry. The clinicopathological findings were compared among the groups.

**Results:** The Hyper, Rim, and Hypo groups comprised 8, 7, and 25 patients, respectively. There were no significant correlations between the groups and clinicopathological factors. Overall survival (OS) was significantly worse in the Hypo than Hyper group ( $p=0.03$ ). OS was also significantly worse in the Rim+Hypo group (i.e., hypo-enhancement in the central tumor) than in the Hyper group ( $p=0.04$ ). Furthermore, inclusion in the Rim+Hypo group was a prognostic factor for OS (hazard ratio=6.68). High HIF-1 expression in the central part of the tumor was correlated with central hypo-enhancement (25% in Hyper group and 72% in Rim+Hypo group).

**Conclusions:** Central hypo-enhancement was a prognostic factor in patients with IHCC. The high malignant potential of tumors with central hypo-enhancement might be associated with HIF-1 upregulation.

#### PL02-31

### LARGE SIZE IS NOT A CONTRAINDICATION TO LAPAROSCOPIC RESECTION OF HEPATOCELLULAR ADENOMA

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**Introduction:** Hepatocellular adenoma (HCA) is a neoplastic liver lesion with an increasing incidence and a strong association with oestrogen therapy. Laparoscopic resection has proven safe for small lesions whilst its use for large adenomas ( $\geq 10$ cm) requires further investigation.

**Methods:** All patients undergoing laparoscopic liver resection for HCA at the Royal Brisbane Hospital between January 2003 - April 2018 were analysed.

**Results:** 33 laparoscopic resections were performed in 32 female patients with a median age of 36 years (range 26 - 75). Nine (27%) laparoscopic resections were performed for large adenomas ( $\geq 10$ cm) and 17 laparoscopic resections were performed for adenomas of intermediate size

(5 - 9.9cm). No conversions to open were required in the large group whilst there was one case in the intermediate group. Haemorrhage, either intra-parenchymal or free intraperitoneal, was the indication for resection in 44% of the large group. Median operative time was 266 minutes in the large group reflecting that hemi-hepatectomy was performed in 55% of cases compared with none in the intermediate group (median operative time 143 minutes). No major complications

(Clavien-Dindo IIIb or greater) were seen in the large adenoma group and only one patient required transfusion. The median length of stay for large lesions was 5 days (range 4 - 9) which was comparable to the intermediate group (4 days, range 1 - 11).

**Conclusions:** Laparoscopic surgery has been demonstrated to be safe for the resection of HCA in this group of patients. Importantly, large size is not a barrier to laparoscopic resection.

PL02-32

### ANALYSIS OF THE RESULTS OF COMPLEX TREATMENT OF PATIENTS WITH HEPATOCELLULAR CANCER

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To analyze the results of treatment of patients with primary liver cancer for the period from 2004 to 2019.

**Materials and methods:** The treatment results were analyzed 174 patients with primary liver cancer using liver resection, local destruction methods, transarterial chemoembolization, targeted therapy, and a combination of these methods.

**Results:** When performing liver resection, the median survival was 34 month. When performing local methods of destruction of a liver tumor, life expectancy increased from 23 before 31 months. The use of local destruction methods, transarterial chemoembolization made it possible to increase the resectability of patients.

**Conclusion:** The use of various methods of treatment of patients with primary liver cancer can increase the overall life expectancy of patients. The use of local destruction methods for tumor recurrences in previously operated patients and / or somatically burdened patients reduces the number of surgical and anesthetic complications, reduces the hospital stay of patients.

PL02-33

### PRIMARY PSEUDOCYSTIC HEPATIC NEUROENDOCRINE TUMOR: A CASE REPORT AND A CASE FOR CHANGING PREOPERATIVE EVALUATION

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**Introduction:** Neuroendocrine tumors (NET) represent rare neoplasms with majority primary NETs being gastroenteropancreatic or bronchopulmonary origin. A hepatic NET is most likely a metastatic lesion. Cystic hepatic lesions are commonly either infectious, benign cystic lesions, or if malignant; a cystadenocarcinoma, hepatocellular carcinoma, or metastasis with cystic degeneration. Primary hepatic neuroendocrine tumors (PHNETs) and primary pseudocystic hepatic neuroendocrine neoplasms are exceedingly rare. Standard tumor markers, AFP and CEA, are almost invariably normal. Pre-operative neuroendocrine markers for solitary liver masses may prove beneficial.

**Methods:** We present a case of a 57-year old healthy female with a finding of a large multi-lobulated cystic right hepatic lesion, diagnosed histopathologically as a pseudocystic primary neuroendocrine tumor.

**Case Presentation (Results):** A 57-year old healthy female had a large hepatic cystic mass on ultrasound. An abdominal MRI showed a large, cystic, multi-lobulated, right hepatic lesion with internal septations. The mass grossly appeared to represent a biliary cystadenoma. Histopathologically, staining was positive for markers consistent with neuroendocrine origin, diagnostic of primary pseudocystic neuroendocrine tumor.

**Discussion:** NETs have a rare, but increasing incidence. When a hepatic neuroendocrine tumor is identified, the diagnosis usually represents metastasis. PHNET is extremely rare. PHNETs are difficult to diagnose pre-operatively. Tumor markers AFP, CEA, and Ca 19-9 are almost uniformly normal. As there has been a trend toward increasing incidence of NETs, this suggests an increasing trend in PHNET cases. Here, we present a case of pseudocystic PHNET diagnosed in a 57-year old female. Our case supports consideration for obtaining pre-operative CgA for all hepatic lesions.

PL02-34

### THE USING OF CRYODESTRUCTION METHODS IN THE TREATMENT OF PRIMARY LIVER CANCER

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**Objective:** to improve treatment outcomes, quality and life expectancy in patients with primary liver cancer.

**Materials and methods:** Since 2012, cryodestruction (CD) was performed in 14 patients with primary liver cancer, in 6 patients with hepatocellular cancer (HCR) and 8 patients with cholangiocellular cancer (CCR), 5 women and 8 men. The size of the lesions in the liver was 2-8 cm, the number of lesions was 1-8 (3±2). The exposure time was 3-5 min, the exposure temperature was -186C. CD in combination with RFA was performed in 5 patients, CD+liver resection - in 2 patients, a CD+RFA+liver resection - in 2 patients. All patients were subsequently given adjuvant chemotherapy.

**Results:** Severe life-threatening complications were observed in 2 (7.1%) operated patients: - 1 (7.1%) intra-abdominal bleeding, 1 - death due to progression of multiple organ failure during sepsis after application of CD in combination with liver resection and RFA. Survival in patients after the use of cryodestruction in combination with other methods of local destruction was 20.5±5 months, after cryodestruction - 12.56±3 months. (p < 0.05). Survival in patients after the use of cryodestruction in combination with other methods of local destruction with CCR was 9.2±4.5 months (p < 0.05), with cryodestruction - 7 + 2.5 months. (p < 0.05).

**Conclusion:** Cryodestruction in combination with other methods of local destruction in primary liver cancer in unresectable patients is an intervention that significantly improves the quality of life of cancer patients. When using adjuvant chemotherapy, there is also a slight improvement in survival rates.

PL02-35

### HEPATIC ANGIOMYOLIPOMA (PECOMA): COMPARISON OF RADIOLOGY AND MORPHOLOGICAL/IMMUNOGISTOCHEMICAL DATAS

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According to modern concepts, angiomyolipoma refers to PEComas, a rapidly replenishing group of tumors from cells with light or granular eosinophilic cytoplasm expressing melanocytic markers, derivatives of a hypothetical perivascular epithelioid cell.

**Objective:** to compare radiology and morphological/immunohistochemical datas in patients with morphologically verified angiomyolipoma.

**Materials and methods:** At A.V. Vishnevsky NMRC of Surgery 9 patients with morphologically verified liver PEComas were treated (women were dominated (88.9%), average age 41.6±1.3 years) Preoperatively, the patients underwent ultrasound, MSCT, MRI. All patients were operated on.

**Results:** In the analysis of the lesions according to radiology, the following data were obtained. Structure: solid - 3; solid with minor areas of discharge - 3; solid with cysts - 1; solid with decay - 1; cystic - 1. Vascularization: hypervascular - 6; moderate vascularized - 2; weakly vascularized - 1.

The diagnoses made according to the preoperative examination (in one patient from one to two diagnoses were made): focal nodular hyperplasia; hepatocellular cancer; angiomyolipoma; mesenchymoma; cystadenoma; cystic lymphangioma; adenoma.

Morphological verification: angiomyolipoma - 4; malignant angiomyolipoma - 1; hepatocellular cancer - 4 (in all cases, after immunohistochemical examination, the diagnosis was changed to angiomyolipoma). In benign form, it was a mixed lipomatous type in 4 cases and myomatous in 4. Various image options correlate with the histological components of the tumor.

**Conclusion:** The presence of blood vessels and mature adipose tissue in the tumor structure according to radiology are the leading signs in the diagnosis of liver angiomyolipoma. Crucial for the diagnosis is immunohistochemical study.

PL02-36

### HEPATIC CYSTADENOCARCINOMA PRESENTING AS OVARIAN NEW GROWTH: A CASE REPORT

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Biliary cystadenoma and cystadenocarcinoma are rare hepatic neoplasms accounting less than 5% of all cystic liver diseases (Brittingham and Tuma 2019) with only less than 200 cases reported worldwide (Pillai et al., 2012). Cystadenocarcinoma accounts for only 0.41% of malignant hepatic epithelial tumors (M. Pitchaimuthu et al., 2015). It commonly arises from the intrahepatic ducts and rarely from extrahepatic areas as in our case. We

present a case of a 65- year old female who consulted in a tertiary hospital for a 4-year history of gradual abdominal distension diagnosed as ovarian new growth but intra-operatively found as a hepatic mass measuring 34x30x20 cm involving the gallbladder. Intraoperative ultrasound revealed a multiloculated cystic mass with no intra hepatic infiltration while intraoperative cholangiogram did not show biliary communication and obstruction. The mass was completely excised from the liver and was confirmed on final biopsy as mucinous cystadenocarcinoma. The patient was discharged with no post-operative complications. Surgical resection remains to be the treatment of choice for hepatic lesions such as cystadenocarcinoma (Silva Neto et al., 2019). However, these lesions are often misdiagnosed preoperatively. Hence, in cases with intraoperative dilemma, an intraoperative ultrasound and a cholangiogram can aid in intraoperative planning and execution of safe surgery.

PL02-37

### HEPATIC ACTIVATION OF FOXO3 IS ASSOCIATED WITH PENTOSE PHOSPHATE PATHWAY ACTIVATION AS WELL AS MTORC2-AKT SIGNALING AND ENHANCES OXIDATIVE DAMAGE-ASSOCIATED HEPATOCELLULAR CARCINOGENESIS

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**Introduction:** Hepatocellular carcinoma (HCC) is the most prevalent primary liver cancer. Mutations are commonly found in the signaling regulating the Akt pathway, leading to oncogenic cell proliferation and survival. Key transcription factors that are negatively regulated downstream of Akt signaling are members of the forkhead box O family (FOXO). FOXOs were initially considered as tumor suppressors by inducing cell cycle arrest and apoptosis. However, there is increasing evidence showing that FOXOs, especially FOXO3, can support tumorigenesis.

**Method:** To understand the roles of FOXO3 in liver tumorigenesis and hepatocarcinogenesis, we analyzed surgically resected HCC patient specimens and also established a doxycycline-regulated transgenic mouse model with hepatocyte-specific FOXO3 expression in a constitutively active form.

**Results:** We observed that FOXO3 protein is overexpressed and activated in livers of HCC patients. Hepatic activation of FOXO3 in mice induced extensive hepatic damage and elevated gene expression of several HCC-associated factors. Furthermore, FOXO3 expression enhanced hepatotoxicin-induced tumorigenesis. Mechanistically, FOXO3 activation caused oxidative stress and

DNA damage and triggered positive feedback-loop for mTORC2-mediated Akt activation presumably in a cell-intrinsic manner. Interestingly, FOXO3 activated not only reactive oxygen species (ROS)-promoting pathways, but also ROS-eliminating systems, which can be associated with the activation of the pentose phosphate pathway.

**Conclusions:** FOXO3 is a master regulator of ROS. On one side, FOXO3 supports in protecting from ROS and may avoid cellular crisis but FOXO3 can also promote ROS signaling on the other side and support hepatocellular carcinogenesis.

PL02-38

### IS ALBUMIN-BILIRUBIN GRADE AN EFFECTIVE FACTOR IN TERMS OF RECURRENCE FOLLOWING RESECTION IN HCC PATIENTS?

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**Introduction:** Recent studies have revealed the fact that albumin-bilirubin (ALBI) grade can be an independent prognostic factor in terms of liver failure, long-term survival and recurrence.

**Material-Method:** Patients who had undergone resection with pathologic diagnosis of HCC were examined retrospectively. Age, gender, etiologic factor, preoperative and postoperative 5th day ALBI grade, type of hepatic resection, length of hospital stay, tumor size, lymph node involvement and resection margin of tumor were examined. Recurrence and survival therefore in the long-term results were investigated. Patients who underwent non-HCC liver resection, those who died in early post-operative period, patients who went out of follow-up and patients who underwent R1-R2 resection were excluded from the study.

**Results:** Thirty-one patients were included in the study. The mean age was 65.52±10.87 years. The median tumor size was 5 cm (2-17). The median hospital stay was 4 (1-25) days. Kaplan-Meier mean recurrence time was 32.17 (standard error = 4.67) months. In the univariate analysis, surgical margin of < 1 mm was the only factor affecting recurrence (p = 0.001). Resection margin (p = 0.002) and lymph node involvement (p = 0.019) were found to be significant for overall survival. Preoperative ALBI grade was found to be significant in terms of recurrence (p = 0.026) (HR = 3.414 (95% confidence interval: 1.154-10.097)).

**Conclusion:** Preoperative ALBI grade is more significant compared to postoperative ALBI grade in postoperative recurrence. At the same time, surgical margin's being < 1 mm is the only negative prognostic factor in terms of recurrence and overall survival.

**Table 1** Characteristics of patients

Characteristics	N
Gender (M / F)	27 / 4
Tumor Size < 5 cm ≥ 5 cm	14 / 17
Etiology HBV / HCV / Other	15 / 4 / 12
Surgery Major resection / minor resection	11 / 20
Preoperative ALBI grade Grade 1/Grade 2/Grade 3	18/12 /1
Postoperative ALBI grade Grade 1/Grade 2 /Grade 3	2/ 21 / 7
Resection margin < 1 mm, ≥ 1- 5 mm, > 5- 10mm, > 8/ 15/ 5 10 mm	/3

PL02-42

### INCREASED ESTIMATED TUMOUR SIZE TO TOTAL LIVER VOLUME RATIO IS ASSOCIATED WITH WORSE SURVIVAL IN RESECTABLE HEPATOCELLULAR CARCINOMA

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**Introduction:** Tumour diameter is a known prognostic factor for hepatocellular carcinoma but does not fully reflect tumour burden. In this study we aim to explore the relationship between the estimated tumour volume to total liver volume ratio and overall survival.

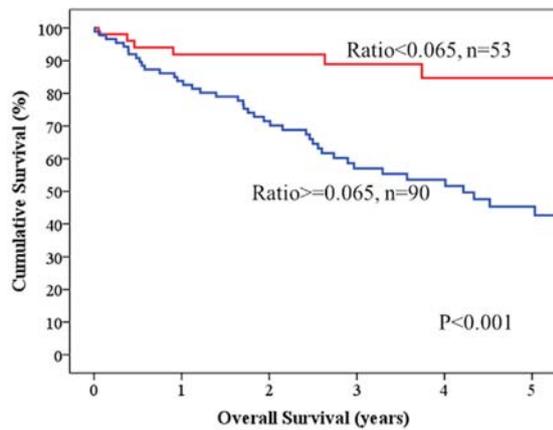
**Method:** Patients who were diagnosed of hepatocellular carcinoma with computer tomography (CT) liver volumetry performed during the period of November 2009 to November 2019 were included. Patients underwent hepatic resection were included.

Estimated tumour volume (ETV) was defined as  $\frac{2}{3} \times \pi \times (\text{largest tumour diameter}/2)^3$

TLV was determined by CT volumetry. Statistical analysis with prospectively collected data was performed.

**Results:** 143 patients was included in the study. The median ETV was 220.9cm<sup>3</sup> (0.9—4188.8cm<sup>3</sup>). The median TLV was 1379.2cm<sup>3</sup> (541.6—136524.0) and ETV:TLV ranges 0.0007—7.7341. The hazard ratio was 1.138 for diameter of largest tumour (p< 0.001) and was 1.540 for ETV:TLV (p< 0.001). The optimal cut-off value of ETV:TLV was 0.065 by the ROC curve. Survival analysis showed that patients with ETV:TLV < 0.065 had significantly better 5-year overall survival than those with ETV:TLV ≥0.065 (84.7% vs 45.3%; p< 0.001). 5-year disease free survival was also better in patients with ETV:TLV < 0.065 (50.7% vs 20.5%; p< 0.001).

**Conclusion:** An increase in ETV:TLV to over 0.065 is associated with worse survival outcomes. This can be used as a prognostic tool in the management of HCC.



Overall survival of patients with ETV:LTV <0.065 and ≥0.065

#### PL02-43 ASSOCIATION BETWEEN PORTAL VEIN THROMBOSIS AFTER HEPATECTOMY FOR HEPATOCELLULAR CARCINOMA AND CLINICOPATHOLOGICAL FACTORS

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**Introduction:** The occurrence of portal vein thrombus (PVT) after hepatectomy is one of the important complications. Although the incidence of PVT after hepatectomy has been reported to be about 9%, the incidence limited to hepatectomy for hepatocellular carcinoma (HCC) has not been clarified. In this study, we investigated the incidence of PVT after hepatectomy for HCC and evaluated the association between PVT and clinicopathological factors.

**Methods:** Patients with HCC who underwent hepatectomy between 2014 and 2018 at in our institution were retrospectively reviewed. The presence of PVT was evaluated by contrast-enhanced CT routinely on postoperative day 7, and its clinicopathological correlations were evaluated. Furthermore, we evaluated whether activation of coagulation and fibrinolytic factors (PIC, total PAI1 and TAT) are related to portal vein thrombus formation.

**Results:** A total of 54 patients underwent hepatectomy. Postoperative PVT occurred in 10 patients (18.5%). No significant correlations were observed between PVT and any patient characteristics. However, PVT was associated with longer duration of Pringle's maneuver and major hepatectomy, though these associations were not significant ( $P > 0.05$ ). In the examination of coagulation and fibrinolytic factors, the rate of increase of TAT was significantly higher in patients with portal vein thrombosis ( $P < 0.05$ ).

**Conclusion:** The present study suggests that PVT after hepatectomy for HCC may occur more frequently than

hepatectomy for other diseases. In the PVT group, the rate of increase of TAT is high, and TAT may be a predictor of PVT after hepatectomy.

#### PL02-45 THE SYSTEMIC IMMUNE- INFLAMMATION INDEX PREDICTS PROGNOSIS IN INTRAHEPATIC CHOLANGIOCARCINOMA: AN INTERNATIONAL MULTI- INSTITUTIONAL ANALYSIS

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Intrahepatic Cholangiocarcinoma Study Group

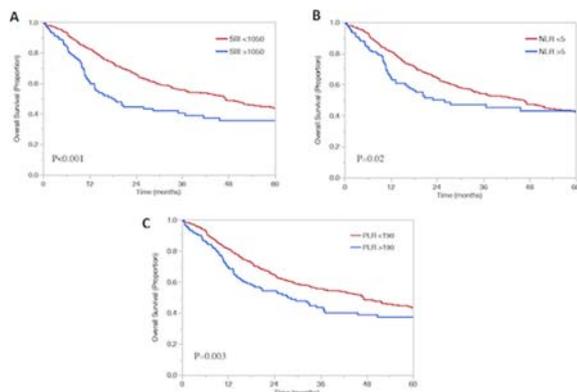
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**Introduction:** Inflammation has been associated with tumor progression and poor prognosis among patients with cancer. We sought to examine whether the systemic immune inflammation index (SII) was associated with prognosis among patients following resection of ICC.

**Methods:** Patients who underwent hepatectomy for ICC between 2000-2016 were identified using an international multi-institutional database. The impact of SII on overall (OS) was assessed. The performance of the final multi-variable models that included clinicopathologic factors along with inflammatory markers (i.e. neutrophil-to-lymphocyte ratio [NLR], platelet-to-lymphocyte ratio [PLR] and SII [platelets<sup>3</sup>/NLR]) was assessed using the Harrell's concordance index.

**Results:** Among 821 patients, median and 5-year OS were 44 months (95% CI: 36.4-51.6) and 29.9%, respectively. Median SII was 560 (IQR:379.2-901.8) and a total of 145 (17.7%) patients presented with an elevated preoperative SII ( $\geq 1,050$ ). Patients with high SII had worse OS compared with patients with low SII (median OS: 17.8 vs 47.1 months,  $p < 0.001$ , Figure 1a). Similarly, high NLR ( $\geq 5$ ) and high PLR ( $\geq 190$ ) predicted worse OS (both  $p < 0.05$ , Figure 1b,c). On multivariable analysis, an elevated SII independently predicted a worse OS (HR=1.40, 95%CI:1.01-1.96), whereas high NLR (HR=1.22, 95%CI:0.85-1.77) and high PLR (HR=1.08, 95%CI:0.78-1.49) were no longer associated with prognosis. Of note, the addition of SII to the multivariable model was associated with a c-index (0.694) that outperformed models that incorporated NLR (c-index:0.689) and PLR (c-index:0.690) alone.

**Conclusion:** SII independently predicted OS among patients with resectable ICC. SII may be a better predictor of outcomes compared with other markers of inflammatory response among patients with resectable ICC.



## PL02-46 DEVELOPMENT AND VALIDATION OF A NOVEL MODEL TO PREDICT LYMPH NODE METASTASIS AMONG PATIENTS WITH INTRAHEPATIC CHOLANGIOCARCINOMA

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**Introduction:** The accuracy of preoperative imaging to assess the status of the nodal basin among patients with intrahepatic cholangiocarcinoma (ICC) remains relatively low. We sought to develop and validate a model to predict the likelihood of occult lymph node metastasis (LNM) among patients with resected ICC.

**Methods:** Patients who underwent hepatectomy for ICC between 1990-2016 were identified using a multi-institutional database. The cohort was randomly divided into a training- and validation-set. Clinicopathological data were assessed and a model to predict LNM was developed and validated. An online calculator was developed to estimate the risk of LNM.

**Results:** Among 843 patients who underwent resection of ICC, 198 (23.5%) individuals had at least one LNM identified on final pathology. Preoperative variables associated with LNM included sex (male: OR=2.91; 95%CI:1.65-5.15), LN status on preoperative imaging (suspicious: OR=8.93; 95%CI:4.56-17.5, metastatic: OR=8.83; 95%CI:3.77-20.7), morphologic sub-type (mass-forming+intraductal growth vs periductal infiltrating, OR=7.45; 95%CI:3.31-16.78), preoperative CEA level (OR=1.40; 95%CI:1.09-1.80), low albumin level (OR=1.69; 95%CI 1.08-

2.65), and number of nodules (OR=1.27; 95%CI:0.96-1.70). A model based on these preoperative factors had a sensitivity of 81% with a 69% specificity to predict LNM (Figure). The Harrell's concordance index (c-index) was 0.84 and 0.83 in the training and validation sets, respectively ([https://medicalcal.shinyapps.io/ICC\\_LNM/](https://medicalcal.shinyapps.io/ICC_LNM/)).

**Conclusion:** Preoperative estimation of LNM can be enhanced utilizing an online calculator that incorporated various clinical, morphologic, and tumor specific factors. Such a tool may guide surgeons in assessing patients for treatment with preoperative therapy, as well as lymphadenectomy at the time of surgical resection of ICC.

## PL02-49 CHARACTERISTICS OF TP53 AND CTNNB1 MUTATION ACCORDING TO THE SERUM TUMOR MARKERS IN HEPATOCELLULAR CARCINOMA

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**Introduction:** AFP, AFP-L3 DCP are useful biomarkers of hepatocellular carcinoma (HCC). However, association between molecular characteristics and serum biomarkers has not fully evaluated yet. We analyzed RNA expression and DNA mutation from TCGA-LIHC data in conjunction with clinical data.

**Method:** Genetic data were retrieved from data portal of TCGA. Among total sample of 371, we selected 91 samples which we could measure serum AFP, DCP and AFP-L3 using preoperatively obtained frozen stored serum. Integrative clinical and molecular analysis of those 91 patients focused on biomarker were performed, and validated with remaining TCGA-LIHC cohort of 280 patients.

**Results:** Patients were divided into 4 subgroups; patients with elevated AFP or AFP-L3 alone (AFP & L3), DCP alone (DCP), elevated all 3 biomarkers (All) and normal tumor marker (Normal) based on clinical and genetic characteristics. CTNNB1 mutation was related to low AFP and AFP-L3 level. It was frequently found in DCP and Normal group, but patients with CTNNB1 mutation in DCP

group showed significant poor survival than those in Normal group. TP53 mutation was associated with elevated AFP and DCP and had different activating pathway according to biomarkers that dominant cell cycle arrest in AFP&L3 group, while RNA editing and DNA repair function in DCP group.

**Conclusion:** Serum AFP, AFP-L3 and DCP are helpful to predict mutation profile of HCC, especially TP53 and CTNNB1 mutations. These clinical oriented finding is useful to predict genetic profile of HCC and it may lead to more rational, targeted approach to treatment easily.

#### PL02-52

### HEPATIC STEM CELL-LIKE SUBTYPES OF HEPATOCELLULAR CARCINOMA REVEALED FROM THE INTEGRATIVE MULTI-OMICS ANALYSIS USING DEVELOPMENTAL HIERARCHIES OF THE LIVER

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**Background:** Hepatocellular carcinoma (HCC) is lethal malignancy showing high relapse rates after curative resection in early-stage. Aggressive tumor biology in resectable HCC remains unclear.

**Methods:** Using human fetal liver signatures, multi-omics dataset from multiple clinical HCC cohorts were analyzed comprehensively to reveal molecular mechanisms for HCC stemness as well as potential biomarkers to enhance therapeutic efficacy for molecular targeted therapy or immunotherapy in stem cell-like HCC subtypes.

**Results:** The patients predicted to the hepatic stem cell (HS) subtype showed aggressive tumor features including large tumor size, high AFP, vascular invasion, and extra-hepatic metastasis as well as worst prognosis with early recurrence even in early-stage. The oncogenic pathways in terms of cell cycle, epithelial-mesenchymal transition, and TGF-beta pathway were highly upregulated in the HS subtype. Higher mutations of TP53, RB1 with PTEN deletion were significantly identified in the HS subtype. We also identified subtype-specific tissue and serum biomarkers. Predicted responders for immunotherapy were significantly lower in stem cell-like subtypes due to higher accumulation of TAM and MDSC. The HS subtype showed potential higher response to multi-tyrosine kinase inhibitors, especially sorafenib and lenvatinib.

**Conclusion:** Stem cell-like HCC is not only associated with significantly higher relapse rate after curative resection but also with molecular biology for the aggressive subtype of HCC. We identified subtype-specific serum and tissue biomarkers for stem cell-like subtypes and precise therapeutic strategies for each subtype regarding immunotherapy and molecular-targeted treatment. Our findings may offer theoretical foundation of biomarker-based clinical trials for new therapeutic approaches to resectable early-stage HCC patients.

#### PL02-53

### ROBOTIC LIVER RESECTION VERSUS PERCUTANEOUS ABLATION FOR SINGLE HCC: SHORT- AND LONG-TERM RESULTS

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**Introduction:** Single hepatocellular carcinoma may be approached with different therapeutic strategies. The aim of this study is to compare short and long-term outcomes of patients that underwent robotic liver resection (RLR) versus percutaneous ablation (PA) for single HCC up to 3 cm.

**Methods:** All consecutive patients presenting at our Institution, between January 2014 and October 2019, with a single HCC up to 3 cm, and treated by RLR or PA (radio frequency ablation [RFA] and microwave ablation [MWA]) were included in this retrospective study.

**Results:** A total of 60 patients were collected, 24 patients underwent RLR and 36 PA. No significant differences were found between the two groups regarding demographics, underlying liver disease, liver reserve and characteristics of HCC. The overall complication rate was 37.50% in RLR-group and 16.67% in PA-group ( $p=0.068$ ). No early reinterventions were observed, and 30-day mortality was 0% in both groups. The incidence recurrence was 16.67% in RLR-group and 55.56% in PA-group ( $p=0.003$ ), including residual disease and all-site recurrence. Disease free survival and overall survival at 3 years in RLR-group and PA-group were 75% vs 33.3% ( $p=0.017$ ) and 63.6% vs 40% ( $p=0.650$ ), respectively.

**Conclusions:** According to our preliminary results, RLR provides a significantly higher disease-free survival, provides a more radical therapy, reduces the incidence of recurrence and shows similar peri-operative complication rates compared to PA procedures. Minimally invasive surgery, and in particular robotic approach, should be preferred over ablative treatments to treat single small HCC.

#### PL02-55

### BIOCHEMICAL PARAMETERS AND PIVKA-II IN PATIENTS WITH HEPATOCELLULAR CARCINOMA ON WAITING LIST FOR LIVER TRANSPLANTATION

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Liver transplantation (LT) is the treatment of choice in HCC but it has been seen that more than 10% of

transplanted patients have recurrences within the first year after surgery. PIVKA-II, or prothrombin induced by the absence of vitamin K, is an abnormal prothrombin molecule that increases in HCC and numerous studies have shown that it could be a useful biomarker for HCC complementary to alpha-fetoprotein (AFP). Peripheral blood was obtained from 36 patients with HCC candidates for LT. PIVKA-II was determined by LUMIPULSE G1200 system. Biochemical parameters (GOT, GPT, GGT, LDH, PCR, bilirubin) were determined by enzymatic, colorimetric and immunoturbidimetric methods in Cobas C711. AFP levels were obtained by electrochemiluminescence (ECLIA) in Cobas e 601. Median levels of PIVKA-II were 87.5 (mAU/mL) (IR: 34.5-523.75). In the correlation analysis between biochemical parameters and PIVKA-II only LDH showed a statistically significant positive correlation with PIVKA-II levels (Rho= 0.367; p=0.046). Likewise, statistically significant differences in PIVKA-II levels were observed between patients with pathological and non-pathological LDH levels (U=50; p=0.044), so that patients with LDH levels  $\leq$ 225 U/L had median PIVKA-II levels of 67 mAU/mL (RI: 30-154) while patients with LDH levels  $>$ 225 U/L had 571 mAU/mL (RI: 138-6232). Therefore, the levels of pre-LT PIVKA-II could be a good predicting marker of the liver function after LT and it would reflect the status of liver inflammation and therefore an increase of these levels would mean a worse prognosis and would be very useful when selecting candidates for LT.

#### PL02-57

### SINGLE SURGEON EXPERIENCE WITH LAPAROSCOPIC LIVER RESECTION FOR HUGE HEPATOCELLULAR CARCINOMA: A DISEASE RISK SCORE-MATCHED COHORT STUDY

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**Introduction:** Liver resection is the mainstay of curative therapy for huge HCCs ( $\geq$ 10cm in diameter) in selected patients with preserved liver function and adequate remnant liver. We present here our early experience with laparoscopic liver resection (LLR) for huge HCCs.

**Methods:** We conducted a retrospective review of 210 consecutive patients who underwent LLR by a single surgeon, of which 87 were for HCC, and 8 patients had radiological diagnosis of huge HCC.

**Results:** Disease-risk score matching was used to compare 8 patients with huge HCC to 32 patients with non-huge HCC. After matching, both groups were well-balanced for baseline characteristics. The huge HCC patients had a

higher mean Iwate difficulty score than the non-huge HCC patients (p=0.0039). Despite this, there were no significant differences in median operating time, estimated blood loss or proportion of patients requiring blood transfusion. More patients in the huge HCC group required inflow occlusion (p=0.0285), however the median Pringle duration was similar. Post-operatively, there were no significant differences in median LOS, overall complication and major morbidity rates between both groups. Median resection margins were also similar for both cohorts.

**Conclusion:** Our current study adds to the growing body of evidence in the literature that LLR when performed by skilled operators is feasible and safe even for giant HCCs in posterosuperior locations, in selected patients with preserved liver function.

#### PL02-59

### INVOLVEMENT OF LIVER CIRRHOSIS IN KERATIN 19-POSITIVE CANCER STEM CELLS ASSOCIATING HUMAN HEPATOCELLULAR CARCINOMA

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**Introduction:** Liver cirrhosis is known to be associated with the development and progression of hepatocellular carcinoma (HCC). We previously reported that keratin 19 (K19) is a novel HCC cancer stem cell (CSC) marker associated with epithelial-mesenchymal transition (EMT) through TGFb/Smad signaling. We also successfully created a 3D culture system preserving natural scaffolds of normal/fibrotic livers. Here, we investigated the relationship between liver cirrhosis and K19+ HCC-CSC.

**Method:** HCC cells were cultured in fibrotic and normal liver scaffolds generated from male Lewis rats, and examined the relationship between liver cirrhosis and K19+/K19- HCC cells by quantitative RT-PCR and immunohistochemistry. Additionally, K19 expression were evaluated by immunohistochemistry in 231 HCC patients who underwent liver resection or liver transplantation. The relationship between K19 expression level and liver cirrhosis was statistically analyzed.

**Results:** In HCC cells, K19+/K19- cells in fibrotic liver scaffolds progressed with an infiltrating pattern, in contrast to K19+/K19- cells in normal liver scaffolds progressing with a nodule-forming pattern. K19 immunohistochemistry revealed that the proportion of K19+ cells were significantly higher in fibrotic than in normal liver scaffolds (P< 0.05). Moreover, fibrotic liver scaffolds containing more K19+ cells showed significantly higher proliferation capacity and EMT-related gene expression than normal liver scaffolds (P< 0.05). In HCC patients, high and low K19 expression were detected in 9/231 and 16/231 patients,

respectively. Liver cirrhosis was significantly correlated with K19 expression level ( $P < 0.05$ ).

**Conclusions:** Liver cirrhosis might be involved in tumor growth and EMT through the maintenance of K19+ CSCs in HCC.

#### PL02-60 TRANSPLANT VS RESECTION FOR INTRAHEPATIC CHOLANGIOCARCINOMA - POTENTIAL FOR BENEFIT WITH TRANSPLANT?

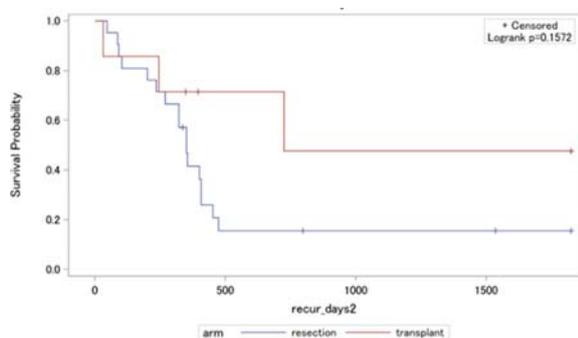
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**Introduction:** Complete tumor extirpation for intrahepatic cholangiocarcinoma (iCCA) was thought to be the only chance for long term survival. However, nearly 25-35% of patients have R1 resections. Moreover, majority recur and recurrences are initially isolated to the liver in 50% of patients. However, the oncologic outcome for transplant vs. resection for iCCA has not been well described.

**Methods:** From a database of over 2000 liver transplants, we identified 10 patients who had undergone incidental transplant for iCCA. Additionally we identified 74 patients who had undergone resection. The transplant patients were matched 1:3 for patients undergoing resection based on explant pathology. Statistical analysis was using SAS software.

**Results:** Average age was 62 $\pm$ 11 years. Lymph node invasion was present in 57% of entire cohort and lymphovascular invasion in 68%. Moderate to poor differentiation was present in 93% of the cohort. Of the resection patients 81% had a recurrence vs. 43% of transplanted patients. In the resection group liver was the first site of recurrence in 43% of patients. No differences were noted in overall survival in transplant vs. resected patients {403(1110 $\pm$ 1359)days vs 529(841 $\pm$ 748)days;  $p=0.8$ }. Recurrence free survival is depicted below



Recurrence free survival - transplant vs. resection

**Conclusions:** These data show that even in an oncologically high risk cohort, with 57% lymph node invasion, patients with intrahepatic cholangiocarcinoma undergoing transplant have a lower recurrence rate and suggestion of a longer recurrence free survival than resected patients. Therefore, we conclude that transplant for intrahepatic cholangiocarcinoma may be beneficial.

#### PL02-61 SOLID BENIGN LIVER LESIONS: ACCURACY OF CLINICAL DIAGNOSIS USING CONVENTIONAL RADIOLOGICAL TECHNIQUES AT TIME OF LIVER RESECTION

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**Introduction:** Solid benign liver lesions (SBLLs) are diverse in pathophysiology, prevalence and clinical manifestations. This study aims to evaluate the diagnostic accuracy of conventional radiological imaging for Solid Benign Liver Lesions (SBLLs) compared with malignant and cystic lesions of the liver at time of liver resection.

**Methods:** All resections of focal liver lesions between July 2014 and July 2019 at our institution were screened and included if histopathological specimen was available. Pre-operative radiological diagnoses were compared with postoperative histological diagnoses. Critical success index (CSI), sensitivity and specificity were used as measures of diagnostic accuracy. Misdiagnosis of solid benign, cystic, and malignant liver lesions was compared using logistic regression to estimate odds ratios with 95%CI. Multivariate logistic regression was used to calculate odds ratios for SBLL misdiagnosis, by pre-operative Ultrasound, CT, MRI, and Fine-needle biopsy.

**Results:** 466 resections in 402 patients were included for analysis, SBLL (n=37), Cystic (n=43), and Malignant (n=322). SBLLs have a significantly lower CSI at 59% (Sensitivity 76%, Specificity 98%) compared to Malignant at 87% (Sensitivity 100%, Specificity 71%), and Cystic lesions at 98% (Sensitivity 98%, Specificity 100%) ( $p < 0.01$ ). Haemangioma (n=13), FNH (n=10), and Adenoma (n=9) accounted for 86% of SBLL resections. On Multivariate analysis, pre-operative US, CT, MRI and FNB were not found to significantly correlate to misdiagnoses ( $p=0.78, 0.26, 0.98$  &  $0.53$  respectively).

**Conclusion:** Low diagnostic accuracy of SBLLs remains a challenge in the clinical management of liver lesions. Diagnostic inaccuracy of SBLLs did not appear to be correlated with choice of pre-operative investigation modality.

#### PL02-62 THE ABERRANT LONG NON-CODING RNA NEAT1 AFFECTED NRF2/HO-1 IN THE REGULATION OF HEPATOCELLULAR CARCINOMA

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**Aim:** NEAT1 (nuclear-enriched abundant transcript 1) is the lncRNA that upregulated and functions as a promoter in hepatocellular carcinoma. This study aims to investigate the role of NEAT1 interacted with nuclear factor erythroid-

derived 2-related factor2 (Nrf2)/ heme oxygenase (HO-1) signaling pathway in HCC.

**Methods:** The lncRNA expression profiling of in HCC tissues were identified by expression microarray analysis and quantitative real-time PCR. The effects of either Nrf2 or NEAT1 knockdown on the proliferation, invasion, apoptosis and oxidative stress-related enzymes were evaluated using a Milliplex Human Oxidative Stress Magnetic Bead Panel. Xenograft tumor assay was carried out to confirm the role of Nrf2 and NEAT1 in HCC cells *in vivo*.

**Results:** Nrf2 and lncRNA NEAT1 were upregulated and positive-correlated in HCC tissues and cell lines. Moreover, we found that under hypoxia/reoxygenation conditions, the activity of oxidative stress-related enzymes (CAT, GSH-Px, SOD) in HCC cells was significantly lower than that before treatment ( $P < 0.01$ ). The expression lncRNA NEAT1 and factors involved in Nrf2/HO-1 were significantly different after H/R treatment compared with pre-treatment which indicating the important relation of Nrf2/HO-1 signaling pathway in oxidative stress. Knockdown of Nrf2 led to the inhibition of cell proliferation and invasion and promotion of cell apoptosis, accompanying with down-regulation of Ki67, Keap-1 and HO-1 and up-regulation of the ROS levels. These observations were confirmed in xenograft mouse models wherein the knockout cells proliferate at a slower rate than the wild-type cells.

**Conclusions:** lncRNA NEAT1 promotes HCC tumorigenesis by affecting oxidative stress and further regulating Nrf2/HO-1 signaling pathway.

#### PL02-63

### RIGHT HEPATECTOMY IN HEPATOCELLULAR CARCINOMA IN A THIRD LEVEL HOSPITAL MÉXICO

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**Introduction:** Primary liver cancer accounts for 4% of all cancers worldwide. Of all those 90% corresponds to CHC. The majority in developing countries. In Mexico it was shown that the incidence doubled in 25 years (1965-1990). More recently, 2000-2006, with a national increase of 14% in mortality. Surgical resection is the treatment of choice at early stage.

**Case presentation:** Male of 62 years, with 2 months with unintended weight loss, asthenia, occasional pain in right hypochondrium.

CT: solid liver injury compatible with CHC. Laboratories: AFP 230.49 ng/ml.

The patient is scheduled for elective surgery, right hepatectomy, complete lesion resection, without accidents or incidents. Discharged on the 9th day.

Pathological report: hepatocellular carcinoma, moderately differentiated, focality solitary size 8x8 cm, negative surgical edges.

Adequate post-surgical follow-up without requiring adjuvant management. Control CT scan without activity. Control AFP 1.58 ng/ml.

**Discussion:** Approaches to surgical curative management according to the BCLC; liver resection, liver transplantation and local ablation. Liver resection is the treatment of choice in individuals with healthy liver and an alternative in individuals with cirrhosis under strict criteria.

In the presence of cirrhosis and under Milan criteria liver transplantation is the treatment of choice, the great disadvantage is the availability. In case of contraindication for transplantation and surgery, the alternative includes locoregional therapies.

**Conclusion:** Obstacles to effective care include complicated diagnostic evaluation and limited availability. However, through the already established staging and the scrutiny criteria, and access to specialized multidisciplinary care, curative surgical management can be achieved, as in this case

#### PL02-64

### REGULATION OF HEPATOCELLULAR CARCINOMA PROGRESSION BY A LONG NONCODING RNA

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**Purpose:** Long noncoding RNAs (lncRNAs) are emerging RNA species with critical physiological and pathological functions, while their roles in human hepatocellular carcinoma (HCC) remain poorly understood.

**Experimental Design:** Microarray analysis identified a new lncRNA HClnc1 associates with HCC progression. Antisense RNA-coupled mass spectrometry was then used to identify interacting proteins of HClnc1. The molecular mechanisms of HClnc1 were demonstrated by *in vitro* experiments using Chromatin Isolation by RNA Purification (ChIRP), RNA pull-down, RNA immunoprecipitation and luciferase analyses, and the *in vivo* functions of HClnc1 were confirmed by a xenotransplanted HCC tumour model.

**Results:** HClnc1 was dramatically increased in higher tumour-node-metastasis staged patients and inversely correlated with survival rates. HClnc1 knockdown compromised proliferation and migration in HCC cells. HClnc1 interacts with pyruvate kinase M2 (PKM2) and protects it from degradation to facilitate STAT3 transcriptional activity and aerobic glycolysis. HClnc1 knockdown blunted HCC tumour growth and metastasis *in vivo*.

**Conclusions:** HClnc1 promotes HCC tumourigenesis by stabilizing PKM2 and therefore facilitates the Warburg effect. Targeting HClnc1 and its pathway sheds lights on HCC treatment.

#### PL02-65

### LOCAL ABLATIVE AND LIVER DIRECTED CHEMOTHERAPY CAN BE CURATIVE FOR HEPATOCELLULAR CARCINOMA

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**Introduction:** Hepatocellular Carcinoma (HCC) is the third most common cause of cancer death worldwide. Latest evidence suggests that local ablative techniques, when used in combination with liver directed chemotherapy may provide outcomes comparable to SR. Our study aims to assess the oncologic outcomes and safety profile of such combination therapies (CT) in order to

determine if these therapies can potentially be introduced as a curative alternative for HCC.

**Methods:** A systematic review was conducted for literature published before April 2019. Outcomes measured were disease-free survival(DFS), overall survival(OS) and major complications. DFS was further divided into local tumour progression(LTP), intrahepatic distant recurrence(IDR) and distant metastasis(DM).

**Results:** Eight retrospective studies and one randomized controlled trial were included. There is no significant difference in 1-year, 3-year and 5-year OS and 1-year DFS between CT and SR. SR had superior 3-year DFS (OR 0.78, 95%CI 0.62-0.98, p=0.03) and 5-year DFS (OR 0.74, 95%CI 0.58-0.95, p=0.02) compared to CT. When analysing only the propensity matched data, the difference in 3-year DFS and 5-year DFS was no longer significant. CT had a higher LTP rate (OR 2.48, 95%CI 1.05-5.86, p=0.04) compared to SR but IDR and DM rates were not significant. CT had lower major complication rate (RR 0.39, 95%CI 0.24-0.62, p< 0.0001), and shorter hospital stay than SR.

**Conclusion:** CT offer comparable oncologic outcomes in patients with HCC as compared to SR with added benefit of lower morbidity. CT should be introduced as an alternative to SR as they can be potentially curative for HCC.

#### PL02-67

### BLEEDING WITH IN A HUGE ANGIOMYOLYPOMA OF LIVER PRESENTING AS AN ACUTE ABDOMEN

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Epithelioid angiomyolipoma (EAML) of liver is a rare neoplasm. It is even rare to present as an acute abdomen. It is usually misdiagnosed as other neoplasms such as hepatocellular carcinoma due to non-specific clinical and radiologic features. Most tumors are small and asymptomatic but few of them can be large in which case there is a possibility of hemorrhage into the tumor. Here, we report a case of 19-year-old girl who presented with an acute abdominal pain and 8 cm mass was found on the right lobe of liver with bleeding within the tumor. With this impression right lobectomy of the liver was done. Grossly there was a clot of blood within the tumor and microscopically, the tumor is composed of predominant epithelioid cells with vascular component and foamy cells. The final diagnosis was hepatic angiomyolipoma with hemorrhage within the tumor.

#### PL02-68

### SYNCHRONOUS DOUBLE PRIMARY: A CASE REPORT ON SIGMOID ADENOCARCINOMA WITH INTRAHEPATIC CHOLANGIOCARCINOMA

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**Objective:** In this case report, we describe our experience with the patient who was diagnosed incidentally with synchronous double primary.

**Method:** 28 year old male presented with obstructive jaundice. Patient underwent ERCP and stenting following which he underwent PET CT which showed metabolically active lesion in segment IV /V of liver along the right sided bile duct and CHD with significant narrowing .Metabolically active lesion in proximal sigmoid.

Colonoscopy showed ulceroproliferative growth in sigmoid colon and biopsy showed F/S/O Tubulo- villous adenoma with high grade dysplasia with a focus of intramucosal carcinoma.

Patient underwent simultaneous resection: Right Trisegmentectomy with Sigmoidectomy.

**Results:** Final biopsy showed Hilar tumor staging: Adenocarcinoma T1b,N0

Sigmoid staging: Well differentiated Adenocarcinoma T1 ,N0

IHC Studies on Liver /CK 7 : Negative/CH19:Positive/CK20 :Negative /Focal positive CK8/18:Postive/Napsin :Negative /CDX2:Negative

IHC Sigmoid mass CH7:Patchy positive /CK20 positive /CDX2:Positive

IHC profile of hilar mass was different from colonic tumor suggestive of Double primary.

**Conclusion:** Incidence of multiple primary tumor are rare and incidence ranges from 2-17%.

PubMed search revealed only one case report by Jing-qiang Guo et al, showing the rarity of this case.

#### PL02-69

### LONG-TERM OUTCOMES AFTER LAPAROSCOPIC HEPATECTOMY FOR HEPATOCELLULAR CARCINOMA

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**Aim:** Laparoscopic liver resection for hepatocellular carcinoma (HCC) is a common and effective approach for treating this disease. There are few published series that report outcomes with long-term follow-up. This study summarises our experience to date and presents our long-term survival outcomes.

**Methods:** A retrospective analysis of consecutive patients undergoing laparoscopic liver resection for HCC in 2 tertiary academic hepatobiliary units in Brisbane, Australia, between 1999 and 2015 was performed. Operative characteristics, perioperative morbidity, and pathological data were described. Patients with and without cirrhosis were analysed and compared.

**Results:** Fifty-two patients underwent resection of 79 HCCs. Sixty-five percent of patients had cirrhosis. Fourteen percent of patients underwent a major hepatectomy. Conversion to an open procedure occurred in 9%. There was one 90-day mortality due to liver failure (1.9%), and 7 patients (13%) experienced a complication. R0 resection was achieved in 92%. Median follow-up was 7.7 years. Overall survival at 1, 3, and 5 years was 88%, 81%, and 73%, respectively. Median survival was 9.8 years.

**Conclusion:** Laparoscopic liver resection for HCC, including cirrhotic patients, is technically challenging. It can be performed with acceptable morbidity and acceptable long-term survival outcomes.

PL02-70

### INFLUENCE OF NEOADJUVANT TRANSARTERIAL CHEMOEMBOLIZATION FOR BCLC STAGE A/B HEPATOCELLULAR CARCINOMA BEYOND MILAN CRITERIA

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**Objective:** The role of transarterial chemoembolization (TACE) plus sequential curative resection for hepatocellular carcinoma (HCC) beyond Milan criteria is still debated. The aim of our study was to investigate the survival benefits of neoadjuvant TACE in patients with HCC beyond Milan criteria.

**Patients and methods:** A total of 262 patients with a diagnosis of HCC classified as BCLC stage A but beyond Milan criteria (solitary HCC beyond 5 cm without macrovascular invasion) and stage B between 2015 and 2018 were evaluated. The factors associated with clinical outcomes were retrospectively analyzed. The Kaplan-Meier method was used to calculate survival, and groups were compared with the log rank test.

**Results:** 76 of 262 patients received neoadjuvant TACE, and had comparable progression-free survival (PFS) and overall survival (OS) as those received primary resection ( $P > 0.05$ ). Among them, patients reached tumor downstaging induced by TACE (35.6%) or total necrosis histopathologically (22.4%) had better PFS and OS than those of no significant response to TACE (19.1 vs 7.73 months,  $P < 0.001$ ; 32.0 vs 21.8,  $P < 0.001$ ). Factors associated with unsuccessful downstaging included baseline pretreatment AFP  $\geq 1,000$  ng/mL (HR: 0.178, 95% CI: 0.050-0.627,  $P = 0.007$ ) and multiple lesions (HR: 0.175, 95% CI: 0.032-0.939,  $P = 0.042$ ).

**Conclusion:** Neoadjuvant TACE did not provide a significant benefit compared with curative therapy alone in patients carrying HCC beyond Milan criteria. However, as for those who may not indicate for curative therapy, downstaging or total necrosis of the tumor resulted from TACE was associated with favorable survival.

PL02-71

### MULTIFOCAL PRIMARY HEPATIC NEUROENDOCRINE TUMOUR: RECOGNITION AND MANAGEMENT

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**Introduction:** Most Neuroendocrine tumours in the liver are secondary. However, Primary NeuroEndocrine Tumour of the Liver is also possible. Its rare and is usually not considered a possible diagnosis for a multifocal Liver lesion.

**Method:** This is a retrospective review of a Large multifocal tumour of the Right lobe that underwent Extended Right hemihepatectomy.

**Results:** A 66 yo female presented with vague abdominal discomfort and bloating. CT abdomen revealed a large multifocal solid/cystic lesion in the Right lobe of the liver, concerning for Cholangiocarcinoma. She unfortunately developed PE preop for which she was put on anticoagulation. She underwent Extended Right Hemihepatectomy from which she made an uneventful recovery. Histology showed three main lesions characterized by trabeculae and cells that stain positively for Synaptophysin, Ki67 3%, and overall Grade 2, consistent with Primary Hepatic NeuroEndocrine tumour. Her Dotatate scan was negative with normal Serum Chromogranin A.

Primary Hepatic NeuroEndocrine tumour is a rare tumour with cells possibly originating from ectopic pancreatic and/or adrenal tissue in the liver or from scattered neuroendocrine cells in the intrahepatic biliary epithelium or differentiation of a stem cell. They can be multifocal or unifocal and can grow to a large size before being noticed.

**Conclusions:** Primary Hepatic NeuroEndocrine tumours usually are slow-growing, have solid/cystic component on CT and lack of NET elsewhere to confirm the diagnosis. Grade including Ki 67% and Mitotic rate can predict prognosis. Hepatic NET should be considered as a differential diagnosis for newly-diagnosed primary hepatic lesion. Enbloc resection is the key.

PL02-73

### MUCINOUS CHOLANGIOCARCINOMA WITH HEMOBILIA: A CASE REPORT

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Pure mucinous cholangiocarcinoma is a very rare variant of intrahepatic cholangiocarcinoma. An 83-year-old female was presented to our hospital with an epigastric pain. She had no liver disease. Contrast-enhanced abdominal computed tomography showed a dilatation of left hepatic duct containing both irregularly nodular enhancing components and hematomas. Endoscopic retrograde cholangiogram revealed a hemobilia of common bile duct. We initially diagnosed as an intraductal papillary neoplasm of the bile duct with hemobilia. Both left hemihepatectomy including middle hepatic vein and caudate resection was performed. Pathologic examination reported mucinous adenocarcinoma with directly invades into hepatic parenchyma and beyond the wall of bile duct. She was discharged without complication on postoperative day 9 and had no recurrence for 6 months. Herein, we described a rare case of mucinous cholangiocarcinoma with hemobilia.

PL02-74

### MUCINOUS CYSTIC NEOPLASM OF THE LIVER (MCN-L) PRESENTING AS HILAR INTRALUMINAL MASS WITH EPISODIC BILIARY OBSTRUCTION

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**Introduction:** Mucinous cystic neoplasm of the liver (MCN-L) is an extremely rare cyst-forming epithelial benign tumor but potentially malignant. We present a rare case of Mucinous cystic neoplasm of the liver (MCN-L) presenting as Hilar Intraluminal Mass with Episodic Biliary Obstruction.

**Method:** A 20-year-old woman came with complains of episodic jaundice. Laboratory tests revealed T-bil: 12.1 mg/mL. Tumor marker levels were normal (CA 19-9: 5.5 U/mL; CEA  $\hat{}$ 0.5 ng/mL). Contrast abdominal CT revealed a 61 9 39 mm multilocular cystic lesion with internal septal formation in the left hepatic lobe (S4). ERCP demonstrated no excretion of mucin from the papilla of Vater. Cholangiography revealed a filling defect in the upper bile duct, and the lower tip of the defect area was oval-shaped. The patient was therefore diagnosed with non-malignant MCN-L and an extended left hepatectomy with right hepaticojunostomy were performed. Patient tolerated the surgery well.

**Results:** Examination of the resected specimen confirmed that the tumor originating from S4 of the liver with polypoidal extension into the left hepatic duct and common bile duct. Microscopic findings indicated a diagnosis of Mucinous cystic neoplasm with low grade dysplasia.

**Conclusion:** The diagnosis of MCN-L requires a high degree of suspicion. Histopathological examination establishes definitive diagnosis. Intrahepatic MCN-L can present with episodic jaundice due to its characteristic intraductal growth pattern and intraluminal mass formation. They are best treated radically as they have a definite potential to transform into malignant tumors in nearly 10%.

#### PL02-75

### LIVER RESECTION FOR PATIENTS WITH HEPATOCELLULAR CARCINOMA AND CHILD B LIVER FUNCTION: A SINGLE-CENTER EXPERIENCE

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**Objectives:** Liver resection is the first-line treatment option for patients with hepatocellular carcinoma (HCC). Whether patient with HCC and Child B liver function can performed liver resection is still controversial.

**Methods:** From January 2012 to June 2018, Child B patients with HCC who underwent liver resection were enrolled in this study. Perioperative complications and risk factors for long-term survival were analyzed.

**Results:** During the study period, 186 Child B patients perform liver resection. Of these, 140 patients (75.3%) were presented with cirrhosis, 154 (82.8%) with ascites, 98 (52.7%) with portal hypertension, and the median tumor size was 7.2 cm. Forty-one patients performed laparoscopic liver resection, and 40 patients received additional splenectomy. Most patients (77.4%) only underwent minor resection and non-anatomical hepatectomy. The minor and major surgical complication was 31.2% and 24.7%, respectively. The 1-, 3-, and 5-year disease-free and overall survival were 49.8% and 69.5%, 33.8% and 47.5%, 24.5% and 30.4%, respectively. The laparoscopic procedure achieved similar long-term survival but better perioperative

outcomes. Among those with portal hypertension, patients received additional splenectomy achieved better oncological outcomes. Multivariate analysis showed that portal hypertension (HR 1.490, 95% CI 0.979-2.269,  $P=0.043$ ), tumor size  $>5$  cm (HR 1.928, 95% CI 1.276-2.914,  $P=0.002$ ), macrovascular invasion (HR 1.746, 95% CI 1.116-2.733,  $P=0.015$ ).

**Conclusions:** Liver resection achieved long-term survival in some selective patients with HCC and Child B liver function, especially for those with small tumor size, and without portal hypertension and macrovascular invasion. A laparoscopic procedure could decrease surgical complications and splenectomy could prolong long-term survival.

#### PL02-76

### MAIN PORTAL VEIN THROMBOSIS POST TACE: A CASE REPORT

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**Introduction:** Transarterial Chemoembolization (TACE) is one of the palliative treatments offered in patients staged Barcelona Clinic Liver Cancer (BCLC) B. TACE can lead to many complications, like decompensation of liver, liver abscess, liver rupture, femoral artery pseudoaneurysm and gallbladder pathology.

**Methods:** We report a case a 58-year old gentleman, which developed extensive portal vein thrombosis immediately post TACE and its management.

**Results:** In this case report, we discuss the presenting signs and symptoms of developing extensive portal vein thrombosis post TACE, along with other complications that may arise from TACE. A review of the literature of this condition and the discussion of possible management is included.

**Conclusion:** Development of extensive portal vein thrombosis post TACE is a rare complication, which can lead to severe morbidity and mortality. Although rare, it has to be considered as one of the possible complications of this procedure.

#### PL02-79

### PREOPERATIVE SERUM AXL/GAS6 ALLOW STRATIFICATION OF ONCOLOGICAL OUTCOME IN PATIENTS UNDERGOING LIVER RESECTION FOR HEPATOCELLULAR CARCINOMA

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**Introduction:** Liver resection is routinely performed in patients suffering from primary liver malignancies. Still, this group of neoplastic entities is known to have an unfavourable prognosis. Thus, preoperative risk assessment is vital for clinical decision making. Recently, Axl and its ligand Gas6 were found to be associated to unfavourable

tumor characteristics in hepatocellular carcinoma (HCC). Further, a negative correlation with overall survival (OS) and disease-free survival (DFS) were observed, which suggests its potential use as a prognostic marker in HCC patients.

**Method:** Serum was collected in 27 patients prior to liver resection for HCC. Levels of Axl/Gas6 were measured via ELISA and evaluated as markers for OS and DFS.

**Results:** Indeed, Axl and Gas6 were elevated in patients with an OS of less than one year and showed a high predictive potential for death within this period as assessed via receiver operating characteristics ( $p=0.033$ ,  $AUC=0.809$ , respectively). Using the Youden index, optimal cut-offs were identified at 45.00 ng/mL for Axl and at 50.00 ng/mL for Gas6. Interestingly, patients above the cut-off for Axl showed significantly reduced OS in Kaplan-Meier analysis ( $p=0.045$ ), and a tendency towards earlier tumor recurrence ( $p=0.067$ ). Similarly, patients with increased Gas6 levels tended to display reduced OS ( $p=0.072$ ), while there was no association to DFS.

**Conclusion:** The present data underlines a potential benefit of incorporation of Axl/Gas6 in clinical routine. Especially combination with other biological markers could further increase validity. Accordingly, clinical decision making and treatment evaluation could be adapted in concordance with these markers.

#### PL02-80

### ROLE OF TRANSIENT ELASTOGRAPHY IN DETERMINING THE SURGICAL STRATEGY IN PATIENTS WITH RESECTABLE HEPATOCELLULAR CARCINOMA

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**Background:** Recurrence is common in patients with chronic liver disease undergoing liver resection (LR) for hepatocellular carcinoma (HCC). The aim was to evaluate if transient elastography (TE) would help in choosing the ideal treatment strategy (resection or transplantation) in these patients.

**Methods:** Liver stiffness (LS) and controlled attenuation parameter (CAP) were measured preoperatively by TE using FibroScan® in patients planned for LR. Predictive factors of overall survival (OS), recurrence-free survival (RFS), early recurrence (ER) were analyzed.

**Results:** One hundred and five patients with HCC planned LR were prospectively included in the study. One- and 2-year OS in patients after LR were 88% and 80.9%. One- and 2-year RFS were 59.5% and 39.5%. Median follow-up after LR was 16.3 months. Poor prognostic factors for OS were  $AFP \geq 100$ ng/mL [hazard ratio (HR):6.03, 95% confidence interval (CI):2.13-17.09],  $LS \geq 30$ kPa [HR:3.46, CI:1.15-10.42], open LR [HR:5.31, CI:1.13-25.04], and severe post-operative complications [HR:3.48, CI:1.24-9.79]. Independent predictors of poor RFS were  $size > 50$ mm [HR:2.22, CI:1.12-4.44],  $AFP \geq 100$ ng/mL [HR:2.42, CI:1.17-4.99],  $CAP < 240$ dB/m [HR:2.49, CI:1.21-5.16], Pringle maneuver  $\geq 75$ min [HR:5.29, CI:1.95-14.37], and intra-operative RBC transfusion

[HR:4.67, CI:1.39-71]. In subgroup patients with advanced fibrosis (F3/F4) and eligible for liver transplantation (LT),  $LS \geq 30$ kPa [HR:5.33, CI:1.27-184.84], and  $CAP < 240$ dB/m [HR:9.46, CI:0.98-91.52] were predictors of ER.

**Conclusion:** LS and CAP help predict the oncological outcomes after LR and would be good pre-operative prognostic biomarkers of survival and recurrence. Patients with  $LS \geq 30$ kPa and  $CAP < 240$ dB/m should preferentially be listed for primary LT and LR would be a bridge to LT.

#### PL02-82

### MULTIPLE DISCIPLINARY TEAM (MDT) TREATMENT COULD HELP CONVERT UNRESECTABLE HCC OF LATE STAGE TO RESECTABLE

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**Introduction:** We report a case of late-stage HCC who was successfully converted from unresectable to resectable with the help of MDT treatment.

**Methods:** A 60-year-old male patient was admitted for HCC with portal vein tumor thrombus (PVTT) (stage C of BCLC). The liver tumor (with a diameter of 15cm) was located in the right lobe with PVTT at the main trunk of portal vein and was judged to be unresectable for insufficient liver volume of the left lobe. After MDT discussion, the comprehensive treatment was performed to downstage the tumor, including Lenvatinib (12mg/d), checkpoint inhibitor (Sintilimab Injection, 200mg q3w) and radiotherapy (GTV, 3.0Gyx10 times).

**Results:** The liver tumor was controlled well and PVTT regressed to the right portal vein. The liver volume of left lobe increased rapidly from 415.7ml to 661.5ml, which is sufficient for right hemi-hepatectomy. The right hemi-hepatectomy was successfully performed and the patient recovered well. The pathological result showed that the majority of liver tumor was necrotic with little middle-low differentiated HCC in the central part of tumor and PVTT. A significant immunological change was found in tumor tissues. The patient continues to take half-dose of Lenvatinib and checkpoint inhibitor after discharger and has survived for 3 months after surgery with no recurrence.

**Conclusion:** MDT treatment could help downstage the late-stage HCC, convert unresectable HCC to resectable, as well as improve the prognosis of late-stage HCC.

#### PL03 - Liver: Surgical Outcomes

##### PL03-001

### A BETTER ROUTE TO ALPPS: MINIMALLY INVASIVE VS OPEN ALPPS

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**Introduction:** Associating liver partition and portal vein ligation for staged hepatectomy (ALPPS) has gained interest and controversy, as an alternative to portal vein embolisation (PVE) by inducing future liver remnant hypertrophy in patients at risk of post hepatectomy liver failure. Open ALPPS induces more extensive hypertrophy

in a shorter timespan than PVE, however, it is associated with higher complication rates and mortality. Minimally invasive surgery (MIS), with its known benefits, has been applied to ALPPS in the hope of reducing the surgical insult and improving functional recovery time, whilst preserving the extensive FLR hypertrophy.

**Methods:** PubMed, Medline, EMBASE and Cochrane Library databases were searched on 10<sup>th</sup> July 2019. 19 open ALPPS studies, 3 MIS ALPPS and 1 study reporting on both were identified and included in the analysis.

**Results:** 1088 open and 46 MIS ALPPS cases were included in the analysis. There were significant differences in the baseline characteristic: open ALPPS patients had a more diverse profile of underlying pathologies ( $p=0.028$ ) and more right extended hepatectomies ( $p=0.006$ ) performed. Operative time and blood loss did not differ between the two groups. MIS ALPPS had a lower rate of severe Clavien-Dindo complications ( $\geq IIIa$ ) following stage 1 ( $p=0.063$ ) and significantly lower median mortality (0.00% vs 8.45%) ( $p=0.007$ ).

**Conclusion:** Although MIS ALPPS would seem to provide a potentially superior alternative to open ALPPS with reduced morbidity and mortality rates, the evidence on MIS ALPPS is still limited and more high-quality studies on MIS ALPPS need to be published before conclusions can be reached.

PL03-002

### SURGICAL RESECTION FOR HEPATOCELLULAR CARCINOMA IN PATIENTS WITH CHRONIC HEPATITIS C VIRUS INFECTION: A CHINESE MULTICENTER EXPERIENCE

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**Background and aims:** There are very few studies on surgical resection for HCC in patients with HCV infection from China. Based on a multicenter database, we aimed to analyze clinical characteristics, short-term and long-term prognosis after HCC resection in Chinese patients with chronic HCV infection.

**Methods:** The records of all patients with HCV infection who underwent curative resection for initial HCC between 2004 and 2015 were reviewed. Perioperative mortality and morbidity, long-term overall survival (OS) and recurrence-free survival (RFS) were evaluated.

**Results:** Of the enrolled 382 patients, nearly half (46.1%) did not know their history of HCV infection before HCC diagnosis, and only 14.6% had received anti-HCV therapy before surgery. The 30-day morbidity and mortality were 44.8% and 2.9%, respectively. The 5-year OS and RFS rates were 45.0% and 34.4% respectively. Multivariable analyses showed that concurrent HBV infection, portal hypertension, tumor size > 5 cm, macrovascular and microvascular invasion, and none of postoperative anti-

HCV therapy were independently associated with OS, while concurrent HBV infection, preoperative AFP level > 400ug/L, tumor size > 5 cm, multiple tumors, and macrovascular and microvascular invasion were independently associated with RFS after curative resection for HCC in patients with chronic HCV infection.

**Conclusions:** The proportion of patients with HCV infection receiving anti-HCV therapy is low in China. Although perioperative morbidity and mortality are acceptable, the long-term outcomes are unsatisfactory, which may be related to high concurrent HBV infection rate, aggressive liver- and tumor-related characteristics, and low proportion of postoperative anti-HCV therapy.

**FIGURE.** Comparisons of overall survival (A) and recurrence-free survival (B) curves in patients with chronic HCV infection after curative liver resection for hepatocellular carcinoma between patients with and without concurrent HBV infection

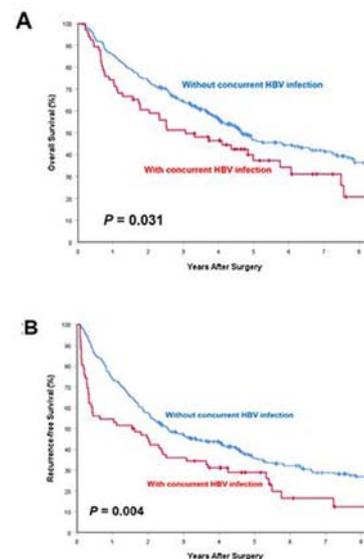


Figure. Comparisons of OS and RFS

PL03-003

### EUROPEAN SOCIETY FOR CLINICAL NUTRITION AND METABOLISM (ESPEN) MALNUTRITION CRITERIA FOR PREDICTING MAJOR COMPLICATIONS AFTER HEPATECTOMY AND PANCREATECTOMY

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**Introduction:** Recently, the diagnostic criteria for malnutrition has been proposed by the European Society for Clinical Nutrition and Metabolism (ESPEN). This study aimed to investigate the effect of ESPEN malnutrition criteria as a predictor for major complication following hepatectomy and pancreatectomy.

**Methods:** Data were reviewed from 176 consecutive patients who underwent hepatectomy (n=103) or pancreatectomy (n=73) between November 2017 and December 2019. Patients were divided into two groups according to the ESPEN malnutrition criteria using a prospectively collected database. The clinical data and the surgical outcomes of patients in the malnourished and normal groups were retrospectively analyzed.

**Results:** 35 (20%) patients diagnosed malnourished according to ESPEN criteria. Malnourished group was significantly low preoperative albumin concentration (p=0.001). After hepatectomy, major complications (Clavien grade  $\geq$  III) occurred significantly more frequently in the malnourished group (p=0.013). Multivariate analysis indicated that operative duration  $\geq$  300 min (hazard ratio: 22.47, 95% CI: 2.17 to 232.73, p=0.009) and malnourished (hazard ratio: 14.56, 95% CI: 2.58 to 82.17, p=0.002) were independently associated with major complications after hepatectomy. On the other hand, malnutrition was not associated with major complications after pancreatectomy.

**Conclusions:** The ESPEN malnutrition criteria is valuable predictor for major complications following hepatectomy.

#### PL03-007

### LOW LEVEL OF POSTOPERATIVE PLASMA ANTITHROMBIN III IS ASSOCIATED WITH PORTAL VEIN THROMBOSIS AFTER LIVER SURGERY

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**Background:** Decreased antithrombin-III (AT-III) is a risk factor of portal vein thrombosis (PVT) in patients with liver cirrhosis. The association between PVT and postoperative AT-III is controversial in patients who underwent liver surgery. The efficacy of postoperative AT-III supplementation on PVT is also uncertain.

**Methods:** Patients who underwent hepatectomy for hepato-biliary disease between 2015-2018 were retrospectively analyzed. Donors and recipients for liver transplantation were excluded. Postoperative PVT was assessed on computed tomography on the day 6-9 after hepatectomy.

**Results:** Of the 325 patients included in this analysis, 19 patients (5.8%) were diagnosed as postoperative PVT. AT-III level on postoperative day (POD) 3 predicted postoperative PVT with a sensitivity/specificity of 74%/59% (area under the curve, 0.644; cut-off value, 60%; p=0.032). Univariate analysis revealed that AT-III level  $\leq$ 60% on POD3 was the only significant risk factor for postoperative PVT (Table). Postoperative AT-III supplementation was not associated with reduced incidence of PVT. Although postoperative AT-III supplementation and major hepatectomy were the significant risk factors for postoperative hemorrhagic complications in univariate analysis, multivariate analysis revealed that major hepatectomy was the only significant risk factor for hemorrhagic complications.

**Conclusion:** Patients with AT-III level  $\leq$ 60% on POD3 should be given careful attention to postoperative PVT. Although postoperative supplementation of AT-III is safe without increased risk of hemorrhagic complication, the efficacy of it on PVT is still controversial.

#### PL03-008

### ONCOLOGICAL SUPERIORITY OF ANATOMIC RESECTION AT INITIAL HEPATECTOMY FOR SOLITARY HEPATOCELLULAR CARCINOMA

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**Introduction:** Optimal choice of surgical maneuver for small hepatocellular carcinoma (HCC) remains inconclusive. This study sought to investigate the oncological superiority and postoperative influence of anatomic resection (AR) at initial hepatectomy for HCC.

**Methods:** From a prospectively corrected database (n=1,175), 203 patients who underwent curative resection for primary, solitary HCC measuring up to 5 cm in diameter, which was confined to one Couinaud's segment and resectable either by AR or limited resection, were studied in detail.

**Results:** AR (i.e. monosegmentectomy) was completed in 38 patients and not completed in the remaining 165 patients (i.e., limited resection). In multivariate analysis, AR was correlated with better recurrence-free survival (hazard rate [HR], 0.45; P=0.008), longer time-to-interventional failure (HR, 0.24; P=0.003), and improved overall survival (HR, 0.24; P=0.006). Recurrence within the same segment was observed in 30.4% when AR was not completed, and in such cases, average number of recurrent lesions and incidence of unresectable recurrence were higher

(3.6 vs. 1.3 nodules; P=0.006 and 20.8% vs. 9.1%; P=0.16, respectively) compared to those who did not present local recurrence. Probability analysis using a Markov model showed that completion of AR at initial hepatectomy is associated with lower transition rates in both 1) from postoperative tumor-free status to resectable recurrence (5.1 vs. 12.5 /100 person-year, P=0.033) and 2) from resectable recurrence to progression to unresectable disease (9.0 vs. 35.6 /100 person-year, P=0.027).

**Conclusion:** Complete removal of tumor-bearing segment at initial hepatectomy is associated with better survival outcomes through decreased risk of multiple/unresectable recurrence in solitary HCC.

#### PL03-009

### PLASMA METABOLOMICS IN LIVER TUMOR PATIENTS AND ITS PREDICTIVE PERFORMANCE FOR POSTOPERATIVE DISEASE-FREE SURVIVAL ASSESSMENT

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**Introduction:** Liver surgery still remains the only curative treatment for primary (HCC, CCC) and secondary (CRCLM) liver cancer. However, patients show significant differences in terms of postoperative disease-free status and recurrences often occur within first six months after

surgery. There is emerging evidence that tumor biology is a huge and heterogenous field with many aspects and not easily comprehensible. Therefore, we try to elucidate differences in tumor biology and its impact on disease-free survival in this prospective cohort using an unbiased metabolomics approach.

**Method:** Plasma from 150 prospectively included patients was collected and each sample was analyzed for 180 metabolites using the Biocrates p180-kit on a mass spectrometry platform.

**Results:** We could identify three metabolites (PC ae C38:23, PC ae C36:3 and lyso PC C18:0) that showed decreased preoperative plasma concentrations and were significantly associated with early recurrence within six months after surgery.

**Conclusions:** Within this prospective study we could show that certain phosphatidylcholines and lyso-phosphatidylcholines could predict already preoperatively the risk of developing an early recurrence within six months after liver resection in a heterogenous collective.

### PL03-010

#### HEPATIC RESECTION IN LOW RESOURCE SETTING: A SINGLE CENTRE EXPERIENCE IN NORTHWEST NIGERIA

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**Introduction:** Hepatic resection is one of the technologically demanding surgeries in the field of surgery. Since the first liver surgery in 1886, hepatic surgeries have undergone intensive modification and advances, aimed at improving morbidity and mortality. However in low resource settings, these advances are not readily available to the surgeons resulting in increased morbidity.

We describe our experience with hepatic resection.

**Methods:** This is a single centre retrospective study conducted in the general surgical unit of Aminu Kano Teaching Hospital, Kano.

Data was collected from operative register from the year 2000 to 2018. All patients that had hepatic resection were included in the study.

The parameters recorded include sociodemographic feature of the patients, indication of the resection, and type of resection.

**Results:** A total of 29 hepatic resections were done for the period studied. The median age of the patients was 47±3.2 years. There were 17 male and 12 females. The indication for the hepatic resection were blunt abdominal injury in 16 patients, penetrating abdominal injury in 6 patients, hepatocellular carcinoma in 6 patients and one case of metastatic colonic cancer.

Anatomic resection was done in only 4 patients while 25 patients had non-anatomic resection. Three patients developed bile leak and one patient developed sub phrenic abscess.

**Conclusions:** Abdominal trauma is the commonest indication for hepatic resection in low resource setting with non-anatomic hepatic resection being the commonest form of hepatic resection in these settings.

### PL03-011

#### LAPAROSCOPIC HEPATECTOMY FOR HEPATOCELLULAR CARCINOMA

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**Introduction:** Laparoscopic hepatectomy has spread worldwide with the development of various medical devices. We analyzed the use of laparoscopic hepatectomy for hepatocellular carcinoma at our institution.

**Materials and procedure:** We analyzed 186 patients who underwent surgery for hepatocellular carcinoma from 2010 to 2019 at our institution. We divided these patients into two groups: the open hepatectomy group (OH) and the laparoscopic hepatectomy group (LH). We evaluated the clinicopathological findings, overall survival, and recurrence-free survival. In the LH group, there were more early-stage patients than in the OH group. We further analyzed the two groups by limiting groups to patients with Stage I and II cancer.

**Results:** In our study, 75 patients underwent laparoscopic hepatectomy (40.3%). The operation time, intraoperative bleeding, duration of hospital stay after surgery, and tumor diameter were significantly less in the LH group. Between the two groups, mortality rate, morbidity rate, overall survival rate, and recurrence-free rate did not significantly differ. We limited the patients to those in stages I and II. Intraoperative bleeding, duration of hospital stay after surgery, tumor diameter, and morbidity rate were significantly less in the LH group. Between the two groups, mortality rate, overall survival rate, and recurrence-free rate did not significantly differ.

**Conclusion:** Laparoscopic hepatectomy is a safe and feasible surgical method that results in less intraoperative bleeding and shorter hospital stay than open hepatectomy for both advanced and early-stage hepatocellular carcinoma.

### PL03-013

#### COMPARATIVE STUDY OF PROPENSITY SCORE MATCHING METHOD AND BENCHMARK ARTICLE METHOD ON THE OUTCOMES OF MAJOR LAPAROSCOPIC AND MAJOR OPEN LIVER RESECTION FOR HEPATOCELLULAR CARCINOMA

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**Objective:** To compare the outcomes of major laparoscopic liver resection (LLR) and open liver resection (OLR) for hepatocellular carcinoma (HCC) with two methods.

**Methods:** We retrospectively reviewed a data of 177 patients who underwent major liver resection for

HCC(LLR;n=67 vs.OLR;n=110). We performed 1:1 propensity score matching (PSM) between two groups and matched 65 patients for both groups. Another comparison was done with already published article as a benchmark after applying similar inclusion and exclusion criteria (LLR;n=30 vs.OLR;n=34).

**Results:** After PSM, there were no significant differences in blood loss ( $1407.2\pm 2322.7$  vs  $1071.5\pm 1160.6$ ml;  $P=0.299$ ), and transfusion rate ( $32.2\%$  vs  $32.0\%$ ;  $P=0.574$ ) between two groups. The mean operative time was significantly longer in LLR than in the OLR group ( $418.7\pm 172$  vs  $335.1\pm 121.6$  min;  $P=0.002$ ). Complication rate ( $21.5\%$  vs  $33.8\%$ ;  $P=0.085$ ) was similar and the mean hospital stay was shorter in the LLR than in the OLR group ( $11.4\pm 8.5$  vs  $17.6\pm 21.4$ days;  $P=0.009$ ). After benchmarking method, there were no significant differences in between two groups in terms of blood loss ( $780\pm 822$  vs  $947\pm 660.5$  ml;  $P=0.382$ ), transfusion rate ( $30.0$  vs  $32.4\%$ ;  $P=0.528$ ), hospital stay ( $9\pm 3.7$  vs  $10.4\pm 3.59$ days;  $P=0.119$ ), and complication rate ( $10.0\%$  vs  $20.6\%$ ;  $P=0.208$ ). Operation time ( $395\pm 166.6$  vs  $296\pm 68.3$ min;  $P=0.002$ ) was significantly longer in the LLR than in the OLR group. Benchmarking method showed significant loss of number of patients analysed, but results were quite similar to PSM method.

**Conclusion:** Both methods showed that major LLR was safe compared to major OLR. Benchmarking method can be easily used to compare with data of other published article.

#### PL03-014

### MAJOR HEPATECTOMY FOR LARGE HEPATOCELLULAR CARCINOMA IN THE ELDERLY: A LARGE-SCALE MULTICENTER STUDY

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**Background:** Due to the increase in life expectancy, more elderly patients with hepatocellular carcinoma (HCC) are considered for hepatectomy, even when the tumor was large. To clarify the impact of age on short-term and long-term outcomes after major hepatectomy ( $\geq 3$  segments) for large HCC ( $\geq 5$  cm).

**Methods:** Using a multicenter database, patients who underwent curative-intent major hepatectomy for large HCC between 2006 and 2016 were identified. Postoperative morbidity and mortality, overall survival (OS) and recurrence-free survival (RFS) were compared between the elderly ( $\geq 65$  years) and the younger ( $< 65$  years). Univariable and multivariable Cox-regression analyses were performed to identify risk factors of OS and RFS in the entire and elderly cohorts, respectively.

**Results:** Of 830 patients, 92 (11.1%) and 738 (88.9%) were elderly and younger aged, respectively. There were no differences in postoperative 30-day mortality and morbidity among elderly versus younger patients ( $5.4\%$  vs  $2.6\%$  and  $43.5\%$  vs  $38.3\%$ , both  $P>0.05$ ). The 5-year OS and RFS rates among elderly patients were also comparable to younger patients ( $35.0\%$  vs  $33.2\%$  and  $20.0\%$  vs  $20.8\%$ , both  $P>0.05$ ). Multivariable analyses identified that elder age was not independently associated with OS and RFS in the entire cohort, while preoperative alpha-fetoprotein level  $>400$   $\mu$ g/L, multiple tumors, macrovascular and microvascular invasion were independently associated with decreased OS and RFS in the elderly cohort.

**Conclusions:** Selected elderly patients can benefit from major hepatectomy for large HCC as much as younger patients. Long-term oncologic survival in the elderly was determined by preoperative alpha-fetoprotein level, tumor number and the presence of vascular invasion.

#### PL03-015

### POPULATION-BASED NATIONWIDE STUDY ON CONCOMITANT HEPATIC RESECTION AND THERMAL ABLATION FOR COLORECTAL LIVER METASTASIS IN THE NETHERLANDS

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**Introduction:** Since combining hepatic resection and thermal ablation (HR+TA) appears to improve short-term postoperative outcomes in patients with colorectal liver metastasis (CRLM), this study assessed hospital variation and short-term postoperative outcomes after HR+TA in the Netherlands.

**Methods:** All patients who underwent liver resection for CRLM in the Netherlands during 2014-2018 were included. Multivariable logistic regression was used to assess case-mix variables and hospital variation in relation to HR+TA. Short-term postoperative outcomes were compared after propensity score matching (PSM) for age, ASA score, Charlson Comorbidity Index, diameter of CRLM prior to treatment, number of CRLM, and history of liver resection. Postoperative complicated course (PCC) was defined as no major complication or death and discharge within 14 days.

**Results:** In total 4639 patients were included of whom 3697 (80%) underwent HR and of whom 942 (20%) underwent HR+TA. Four or more CRLM and bilobar disease were positively associated with use of HR+TA. Decreasing diameter of CRLM was negatively associated with HR+TA. Unadjusted percentage of HR+TA per hospital ranged between 4% and 44%. After PSM, 734 patients were included in each group. Length of stay (LOS) (median 7 vs 6 days,  $p=0.01$ ), postoperative complicated course ( $15\%$  vs  $11\%$ ,  $p=0.04$ ) and 30-day mortality ( $2\%$  vs  $1\%$ ,  $p=0.01$ ) were significantly lower in the HR+TA group.

**Conclusions:** Significant hospital variation in the use of HR+TA is observed in the Netherlands. Short-term post-operative outcomes were significantly better regarding HR+TA and therefore HR+TA should be considered in patients with CRLM.

PL03-016

### OPEN HEPATIC RESECTION: OUTCOMES AUDIT FROM A LOW VOLUME TERTIARY CARE CENTRE IN PAKISTAN

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**Objective:** We are a tertiary care institution in a developing country where open surgery is the only option for hepatic resection due to low volumes and inadequate infra-structure. We conducted an audit of open hepatic resection at our hospital to review the short-term outcomes.

**Methods:** This was a retrospective review of 150 patients who underwent hepatic resection at Aga Khan University Hospital, Pakistan, from January 2008 to December 2018. The outcomes studies included in-hospital morbidity, 30-day and 90-day mortality. Mean and standard deviations were used to describe categorical data whereas frequencies and proportions to describe quantitative data. A univariate analysis was done to identify risk factors associated with morbidity and mortality.

**Results:** Mean age of the patients was 53±15 years including 83 (55%) males. Nearly half (51%) of the patients had at least one comorbid condition. Indication for surgery included primary hepatic malignancy in 89 (59%), metastatic malignancies in 35 (23%) and benign liver pathology in 26 (17%) patients. Major hepatic resections were performed in 54 (36%) patients. Mean estimated blood loss was 655±538ml and duration of surgery was 282±121minutes. Postoperative complications were observed in 51(34%) patients and mortality rate at 30-day and 90-day were 5 (3.3%) and 8 (5.3%) respectively. The presence of comorbid conditions (p=0.025) and longer duration of surgery (p=0.026) had significant association with postoperative morbidity.

**Conclusion:** Despite low volumes, short term outcomes of open hepatic resection at our center are comparable to international standards. Preoperative optimization of comorbid conditions is crucial to improve the overall morbidity.

PL03-018

### VOLUME REDUCTION HEPATECTOMY FOR HIGHLY ADVANCED HEPATOCELLULAR CARCINOMA

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**Introduction:** The aim of this report is to evaluate the effect of volume reduction hepatectomy in highly advanced hepatocellular carcinoma (HCC).

**Methods:** Thirty patients with highly advanced HCC underwent volume reduction hepatectomy after 2000. Clinical data (sex, age, tumor number, tumor size, tumor differentiation, extrahepatic metastasis, vascular invasion, blood checks, tumor number in the remnant liver, survival) of those patients were reviewed. The patients were divided into 2 groups, Group.1 (n=8): patients who achieved complete remission of the evaluable lesions by multidisciplinary treatment including tyrosine kinase inhibitors after the hepatectomy and Group 2 (n=22): patients who did not achieve complete remission after the hepatectomy.

**Results:** Average tumor size were 10.1 cm and all the cases had multiple tumor. 17 cases accompanied major vascular invasion. 3 cases had extra-hepatic metastasis in lung and bone (Table). The MST and survival rates at 5 years after the volume reduction hepatectomy were 2.37 years and 17.0% in All, 4.71 years and 37.5% in Group.1 and 1.24 years and 8.1% in Group.2 (Image). Comparing the clinical data between two groups, significant difference was detected in only number of remnant liver tumor (the ratio of 1-3/4over of Group 1 and Group 2: 7/1 and 5/17) (p=0.0025).

**Conclusions:** Volume reduction hepatectomy improved the survival of patients with highly advanced HCC when the complete remission of the tumor was achieved by multidisciplinary treatment after the hepatectomy. Reduction hepatectomy with less than/or 3 tumors in the remnant liver should be planned for highly advanced HCC.

PL03-020

### A NOMOGRAM PREDICTING SURGICAL SITE INFECTION BEFORE LIVER RESECTION, A MULTICENTER COHORT STUDY

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**Background:** Surgical site infections (SSI) after liver resection are associated with high morbidity and lower survival. This study aimed to analyze the incidence, risk factors, and consequences of SSI.

**Methods:** In this multicenter cohort study, all patients undergoing liver resection in four centers from 2013 to 2017 were retrieved from a prospectively held database. Logistic regression was used to identify independent predictors for SSI.

**Results:** In 982 liver resections, the incidence of SSI was 80 (8.1%), including 50 organ space SSI and 30 incisional SSI. Bile leakage (OR 6.644,  $p < 0.001$ ), primary liver tumors

(OR 3.630,  $p = 0.001$ ), concomitant radiofrequency ablation (OR 2.264,  $p = 0.024$ ), simultaneous liver and colorectal resection (OR 2.914,  $p = 0.001$ ), and abdominal/gastro-intestinal comorbidity (OR 4.471,  $p < 0.001$ ) were independent predictors for SSI. Except for bile leakage, these factors were included in a nomogram in order to predict SSI preoperatively. Furthermore, SSI was

associated with 42 re-interventions, prolonged median length of stay

(16 days versus 5 days,  $p < 0.001$ ), and added hospital expenditure around € 8,500. In approximately half of SSI cases, cultures revealed resistance against standard preoperative antibiotic prophylaxis.

**Conclusions:** Surgical site infections after liver resection are common, and the consequences are extensive for both patient and hospital. Factors related to microbial exposure and compromised immune states are independent predictors of SSI. A nomogram and an online calculator ([www.evidencio.com/models/show/2006](http://www.evidencio.com/models/show/2006)) based on preoperative predictors were provided to identify high-risk patients. These patients can receive an extended immunonutritional and antiseptic work-up.

### PL03-021

#### THE TRANSITIONAL CHANGES IN HORMONES THAT HAVE WATER RETENTION EFFECT AFTER LIVER RESECTION

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**Background:** In Japan, the use of anti-aldosterone drugs for postoperative water retention caused by hyperaldosteronism after liver resection (LR) is standard. Increased values of arginine vasopressin (AVP) are also expected after LR. We examined the transitional changes in values of plasma aldosterone concentration (PAC) and AVP and volume of drained ascites after LR.

**Methods:** 56 patients underwent LR. PAC and AVP values were measured on before (baseline) and after LR, and postoperative-day (POD) 1, 2, 3, and 5.

**Results:** The PAC values on just after LR ( $p < 0.01$ ), POD1 ( $p < 0.01$ ) and POD2 ( $p = 0.02$ ) were higher than baseline, but POD3 and POD5 were not significant. AVP values were higher on just after LR, POD1, POD2, and POD3 (all  $p < 0.01$ ), and POD5 did not differ from baseline. When classified into two groups, impaired-liver (IL) group and normal-liver (NL) group, based on  $ICG_{R15} \geq 10\%$ , AVP values were higher than baseline on just after LR, POD1 ( $p < 0.01$ ), POD2

( $p < 0.01$ ), and POD3 ( $p = 0.02$  and  $0.01$ , respectively) in both groups. On the other hand, though the PAC values in

IL group were higher on just after LR ( $p < 0.01$ ), POD1 ( $p < 0.01$ ) and POD2 ( $p = 0.04$ ), these in NL group were not different from the baseline except on just after LR ( $p < 0.01$ ). Ascites volume was significantly larger in cases of hemihepatectomy or larger ( $n = 11$ ) than other cases ( $p < 0.01$ ).

**Conclusions:** The addition of the vasopressin-V2-receptor antagonists may be effective for water retention in the patients with hemihepatectomy or larger.

### PL03-022

#### EXPERIENCE OF CASES FOR HEPATIC INJURY SURGERY TREATED WITH UNCROSSMATCHED RED BLOOD CELL OF TYPE O TRANSFUSION

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**Introduction:** Patients with hemorrhagic shock need transfusion of uncrossmatched type O packed red blood cells (PRBCs) immediately on arrival at the hospital. Here, we report the outcomes of patients who received transfusion of uncrossmatched type O PRBCs for hepatic injury surgery in our hospital. This study was conducted to investigate effective management strategies for patients with severe blunt liver injuries.

**Patients and methods:** From January 2017 to December 2019, three patients who underwent emergency laparotomy for hepatic injury underwent transfusion of uncrossmatched type O PRBCs. Data, including age, sex, AAST(American Association for the Surgery of Trauma) liver injury scale, injury severity score (ISS), revised trauma score (RTS), probability of survival (Ps), time to hemostasis, and RBC transfusion volume in 24 hours, were compared between survivors and non survivors.

**Results:** Of the three patients, two were men and one was a woman (mean age: 73 years). The results are listed in the table1. Damage control surgery (DCS), open abdominal management, and interventional radiology (IVR) were performed in all patients. Of the three patients, one survived and two died. One case was a case with acute myocardial infarction. The Ps of the surviving patient was 0.26. The survivor underwent operation more quickly when compared with the non survivors.

**Conclusion:** Early DCS combined with IVR may improve the outcome in patients with severe blunt hepatic injuries.

Table 1

Case	liver injury scale (AAST) Grade	ISS	RTS	Ps	Time to hemostasis(min)	RBC transfusion volume in 24 hours (units)	Outcome
1	V	21	7.84	0.92	288	40	death
2	III	33	2.63	0.06	175	48	death
3	V	38	3.19	0.26	22	100	survival

PL03-025

### SKIN AUTOFLUORESCENCE IN PREDICTION OF ACUTE KIDNEY INJURY AFTER LIVER RESECTION

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**Introduction:** Skin autofluorescence (SAF) reflects accumulation of advanced glycation end-products (AGEs), which is known to impair renal function. The aim of this study was to assess usefulness of SAF measurement in prediction of acute kidney injury (AKI) in patients undergoing liver resection.

**Methods:** This prospective observational study was performed on 130 patients undergoing liver resection in the Department of General, Transplant and Liver Surgery (Medical University of Warsaw) between 2018 and 2019. The primary outcome measure was AKI, as defined by Kidney Disease Improving Global Guidelines criteria. SAF, the primary factor of interest, was based on 3 separate preoperative measurements on the anterior side of the forearm and expressed in arbitrary units (AU).

**Results:** AKI was observed in 26 of 130 patients (20.0%). SAF was an independent predictor of AKI (odds ratio [OR] 2.90; 95% confidence interval [95% CI] 1.33 - 6.32; p=0.008), along with the extent of liver resection (OR 2.91; 95% CI 1.68 - 5.04; p< 0.001). Optimal cut-off for SAF in prediction of AKI was 2.4 AU (area under the curve 0.676, 95% CI 0.564-0.787; p=0.002), with positive and negative predictive values of 28.3% and 87.1%, respectively. The rates of AKI were 2.5% and 11.8% in patients undergoing minor liver resection with low and high SAF, respectively, and 26.7% and 50.0% in patients undergoing major liver resection with low and high SAF, respectively (p< 0.001).

**Conclusions:** SAF measurement is useful in prediction of AKI in patients undergoing liver resection and point towards the pathogenetic role of AGEs.

PL03-027

### HEPATIC VENOUS OUTFLOW OBSTRUCTION IN POLYCYSTIC LIVER DISEASE

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**Background:** The development of prolonged ascites in posthepatectomy polycystic liver disease (PCLD) patients is not well understood. The pathology may be related to hepatic vein outflow obstruction (HVOO). Herein we describe posthepatectomy patients with preoperative hepatic venous collateralization who developed prolonged ascites in the setting of polycystic liver disease.

**Methods:** A single institution cohort of 183 patients with PCLD undergoing partial hepatectomy between 1987 and 2014 was retrospectively reviewed. Of those, 90 patients had preoperative imaging available for analysis. Prolonged ascites was defined as greater than 200 cc of intraperitoneal

drain (IP) output per day after postoperative day 5 or the need for an IP drain greater than 2 weeks. HVOO was defined as non-thrombotic obstructive involvement of the large HVs and/or IVC.

**Results:** A total of 90 patients with preoperative imaging underwent liver resection. No patients presented with clinically significant ascites preoperatively. Among this cohort 88% were female and the mean age was 49 years. Posthepatectomy liver failure occurred in 8 (9%) of patients and was not significant in patients with prolonged ascites. All 90 patients demonstrated non-thrombotic HVOO (60% IVC, 94% HV and 76% IVC+HV involvement) on preoperative imaging. Prolonged postoperative ascites was seen in 71% of patients; this was significantly higher in those with hepatic venous collateralization (52 vs 12 p=0.001).

**Conclusions:** Patients with PCLD also had HVOO and frequently developed venous collateralization. Operative disruption of this may result in prolonged postoperative ascites. Collateralization is a strong parameter to be considered when electing a surgical intervention.

PL03-028

### RADIOFREQUENCY ASSISTED HEPATIC RESECTION CAN PROVIDE COST-EFFECTIVE HEPATECTOMIES DURING A FINANCIAL CRISIS IN A NATIONAL HEALTH CARE SYSTEM

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**Introduction:** Hepatectomy or hepatic resection is a key part of the management of several types of hepatobiliary disease. Our study aims to present our protocol which is based on radiofrequency assisted hepatectomy.

**Methods:** We created a highly standardized open hepatic resection protocol, which was implemented on every patient admitted in our department for a hepatectomy since 2010. Our protocol regulates the preoperative care, the surgical procedure and the postoperative management of the patients. Data regarding the cost of our protocol was collected from the electronic medical records of the hospital, the pharmacy department and the finance department.

**Results:** We included 80 hepatectomies performed for the treatment of benign (n=6, 7.5%) or malignant (n=74, 92.5%) tumors. We performed 35 major (≥3 Couinaud segments) and 45 minor hepatectomies. Regarding postoperative complications, based on the Clavien - Dindo scale, our patients developed the following complications: 10 patients of scale I, 16 patients of scale II, 2 patients of IIIb and 6 patients of scale IV. Our 30-day mortality rate was 8.8% (7 patients). Regarding cost, the mean overall cost of preoperative care was €634.89±531.17, of the surgical procedure was €4082.08±1443.9 and of the postoperative care was €2971.25±1916.28. A detailed total cost analysis is included in the Table provided.

**Conclusions:** Minimally invasive techniques tend to gain ground against traditional open laparotomies. However,

due to lack of financial resources, many countries fail to follow this strategy. Our protocol provides a cost-effective open laparotomy alternative with postoperative complications and mortality rates comparable to other studies.

#### Total Cost analysis

Variable	Cost (mean± SD and % of total cost)
Surgery Materials	€2976.49±1238.37 (38.74%)
Ward Stay and ICU	€1329.43±1058.25 (17.30%)
Salaries	€551.75±173.60 (7.18%)
Drugs	€573.86±391.38 (7.47%)
Transfusion Cost	€955.13±1266.32 (12.43%)
Laboratory Tests	€1112.47±619.90 (14.48%)
Imaging	€184.35±214.26 (2.40%)
Total Hepatectomy Cost	€7683.48±2942.04

#### PL03-029

### LAPAROSCOPIC LIVER RESECTION IN CIRRHOTICS- FEASIBILITY AND SHORT-TERM OUTCOMES COMPARED TO NON-CIRRHOTICS

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**Background:** Laparoscopic liver resection(LLR) is increasingly common worldwide but its suitability in patients with cirrhosis is not clearly defined. There is minimal data in the western literature on this topic and previous work has compared LLR to open hepatectomy rather than to LLR in non-cirrhotics. This study compared short term outcomes of LLR in cirrhotics to LLR in non-cirrhotics.

**Methods:** Retrospective review of minor LLR at the Royal Infirmary of Edinburgh from Jan 2006-2018. Patients were stratified by whether they had cirrhosis- defined as per radiological appearances and liver function tests. Variables of interest included baseline clinicopathological information with short term outcomes (Length of stay (LOS), complications) regarded as the primary outcome of interest.

**Results:** Out of 1207 liver resections in the study period, there were 120 LLR with 30 patients having cirrhosis. Patients with cirrhosis were more likely to be male and have higher median ASA scores (3 vs. 2;  $p < 0.01$ ). The commonest operation was left lateral sectionectomy ( $n=67$ ). There was no difference in duration of surgery (Cirrhosis: 88 mins vs. No Cirrhosis: 99 mins;  $p=0.64$ ) and patients in the cirrhosis arm had no conversions to open (0% vs 12%;  $P=0.06$ ). There was no difference in complications (12% vs

13%;  $p=0.75$ ) or median LOS (4 vs. 4 days;  $p=0.14$ ) and no difference in survival between both groups.

**Conclusion:** With careful patient selection, LLR is feasible in patients with cirrhosis and provides comparable outcomes to non-cirrhotic patients undergoing LLR.

#### PL03-031

### WHEN DOES A PRINGLE MANEUVER CAUSE HARM?

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**Introduction:** The Pringle Maneuver (PM) is considered to be safe and effective despite scarce level one data to support its use. However, the PM has not been analyzed when stratified by extent of hepatectomy and pathology. Therefore, the aim of this analysis is to compare the outcomes of patients who have and have not undergone a PM in the North America.

**Methods:** Patients undergoing major hepatectomy ( $\geq 3$  segments) or partial hepatectomy ( $\leq 2$  segments) were identified in the 2014-17 ACS-NSQIP procedure-targeted database. Patients undergoing concomitant colon or another major resection were excluded. Subset analyses were performed based on hepatectomy extent and pathology type (metastatic disease and primary hepatobiliary malignancies). Outcomes of PM were compared to no PM after propensity score matching by chi-square and Mann-Whitney U tests.

**Results:** Prior to matching, 3,706 (24%) of 15,748 hepatectomy patients underwent a PM. PM was utilized in 1,445 (37%) of major hepatectomies and 2,261 (28%) of partial hepatectomies. After matching, patients undergoing a PM during a partial hepatectomy had significantly increased rates of post-hepatectomy liver failure (PHLF), reintubation and septic shock ( $p < 0.05$ ), but these differences were not observed in major hepatectomy patients (Table). Patients with metastatic disease undergoing a PM had significantly increased rates of PHLF, septic shock and acute renal failure ( $p < 0.05$ ) while adverse outcomes did not develop in patients with primary hepatobiliary malignancies.

**Conclusions:** Patients undergoing a partial hepatectomy and those with metastatic disease have worse outcomes when a Pringle Maneuver is performed.

Table: Propensity-Matched 30-day postoperative outcomes

	Hepatectomy Extent			
	PARTIAL HEPATECTOMY		MAJOR HEPATECTOMY	
	No Pringle (N = 1,982)	Pringle (N = 1,982)	No Pringle (N = 1,319)	Pringle (N = 1,319)
PHLF (%)	1.7	4.0*	12	12
Reintubation (%)	1.2	2.2*	4.8	3.8
Septic shock (%)	0.8	1.7*	3.3	3.5
Operative time (minutes, median)	196	224*	265	285*
	Pathology Type			
	METASTATIC		PRIMARY HPB CA	
	No Pringle (N = 1,791)	Pringle (N = 1,791)	No Pringle (N = 1,024)	Pringle (N = 1,024)
PHLF (%)	4.4	6.9*	10	10
Septic Shock (%)	1.0	2.0*	5.0	3.8
ARF (%)	0.3	0.8*	2.3	2.9
Operative time (minutes, median)	228	257*	232	241*

\*p-value < 0.05 vs. No Pringle

Primary HPB CA = Primary hepatobiliary cancer

PHLF = Post-hepatectomy liver failure (Grade A-C)

ARF = Acute renal failure

PL03-032

### THE USE OF LOCAL DESTRUCTION METHODS IN COMBINATION WITH LIVER RESECTION IN CASES OF MASSIVE MALIGNANT LESION

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**Objective:** To improve the results of surgical treatment of patients with massive malignant liver damage.

**Materials and methods:** RFA was performed in 387 patients (percutaneous -292, open approach-in 42). Liver resection with RFA of the remaining nodes was performed in 62 patients.

MVA was performed in 18 patients with percutaneous approach. Liver resection+MBA - in 6 patients.

Cryodestruction (CD) was performed in 60 cases (in primary cancer - in 14, and in mts - in 46). In 28 cases liver resection was combined with CD of the remaining nodes.

Laser destruction (LD) was performed in 6 patients.

All of the patients underwent adjuvant chemotherapy after the intervention.

**Results:** After resection + RFA, 1 death was noted in connection with the development of multiple organ failure. There were no cases of hemorrhage and bile leakage after interventions.

RFA: the survival rate of 1 year - 84.2%, 2 - 56.7%, 3 - 47.2%, 4 - 28.4%, 5 - 24.2% (the median survival - 29.3 months).

CD: in primary liver cancer the survival rate of 1 year-76%, 3-52.4%, 5-26.4% (the median survival -34 months); in mts. the survival rate of 1 y/-72%, 3-36.4%, 5.-13.4% (the median survival - 24.4 months)

MBA: the survival rate of 1- 74.2%, 2- 68.4%, 3- 16.2% (the mediana-26.8 months).

**Conclusions:** Local destruction methods for unresectable liver cancer can be an alternative to surgical treatment. In combination with chemotherapy, there is an improvement in survival rates

PL03-033

### UTILIZATION OF THE KAWAGUCHI-GAYET COMPLEXITY CLASSIFICATION TO STRATIFY HEPATECTOMY PATIENTS FOR DISTINCT ENHANCED RECOVERY PATHWAYS BASED ON ANTICIPATED LENGTH OF STAY

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The Kawaguchi-Gayet (K-G) Classification of laparoscopic hepatectomy complexity was recently validated for open liver resection. The objective of this study was to use the K-G classification to stratify patients based on anticipated length of stay for the creation of distinct enhanced recovery pathways.

A single-institution prospective database was queried to identify a continuous set of patients from 1/1/2017-12/31/2018. The 3-level K-G classification was utilized for open operations: Grades I ("low": non-anatomic resection for anterolateral or posterosuperior segment and left lateral sectionectomy), II ("intermediate": anterolateral segmentectomy and left hepatectomy), and III ("high": posterosuperior segmentectomy, right posterior sectionectomy, right hepatectomy, central hepatectomy, and extended hepatectomy). All hepatectomies were classified into one of four categories: MIS, Low-Intermediate (Open K-G I-II), High (Open K-G III), and Combo.

Of 466 patients, the distribution of hepatectomies included: 86(18.5%) MIS, 168(36%) Low-Intermediate, 140(30%) High, and 72(15.5%) Combo. Modified Accordion Complications Grade  $\geq 3$  occurred more frequently with more complex hepatectomies (MIS: 3[4%], Low/Intermediate: 17[10%], High: 25[18%], and Combo: 9[13%],  $p < 0.001$ ). Median LOS was associated with approach and difficulty (MIS:2d, Low:4d, High:5d and Combo:5d,  $p < 0.001$ , Figure 1). Multivariate analysis confirmed that K-G classification (Low/Intermediate: OR 5.5, High: OR 11.6, Combo: OR 11.8,  $p < 0.001$ ) was the greatest predictor of LOS (LOS>median 4 days).

Kawaguchi-Gayet Classification grouped a contemporary cohort of patients undergoing hepatectomy into four strata with LOS between 2-5 days. Using surgical approach and K-G Classification, future patients can be grouped *a priori* into pathways at the time of surgical consent in clinic.

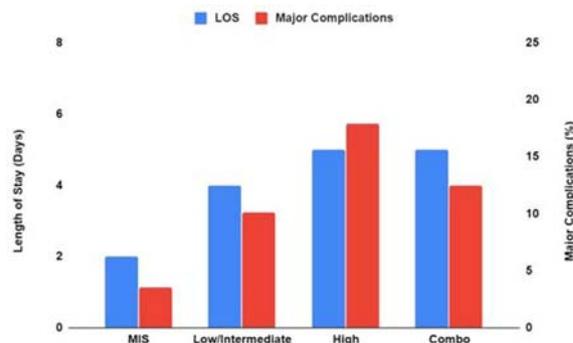


Figure 1. Length of stay and rates of major complications between complexity of hepatectomy

PL03-034

### SAFETY OF HEPATOBILIARY AND PANCREATIC SURGERY IN PATIENTS RECEIVING DIRECT ORAL ANTICOAGULANTS (DOACS)

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**Introduction:** The safety and optimal perioperative management of patients receiving direct oral anticoagulants (DOACs) during hepatobiliary and pancreatic (HBP) surgery is still controversial.

**Methods:** Between 2012 and 2018, 115 anticoagulant-prescribed patients who underwent elective HBP surgery (65 benign and 50 malignant diseases, 69 laparoscopic and

46 open-fashioned operations) in our department were enrolled in this study. Patients undergoing emergency operations were excluded from the study. The patients were divided into two groups; patients receiving DOACs (DOAC group, n = 35) and patients undergoing warfarin therapy (WF group, n = 80). Background characteristics, surgical blood loss, and postoperative complications, including bleeding and thrombotic complications, were compared between the groups.

**Results:** In the DOAC group, dabigatran, apixaban, rivaroxaban, and edoxaban were used in 10, 8, 10, and 7 patients, respectively, and only 11 patients (31.4%) received perioperative heparin bridging. There were no differences in patients' background characteristics and mode of surgery (open or laparoscopic). The duration of operation ( $p = 0.148$ ), surgical blood loss ( $p = 0.782$ ), and the rate of intraoperative red blood cell transfusion ( $p = 1.000$ ) were similar between the groups. Overall, any thromboembolic complications were not observed in the current cohort, and only 1 patient (2.9%) suffered from postoperative bleeding complication in the DOAC group. The mortality was zero, and the length of postoperative stay was also identical between the groups ( $p = 0.998$ ).

**Conclusion:** HBP surgery is safely performed in patients receiving DOAC therapy, without increase in bleeding or thromboembolic complications compared with warfarin therapy.

#### PL03-036

### DOES LAPAROSCOPIC LIVER RESECTION FOR HEPATOCELLULAR CARCINOMA REDUCE POSTHEPATECTOMY LIVER FAILURE?

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**Introduction:** Several studies have suggested that laparoscopic liver resection (LapLR) is associated with fewer incidence of posthepatectomy liver failure (PHLF) than open liver resection (OLR) for hepatocellular carcinoma (HCC). However, this issue remains controversial since the results may have been attributable to selection bias.

**Methods:** We retrospectively analyzed 290 hepatectomies for HCC between 2011 and 2019. Difficulty of liver resection was based on the difficulty score (DS) proposed by Ban et al. (J Hepatobiliary Pancreat Sci. 2014) and the resection ratio was calculated using CT volumetry. Patient characteristics and operative outcomes were compared between LapLR and OLR groups. PSM was adopted to adjust the imbalance between the cohorts. Predictors of PHLF were analyzed by multivariate analysis.

**Results:** DS and RR were significantly lower in LapLR (n=112) than in OLR (n=178) (DS:  $4.4 \pm 2.4$  vs.  $7.8 \pm 2.6$ ,  $p < 0.001$ , RR:  $11.4 \pm 12.7$  vs.  $22.7 \pm 17.2\%$ ,  $p < 0.001$ ). Incidence of PHLF was lower in LapLR (9.8% vs. 21.4%,  $p = 0.011$ ). PSM generated well-balanced 58 patients in each group and abolished the difference in the incidence of PHLF (10.3% v. 19.0%,  $p=0.189$ ). By multivariate analysis, RR was one of the independent risk factors for PHLF but surgical approach (LapLR or OLR) was not ( $p=0.574$ ).

**Conclusion:** The present study suggested imbalance of RR and DS, which have been hardly considered in the previous studies, may have resulted in the fewer PHLF in LapLR. Further data needs to be accumulated to prove LapLR reduces PHLF.

#### PL03-038

### TYROSINE PHOSPHATASE INHIBITION INCREASES YAP ACTIVITY AUGMENTING LIVER REGENERATION IN MURINE PARTIAL HEPATECTOMY

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**Background:** The liver can regenerate in response to surgical resection, and impaired regeneration is associated with morbidity and mortality. The Hippo pathway effector YAP is associated with liver regeneration and our group has demonstrated activation of YAP transcriptional co-activity utilizing a tyrosine phosphatase inhibitor.

**Methods:** Human primary hepatocyte and liver sinusoidal endothelial cell cultures were exposed to the tyrosine phosphatase inhibitor NSC87877(NSC). YAP localization was assessed by immunofluorescence. Male C57BL/6J mice were treated with NSC (7.5mg/kg) before and after a standard two-thirds partial hepatectomy (PH). Liver regeneration was evaluated by liver to bodyweight ratio at 40 and 72 hours post PH, protein levels by immunoblot, and YAP target gene expression by RT-PCR. Mitotic figures were quantified.

**Results:** Primary human cell cultures demonstrated redistribution of YAP to the nucleus following exposure to NSC, demonstrating activation. Following treatment of mice with NSC and subsequent PH there was an increase in p-YAP<sup>Y357</sup> levels by immunoblot, and expression levels of the YAP target genes Ctgf and Nuak2 as compared to vehicle treatment. Hepatocyte mitotic activity at 40 and 72 hour time points was increased in the NSC treated group, and concordantly we observed an increased liver-to-body weight ratio in mice treated with NSC at both the 40 and 72 hour time points when compared to vehicle treated mice ( $p < 0.01$ ).

**Conclusion:** Our data suggest that inhibition of tyrosine phosphatase activity with NSC increases the abundance of the activated Hippo effector protein YAP, which has the potential to augment regeneration in partial hepatectomy.

#### PL03-041

### MINIMALLY INVASIVE MICROWAVE ABLATION PROVIDES EXCELLENT LONG-TERM OUTCOMES FOR OTHERWISE INACCESSIBLE HEPATOCELLULAR CANCER

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**Background:** Microwave ablation (MWA) can be used as a bridge to transplant or with curative intent for

hepatocellular carcinoma (HCC). We report our experience with laparoscopic ablation of HCC in patients deemed inaccessible by percutaneous approach.

**Methods:** We performed a retrospective review of surgical ablations from 2009-2017. Demographics, disease and treatment characteristics, and outcomes were abstracted. Kaplan-Meier modeling was performed.

**Results:** We ablated 39 tumors in 33 patients with a median age of 62. Most patients were male (76%) and Caucasian (70%). Hepatitis C was the most common primary liver disease (22 patients, 67%) and 32 patients had underlying cirrhosis (97%). Median MELD-NA was 9.5 (IQR 8-12). The median tumor diameter was 2.6 cm (IQR 1.8-3.0). The median ablation zone diameter was 4.8 cm (3.8-5.7) with a median difference of ablation zone to tumor of 2.0cm (1.5-2.75). All cases were approached laparoscopically, 1 was converted to open. With a median follow up of 42.9 months, 13 patients (39%) developed recurrent disease. Two had recurrences at the site of a prior ablation (6%), 9 developed intrahepatic recurrences separate from previous ablation site (27%), and 2 developed metastases (6%). The rate of local failure per lesion ablated was 5% (2/39). Median recurrence free survival was 66.7 months. Median overall survival was not reached. The 1,3,5-year survival was 97% (CI 91-100%), 76% (CI 61-93%) and 66% (CI 49-88%).

**Conclusion:** Laparoscopic MWA of HCC provides excellent local control and overall survival. It should be the preferred treatment approach when percutaneous access is not possible.

#### PL03-043

### THE IMPACT OF BODY MASS INDEX ON ASIAN PATIENTS WITH HEPATOCELLULAR CARCINOMA UNDERGOING HEPATECTOMY

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**Background:** Patients with malnutrition or low body mass index (BMI) are associated with a higher risk of complications after surgery while obesity were also associated with poor surgical outcomes. We aimed to investigate the perioperative outcome for Asian patients of hepatectomy in grouping with WHO BMI classification.

**Methods:** From our prospectively maintained database, we identified consecutive patients who underwent hepatectomy between January 2000 and December 2017. Perioperative outcomes and survival were analyzed

**Results:** In the study period, 1558 patients underwent hepatectomy in our center. According to WHO BMI classification, 109, 658, 604 and 187 patients were classified into under-weight, normal, over-weight and obesity classes respectively. Overall survival of the under-weight group were 59.2% and 44.4% in 3- and 5-year compared with the other groups (69.8%, 59.3%,  $p < 0.001$ ). In the under-weight group, 58.7% patients received major hepatectomy compared with 50.2% ( $p=0.337$ ) in the other groups. For pathological feature, the under-weight group patient had similar number of tumor, but larger tumor size 6cm vs 4.5cm ( $p < 0.001$ ). The under-weight group had more complications (Clavien 3A or above) as 22.2% vs 10.8%,  $p=0.007$ . They also had a longer hospital stay with median

9 days (vs 8 days,  $p=0.002$ ). Operation time, blood loss and the need for blood transfusion were comparable.

**Conclusion:** Hepatectomy in under-weight patients was associated with worse overall survival, more complication and longer hospital stay. Pre-operative optimization for the under-weight status is suggested.

#### PL03-045

### LAPAROSCOPIC VERSUS OPEN HEPATECTOMY FOR LARGE HEPATOCELLULAR CARCINOMA: A RANDOMIZED CONTROLLED STUDY

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**Background:** Strong evidence from prospective studies for the superiority of either the open or laparoscopic approach in managing large HCC is still lacking. Aim was to compare surgical and oncologic efficiency of laparoscopic versus open hepatectomy in solitary large (>5 cm) HCC in Child A cirrhotic patients.

**Methods:** 150 patients with large HCC met the inclusion criteria and were randomly assigned to either OH group (75 patients) or LH group (75 patients).

**Results:** LH had significantly less operative time ( $280.35 \pm 24.69$  versus  $255.65 \pm 22.63$  minutes,  $P < .001$ ), shorter duration of hospital stay ( $8.50 \pm 0.78$  versus  $10.52 \pm 0.78$  days,  $P < .001$ ), with comparable overall complications (43 versus 39%,  $P = .03$ ). LH had comparative resection time ( $184.65 \pm 47.50$  versus  $174.46 \pm 29.35$  minutes,  $P = .319$ ), amount of blood loss (1060 versus 980mL,  $P = .817$ ), transfusion rate ( $P = 1.00$ ), and R0 resection rate when compared with OH. After median follow-up of 62.34 (34.52-89.47) months, LH achieved similar adequate oncological outcome of OH, no local recurrence, with no significant difference in early recurrence or number of de novo lesions ( $P = .42$ ). One-year and 3-year disease free survival (DFS) rates, 69% and 39%, in the LH were comparable to corresponding rates of 65% and 36% in OH ( $P = .8$ ).

**Conclusion:** LH is superior to the OH in solitary large HCC with significantly shorter duration of hospital stay. LH does not compromise the oncological outcomes and achieve similar disease-free survival compared to OH.

#### PL03-047

### MINIMALLY INVASIVE MICROWAVE ABLATION OF COLORECTAL CANCER LIVER METASTASES: A SINGLE INSTITUTION EXPERIENCE WITH 135 SURGICAL ABLATIONS

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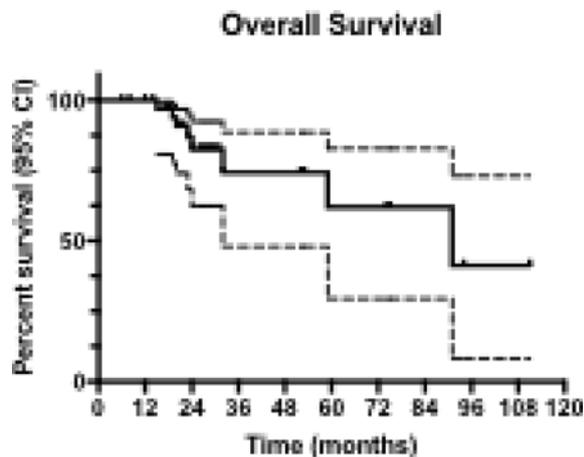
**Background:** Percutaneous Microwave Ablation (MWA) is an effective therapy for non-resectable colorectal liver metastases (CRLM), but many are not percutaneously

treatable. We report one of the largest single-institution experiences with laparoscopic, ultrasound-guided MWA of 135 unresectable CRLM.

**Methods:** We performed a retrospective review of ablated CRLM from 2009-2018. Demographics, disease and treatment characteristics were abstracted. Kaplan-Meier modeling was performed.

**Results:** We ablated 135 CRLM in 36 patients. Median age was 52 years and 58% of patients were male. The primary tumor was of colonic origin in 26 patients (72%), and the remainder (28%) were rectal cancer metastases. All patients received systemic chemotherapy. Non-resectability was due to inadequate future remnant in 25 cases (69%), physiologic frailty in 8 (22%), and complexity of concurrent rectal resection in 3 cases (8%). Ablation was combined with colon or rectal resection in 15 (38%) patients. Median number of ablations per patient was 2 (IQR 1-5, range 1-15). Median diameter of ablated lesions was 1.9 cm (IQR 1.3-2.3). During follow up, 18 patients experienced recurrence. Six had local recurrence (treatment failure), 11 had intra-hepatic recurrence, and 1 had systemic recurrence. Median follow up of the study was 28 months. Median disease-free survival was not reached. Of the 135 lesions ablated, the per-lesion local recurrence rate was 6/135 (4.4%). Median overall survival for the cohort was 81 months.

**Conclusions:** Surgical ablation of CRLM provides excellent local control and long-term survival outcomes in patients who may otherwise not be candidates for other liver-directed therapies.



Overall Survival for Patients Undergoing Laparoscopic MWA of Colorectal Liver Metastases

PL03-048

### MIDDLE-TERM AND PERIOPERATIVE OUTCOMES OF LAPAROSCOPIC VERSUS OPEN MAJOR HEPATECTOMY FOR HEPATOCELLULAR CARCINOMA: A HISTORICAL CONTROL AND PROPENSITY SCORE MATCHED STUDY

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**Background:** Laparoscopic major hepatectomy (LMH) has been adopted as the standard procedure from April 2016 in Japan. The aim of this study is to clarify the middle-term outcomes and perioperative outcomes of LMH for hepatocellular carcinoma (HCC) compared with those of open major hepatectomy (OMH).

**Methods:** Ninety two patients who underwent primary major hepatectomy for HCC between January 2012 and April 2019 in our institution were divided into LMH (n=33) and OMH (n=59) groups. A one-to-one propensity case-matched analysis was used with covariates of baseline characteristics, including tumor characteristics.

**Results:** The two groups were well balanced by propensity score matching and 25 patients were matched. The median blood loss (277 vs. 825ml, P=0.005) was significantly less in the LMH group. The median postoperative hospital stay (9 vs. 10days, P=0.586) and severe complication rate (16 vs. 12%, P=0.440) were similar in the two groups. The median observation period in the LMH group was 21.5 months and that in the OMH group was 47.7 months. The cumulative 1-, 2- and 3-year overall survival (OS) rates were 95.7, 95.7 and 95.7% in the LMH group, 84.0 and 79.8, and 75.1% in the OMH group. The cumulative 1-, 2- and 3-year disease free survival (DFS) rates were 78.9, 43.2 and 43.2% in the LMH group, 66.7, 58.3 and 50.0% in the OMH group. There were no significant differences in OS (P=0.131) and DFS (P=0.826) between the matched two groups.

**Conclusion:** LMH might be safety procedure with acceptable middle-term outcomes.

PL03-049

### ROBOTIC HILAR CHOLANGIOCARCINOMA RADICAL RESECTION COMPARE WITH LAPAROTOMY RADICAL RESECTION: 2-YEARS FOLLOW-UP

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**Introduction:** To compare the long term and short term outcomes between robotic and open surgery for hilar cholangiocarcinoma radical resection.

**Method:** This is a single-center and retrospective case-control study. Patients underwent hilar cholangiocarcinoma radical resection between January 1st 2016 and December 31st 2016 at Department of HPB oncology Surgery of the PLA General Hospital were include. Evaluation of safety, effectiveness and long-term prognosis of tumors. Patients were were divided into robotic group (N=16) and open group (N=31).

**Results:** In this study, compared with the open group, the robotic group had a longer operation time [(338 ± 71) min than (256 ± 56) min, P = 0.001], but the intraoperative blood loss was less (100 ml is less than 200 ml, P = 0.040), the gastric tube removal time was earlier (3 d than 4 d, P = 0.011), and the postoperative hospital stay was shorter (9 d than 12 d, = 0.040), and the difference is statistically significant. There was no significant difference in the blood transfusion rate, R0 resection rate, and tumor size between the two groups. The recurrence rates in the robotic group

and open surgery were 53.3% and 67.0%, respectively ( $P = 0.307$ ). The median survival time of the robotic group and the open group was 22.0 months and 25.0 months. There was no significant difference in the overall survival rate between the two groups ( $P > 0.05$ ).

**Conclusions:** Compared with laparotomy, robotic HCC radical resection could be concluded as an equivalence or non-inferiority approach with acceptable long-term outcome.

#### PL03-051

### EFFICACY OF SALVAGE SURGERY FOR HCC RECURRENT WITH VASCULAR INVASION AFTER LONG-TERM NON-SURGICAL THERAPIES

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**Introduction:** In patients of hepatocellular carcinoma (HCC) with good liver function and without vascular or extra-hepatic metastasis, hepatectomy or non-surgical therapies such as radiofrequency ablation and transcatheter arterial chemo-embolization are recommended. However, non-surgical therapies may cause local recurrence, and the recurrence may repeatedly be treated non-surgically, and finally vascular invasion or extrahepatic metastasis may occur. In such cases, definitive therapy is only hepatectomy, which is called salvage surgery. But its pros and cons of this salvage surgery are still unclear.

**Methods:** Between April 2010 and December 2018, 274 patients underwent hepatectomy for HCC at our institution. Out of 10 patients who underwent non-surgical therapies for more than 2 years before hepatectomy, 8 patients who recurred with vascular invasion were enrolled in this study.

**Results:** The median survival duration after hepatectomy was 13.5 months, and the 1- and 3-year survival rates were 62% and 37.5%, respectively. Six patients died because of recurrence or extra-hepatic metastases. The median post-operative hospital stay was 20 days (11-44) and the peri-operative mortality was 0%. Complications of Clavien-Dindo Class IIIa and IIIb were observed in 4 patients (bile fistula, postoperative bleeding).

**Conclusion:** Although liver function is often deteriorated in recurrent cases with vascular invasion after long-term non-surgical therapies against HCC, salvage surgery can be safely performed by adding preoperative treatments such as portal vein embolization, and may lead to better prognosis.

#### PL03-053

### SIGNIFICANCE OF ANATOMIC RESECTION FOR THE PATIENTS WITH PRIMARY SOLITARY HEPATOCELLULAR CARCINOMA LOCATED ON THE LIVER SURFACE

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**Introduction:** It is unclear whether anatomic resection achieves better outcomes than non-anatomic resection in patients with hepatocellular carcinoma (HCC). This study aimed to compare the outcomes of anatomic resection and non-anatomic resection for hepatocellular carcinoma located on the liver surface via one-to-one propensity score-matching analysis.

**Methods:** Data from all consecutive patients who underwent liver resection for primary solitary hepatocellular carcinoma at Nara Medical University Hospital, Japan, January 2007- December 2015 were retrieved. Superficial hepatocellular carcinomas were defined as hepatocellular carcinoma that extended to a depth of  $< 3$  cm from the liver surface and measured  $< 5$  cm in diameter. The prognoses of the patients with superficial hepatocellular carcinoma who underwent anatomic resection and non-anatomic resection were compared.

**Results:** In this study 23 patients with superficial hepatocellular carcinoma underwent anatomic resection, while 70 patients underwent non-anatomic resection. The recurrence-free survival rate of the patients who underwent anatomic resection was better than that of the patients who underwent non-anatomic resection ( $P = .006$ ), while no such difference was observed for non-superficial hepatocellular carcinoma. After the propensity score-matching procedure, the resected liver volume and operation time were the only background or clinical characteristics to exhibit significant differences between the anatomic resection ( $n = 20$ ) and non-anatomic resection groups ( $n = 20$ ). The recurrence-free survival rate of the patients who underwent anatomic resection was significantly better than that of the patients that underwent non-anatomic resections ( $P = .030$ ), but overall survival did not differ significantly between the groups ( $P = .182$ ).

**Conclusions:** Anatomic resection improves recurrence-free survival compared with non-anatomic resection in patients with superficial hepatocellular carcinoma.

PL03-054

### EFFECTIVENESS OF THE ALBUMIN-BILIRUBIN SCORE AS A PROGNOSTIC FACTOR FOR EARLY RECURRENCE AFTER CURATIVE HEPATIC RESECTION FOR HEPATOCELLULAR CARCINOMA

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**Introduction:** The albumin-bilirubin (ALBI) score has been validated as a predictor of disease-free survival and overall survival in hepatocellular carcinoma (HCC). The purpose of this study was to assess the ALBI score as a risk factor for early recurrence (ER) after curative liver resection in HCC.

**Methods:** Patients who underwent liver resection with curative intent for HCC without previous treatment between January 2004 and December 2014 were included in this retrospective study. The utility of the ALBI score in predicting ER and late recurrence (LR) was evaluated.

**Results:** A total of 465 HCC patients were enrolled; multivariate analysis identified ALBI grade  $\geq 2$  ( $p=0.003$ ) as a risk factor for ER, in addition to hepatitis B virus surface antigen (HBsAg)-positive status ( $p < 0.001$ ), tumor size  $\geq 3.5$ cm ( $p \leq 0.001$ ), lymph-vascular invasion ( $p=0.001$ ), and the presence of satellite lesions ( $p=0.009$ ). In subgroup analysis for ALBI grade 1, Model for End-stage Liver Disease score  $> 9$  ( $p=0.046$ ), HBsAg positive status ( $p=0.004$ ), tumor size  $\geq 3.5$  cm ( $p < 0.001$ ), lymph-vascular invasion ( $p=0.001$ ), presence of satellite lesions ( $p=0.002$ ), and poor tumor differentiation ( $p=0.007$ ) were independent risk factors for ER; however, in subgroup analysis for ALBI grade 2, no significant associations with ER were found. Kaplan-Meier curve analysis showed that long-term survival in HCC with ER was significantly shorter than in patients with LR.

**Conclusions:** The ALBI score was a preoperative risk factor for ER and may be useful in determining appropriate management according to liver function when recurrence develops.

PL03-057

### ACCURACY OF VOLUMETRIC AND FUNCTIONAL PRE-OPERATIVE TESTS FOR PREDICTING POST-HEPATECTOMY LIVER FAILURE - A SYSTEMATIC REVIEW AND META-ANALYSIS

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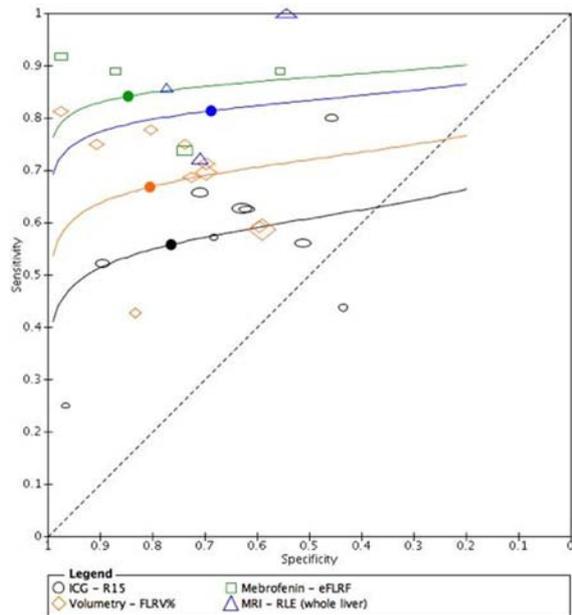
**Introduction:** Pre-operative measurements of remnant liver volume or function are performed to predict which patients are at risk of developing post-hepatectomy liver failure (PHLF) after liver resection. It is uncertain which measures are better at predicting PHLF and clinical practices vary widely. The aim of this study is to determine whether volumetric or functional pre-operative measures best predict PHLF.

**Methodology:** The index tests chosen for comparison were CT/MRI volumetry, indocyanine green (ICG), <sup>99m</sup>Tc-GSA scintigraphy, <sup>99m</sup>Tc-GSA mebrofenin scintigraphy and gadolinium-enhanced (Gd-Eob-Dtpa) MRI. CENTRAL, MEDLINE, EMBASE and Web of Science were searched. Hand-searching of conference abstracts and references was performed. The most common (dominant) formula reported for each index test was chosen for comparison between index tests. Statistical analysis was performed using a hierarchical model in RevMan and SAS.

**Results:** 1 prospective and 32 retrospective cohort studies were included, with 5195 participants. The dominant formula for each index test were R15 (ICG), FLRV% (volumetry), eFRLF (<sup>99m</sup>Tc-mebrofenin scintigraphy) and RLE (whole liver) (Gd-Eob-Dtpa MRI). <sup>99m</sup>Tc-GSA mebrofenin scintigraphy was excluded from analysis as few studies were retrieved. eFRLF showed the highest predictive accuracy for PHLF (Diagnostic Odds Ratio = 29.1) and was significantly higher than FLRV% ( $p = 0.003$ ) and R15 ( $p < 0.001$ ). eFRLF did not perform better than RLE (whole liver) ( $p = 0.217$ ). Pooled sensitivity and specificity for eFRLF were 84% (95%CI, 71% - 92%) and 85% (95%CI, 74% - 91%).

## Summary Measures for Predicting Post Hepatectomy Liver Failure

Index Test	Summary Sensitivity (95% CI)	Summary Specificity (95% CI)	Positive Likelihood Ratio (95% CI)	Negative Likelihood Ratio (95% CI)	Diagnostic Odds Ratio (95% CI)
ICG	59% (51 - 66)	63% (50 - 74)	1.6 (1.1 - 2.3)	0.7 (0.5 - 0.9)	2.4 (1.2 - 4.7)
Volumetry	67% (60 - 73)	80% (71 - 87)	3.4 (2.2 - 5.4)	0.4 (0.3 - 0.5)	8.3 (4.3 - 16.0)
99mTc-meb. scintigraphy	84% (71 - 92)	85% (74 - 91)	5.5 (3.1 - 9.6)	0.2 (0.1 - 0.4)	29.1 (10.2 - 82.9)
Gd-Eob-Dtpa MRI	81% (64 - 91)	69% (47 - 85)	2.6 (1.3 - 5.1)	0.3 (0.1 - 0.6)	9.6 (2.4 - 37.8)



Summary ROC Curves for R15, FLRV%, eFLRF and RLE (Whole Liver) with Pooled Sensitivity and Specificity Points (solid circles)

**Conclusions:** Functional pre-operative measures perform better than volumetric measures alone for predicting PHLF.

### PL03-058 LAPAROSCOPIC COMBINED RESECTION OF LIVER METASTASES AND COLORECTAL CANCER: SINGLE CENTER EXPERIENCE

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**Introduction:** We aim to report a series of laparoscopic combined resection of liver metastases and colorectal cancer in one center.

**Methods:** Between 2011 and 2018, 71 patients underwent curative laparoscopic combine resection of liver metastases and colorectal cancer for synchronous colorectal liver metastases. We retrospectively reviewed the surgical and postoperative variables

**Results:** The median number of liver lesions was 1 (1-12) and the median larger diameter at diagnosis was 15 (3-50) mm. Procedures of laparoscopic liver resection included wedge resection (n=52), two segmentectomy (n=4), left lateral sectionectomy (n=6), right hepatectomy (n=3), left

hepatectomy (n=2), extended right hepatectomy (n=1), extended left hepatectomy (n=1), central bisectionectomy (n=1), and right posterior sectionectomy (n=1). The median operative time was 437 (269-1183) min and median blood loss was 150 (13-2220) ml. Six cases required blood transfusion (8.5%). Conversion to open surgery was required in 5 cases (7.0%). The median length of stay was 7 (4-26) days. Overall complication rate was 25.4 % and major complication rate was 11.3 %. The mortality rate was 1.4 %. After a median follow-up of 28.4 (1-95) months, 47 patients (66.2 %) developed tumor recurrence. Curative treatment of recurrence was possible in 23 patients (48.9 %), including a second liver resection in 17 patients (36.2 %). Overall 1-, 3-, and 5-year survivals were 98.6, 72.8, and 57.4 %, respectively.

**Conclusion:** Simultaneous laparoscopic approach is technically feasible, safe, and associated with good oncological outcomes.

### PL03-059 SHORT TERM SAFETY AND EFFICACY OF ROBOTIC VERSUS LAPAROSCOPIC LIVER RESECTION: A SYSTEMATIC REVIEW AND META ANALYSIS

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**Introduction:** Laparoscopic liver resection (LLR) remains technically challenging with its use limited to experienced surgeons. Robotic liver resection (RLR) may potentially produce favorable peri- and postoperative outcomes when compared to LLR.

**Methods:** MEDLINE, EMBASE, PubMed, and Cochrane CENTRAL databases were systematically reviewed to identify studies comparing robotic and laparoscopic partial hepatectomy (last search 5<sup>th</sup> August 2019). Quantitative comparative studies in English published since the introduction of RLR were identified for inclusion. Outcomes extracted include operative time (OT), estimated blood loss (EBL), conversion to open, perioperative transfusion requirement, post-operative complications, length of stay, R0 resection rate, and mortality. Subgroups were defined as major, and minor resections. Meta-analysis and subgroup meta-analysis was carried out using a random effects model. Effect measures were odds ratio (OR) for dichotomous data and mean weighted difference (MWD) for continuous data.

**Results:** Twenty-two non-randomised comparative studies with a total of 1890 patients (Robotic; n=836, Laparoscopic; n=1054) was included in analysis. Operative time

was significantly longer for RLR [MWD=+39.8 minutes, 95% CI (21.1, 58.6),  $p < 0.001$ ], but not significantly different in sub-group analysis. EBL, length of stay, conversion rate, transfusion, complication rate, R0 resection rate, and mortality was not significantly different between RLR and LLR nor in major or minor sub-groups [ $p > 0.05$ ]. **Conclusion:** RLR provides comparable peri- and post-operative outcomes to LLR, potentially being a preferable approach in complex and major liver resections due to the inherent advantages of the robotic platform. Further randomised controlled studies are required in establishing the role of robotics in liver resection.

### PL03-061

#### EFFECT OF PERIOPERATIVE ANTIPLATELET MANAGEMENT ON THROMBOEMBOLIC COPLICATIONS AFTER LIVER RESECTION

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**Aim:** The aim of the study is to specify the effect of perioperative antiplatelet (APT) management on postoperative thromboembolism (TE) after liver resection.

**Methods:** Consecutive 398 patients undergoing liver resection at our hospital from 2005 to 2017 were retrospectively reviewed. Our perioperative antithrombotic management protocol includes preoperative aspirin monotherapy for patients with high thromboembolic risks. Among them, 125 patients (31.4%) had atherosclerotic thromboembolic risk and received APT. The cohort was classified into three groups; patients without APT (N-APT group), APT-discontinued patients (D-APT group), and aspirin-continued patients (C-APT group). The predicted risk of each group was assessed by CHADS2 score, and the rates of TE were compared between the groups.

**Results:** Significantly lower CHADS2 score of N-APT group was observed compared to those of other groups, although the D-APT and C-APT groups had similar distribution of the scores. Among 398 patients, postoperative TE was found in 6 cases (1.5%). Three cases resulted in in-hospital death and other 3 patients were discharged with moderate to severe sequelae. More TE occurred in the D-APT group (4.2%), whereas only one case in the C-APT group (1.9%) and three cases in the N-APT group (0.7%) were observed ( $p=0.038$ ). Although having high CHADS2 scores, patients in C-APT group showed a relatively low rate of postoperative TE events, mainly due to the preventive effect of preoperative aspirin continuation against TE.

**Conclusion:** Especially in patients with APT for thrombotic risks, it is suggested that management with continued preoperative single aspirin therapy should be considered regardless of TE risks.

### PL03-062

#### LAPAROSCOPIC LIVER RESECTION IN PATIENTS WITH PREVIOUS UPPER ABDOMINAL LAPAROTOMY

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**Introduction:** Laparoscopic Liver Resection (LLR) is now performed worldwide. However, LLR is sometimes difficult in patients with previous upper abdominal laparotomy. **Methods:** We did 78 LLRs in our institution from January 2012 to December 2019. In our cases, 7 patients were performed upper abdominal laparotomy previously. We did pure LLR and partial hepatectomy in the patients. We report the surgical outcomes of LLR in the patients.

**Results:** The history of the upper abdominal surgery was as follows: gastrectomy in 2 cases, cholecystectomy in 1, and hepatectomy in 4. LLRs were performed for hepatocellular carcinoma in 5 cases and metastasis of gastro intestinal stromal tumor in 2. Their Child-Pugh Score was as follows: A in 5 cases and B in 2. There were no cases of conversion to open hepatectomy. Median intraoperative blood loss was 75ml and operative time was 151 minutes. Blood transfusion was performed in only one case. No postoperative complication was seen. Average duration postoperative hospital stay was 8 days.

**Conclusion:** We investigated surgical outcome of LLR in patients with previous upper abdominal laparotomy. While our outcomes seems favorable and safety, further number of cases would be required to determine whether LLR is superior to open hepatectomy in patients with previous upper abdominal laparotomy.

### PL03-064

#### SHORT-TERM OUTCOMES OF LAPAROSCOPIC ANATOMICAL LIVER RESECTIONS WITH GLISSONIAN APPROACH

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**Background:** Anatomical liver resections (ARs) have been shown to improve oncological outcomes in patients with liver malignancies. Few experiences on laparoscopic ARs (Lap-ARs) have been reported. This study aimed to evaluate the feasibility of Lap-ARs with Glissonian approach. **Method:** A total of 111 patients who underwent Lap-ARs with Glissonian approach from April 2016 to December 2019 were retrospectively reviewed.

**Results:** Median age was 73 (19-91). 67 patients had hepatocellular carcinoma (HCC) while 30 had colorectal liver metastasis (CRLM) and 14 had others. 13 anatomical subsegmentectomies (HrS-), 48 segmentectomies (HrS), and 50 sectionectomies (Hr1, 2, and 3) were performed. Median difficulty score (IWATE criteria) was 7 (5-11). Surgical time was 342 min (102-639) and blood loss was 130 ml (5-1523). Conversion rate was 1.8%. Resected liver volume was 192 g (23-974). 13 patients (11.7%) experienced morbidities ( $\geq$  Clavien-Dindo IIIa) and 90-day mortality rate was 0.9%. Negative surgical margin was achieved in 94.2%. IWATE criteria  $\geq 8$  was associated with increased operative time, blood loss and postoperative morbidities.

**Conclusions:** Lap-ARs with Glissonian approach are feasible procedures that integrate radicality and safety with the parenchymal-sparing principle.

PL03-065

### ADVANCED AGE IS NOT A CONTRAINDICATION TO PANCREATODUODENECTOMY

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**Introduction:** With a growing elderly population, the pancreatic surgeon is increasingly required to determine whether older patients with pancreatic cancer should undergo a pancreaticoduodenectomy. This operation offers the only potentially curative treatment, however questions remain as to the safety and feasibility of PD in this elderly population.

This study aims to provide evidence from a high-volume single-centre for the safety and feasibility of pancreaticoduodenectomy in patients aged 75 years and above.

**Method:** A retrospective review of a prospectively maintained database was performed, including all patients who underwent pancreaticoduodenectomy by a single surgeon between 2007-2019. Patients were divided into two groups, those 75 years or older and patients younger than 75. Patient characteristics, operative and post-operative outcomes were reviewed and compared between the two groups.

**Results:** Of the 282 patients who underwent pancreaticoduodenectomy, 67 (24%) patients were 75 years or above. This included, 20 (30%) elderly patients who also underwent portal vein reconstruction, compared with 78 (36%) patients in the younger group. Overall perioperative mortality was low at 1/67 (1.5%) in the elderly group, compared with 1/215 (0.5%) in the younger group. Overall complication and major complication rates were 17/67 (25%) and 3/67 (4%) in the elderly group respectively, which were comparable to the younger group with 28/215 (13%) and 1/215 (0.5%) respectively.

**Conclusion:** Carefully selected elderly patients can safely undergo pancreaticoduodenectomy with low rates of morbidity and mortality. Although higher than the younger patients, morbidity and mortality rates remain low for an operation which provides the only potential curative treatment.

PL03-067

### PORTO-CAVAL SHUNT IS A SALVAGE MANOEUVRE TO REDUCE DE NOVO PORTAL HYPERTENSION AFTER MAJOR HEPATECTOMY

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**Background:** Extended hepatectomy offers the only possibility of cure to patients with large or multifocal hepatic cancers. Post-hepatectomy de novo portal hypertension is a known risk factor of post-operative liver failure (PHLF).

Intra-operatively pharmacological (somatostatin infusion) and surgical (splenic artery ligation) management of post hepatectomy portal hypertension have already been described.

**Objectives:** We present here 3 cases where major hepatectomy was followed by intra- or post-operative

creation of a porto-caval shunt in order to avoid de novo portal hypertension and subsequently PHLF. To our knowledge, no other similar cases have been reported in the literature.

**Case reports:** In one case, the porto-caval shunt was performed intra-operatively after discovering a high portal pressure and porto-caval gradient at the end of the surgery. In the other 2 cases the shunt was performed post-operatively as a rescue procedure to treat a portal thrombosis related to portal hypertension. In all cases the porto-caval shunt managed to reduce the portal pressure and subsequently the porto-caval gradient and no post-hepatectomy liver failure occurred.

**Conclusion:** In the event of de novo portal hypertension after major hepatectomy and in case of fail of peri-operative pharmacological treatment or splenic artery ligation, a porto-caval shunt may be a salvage manoeuvre to avoid post-operative liver failure.

PL03-068

### LAPAROSCOPIC LIVER RESECTION CAN BE A STANDARD TREATMENT FOR HEPATOCELLULAR CARCINOMA OF LOW AND INTERMEDIATE DIFFICULTY

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**Introduction:** To investigate the feasibility of laparoscopic liver resection (LLR) for hepatocellular carcinoma (HCC) with various difficulty, we compared LLR and open liver resection (OLR) in serial patient groups with matched difficulty level.

**Methods:** We retrospectively reviewed 607 patients with HCC undergoing liver resection (81 of LLR, 526 of OLR) in our hospital from 2012 to 2019. Propensity score-matched (PSM) analysis was used to balance LLR and OLR with characteristics and difficulty levels by IWATE criteria. We compared the matched patients, and further analyzed the results in patient groups stratified by difficulty score (DS).

**Results:** After 1:1 PSM process, 146 patients were selected. Compared to OLR, LLR had shorter hospital stay (9.4 vs. 11.5 days,  $p=0.071$ ), less surgical complications (16.4% vs. 30.1%,  $p=0.049$ ), lower inflow control rate (42.5% vs. 65.8%,  $p=0.005$ ), while comparable disease-free and overall survival. Among the 73 matched patients of each group, 13, 41, 13 and 6 patients were classified as low, intermediate, advanced and expert DS group, respectively. Accordingly, LLR was associated with shorter hospital stay and less surgical complications in low and intermediate DS groups. The disease-free survival of LLR in intermediate DS group was superior to OLR ( $p=0.020$ ). In advanced and expert DS groups, the peri-operative and oncologic outcomes between LLR and OLR were comparable.

**Conclusions:** With careful patient selection, LLR for HCC had promising outcome in comparison to OLR. Our data suggest that LLR should be considered a standard procedure in HCC case of low and intermediate difficulty according to IWATE criteria.

## Comparison of clinical and oncologic outcomes between LLR and OLR after propensity score matching analysis

	Matched-LLR (n=73(100%))	Matched-OLR (n=73(100%))	P value
Hepatic inflow control (Yes (n%))	31 (42.5)	48 (65.8)	0.005
Grade $\geq$ II complication (n%)	12 (16.4)	22 (30.1)	0.049
Grade $\geq$ III complication (n%)	2 (2.7)	7 (9.6)	0.166
In-hospital mortality (n%)	0 (0.0)	2 (2.7)	0.497
Surgical time (min) (mean $\pm$ SD)	288.6 $\pm$ 102.1	276.0 $\pm$ 106.7	0.501
Blood loss (ml) (mean $\pm$ SD)	342.5 $\pm$ 394.4	400.7 $\pm$ 531.9	0.456
Post-OP length of hospital stay (day) (mean $\pm$ SD)	9.4 $\pm$ 5.3	11.5 $\pm$ 9.8	0.071
Positive resection margin (n%)	1 (1.4)	4 (5.5)	0.172
Follow up period (month) (mean $\pm$ SD)	38.4 $\pm$ 26.9	46.2 $\pm$ 24.2	0.083

PL03-069

### PROGNOSIS AND RISK OF LONG-TERM RECURRENCE AFTER LIVER RESECTION FOR HEPATOCELLULAR ADENOMA WITH MALIGNANT TRANSFORMATION

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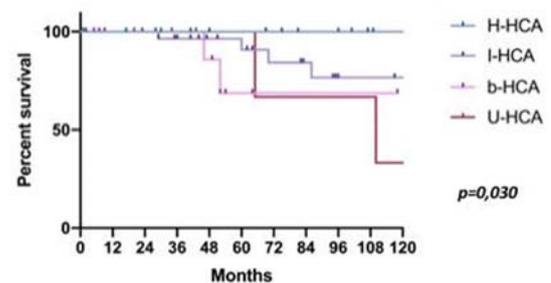
**Introduction:** The aim of the study was to compare the long-term outcomes of resected hepatocellular adenomas with malignant transformation (MT-HCA) and well-differentiated hepatocellular carcinoma on normal liver parenchyma (WD-HCC) and HCA without malignant transformation (HCA).

**Methods:** From 2001-2018 all patients undergoing hepatectomy for M-HCA were included in this monocentric retrospective study. MT-HCA were classified as borderline HCA (Bo-HCA) in case of small malignant foci and as Malignant-HCA (M-HCA) in case of predominant HCC component. Overall (OS) and recurrence-free (RFS) survivals after LR for HCA, Bo-HCA, M-HCA and WD-HCC were compared.

**Results:** Thirty-nine patients (23 men, 16 women) underwent LR for MT-HCA (22 Bo-HCA, 17 M-HCA) and were compared to 90 patients with WD-HCC and 30 patients with HCA. Among the 39 patients with MT-HCA, 14 were  $\beta$ -catenin mutated (b-HCA), 21 were inflammatory (I-HCA), and 4 were unclassified (U-HCA). After a median follow-up of 67 months, 10 patients (25%) experienced tumor recurrence, including 9 M-HCA and one Bo-HCA ( $p < 0.001$ ). Five-year RFS were 83%, 46%, 25% for the Bo-HCA, M-HCA, WD-HCC groups respectively ( $p < 0.001$ ). On univariate analysis, risk factors for recurrence were age ( $p=0.010$ ), Tumor size  $> 5$ cm ( $p=0.028$ ), presence of satellite nodules ( $p=0.001$ ), microvascular invasion ( $p=0.001$ ), and the U-HCA subtype ( $p=0.038$ ). On multivariate analysis, only age and tumor size  $> 5$ cm were independently associated with recurrence following LR.

**Conclusion:** HCA with malignant transformation yield a better long-term prognosis than WD-HCC. Among MT-HCA, Bo-HCA have a better prognosis than M-HCA.

#### Recurrence Free Survival according to HCA subtypes



5 years Recurrence free survival according to HCA subtypes

PL03-071

### MAJOR LIVER RESECTIONS: AN AUDIT OF DEVELOPING HPB UNIT

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**Background:** With proper training and improved perioperative care, major liver resections are being safely performed even in low volume center of the underdeveloped country. Here, we present the outcome of major liver resections performed in developing HPB unit of T U Teaching Hospital, Kathmandu, Nepal.

**Methods:** The Chief surgeon of the unit received two years of HPB training at high volume centers in Melbourne. The surgeon had received general surgical training in Nepal and had worked for few years prior to receiving HPB training. Retrospective review of the medical records of major liver resections performed by single unit were reviewed. Indications, extent of hepatectomy and perioperative outcomes were analyzed.

**Results:** Total 79 liver resections have been performed by the single unit out of which 54 were major liver resections (Three or more segments) over 6 years period. Out of them, total 3 were for right donor hepatectomy, 2 for trauma and remaining 49 were for other benign and malignant conditions. There were 16 Right hepatectomy, 14 left, 9 extended right, 13 non anatomical, 1 HPD and 1 ALPPS procedure. Two patients were operated following right portal vein ligation. There was 25% morbidity (Clavien Dindo Grade 1-3, SSI, Chest infection, UTI, Transfusion, bile leak). Post hepatectomy liver failure (PHLF) was 1.8% and mortality was 3.7% (1 Post AIPPS Sepsis, 1 PHLF).

**Conclusion:** With proper training and improved perioperative care, major liver resection can be performed safely with acceptable outcome even in low volume centers of developing nations.

PL03-072

### THE FEASIBILITY AND EFFICACY OF REPEAT LAPAROSCOPIC LIVER RESECTION: A PROPENSITY-MATCHED ANALYSIS OF SHORT-TERM OUTCOMES

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**Background:** Repeat hepatectomy has been widely accepted for liver tumors due to progress of anti-viral or anti-cancer drugs. However, repeat laparoscopic liver resection (LLR) is technically more difficult. The aim of this study is to assess the feasibility and efficacy of repeat LLR, as compared with repeat open liver resection (OLR). **Methods:** We performed 45 repeat OLR and 28 LLR from 2007 to 2018. This study retrospectively compared the patients' clinico-pathological characteristics and operative and short-term outcomes of the 2 groups.

**Results:** There were no significant differences in patient characteristics between the 2 groups, excluding Child-Pugh grade. The repeat LLR group had less blood loss during operation (median 224 ml vs. 578 ml;  $P < 0.001$ ) and shorter postoperative hospital stays (median 11.5 days vs. 20.9 days;  $P < 0.01$ ). The other results including operating time and postoperative complications ( $>$  Clavien-Dindo grade 3) were comparable between the 2 groups. A propensity score-matched analysis resulted in 27 one-to-one patient pair comparisons with repeat OLR and LLR. Child-Pugh grade or liver damage of all selected patients was grade A. In this analysis, the repeat LLR group had less blood loss during operation (median 190 ml vs. 580 ml;  $P < 0.001$ ) and shorter postoperative hospital stays (median 11.5 days vs. 22.2 days;  $P < 0.05$ ), while the other results including operation time and postoperative complications were comparable between the 2 groups.

**Conclusions:** Repeat LLR is feasible and useful with good short-term outcomes, at least, for patients with good reserve capacity.

PL03-073

### SHORT TERM OUTCOME OF REPEAT LAPAROSCOPIC COMPARED TO OPEN HEPATECTOMY AFTER AN INITIAL OPEN HEPATECTOMY

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**Background:** Repeat laparoscopic hepatectomy (RLH) is safe and feasible, with favorable oncologic outcome for recurrent liver malignancies after curative intent resection, however it is rarely performed after an initial open hepatectomy (OH). The aim of the study is to evaluate the outcome of RLH compared to repeat OH (ROH) following initial OH.

**Methods:** Patients who underwent RH after initial OH were retrieved from prospective data bases at Paul Brousse and Henri Mondor hospitals, France and Sir Run Run Shaw Hospital, China from 2012 to 2019. The patients were divided into two groups according to their RH, RLH (group A) and ROH (group B).

**Results:** Sixty-four patients matched the criteria, 20 in group A and 44 in group B. Diagnoses were primary hepatic lesions in 59%, CRLM in 39% and others in 2% of cases. Median operative time and blood loss were significantly lower in group A (199 vs 260 minutes,  $p < 0.001$  and 100 vs 400 ml,  $p = 0.011$  respectively), as well as overall postoperative complications (20% vs 50%,  $p = 0.024$ ). One patient died in group A of postoperative pancreatitis; this patient had been converted to open. Another case was converted due to exposure difficulties. Median hospital stay was as well lower in group A (5 vs 8,5 days,  $p = 0.001$ ). R1 resection was 10% and 22,7%, respectively ( $p = 0.312$ ).

**Conclusion:** LRH is a feasible, safe technique and a realistic option to be considered in selected patients after previous OH. Conversion should be considered when adhesions are more severe than expected.

PL03-074

### SYSTEMATIC REVIEW ON PERCUTANEOUS ASPIRATION AND SCLEROTHERAPY VERSUS SURGERY AS FIRST-LINE TREATMENT IN SYMPTOMATIC SIMPLE HEPATIC CYSTS

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**Background:** Simple, non-parasitic, non-polycystic hepatic cysts (SHCs) may cause pain and bloating which impairs quality of life (QoL). Treatment options include percutaneous aspiration and sclerotherapy (PAS), and laparoscopic or open surgical management. Current guidelines recommend laparoscopic deroofing as primary treatment. This review assesses the effect of PAS and surgery on the symptoms and QoL in patients with SHCs.

**Methods:** A systematic search in MEDLINE (PubMed) and Embase was performed according to PRISMA guidelines. Studies reporting symptoms before and after treatment of SHCs were included. Methodological quality of included studies was assessed by the MINORS-tool. Primary outcomes were symptom relief and QoL. Secondary

outcomes were recurrence and complications. Pooled estimates were produced using the Mantel-Haenszel method.

**Results:** In total, 764 patients from 34 studies with SHCs were included, of which 294 (38.5%) underwent PAS, 348 (45.5%) laparoscopic, and 122 (16.0%) open surgical management. Prior to surgical management, 9.9% (95% CI: 9.1-10.6%) of patients underwent other treatment. Symptom relief (percentage with 95% CI) was accomplished in 92.5% (91.7-93.3%), 91.4% (90.6-92.2%), 86.9% (84.9-88.9%) of patients treated with PAS, laparoscopic or open surgery, respectively. QoL was rarely examined. Cyst recurrence rates were 0.3% (0.3-0.4%), 16.4% (14.9-17.8%) and 13.1% (11.1-15.1%). Major complication rate was 0.7% (0.6-0.8%), 1.7% (1.6-1.9%) and 2.5% (2.0-2.9%), respectively.

**Conclusions:** Similar results were found for PAS and surgery with respect to symptom relief and complications. PAS was associated with lower cyst recurrence rates than surgery. We advocate PAS as primary treatment in a step-up protocol for SHCs.

PL03-076

### RADICAL SURGERY REDUCES RISK OF RECURRENCE IN LIVER HYDATID CYST

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**Background and aims:** Effects of conservative surgical procedures applied in cyst hydatid surgery and radical surgical interventions on emergence of postoperative biliary complications and recurrence were examined.

**Methods:** Data of 804 patients operated with the diagnosis of liver cyst hydatid were examined retrospectively. Demographic features, preoperative imaging methods, cyst type, location, complication and type of surgery were recorded. The patients were divided into two groups according to the difference of the surgical methods applied (conservative / radical) and the period of hospitalization, morbidity and mortality in the first 30 postoperative days and long-term recurrence rates were compared.

**Results:** Conservative surgery was applied to 605 patients while radical surgery was applied to 199 patients of the total 804 patients. The demographic characteristics of the patients were similar in the two groups. In the postoperative period, there was no statistically significant difference between the two groups in terms of period of hospitalization, morbidity and mortality rates. However, biliary complications observed as 4.1% in conservative surgery know was found to be 3% in radical surgery. The mean follow-up period was 50.66 ± 23.9 (3-147) months and recurrence developed in 86 patients. The recurrence rate, which was 13.2 % in the conservative surgical group, was found to be 3% in the radical surgical group (p = 0.0001) (Table 1).

**Conclusions:** Radical surgery decreases biliary complications including primarily bile leakage without causing additional morbidity in patients, makes follow-

up easier but most importantly it decreases recurrence rate significantly.

**Table 1** Period of hospitalization, morbidity, mortality and recurrence rates

	Conservative Surgery Group (n = 605)	Radical Surgical Group (n = 199)	P
Period of hospitalization (day)	6.5±6.1 (2-60)	5.2±1.7 (3-11)	> 0.05
Morbidity (30 days)	106 (% 17.5)	37 (% 18.6)	=0.754
Reoperation (30 days)	4 (% 0.66)	1 (% 0.50)	=1.000
Mortality (30 days)	5 (% 0.82)	1 (% 0.5)	=1.000
Recurrence	80 (% 13.2)	6 (% 3.01)	=0.0001

PL03-077

### ASSOCIATION OF THE CHANGE OF ALKALINE PHOSPHATASE LEVEL AND LIVER REGENERATION IN PARTIAL HEPATECTOMIES

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**Introduction:** The level of alkaline phosphatase (100U/L) was an independent prognostic factor in our studies. (J Gastrointest Surg. 2011 Aug;15(8):1440-9.) The biological analysis for the impact on HCC outcome was unknown.

**Methods:** Based on the surgical analysis of liver cancer patients from 2015 to 2018, we selected two groups of patients, namely patients with right hepatectomies (group 1) and lateral segmentectomies (group 2).T

**Results:** differences in gender, AST, and alkaline phosphatase (ALKP) between the two groups. There is no statistical difference in BMI, ICG-R15, cirrhosis, and other biochemical indicators. There were no mortality in the cases included in this study. One month later, PTLV (postoperative liver volume) is 997.5 ± 204.2 and 1138.8 ± 241.7ml (p = 0.019), although the right The regeneration volume of hepatic lobe resection is still slightly smaller than the original volume (0.65 ± 0.14 and 0.89 ± 0.11), but the regeneration ratios (PTLV / est. Preserved) are 1.88 ± 0.59 and 1.18 ± 0.15 (p < 0.001), respectively. Moreover, the regeneration ratio at AlkP> = 100 and < 100 U / L has a regeneration ratio (PTLV / est. Preserved) of 1.80 ± 0.68 and 1.39 ± 0.32 (p = 0.003), and correlation analysis shows that the regeneration ratio is related to AlkP (pearson correlation = 0.301, p = 0.049), has nothing to do with other liver function indicators.

**Conclusion:** The result showed the serum change of ALKP was association with liver regeneration.

PL03-080

### IDENTIFICATION OF HIGH-RISK PATIENTS OF CLINICALLY RELEVANT POSTOPERATIVE PANCREATIC FISTULA

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**Background:** Pancreatic fistula (POPF) remains a significant concern after pancreaticoduodenectomy (PD). Recently, there have been the development of risk-stratification and increasing needs in the management base on such risk-model. The purpose of this study was to examine the identification of risk factor and the invention of risk-model using these risk factors.

**Methods:** Patient characteristics, preoperative laboratory, and radiographic findings and their association with post-operative pancreatic fistula after pancreaticoduodenectomy were analyzed for 158 patients who underwent resection between 2011 and 2017. CR-POPF was defined as Grade B or C pancreatic fistula based on the International Study Group of Pancreatic Surgery (ISGPS) 2016 consensus.

**Results:** CR-POPF developed in 38 patients (24.2%). On multivariate logistic analysis, abdominal fat area (ORs=1.006;  $P=0.05$ ), main pancreatic duct diameter (ORs=0.72;  $P=0.0008$ ), diabetes mellitus (ORs=4.8;  $P=0.0038$ ) and the pathology of non-pancreatic cancer (ORs=6.3;  $P=0.0002$ ). The risk-model based on these factors classified the high risk group, whose discriminant score was above 0.70. To prevent the development and deterioration of POPF, modified Blumgart method, external stenting of bile and pancreatic secretion and continuous irrigation after POPF were instituted. After 2018, 5 patients out of 60 patients in total was the high-risk group. Among them, 1 patient underwent CR-POPF. No patients experienced Grade C POPF.

**Conclusions:** The risk assessment based on preoperative factors for the prediction of POPF after PD was considered as effective in view of the identification of high risk patients and intervention to them. However, the rate of POPF remains high despite several improvement of perioperative management.

PL03-081

### ROUTINE APPLICATION OF LAPAROSCOPIC SURGERY FOR HEPATOCELLULAR CARCINOMA LOCATED IN THE ANTEROLATERAL SEGMENTS OF THE LIVER: OUTLIER ANALYSIS

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**Introduction:** The aim of this study was (1) to compare the perioperative outcomes of laparoscopic anterolateral liver resection (LALLR), open anterolateral liver resection (OALLR) and open conversion anterolateral liver resection (OCALLR) (2) to analyze the risk factors for open conversion.

**Methods:** We retrospectively reviewed the data of 374 patients who underwent laparoscopic (N=299) or open (N=62) or open conversion (N=13) liver resection for hepatocellular carcinoma located in anterolateral segments between 2004 and 2018.

**Results:** Among preoperative factors, tumor size (cm) ( $4.11 \pm 2.01$  vs.  $4.98 \pm 3.49$  vs.  $2.82 \pm 1.52$ ,  $p = 0.000$ ) and proportion of other organ invasion (23% vs. 15.4% vs. 1.7%,  $p = 0.001$ ) were significantly higher in OCALLR and OALLR than LALLR group.

In operative outcome analysis, estimated blood loss (ml) ( $1596.1 \pm 1604.8$  vs.  $812.5 \pm 977.6$  vs.  $411.3 \pm 614.3$ ,  $p = 0.003$ ), postoperative hospital days ( $10.38 \pm 5.69$  vs.  $11.82 \pm 9.31$  vs.  $6.48 \pm 6.71$ ,  $p = 0.000$ ) and complication (38.5% vs. 29.0% vs. 12.5%,  $p = 0.001$ ) were significantly higher in OCALLR and OALLR than LALLR group.

**Conclusion:** Laparoscopic approach showed better operative outcomes than open surgery in anterolateral liver resection in selected patients. Moreover, OCALLR showed even poorer operative outcomes than OALLR and risk factors for open conversion were bigger tumor size and other organ invasion.

PL03-082

### SURGICAL OUTCOMES AFTER MICROSCOPIC INCOMPLETE RESECTION (R1) OF COLORECTAL LIVER METASTASES IN THE ERA OF AGGRESSIVE SURGICAL APPROACH

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**Background and purpose:** A  $\geq 1$ -mm margin is standard for resection of colorectal liver metastases (CRLM). However, microscopic incomplete resection (R1) is not rare because aggressive surgical resection has been attempted in multiple and bilobar CLM. In this study, we analyzed surgical outcomes after R1 resection of CRLM.

**Method:** From 2005 to 2018, 371 consecutive patients undergoing liver resection for CRLM were included. R1 resection was defined to have zero tumor free margin at the pathologic report. All patients were divided into R0 (tumor free margin more than 0mm) and R1 group. Recurrence pattern and disease-free survival were analyzed between the two groups.

**Results:** A total of 371 patients included in the study. Among them, R1 resection was found in 42 (11.3%) patients. The median age at diagnosis was 59 years (range, 22 to 86). There were 246 (33.7%) men and 125 women (66.3%). The incidence of intrahepatic recurrence was not significantly different between R0 and R1 resection. Similarly, there was no significant difference in term of surgical margin recurrences between patients with R0 and R1 resections (42% [35/84] vs 35% [6/17], respectively,  $P = 0.788$ ). When comparing R0 and R1 resection, the 1-, 3-, and 5-year disease-free survival rates was not statistically significant.

**Conclusion:** R1 resection showed similar marginal recurrence rate and comparable disease-free survival compared

to R0 resection. R1 resection should be part of the modern multidisciplinary, aggressive approach to CRLM.

PL03-083

### PROGNOSTIC SIGNIFICANCE OF THE POSTOPERATIVE NEUTROPHIL-TO-LYMPHOCYTE RATIO IN SOLID TUMORS: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Inflammation plays a critical role in tumorigenesis, progression and metastasis. A high preoperative neutrophil-to-lymphocyte ratio has been reported to be a worse prognostic indicator in malignancies. However, the association between postoperative NLR (postNLR) elevation and survival outcome in patients with solid tumors remains controversial.

A systematic review was conducted to explore the association between the postNLR and survival outcome, including overall survival (OS), disease-free survival (DFS), and cancer-specific survival (CSS), in solid tumors. Relevant literature was identified using PubMed, Embase, and the Cochrane Library from the initiation of the databases to October 2019. Data were extracted from included studies reporting hazard ratios (HRs) and 95% confidence intervals (CIs) and were pooled using generic inverse-variance and random-effects modeling. All statistical tests were two-sided.

Ten studies reporting on 5653 patients were included in the analysis. Elevated postNLR was associated with worse OS (HR 1.93, 95% CI = 1.33-2.79;  $P = 0.0005$ ) and CSS (HR 1.34, 95% CI, 1.03-1.74;  $P = 0.03$ ).

Elevated postNLR might be a readily available and inexpensive biomarker for OS and CSS in solid tumors. Multicenter and prospective studies are needed to explore the impact of the postNLR, especially in immunotherapy, on the prognosis of solid tumors.

PL03-084

### PERI-OPERATIVE PREDICTORS OF WITHIN 1-YEAR MORTALITY IN PATIENTS WITH HEPATOCELLULAR CARCINOMA TREATED BY HEPATECTOMY WITH CURATIVE INTENT

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**Introduction:** Investigators routinely report short term(30 or 90 days mortality) or long term(1,3,5 year Disease Free Survival and Overall Survival) outcomes. Intermediate

outcomes between 90days and 1 year are also important as it puts into question the surgical risk assessment. We study the risk factors predicting 1-year mortality following elective liver resection for hepatocellular carcinoma (HCC).

**Method:** This is a retrospective study of 400 patients who underwent liver resection from January 2007 to April 2016. Univariate and multivariate analysis were performed on peri-operative variables using Cox-Regression analysis. Kaplan-Meier Survival curves and hazard ratios were obtained.

**Result:** 163 patients had curative hepatectomy for HCC. The median tumour diameter was 40mm (1-200mm) with 68 patients(41.7%) having tumors  $\geq 50$ mm. 17(10.4%) were of Child-Pugh Class B/C, and over half (51.5%) had Hepatitis B. 71 patients (43.6%) underwent major HR and 101(62.0%) had laparoscopic hepatectomy. 30-day mortality was 3.7% (n=6) and 90-day mortality was 4.9% (n=8). Fifteen patients (9.1%) experienced 1-year mortality. Multivariate analysis identified five risk factors (Table 1). A prognostic algorithm calculating the total number of identified risk factors in patients shows that patients with  $>3$  risk factors do not survive 1-year ( $p < 0.001$ ).

**Conclusions:** We identified five peri-operative risk factors that predict 1-year mortality following elective liver resection for HCC. Pre-operative factors are Child score, multinodularity and macrovascular invasion and it remains to be determined if patients with two or more of these three factors are better managed with a combination of radio-frequency ablation and liver directed chemotherapy instead of surgical resection.

**Table 1** Identified independent risk factors for predicting 1-year mortality

Peri-Operative Risk Factor	HR	95% Confidence Interval (CI)	p-value
Child Score (B/C)	5.5	1.130-26.551	0.035
Multi-nodularity (>1 Tumor)	7.1	2.305-21.899	0.001
Macrovascular Invasion	4.2	1.046-17.191	0.043
Acute Renal Insufficiency	5.8	1.009-33.294	0.049
Post-Hepatectomy Liver Failure	9.6	1.778-51.320	0.009

PL03-086

### HIGH FIB-4 INDEX PREDICTS POOR PROGNOSIS IN ALCOHOLIC DRINKERS WITH HEPATOCELLULAR CARCINOMA

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**Background:** Hepatocellular carcinoma (HCC) is one of the most aggressive cancer with a poor prognosis. Prediction of the prognosis is important to determine the treatment strategy. Alcohol consumption is a well-known major risk

factor for liver fibrosis and HCC. FIB-4 index is a non-invasive and easily applicable indicator of liver fibrosis based on age, AST, ALT and platelets, which is a highly predictive risk factor for HCC. The aim of this study is to evaluate the association between preoperative FIB-4 index and prognosis in patients with HCC among alcohol drinkers.

**Methods:** Consecutive 197 patients who underwent surgical resection of HCC between 2000 and 2018 were included. The cut off value of FIB-4 was determined by ROC analysis. We analyzed the relationship between clinicopathological variables including FIB-4 and survival after hepatectomy. Survival data were analyzed using the Log-rank test for univariate analysis and Cox proportional hazards for multivariate analysis. P value of < 0.05 was judged as significant.

**Results:** A univariate analysis revealed that HCV positive (p=0.023), high preoperative ICG retention rate at 15 minutes (p=0.020), high AFP (p=0.030), high PIVKA-II (p=0.005) and high FIB-4 index ( $\geq 2.6$ ; p< 0.001) were significant poor prognostic factors for OS. FIB-4 index retained its significance on multivariate analysis for OS (HR 2.281, 95%CI 1.309-3.975) along with PIVKA-II (p=0.0006). High FIB-4 index was also an independent prognostic factor for DFS (HR 1.772 95%CI 1.231-2.552). **Conclusion:** Preoperative high FIB-4 index is an independent prognostic factor for OS and DFS in resected HCC.

#### PL03-087

### OUTCOMES OF ROBOTIC HEPATECTOMY IN A NEW COMMUNITY-HOSPITAL BASED HPB PROGRAM. LESSONS LEARNED AND ACS RISK COMPARISON TO OPEN SURGERY OUTCOMES

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**Introduction:** Robotic hepatectomy is safe and feasible when performed by trained surgeons. Universal adoption is limited due to the complexity of the operation and the steep learning curve as well as inherent risks associated with liver resection including bleeding. We describe in our series consecutive robotic hepatectomies performed in a community hospital using ACS score.

**Methods:** Consecutive patients undergoing liver resection surgery by a robotic fellowship trained HPB surgeon at a community hospital setting were evaluated. ACS NISQUIP risk score for any and serious complications, 90-day mortality, 30-day readmission, preoperative embolization as well as conversion to open surgery.

**Results:** 22 consecutive patients underwent robotic hepatectomy surgery. Median: Age was 56.5y, BMI was 29.5. Median expected LOS was 6 days and actual LOS 3 days. Median ACS risk for any complications was 20% and for serious complications was 18%. Median for observed rates of any complications was 13.7%. Major hepatectomy was performed in 31.5% and post-operative bleeding occurred in 4.5% and infection in 13.7%. There was an associated major procedure (Colon resection, pancreaticoduodenectomy etc.) in 18.7% of patients. There was no mortality and

4.5% readmission rates. There was 87.7% R0 resection rates in this cohort. R0 resection rates.

**Conclusion:** Robotic hepatectomy is safe to perform even in a community hospital setting provided there is technical expertise to do. The outcomes are superior to open surgery as predicted by the ACS NISQUIP risk calculator. In addition, the outcomes are seen even in the learning curve phase of a fellowship trained HPB surgeon.

#### PL03-093

### LONG-TERM OUTCOMES OF LAPAROSCOPIC VERSUS OPEN LIVER RESECTION FOR COMBINED HEPATOCELLULAR - CHOLANGIOCARCINOMA

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**Background:** Combined hepatocellular-cholangiocarcinoma (cHCC-CCA) is a rare primary hepatic neoplasm. Liver resection is still the preferred method for curative treatment. This study aims to compare the long-term survival and postoperative complications of LLR with open liver resection (OLR) in cHCC-CCA.

**Study design:** Patients who underwent liver resection for cHCC-CCA from August 2004 to June 2015 were enrolled. Those who received palliative surgery, and those who had follow-up of less than 3 years were excluded. Medical records of these patients were retrospectively reviewed. Primary endpoint was 3-year disease-free survival (DFS) and 3-year overall survival (OS). Kaplan-Meier survival analysis was performed to compare survival.

**Results:** A total of 40 patients were enrolled with 23 in the laparoscopic group and 17 in the open group. The 3-year OS was 81.6% in the laparoscopic group and 72.1 % in the open group (p=0.641). The 3-year DFS was 63.3% in the laparoscopic group and 48.2% in the open group (p=0.742). Mean operation time for the laparoscopic group was 326.1 ± 152.0 minutes and open group was 313.9 ± 135.7 minutes (p=0.795).

Hospital stay was significantly shorter in the laparoscopic group (7.8 ± 2.7 days) than the open group (16.1 ± 11.7 days, p=0.010). Complication (Clavien-Dindo grade II or more) was also less in the laparoscopic group (2, 8.7%) than the open group (8, 47.1%, p=0.016).

**Conclusion:** Laparoscopic liver resection for cHCC-CCA is technically feasible and safe, providing short-term benefits without affecting long-term survival

#### PL03-094

### EVALUATION OF IWATE CRITERIA MODEL TO PREDICT DIFFICULTY OF LAPAROSCOPIC LIVER RESECTION

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**Background:** Iwate criteria is a recently proposed classification system for assessing the surgical difficulty of laparoscopic liver resection (LLR). The aim of the present study was to externally validate this scoring system.

**Methods:** All consecutive patients who underwent pure LLR between April 2008 and October 2019 at a single tertiary referral center were included. Iwate criteria was calculated according to original proposition which includes four difficulty levels based on six risk factors. Both intra- and postoperative complications were compared according to the difficulty scores.

**Results:** The difficulty of 142 LLR were scored as low, intermediate, advanced and expert level in 41 (28.9%), 53 (37.3%), 32 (22.5%) and 16 (11.3%) patients, respectively. Intraoperative complication was detected in 26 (18.3%) patients. The rates of intraoperative complications (2.4, 7.5, 34.3, and 62.5%) increased gradually with statistically significant values among difficulty levels ( $P < 0.001$ ). 90-day major postoperative complications occurred in 19 (13.4%) patients where rates were also statistically significant among difficulty levels ( $P < 0.001$ ). We analysed our results and proposed mean risk curves/assessments for intraoperative complications and postoperative complications, based on the original proposal and the improved proposal with the new tumor size threshold ( $n = 3,8$  cm) to validate the Iwate criteria and its practical application.

**Conclusion:** We observed associations between the Iwate criteria and intraoperative and postoperative outcomes on our database. Additionally we proposed different tumor size threshold, which gives better results especially for intraoperative complications.

PL03-096

### LONG-TERM OUTCOME OF INTRAOPERATIVE RADIOFREQUENCY ABLATION FOR HEPATOCELLULAR CARCINOMA

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**Introduction:** We conducted this study to identify long-term outcomes following intraoperative radiofrequency ablation (IO-RFA) for hepatocellular carcinoma (HCC) and to reveal independent prognostic factors for survival.

**Method:** From December 1998 to February 2019, 183 patients underwent IO-RFA for HCC. These patients were divided into two groups according to whether RFA was done as a first-line (1-RFA group,  $n=106$ ) or secondary-line (2-RFA group,  $n=77$ ) treatment. Furthermore, we compared the survival outcomes between the 1-RFA and 2-RFA groups.

**Result:** There were no significant differences in type of surgical approaches between the two groups ( $p=0.079$ ). The number of tumors and largest tumor size were not significantly different between the two groups. Overall recurrence rate was 53%, and the 2-RFA group showed a higher recurrence rate (46.2% in 1-RFA group versus 62.3% in 2-RFA group;  $p=0.031$ ). The 5-year overall survival (OS) and disease-free survival (DFS) rates of all the patients were 75.2% and 27.9%, respectively. The OS and

DFS rates were significantly higher in the 1-RFA group. The 5-year OS rates were 83.6% and 64.9% in the 1-RFA and 2-RFA groups, respectively ( $p=0.010$ ), whereas the 5-year DFS rates were 32.2% and 21.6%, respectively ( $p=0.012$ ). On multivariate analysis, HBV-LC, 2-RFA, recurrence, and postoperative complications were independent predictive factors for survival.

**Conclusion:** Therapeutic outcomes of IO-RFA were comparable to those of surgical resection. Additionally, 1-RFA might be an alternative treatment for naïve HCC in patients with uncompensated liver function and severe comorbidities.

PL03-098

### RESULTS OF HEPATIC TRISECTIONECTOMY FOR HILAR CHOLANGIOCARCINOMA

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**Objective:** Aim of this study was to describe results of Hilar cholangiocarcinoma after trisectionectomy in Department of Surgery, Chulalongkorn Hospital, from July 2015 to December 2019.

**Study design:** Descriptive study.

**Results:** From 23 patients who underwent trisectionectomy, median age was 50.7 (31-80) years. Sixteen patients (69.5%) had left trisectionectomy, 7 patients had right trisectionectomy. Portal vein reconstruction was performed 5 and 4 patients in left and right trisectionectomy, respectively. While hepatic reconstruction was performed only in right trisectionectomy group (4 patients). Median length of hospital stay was 22.9 (11-63) days. Pathologically margin negative was 10 and 2 patients (62.5% and 28.5%). Node positive for malignancy was 43.75% and 42.85%. Median times to recurrence was 471 days.

**Conclusion:** Most hilar cholangiocarcinoma patients were diagnosed in advanced stage. Even hepatic trisectionectomy is aggressive surgical approach but increase resectability and complete resection with negative margin.

PL03-099

### IMPACT OF NEUTROPHIL LYMPHOCYTE RATIO (NLR) PLATELET LYMPHOCYTE RATIO (PLR), ALBUMIN GLOBULIN RATIO (AGR) AND ASPARTATE AMINASE PLATELET RATIO INDEX (APRI) ON PREDICTING OUTCOMES AFTER LIVER RESECTION

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**Introduction:** The presence of various biomarkers like NLR, PLR, AGR and APRI has been associated with increased morbidity and mortality in several malignancies.

**Methods:** Retrospective analysis of a prospectively maintained database of 309 patients undergoing liver resection for benign and malignant indications during January 2013

to December 2016 was performed. The association of preoperative NLR, PLR, AGR, APRI with clinicopathological characteristics and prognosis were assessed. Receiver operating characteristic (ROC) curve with Youden index was used to establish the cut-off value of NLR (3.6 for preoperative value and 8.6 for post-operative value) in predicting morbidity and mortality.

**Results:** Median age was  $52.57 \pm 13.99$  years (Range; 7-84 years). The high-NLR, PLR group had a significantly higher morbidity (40.2 % vs 28.4%  $P < 0.044$ ) High NLR was also associated with decrease disease-free survival (37.7 % vs 52.7 %,  $P = 0.04$ ) and overall survival (59 % vs 80.1 %,  $P < 0.001$ ) than the low-NLR group. AGR did not affect peri-operative as well as long term outcomes. High APRI group was associated with increased post-operative mortality ( $p=0.052$ ) without influencing overall outcomes.

**Conclusion:** Preoperative NLR had a statistically significant association with preoperative morbidity and mortality and also OS and DFS at 3 years and may be considered as a low cost, reliable marker for predicting postoperative morbidity and oncological outcomes.

#### PL03-101

### SARCOPENIA PREDICTS THE POOR PROGNOSIS OF PATIENTS WITH HEPATOCELLULAR CARCINOMA UNDER HEPATECTOMY

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**Background:** Sarcopenia was a poor prognostic factor for various types of malignancies. This study evaluated the prevalence and prognostic significance of sarcopenia and its association with survival in hepatocellular carcinoma (HCC) patients who underwent hepatectomy.

**Materials and Methods:** Between April 2010 and December 2017, 251 patients with HCC that underwent hepatectomy were retrospectively studied. Sarcopenia was defined as an L3 skeletal muscle index of  $< 49$  cm<sup>2</sup>/m<sup>2</sup> for men and  $< 41$  cm<sup>2</sup>/m<sup>2</sup> for women. Sarcopenia was identified preoperatively (within 2 months from operation).

**Results:** Pre-OP sarcopenia occurred in 113 (45.0%) patients and was significantly associated with older age, lower body weight, lower body-mass index, higher post-op length of hospital stay. At a median follow-up of 42 months, median overall survival (OS) was significantly lower in patients with pre-OP sarcopenia than in those without ( $p = 0.01$ ). In multivariate analysis [reporting hazard ratio (HR): 95% confidence interval (CI)], sarcopenia (1.84:1.01-3.35;  $p = 0.04$ ), post-op complication (2.28: 1.19-4.39;  $p = 0.01$ ), and recurrence (5.96: 0.31-32.42;  $p < 0.001$ ) were independent OS prognostic factors.

**Conclusion:** Sarcopenia was an independent adverse prognostic factor for OS of patients with HCC underwent hepatectomy. This result suggests the possibility that early intervention such as nutritional support and exercise therapies before operation could prevent muscle wasting and may be effective in improving the prognosis of HCC patients.

#### PL03-103

### DEFINING THE ROLE OF LAPAROSCOPIC LIVER RESECTION IN ELDERLY HEPATOCELLULAR CARCINOMA PATIENTS: A PROPENSITY SCORE MATCHED ANALYSIS

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**Objective:** To elucidate the role and efficacy of laparoscopic liver resection for elderly patients with hepatocellular carcinoma (HCC).

**Method:** A retrospective comparative analysis between laparoscopic and open liver resection was performed. Consecutive HCC patients aged 65 or above at the time of operation were recruited. Patients with recurrent HCC and pathology other than HCC were excluded. Short term and long-term outcomes of laparoscopic liver resection were compared with that of open group. Propensity score matching of patients in a ratio of 1:2 were conducted before comparison.

**Results:** There were 911 patients who underwent hepatectomy for primary HCC from year 2008 to 2018. Among them, 320 elderly patients aged over 65 years old were eligible for analysis. Heterogeneities between laparoscopic and open group were identified namely pre-operative albumin level, aspartate transaminase and proportion of hepatectomy (major vs minor). After propensity score matching of 1:2, there were 46 patients and 92 patients in the laparoscopic group and the open group respectively for comparison.

The laparoscopic group had less blood loss (326 vs 735 ml;  $P < 0.001$ ), shorter operative time (223 vs 324 minutes;  $P < 0.001$ ), and shorter hospital stay (6.3 vs 10.5 days;  $P < 0.001$ ). There were no significant differences in post-operative morbidity and hospital mortality. Laparoscopic group had a superior disease-free survival (59.7% vs 44.5%,  $P=0.041$ ), and a trend towards better overall survival. (78.4% vs 64.8%  $P=0.110$ ).

**Conclusion:** Laparoscopic liver resection is a safe approach for elderly patients with HCC with benefits from faster recovery and better oncological outcomes.

#### PL03-104

### OUTCOMES OF LIVER RESECTIONS BY TRAINEE SURGEONS VERSUS CONSULTANT SURGEONS - A SINGLE CENTRE EXPERIENCE

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**Introduction:** Liver resection is a most effective treatment for patients with operable primary or certain secondary cancer deposits. The role of trainee as a lead surgeon versus

consultant surgeon performing liver resections and its impact on surgical outcomes had never been reported.

**Methods and materials:** This study was aimed to assess the liver resection outcomes including operative time, acute kidney injury (AKI), bile leak, sepsis, mortality and hospital readmission within 3 months. A total of 320 liver resections from Addenbrookes Hospital at Cambridge between 2015 to 2017 were included in this study.

All liver resections were performed under supervision of the consultant surgeon who is either scrubbed or unscrubbed in theatre. Trainee surgeons have performed 116 of 320 as lead surgeon and the consultant surgeons performed the remaining 204.

**Results:** The mean operative time was  $413 \pm 129$  versus  $383 \pm 110$  ( $P=0.41$ ) minutes in trainee surgeons and consultant surgeons respectively. The incidence of post-operative AKI were similar in between the groups (5/116 versus 11/204;  $P=0.79$ ). Although the bile leak was numerically high in the trainee group, did not reach statistical difference (13/116 versus 12/204;  $P=0.12$ ); similar results noted in the incidence of sepsis too (3/116 versus 4/204;  $P=0.70$ ). Mortality, hospital readmission at 3 months were (1/204 versus 1/116;  $P=1$ ) and (2/116 versus 4/204;  $P=1$ ) respectively. No significant difference was observed.

**Conclusion:** Liver resections performed by the trainee surgeons under supervision appeared to be safe without increasing the operative time, morbidity, mortality and hospital readmission at 90 days. Further multicentre prospective study with long-term follow up is recommended.

### PL03-105

#### LAPAROSCOPIC HEPATIC LOBECTOMY FOR SYMPTOMATIC POLYCYSTIC LIVER DISEASE

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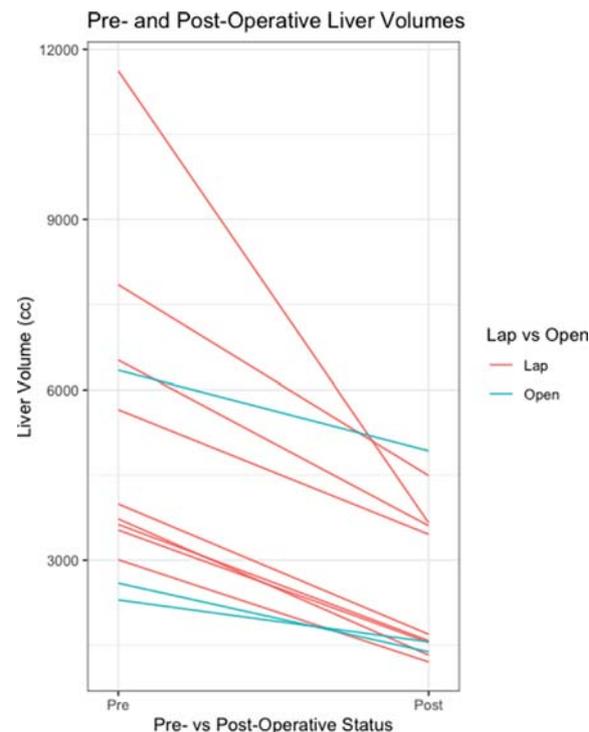
**Introduction:** Laparoscopic fenestration has largely replaced open fenestration of liver cysts. However, most hepatectomies for polycystic liver disease (PCLD) are performed open. Data on laparoscopic hepatectomy for PCLD is lacking. We present a series of patients who underwent laparoscopic hepatectomy for symptomatic PCLD.

**Methods:** A retrospective review of patients who underwent surgery for PCLD at a single institution between 2010 and 2019 was performed. Patients were grouped based on operative approach. Pre- and post-operative volumes were calculated for patients who underwent resection. The primary outcomes were: volume reduction, re-admission and postoperative complications.

**Results:** Twenty-six patients were treated for PCLD: 13 (50%) with laparoscopic fenestration, nine (34.6%) with laparoscopic formal hepatectomy, three (11.5%) with open formal hepatectomy and one (3.8%) with liver transplantation. Average length of stay for the patients who underwent laparoscopic resection was 3 days (IQR 2-3.5), with no readmissions. One patient developed postoperative atrial fibrillation. There were no other complications. Overall volume reduction was 51.4% (22.3-68.5), 32.2% (range 22.3-46.7) after open resection and 56% (range 38.8-68.5) after laparoscopic resection. Average length of

follow-up for the patients who underwent laparoscopic resection was 26 months (IQR 4-102).

**Conclusion:** Performing hepatectomy for PCLD is challenging as anatomic planes and vasculature are distorted. The laparoscopic approach even more so due to limited working domain from hepatomegaly. Volume reduction achieved through laparoscopic approach is comparable to volume reduction in previously published open resection series, and exceeded open volume reduction at our institution. Adequate volume reduction can be accomplished by laparoscopic means with acceptable postoperative morbidity.



PCLD Figure 1 (Liver Volumes)

### PL03-106

#### OUTCOMES OF LIVER RESECTIONS FOR PRIMARY LIVER PATHOLOGY VERSUS SECONDARY CANCER DEPOSITS- A SINGLE CENTRE EXPERIENCE

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**Introduction:** Liver resection is a most effective treatment for patients with operable primary or secondary liver tumours. This study assesses the outcomes of liver resection performed for primary liver lesions (PLL) versus secondary/metastatic liver lesions (SLL).

**Methods and Materials:** The parameters were operative time, acute kidney injury (AKI), bile leak, sepsis, mortality

and hospital readmission within 3 months. After excluding 12 cholangiocarcinomas resections, a total of 308 liver resections from Addenbrookes Hospital between 2015-2017 were included in this study. 66 liver resections were performed for PLL and remaining of 242 for SLL group. Relevant parameters were collected from a prospective electronic patient database.

**Results:** The mean operative time was  $403 \pm 139$  versus  $417 \pm 122$  ( $P=0.38$ ) minutes PLL group and SLL groups respectively. The incidence of postoperative AKI were not different in between the groups (6/66 versus 9/242;  $P=0.10$ ). But the incidence of bile leak was significantly high in PLL group (11/66 versus 14/242;  $P=0.008$ ). Similarly high incidence of postoperative sepsis noted in the PLL group compared to SLL (4/66 versus 3/242;  $P=0.04$ ). Mortality, hospital readmission at 3 months were (1/66 versus 1/242;  $P=1$ ) and (1/66 versus 3/242;  $P=0.38$ ) respectively.

**Conclusion:** Liver resections performed for primary liver lesions were associated with the risk of postoperative bile leak and sepsis compared to metastatic liver diseases. Further multicentre prospective study with long-term follow up is recommended.

#### PL03-107

### PURE VS. HAND-ASSISTED LAPAROSCOPIC HEPATECTOMY IN HPB CENTER OF ARGENTINA

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Hand-assisted laparoscopic (HAL) and pure laparoscopy (PL) are two effective methods to perform mini invasive laparoscopy liver surgery. The aim of this study was to assess the advantage of one technique over the other one.

Retrospective analysis of clinical outcomes for patients who underwent a laparoscopic hepatectomy (LH) between August 2010 and January 2020. 112 LH were performed: 47 PL (42%) and 65 HAL (58%). Variables included were: demographics, diagnostic, benign or malignant disease, operative time (OT), hospital stay (HS), postoperative 90-day mortality and complications. To overcome selection bias, a 1:1 propensity score matching (PSM) analysis was performed, each group containing 27 LH.

After PSM, there were no significant differences in age (PL  $53 \pm 15$  vs HAL  $55 \pm 16$ ), sex (16 females in each group), benign/malignant disease (PL 14/10 vs HAL 13/17) and major hepatectomy (PL 7 vs HAL 9). There were no statistical difference in OT between PL and HAL (PL:  $225 \text{ min} \pm 90$  vs HAL,  $262 \text{ min} \pm 111$ ) ( $p=0.17$ ). Global and major complication were also similar for both groups: 3 complications for the PL group (all minor) and 5 for the HAL, 3 of which were major (Dindo-Clavien IIIb-IV) ( $p=NS$ ). 90-day mortality was 0% in both groups. There was a significantly shorter HS in the PL group ( $2,8 \pm 1$  vs HAL  $4,81 \pm 3,7$ ) ( $p=0.002$ ).

We observed that over result suggests that PL had shorter HS, probably due to a lower number of complications.

We could not find any significant differences in this study probably due to the small patient sample size.

#### PL03-109

### USEFULNESS OF COMPLEXITY CLASSIFICATION AS A PREDICTOR OF POSTOPERATIVE OUTCOMES IN PATIENTS WITH HEPATOCELLULAR CARCINOMA

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**Background:** Recently, complexity classification to classify the types of hepatic resection was proposed in predicting the perioperative outcomes. The aim of this study is to validate the utility of this classification comparing with the other predictive models in patients with hepatocellular carcinoma (HCC).

**Methods:** Four hundred forty patients were retrospectively reviewed who received hepatic resection for hepatocellular carcinoma from January 2006 to December 2015. Liver resections were separated into three categories of complexity (low, medium, or high).

**Results:** There was a significant difference between three groups by complexity classification in severe complication ( $P=0.001$ ) and PHLF with grade BC ( $P < 0.001$ ) although there was no significant difference between two groups by conventional classification. Complexity classification was only a risk factor for severe complication ( $P=0.008$ ) and PHLF with grade BC ( $P=0.006$ ). The ability to predict PHLF with grade BC was not significantly different between the major/minor classification and the complexity classification [area under the curve (AUC) 0.634 vs 0.553, respectively;  $P=0.0628$ ). However, the complexity classification showed stronger correlations with severe complication (AUC 0.630 vs 0.542, respectively;  $P=0.0122$ ), blood loss ( $\geq 655\text{ml}$ ) (AUC 0.667 vs 0.561, respectively;  $P < 0.0001$ ), operation time ( $\geq 445 \text{ min}$ ) (AUC 0.744 vs 0.601, respectively;  $P < 0.0001$ ), and hospital stay ( $\geq 18 \text{ days}$ ) (AUC 0.651 vs 0.578, respectively;  $P < 0.0021$ ) compared with the major/minor classification.

**Conclusion:** Complexity classification is more useful than conventional classification and holds all the characteristics of an ideal classification for hepatic resection to predict severe complication and PHLF.

#### PL03-110

### SHORT-TERM OUTCOMES OF LAPAROSCOPIC REPEAT HEPATECTOMY

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**Background:** Although repeat hepatectomy is an effective treatment for recurrence hepatocellular carcinoma and metastatic liver tumor, laparoscopic repeat hepatectomy (LRH) is not widely accepted and its indication has not been established. The aim of this study was to clarify feasibility and safety of LRH.

**Methods:** Seventy-eight patients who underwent repeat hepatectomy from January 2013 to December 2019 were

retrospectively reviewed. Short-term outcomes of LHR and open repeat hepatectomy (ORH) were investigated.

**Result:** LRH and ORH were applied for 42 (53.8%) and 36 (46.2%) patients, respectively. Among LRH group, conversions to open surgery including mini laparotomy were needed for 4 patients (9.5%) due to severe adhesion (n=2) and tumor status (n=2). As compared to ORH group, number of tumors was small (median 1 vs. 2;  $P=0.0003$ ), tumor size was small (median 1.95 vs. 2.45;  $P=0.0388$ ) in LRH group. Previous open hepatectomy had undergone for 9 patients (21.4%) in LRH group and 27 patients (75.0%) in ORH group ( $P < 0.0001$ ). Liver resection more than 2 Couinaud's segment was performed for 21.4% in LRH group and 78.5% in ORH group ( $P=0.25$ ). There was no significant difference in operation time and postoperative complication rate between two groups. Intraoperative blood loss was smaller (median 60 ml vs. 310 ml;  $P < 0.0001$ ) and postoperative hospital stay was shorter (median 7 days vs. 9 days;  $P < 0.0001$ ) in LRH group.

**Conclusion:** LHR is feasible and safety option for patient with recurrent liver tumors.

#### PL03-111

### PREDICTIVE NOMOGRAMS FOR 90-DAY POST-OPERATIVE MORBIDITY AND MORTALITY IN PATIENTS UNDERGOING HEPATECTOMY FOR VARIOUS HEPATOBILIARY DISEASES

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**Background:** Post-operative complications affect the long-term survival and quality of life in patients undergoing liver resection (LR). No model has yet been validated to predict 90-day severe morbidity and mortality after LR.

**Methods:** Patients planned LR was prospectively recruited. Pre-operative clinical and laboratory data including liver stiffness (LS), and intra-operative parameters were analyzed to determine predictors of morbidity and mortality. Nomograms were developed using independent predictors in the study (training) cohort and validated using an external cohort by testing the Goodness of fit in calibration plots.

**Results:** The most common indications in 418 LRs performed were colorectal metastases [35.6%], hepatocellular carcinoma [25.4%] and benign liver tumors [14.3%] with 39.2% of patients undergoing major LR. Post-operative severe morbidity and mortality rates were 20.8% and 2.2%, respectively. Independent predictors of severe morbidity were age [Odds ratio (OR):1.02,  $p=0.06$ ], LS [OR:1.23,  $p=0.04$ ], number of resected segments [OR:1.28,  $p=0.004$ ], and operative time [OR:1.01,  $p=0.01$ ]. Independent predictors of mortality were diabetes mellitus [OR:6.6,  $p=0.04$ ], tumor size  $\geq 51$  mm [OR:4.8,  $p=0.08$ ], LS  $\geq 22$  kPa [OR:7.0,  $p=0.04$ ], and operative time  $\geq 6$  hours [OR:6.1,  $p=0.05$ ]. Nomogram for severe morbidity had an excellent Goodness of fit in the study cohort ( $p=0.64$ ) and an external validation cohort ( $p=0.70$ ). Goodness of fit for mortality nomogram in both the study cohort ( $p=0.80$ ) and the external cohort ( $p=0.60$ ).

**Conclusion:** In the era of personalized medicine, proposed nomograms would enable surgeons to adapt surgical strategy in patients undergoing LR according to their clinical profile and the center's expertise.

#### PL03-112

### MINIMALLY INVASIVE APPROACH FOR LIVER RESECTIONS IN PATIENTS WITH HEPATOCELLULAR CARCINOMA AND CHILD-PUGH B CIRRHOSIS: SHIFTING THE PARADIGM? LONG-TERM OUTCOMES FROM AN INTERNATIONAL MULTICENTRE STUDY

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**Aim:** To compare the short- and long-term outcomes between open (OLR) and laparoscopic resection for HCC in the setting CP-B cirrhosis.

**Methods:** Between January 2002 and December 2018, 382 liver resections in CP-B cirrhosis were gathered from 17 international centres. A 1:1 propensity score matching (PSM) was performed according to age, sex, BMI, ASA, comorbidities, Child-Pugh score, previous treatment, previous surgery, preoperative portal hypertension, ascites and varices, position of lesions, distance from major vessels, number and size of lesions, year of operation, type of resection and additional procedure.

**Results:** 100 LLR and 100 OLR were analysed. Conversion rate was 6%. LLR group displayed lower blood loss (110 ml vs. 400 ml;  $p=0.004$ ) and number of blood transfusions (1 vs. 3;  $p=0.006$ ), lower morbidity rate (38% vs. 51%;  $p=0.04$ ) and less major complications (7% vs. 21%;  $p=0.01$ ). Postoperative ascites was lower at postoperative day 1, 3 and 5. Median hospital stay was 7.5 days (2-243) in LLR and 18 days (3-104) in OLR ( $p=0.05$ ). R0 resection rate was comparable (96% OLR vs. 95% LLR  $p=0.50$ ). Recurrence rate was 50% in OLR and 57% in LLR ( $p=0.39$ ). The 5 years OS was 47% in OLR and 65% in LLR ( $p=0.14$ ). The 5 years DFS was 32% in OLR and 37% in LLR ( $p=0.74$ ).

**Conclusions:** LLR is associated with reduced blood loss, overall morbidity and a lower chance of postoperative liver decompensation in CP-B patients eventually leading to shorter hospital stay maintaining comparable oncological outcomes to OLR.

#### PL03-113

### PATHOPHYSIOLOGY OF BILE ACIDS AFFECTS LIVER REGENERATION IN PATIENTS UNDERGOING LIVER RESECTION

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**Introduction:** Bile acids (BAs) are known initiators of liver regeneration (LR) after partial hepatectomy. Previous data shows that BAs positively influence LR through induction of pro-regenerative proteins and via a direct effect on proliferation. However, BAs are known to be toxic in high concentrations. As the majority of the data regarding BAs during LR derives from experimental studies, the present investigation aimed to elucidate the influence of these effectors during human LR.

**Method:** In our cohort of 46 patients undergoing liver resection, circulating BAs were measured and profiled preoperatively and on the first postoperative day (POD1). Additionally, liver biopsies were taken at baseline and during LR in a subset of 8 patients. Postoperative liver dysfunction (LD) was prospectively recorded.

**Results:** While BAs were found to increase significantly during early LR in liver tissue, they seem to decrease from prior to the operation to POD1 in circulation ( $p=0.001$ ). Interestingly, higher levels were found in patients with LD on POD1. This difference was found to obtain a striking predictive potential with an area under the ROC-curve of 0.860. A cut-off for postoperative BAs was set at 7.7ng/mL, which could identify all patients with LD in the postoperative period (0% in  $BAs < 7.7ng/mL$  vs 38% in  $BAs \geq 7.7ng/mL$ ,  $p < 0.001$ ). Ultimately, not only concentration but also the profile of BAs in circulation differed markedly between the two groups.

**Conclusions:** This data suggests that BAs are important initiators of LR, while a BA-overload might ultimately lead to liver toxicity and impaired LR after liver resection.

PL03-114

### HISTOLOGICAL SEVERITY OF CIRRHOSIS, AN IGNORED PROGNOSTIC FACTOR DETERIORATING SURGICAL OUTCOMES OF HEPATOCELLULAR CARCINOMA

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**Background:** The impact of cirrhotic severity of the liver on long-term survival of patients with hepatocellular carcinoma undergoing hepatectomy has been previously reported in the quite small cohorts by our center. This study aimed to investigate the impact of histological severity of cirrhosis on long-term surgical outcomes for HCC in a large cohort.

**Methods:** The consecutive patients who underwent curative liver resection(LR) for HCC between 2001 and 2015 were retrospectively studied. The severity of liver cirrhosis was histologically staged by the Laennec staging system. The short- and long-term outcomes were analyzed.

**Results:** Of 1524 patients, mild, moderate, and severe cirrhosis were identified in 575(37.7%), 597(39.2%), and 132(8.7%) patients, respectively. The remaining 220(14.4%) patients were non-cirrhotic. Patients in the severe cirrhosis group had significantly higher morbidity and mortality rates than those in the mild, moderate and non-cirrhosis groups. The 5-year recurrence-free survival(RFS) and overall survival(OS) rates were 36.8% and 64.5% in the non-cirrhosis group, compared with 34.8%

and 60.4% in the mild, 17.3% and 43.4% in the moderate, and 6.1% and 24.1% in the severe cirrhosis groups, respectively. The RFS and OS rates did not differ significantly between the non-cirrhosis and the mild cirrhosis groups. However, long-term survival were significantly worsened as the degree of cirrhosis was upgraded. On multivariate analysis, moderate and severe cirrhosis were independent risk factors of decreased RFS and OS.

**Conclusions:** Histological severity of cirrhosis significantly affected the short- and long-term outcomes of HCC patients after LR.

### PL04 - Liver: Technical Surgery

PL04-01

#### LATERAL APPROACH TOWARD HEPATODUODENAL LIGAMENT DURING LAPAROSCOPIC RADICAL CHOLECYSTECTOMY FOR GB CANCER

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**Introduction:** Lymph node dissection (LND) during laparoscopic radical cholecystectomy (LRC) is usually approached through an anterior approach, mimicking and with similar view than in open surgery. However, safe and complete isolation of the post-pancreatic node or retro-portal node are sometimes more difficult in laparoscopic surgery because the dorsal structures of hepatoduodenal ligament are embedded and might be difficult to expose.

**Methods:** During last 20 years, we performed 120 surgery for GBC including 12 cases LRC in our institution. Most of all diagnosed prior to operation two cases of incidental cancer underwent 2nd operation of LND and liver resection. Half of cases were dissected lymph nodes only and six liver resection were done.

**Results:** Majority of them revealed T2 and T1b finally. LRC is performed successful using lateral laparoscopic approach. None of patients undergoing LRC required conversion to another view during hilar dissection. The retro-portal vein and pancreas head LND could be reached expeditiously and safely prior to parenchymal transection. Retrieved nodes were 1 to 17 and median was 7. There was one complication of small bowel perforation during adhesiolysis.

**Conclusion:** Lateral approach during LRC appears to facilitate the visualization, exposure and dissection of the dorsal part of hepatoduodenal ligament and very useful for LND #12,13.

PL04-02

#### ORIGIN REGRESSION IN RIGHT ANATOMICAL HEPATECTOMY FOR 70 YEARS

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Right anatomical hepatectomy (RH) is a standard procedure for liver malignancies and its history is quite fascinating. To understand origin and concept such as pioneers, development of procedures and future aspects of RH, we attempted to review the "hidden" history worldwide since 1945 by searching not only English but also non-English published documents, and international experts' comments. In RAH, anatomical concept and identification, vascular control technique, approaches, preoperative managements are considered to be important issues. Basis of the modern liver anatomy has been clarified in French article by Tung (Vietnam) and Meyer-May in 1939, who applied to liver anatomical resection thereafter. Who was a pioneer? Honjo in 1949 and Jacob in 1951 succeeded RH in 1941 and 1951 in each, which were published in *Japanese and French*, respectively. This is a begging of RH and RH has began to spread as the surgical treatment of liver malignancies worldwide since then. Vascular in-flow control is divided as intrafascial, extrafascial or transfascial access. The anatomical border along the main hepatic veins was clarified for transection according to establishment of liver anatomy. Anterior approach were proposed as an alternative option in the hazardous situations of right liver rotation. Hanging maneuver for anterior approach has been developed for various anatomical hepatectomies. Laparoscopic or robotic new technology provides patients benefit even in RH. Thus, understanding origin sources regarding RH established for 70 years is quite necessary for liver surgeons. Future aspects of RH will include changes of concepts, new technology to ensure patient safety and disease curability.

#### PL04-03

### ROLE OF ROBOTIC SURGERY IN THE MANAGEMENT OF BENIGN HEPATOBILIARY DISEASES

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**Background:** Recently robotic surgery has emerged as one of the most promising surgical advances. Despite its worldwide acceptance in many different surgical specialties, the use of robotic assistance in the field of hepatobiliary (HBP) surgery remains relatively unexplored.

Our study presents single institution's initial experience of robotic assisted surgery for treatment of benign hepatobiliary pathologies.

**Methods:** A retrospective analysis of a prospectively maintained database on clinical outcomes was performed for 26 consecutive patients that underwent robotic assisted surgery for benign HBP disease at Rambam Medical Center during 2013-2015.

**Results:** There were 26 robotic assisted surgical procedures performed for benign HBP pathologies during the study period. There were 3 anatomical robotic liver resections for symptomatic hemangiomas, 9 cases of giant liver cyst, 5 robotic assisted surgery for type I choledochal cyst, 2 case

of benign (iatrogenic) common bile duct (CBD) stricture, 3 cases of robotic (CBD) exploration due to large intra-choledochal stones and 6 cases of cholecystectomy for cholelithiasis. The median postoperative hospital stays for all procedures were 3.5 days (range 1-6 days). General morbidity (minor) was 2%. There was no mortality in our series.

**Conclusions:** Robotic surgery is feasible and can be safely performed in patients with different benign HBP pathologies. Further evaluation with clinical trials is required to validate its real benefits.

#### PL04-04

### LAENNEC'S APPROACH FOR LAPAROSCOPIC ANATOMIC HEPATECTOMY BASED ON LAENNEC CAPSULE

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**Background:** Although Glissonean pedicle isolation and hepatic vein isolation should be the critical procedure for anatomical liver resection (ALR), there is no standardized approach for the hepatic vein and Glissonean pedicles. We proposed the novel Laennec's approach for laparoscopic anatomic hepatectomy (LAH) based on Laennec's capsule, which serves as the key anatomic landmark for Glissonean pedicle and hepatic vein isolation, liver mobilization, and Hanging maneuver.

**Methods:** 156 cases were enrolled in this trial. They underwent LAH for the liver diseases, such as benign or malignant neoplasms, or hepatolithiasis. We conducted the novel Laennec's approach for LAH based on Laennec's capsule. The liver tissues close to Glissonean pedicle, hepatic veins, naked area, and inferior vena cava (IVC) were collected for H&E and resorcinol-fuchsin staining, and immunohistochemistry for smooth muscle actin. The operative index were also collected.

**Results:** All staining showed that there was the capsule packaging the whole liver independent to the adjacent tissues and intrahepatic vessels. There was the natural gap between Laennec's capsule and the adjacent tissues at different sites. Laennec's capsule serves as the landmark for Glissonean pedicle and hepatic vein isolation, liver mobilization, and Hanging maneuver. 156 cases underwent LAH with this strategy. Operation time was 258.34 minutes, and four cases has been transferred to open hepatectomy for bleeding. Hospital day was 9.4 days. Four cases had bile leakage.

**Conclusion:** Laennec's approach based on Laennec's capsule would contribute to standardize the surgical techniques for LAH, and would bring innovative changes for spreading safe and curable liver resection under laparoscopy.

## PL04-06

### HAEMOSTATIC EFFICACY OF TOPICAL AGENTS DURING HEPATECTOMY: A NETWORK META-ANALYSIS

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**Background:** Hepatic resection carries a high risk of parenchymal bleeding both intra- and post-operatively. Topical haemostatic agents are frequently used to control bleeding during hepatectomy, with multiple products currently available. However, it remains unknown which of these is most effective for achieving haemostasis and improving peri-operative outcomes.

**Methods:** A systematic review and random-effects Bayesian network meta-analysis of randomised trials investigating topical haemostatic agents in hepatic resection was performed. Interventions were analysed by grouping into similar products; fibrin patch, fibrin glue, collagen products, energy devices, and control. Primary outcomes were the rate of haemostasis at 4 and 10 minutes.

**Results:** Twenty-three randomized controlled trials were included in the network meta-analysis, including a total of 3,552 patients and 8 different interventions. Fibrin patch was the most effective intervention for achieving haemostasis at both 4 minutes and 10 minutes, followed by fibrin glue. There were no significant differences between haemostatic agents with respect to blood loss, transfusion requirements, bile leak, post-operative complications, reoperation, or mortality.

**Conclusions:** Amongst the haemostatic agents currently available, fibrin patch is the most effective method for reducing time to haemostasis during liver resection.

## PL04-07

### ANATOMIC VERSUS LIMITED NON-ANATOMIC RESECTION FOR SOLITARY HEPATOCELLULAR CARCINOMA: A RETROSPECTIVE STUDY OF 1515 CASES

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**Introduction:** Surgical resection remains the only curative treatment for HCC. The optimal resection choice in patients with solitary HCC is controversial with regards to underlying diseases, remnant functional hepatic parenchyma and substantial heterogeneity of HCC. The aim of this retrospective investigation was to determine whether anatomical resection (AR) is superior to limited non-anatomical resection (NAR) for single HCC tumor.

**Methods:** From January 2013 to December 2015, 1515 consecutive patients received solitary HCC resection were selected from a database of 3835 cases. Among them, 859 patients underwent anatomical resection (AR Group) and the other 656 cases had non-anatomical resection (NAR Group). Basic characteristics, tumor factors, intra- and

post-operation characteristics, mortality, recurrence and metastasis patterns were compared between groups.

**Results:** There was no significant difference in basic characteristics, tumor locations, post-operative complication or mortality between AR and NAR Group. AR Group presented with longer surgery time ( $p < 0.001$ ), while blood loss and transfusion showed no difference. AR Group obtained optimal prognosis with total recurrence rate lower than that in NAR Group ( $p < 0.001$ ). NAR Group presented higher rates of intrahepatic, resection margin and adjacent segment recurrences. However, AR Group showed higher distal segment recurrence, which might due to the death caused by intrahepatic recurrence in NAR Group before distal recurrence happened. No statistical difference was observed in lung or abdominal metastasis.

**Conclusion:** Patients can clinically benefit from anatomical resection and major resection provided that they have well-preserved liver function. Further prospective randomized controlled trials were requested to determine this conclusion.

## PL04-08

### MESSAGE OF THE HEPATODUODENAL LIGAMENT RECOVERS PORTAL VEIN FLOW IMMEDIATELY AFTER THE PRINGLE MANEUVER IN HEPATECTOMY

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**Introduction:** The Pringle maneuver is often used in liver surgery to minimize bleeding during liver transection. Many authors have demonstrated that intermittent use of the Pringle maneuver is safe and effective when performed appropriately. However, some studies have reported that the Pringle maneuver is a significant risk factor for portal vein thrombosis. In this study, we evaluated the effectiveness of portal vein flow after the Pringle maneuver and the impact that massaging the hepatoduodenal ligament after the Pringle maneuver has on portal vein flow.

**Materials and methods:** Patients treated with the Pringle maneuver for hepatectomies performed to treat hepatic disease at our hospital between August 2014 and March 2019 were included in the study (N=101). We divided these patients into two groups, a massage group and nonmassage group. We measured portal vein blood flow with ultrasonography before and after clamping of the hepatoduodenal ligament. We also evaluated laboratory data after the hepatectomy.

**Results:** Portal vein flow was significantly lower after the Pringle maneuver than before clamping of the hepatoduodenal ligament. The portal vein flow after the Pringle maneuver was improved following massage of the hepatoduodenal ligament. After hepatectomy, serum prothrombin time was significantly higher and serum C-reactive protein was significantly lower in the massage group than in the nonmassage group.

**Conclusion:** Massage of the hepatoduodenal ligament is recommended after the Pringle maneuver to immediately

recover portal vein flow during hepatectomy allowing us to shorten the declamping time, which may contribute to a reduction in the operation time.

PL04-09

### IMAGE-GUIDANCE FOR NON-ANATOMICAL LIVER RESECTIONS: AN EX-VIVO STUDY

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**Introduction:** Non-anatomical resections of liver tumors are becoming more popular because they spare a larger portion of healthy liver parenchyma. However, the lack of anatomical landmarks to follow during the resection process makes them technically more challenging than anatomical resections. Image-guidance systems have been introduced to provide additional guidance, but are rarely used due to their inaccuracy, time-effort and complexity in usage and setup. Therefore, we have designed a new navigation approach that renders a surgical plan intra-operatively in real time using only navigated ultrasound.

**Method:** The ultrasound based navigation approach comprises the following steps:

- i) scanning the surface using the navigated ultrasound,
- ii) marking the tumor location and size on a midsection ultrasound image,
- iii) specifying a resection shape and a safety margin to create an optimal surgical plan.

In this study, we evaluated this method in an ex-vivo porcine model by three experienced hepatobiliary surgeons with respect to R0 resection status.

**Results:** In 22 out of 23 resections an R0 resection (margin > 1mm) was achieved (95.7%) with a median resection margin of 5.9 mm (IQR 3.5 - 7.7 mm). There was a difference between the surgeons in terms of resection margin with operators 1,2 and 3 having 7.8 mm, 4.15 mm and 5.1 mm median resection margin respectively (p = 0.054).

**Conclusions:** This navigation approach could represent a useful tool for intra-operative guidance in non-anatomical resection alongside conventional ultrasound guidance. A clinical pilot trial with 10 patients is currently in planning and will start beginning of 2020.

PL04-10

### TAILORED SEGMENTECTOMY FOR HCC LOCATED IN SEGMENT 8 ACCORDING TO INTRAHEPATIC ANATOMICAL VARIATION OF GLISSON PEDICLES

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There are three techniques in systematic segmentectomy 8 for HCC located in Couinaud segment 8. The first approach is the US-guided dye injection technique, proposed by Professor Makuuchi. The second technique is Takasaki's cone unit resections through the dorsocranial opening of the main portal fissure. And the third approach is a technique through the anterior opening of main portal fissure. As the anterior liver is thin, the hepatotomy requires a little efforts. It is followed by confirmation, ligation and division of the G8 pedicle(s), and the surface of the S8 is discolored. Thereafter, we remove the stained liver.

Since 2016, we have used preoperative 3D image (Synapse 3D, Fuji film), and have confirmed the patterns of intrahepatic anatomical variations of portal veinous branches. And we could select the tailored technique in systematic segmentectomy 8 getting the high success rate of anatomical resection. We got the 3D images using Synapse 3D (Fuji film) in 96 LDLT donor liver. There were four types in anatomical variation of right anterior portal branches: Type A (Cranio-caudal type: 49 cases, 46.2%), Type B (Ventral-dorsal type: 14 cases, 13.2%), Type C (Radial type: 37 cases, 34.9%) and Type D (Slidden branch type between RAS and RPS: 6cases, 5.7%). We can do anatomical segmentectomy 8 in only Type A (46%) using conventional technique. Today, I would like to show experiences of tailored surgical approaches (to apply complementally one of the three approaches) according to their patterns for HCC located in segment 8.

PL04-11

### HIGH COMPLEXITY MAJOR LIVER RESECTION BY THUNDERBEAT AS A SOLE DEVICE UNDER THE PRINGLE MANEUVER AND INFRA-HEPATIC INFERIOR VENA CAVA CLAMPING (WITH VIDEO)

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**Introduction:** In addition to conventional major or minor classification in liver resection (LR), recently, a complexity classification with 3 categories (low, medium, or high) according to its technical difficulty was proposed and validated. We describe the outcomes of high complexity major LR by Thunderbeat (TB) as a sole device under the Pringle maneuver and infra-hepatic inferior vena cava (IVC) clamping.

**Methods:** Of 85 patients undergoing LR between July 2013 and November 2019, we reviewed seven patients who underwent this procedure. To evaluate the safety and rapidity, we compared the parenchymal transection time (PTT), estimated blood loss (EBL), and post-operative major complications (PMC) with nine patients who underwent medium or high complexity open major LR by the basic procedure, i.e. the clamp-crushing or the CUSA with supplemental use of energy devices.

**Results:** Seven patients underwent extended right hepatectomy with hepaticojejunostomy (n=3), anatomical

middle hepatectomy (n=2), and right trisectionectomy (n=1) or extended left hepatectomy (n=1) with IVC resection and reconstruction. Two patients experienced PMC (Clavien-Dindo classification IIIa: n=1, IIIb: n=1). There was no in-hospital mortality. Six patients are currently alive without recurrence with a median follow-up of 24 months. PTT [median (range)] in the TB group was significantly shorter: 19 (13-45) compared to 52 (18-174) min in the basic group ( $p=0.012$ ). There was no significant difference in terms of EBL ( $p=0.918$ ) and PMC ( $p=0.771$ ).

**Conclusions:** TB with the Pringle maneuver and infrahepatic IVC clamping is feasible and may offer rapidity during high complexity major LR.

All patients were postoperatively managed under the concept of ERAS.

**Results:** The extent of resections included segmentectomy (n=10), left lateral sectionectomy (n=3), bisegmentectomy (n=12), left hemihepatectomy (n=4), right hemihepatectomy (n=12) and central hepatectomy (n=2). There was no case converting to open and no postoperative mortality. The median operation time was 200 min (range 110-445), and the median estimated blood loss was 200 ml (range 50-800). The overall complication rate was 32.5 % (grade I, 8; grade II, 4; grade III, 2). The median length of postoperative hospital stay was 6 days (range 3-17).

**Conclusions:** Laparoscopy can achieve safe and feasible anatomical liver resection via an extrahepatic Glissonean pedicle approach with the technique of ICG counterstaining.

#### PL04-13: Postoperative outcomes of the patients who undergoing laparoscopic ALR

	Operation time, min (IQR)	Estimated blood loss, ml (IQR)	Postoperative hospital stay, day (IQR)	Complication, n (%) (IQR)
Segmentectomy, n=10	195 (175-213)	125 (87.5-125)	4.5 (4-5)	2 (20%)
Left lateral sectionectomy, n=3	130 (130-445)	50 (50-400)	5 (3-9)	1 (33.3%)
Bisegmentectomy, n=12	222.5 (191.3-260)	200 (125-300)	7 (4.25-7.8)	1 (8.3%)
Left hemihepatectomy, n=4	177.5 (126.3-206.3)	100 (62.5-175)	7 (3.75-3.3)	2 (50%)
Right hemihepatectomy, n=12	200 (182.5-287.5)	200 (100-275)	6.5 (6-7)	7 (58.3%)
Central hepatectomy, n=2	222.5 (210-235)	275 (20-500)	11.5 (6-17)	1 (50%)

#### PL04-13

### LAPAROSCOPIC EXTRAHEPATIC GLISSONEAN PEDICLE APPROACH (TAKASAKI APPROACH) FOR ANATOMICAL LIVER RESECTION BY INDOCYANINE GREEN (ICG) FLUORESCENCE COUNTERSTAINING

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**Introduction:** Although the extrahepatic Glissonean pedicle (Takasaki) approach has been widely used in open anatomic liver resection (ALR), it is still the most challenging procedure in laparoscopy. This study aimed to introduce our strategy of the laparoscopic Takasaki approach using a fluorescence counterstaining (ICG) technique and report perioperative outcomes.

**Methods:** From April 2017 to December 2019, a total of 43 consecutive patients underwent ALR by laparoscopic Takasaki approach in our institution. The innovatively key steps of the procedure are as follows:

- 1) preoperative 3D construction of portal territory;
- 2) prearrangement of Pringle maneuver rubber band tourniquet;
- 3) descending the hilar plate using laparoscopic Peng's multifunctional operative dissector and ultrasonic energy devices (Two-handed technique);
- 4) test-clamping the target Glissonean pedicle;
- 5) visualization of territory by ICG counterstaining technique;
- 6) transection liver parenchymal according to ICG boundary.

#### PL04-16

### "ZOOM RESECTION": A TWO-STEP WEDGE LIVER RESECTION TECHNIQUE TO RESECT DEEP TUMORS AND SPARE PARENCHYMA

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In certain cases, huge liver resections are required to deal with deep tumors located near vascular pedicles. However, this implies a higher risk of postoperative liver failure and mortality. Liver parenchyma sparing techniques play an essential role in decreasing these risks. In November 2018, our surgical team reported a new two-step wedge liver resection technique to resect deep tumors in an easy way. Although it was a case report, more patients have already been successfully operated with this approach since then. Regarding the technique itself, intraoperative ultrasound is a very important tool employed to plan and guide both steps of the procedure. Initially, we put stitches and resect a cylindrical piece of normal liver parenchyma above the deep tumor. This way, we can "superficialize" the tumor. After that, we place stitches on the future specimen and resect it in the same way it is done with superficial metastases. The main advantage of this procedure is the clear sight and vascular control that can be achieved in those cases in which the tumor is close to vascular pedicles. As a result, the bigger the chance of preserving vascular pedicles, the bigger the chance of sparing parenchyma as well. We have named this procedure "zoom resection" because its dynamics is similar to that of the photograph camera telescopic system.

PL04-18

### THE SAFETY AND FEASIBILITY OF TWO-SURGEON TECHNIQUE DURING ANATOMICAL LAPAROSCOPIC LIVER RESECTION

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**Introduction:** Although laparoscopic liver resection(LLR) has the potential advantages such as minimal degree of body wall damage, decreased surgical blood loss, and fewer postoperative complications, it has been associated with a much slower adoption than other laparoscopic procedures. The aim of the study is to assess the impact of "two-surgeon technique" during anatomical LLR on the surgical outcome.

**Methods:** Consecutive 162 patients receiving anatomical liver resection at our institution between 2010 and 2019 were retrospectively reviewed. We introduced and maintained "two-surgeon technique" during LLR in order to perform safe liver parenchymal transection without critical intraoperative bleeding (Fujikawa, World J Gastrointest Endosc 2017;9:396-404). In this technique, the primary surgeon dissects the hepatic parenchyma, while the secondary surgeon is focused on hemostasis using a saline-linked electrocautery. The included patients were classified into three groups: patients undergoing open liver resection(OLR group, n=97), those undergoing hybrid LLR(HLR group, n=26) and those receiving pure LLR(LLR group, n=39), and outcome variables were compared between the groups.

**Results:** 66 bi-/tri-sectionectomy and 96 sub-/mono-sectionectomy were included in the cohort. The duration of operations were similar between the groups(344 vs 304 vs 352min, p=0.11), although significantly less surgical blood loss (590 vs 190 vs 70mL, p< 0.001) and shorter length of postoperative day (16 vs 12 vs 8days, p< 0.001) were observed in the LLR group. Severe complications(Clavien-Dindo class>=3) occurred more often in the OLR group than HLR or LLR groups(16% vs 0% vs 5%, p=0.033).

**Conclusion:** The two-surgeon technique is feasible and safely performed even during anatomical LLR.

PL04-19

### SHORT TERM RESULT OF PARENCHYMAL SPARING ANATOMICAL LIVER RESECTION BASED ON PORTAL RAMIFICATION OF THE RIGHT ANTERIOR SECTION: A SINGLE CENTER EXPERIENCE

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**Introduction and Objectives:** Anatomical liver resection is the treatment of choice for primary liver cancer. However, the remnant liver volume is equally important in patient selection for operation. Recent appreciation of the liver segmentation could divide the right anterior section (RAS) into ventral-dorsal segment or segment 5-segment 8.

Thus, we aim to evaluate the short term results of parenchymal sparing liver resection based on portal ramification of the right anterior section.

**Material and Methods:** From July 1,2018 to December 30, 2019, 19 patients with primary liver cancer underwent ventral or dorsal segment sparing hepatectomy. The portal ramification of RAS were analyzed using the Multidetector Computed Tomography scan. The procedures were performed by 4 liver surgeons.

**Results:** Among 19 patients with ventro-dorsal type of the RAS, there were 17 men with HCC and 2 women with ICC. The mean age was  $59.8 \pm 11.5$  years. The ventral-segment preserving right hepatectomy was performed in 16 patients, the dorsal-segment mesohepatectomy in 2 patients and the dorsal-segment trisectionectomy in 1 patient. The mean operative time was  $244.7 \pm 44.1$  minutes with a mean estimated blood loss of  $277.4 \pm 275.6$  ml. Post-operative morbidity was reported in 4 cases (21.1%). The mean length of hospital stay was  $13.3 \pm 9.1$  days. There was one operative death due to acute portal vein thrombosis.

**Conclusions:** The pre-operative evaluation of RAS's anatomy is very important to decide the method of parenchymal sparing liver resection. This procedure is technically safe and feasible.

PL04-20

### SHORT TERM RESULT OF ANTERIOR APPROACH WITH LIVER HANGING MANEUVER FOR ANATOMICAL RESECTION: A SINGLE CENTER EXPERIENCE

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**Introduction and Objectives:** Anatomical liver resection is the treatment of choice for hepatocellular carcinoma (HCC). Anterior approach with liver hanging technique is useful to prevent the dissemination of tumor cells to systemic circulation. Thus, we aim to evaluate the short term results of anterior approach with liver hanging maneuver for anatomical resection.

**Material and Methods:** A retrospective review of all patients with HCC who underwent anatomical resection from July 1 to December 20, 2019. The procedures were performed by 4 liver surgeons.

**Results:** Among 9 patients, there were 5 men and 4 women. The mean age was  $53.3 \pm 11.5$  years. The right hepatectomy was performed in 5 patients, the right anterior sectionectomy in 2 patients, and ventral segment preserving right hepatectomy in 2 patients with small left lobe. Anterior approach with liver hanging maneuver was performed in all patients. The mean tumor size is 8.9 cm. Two patients had macrovascular invasion (right hepatic vein and right posterior portal vein). The mean operative time was  $231.1 \pm 37.2$  minutes with a mean estimated blood loss of  $303.3 \pm 450.6$  ml. Complications included 1 bilake (Clavien-Dindo grade II) and 1 acute portal vein thrombosis (grade IVa) were reported. The mean length of hospital staybil was  $12.2 \pm 8.4$  days. There was no reported 30 days mortality.

**Conclusions:** The anterior approach with liver hanging technique can be apply for various kind of anatomical resection. This procedure is technically safe and feasible.

PL04-25

### LAPAROSCOPIC ANATOMIC RESECTION GUIDED BY INDOCYANINE GREEN FLUORESCENCE IMAGING - A SINGLE INSTITUTION EXPERIENCE -

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In laparoscopic anatomic resection, especially in the sub-segmentectomy of segment 8 or 7, it can be difficult to detect and dissect the targeted branch of Glisson sheath from the hepatic hilum. When that is the case, we inject dye into the targeted portal vein to stain the resection area by using an ultrasound-guided vascular access system for laparoscopic surgery.

We use the Bk5000/9066 (BK medical) ultrasound machine with a built-in probe for ultrasound-guided vascular access. This system has an advanced laparoscopic ultrasound transducer that has a small hole for the needle on the tip of the probe which can draw a guideline for the needle. We also use the laparoscope Indocyanine Green (ICG) fluorescence imaging camera system (Storz). The dye is a mixture of ICG and Indigo carmine. Under guidance of ultrasonography, we detect the targeted portal vein and percutaneously insert the PTCO needle into the portal vein. Then, we slowly inject the dye observing the dyeing process with the ICG imaging camera. By using ICG together with Indigo carmine we can detect the color contrast between the area to be resected and the rest of the liver more precisely, especially when we cannot get a clear border line with Indigo carmine for whatever reason.

The US-guided injecting ICG together with Indigo carmine into the targeted portal vein can draw a demarcation line more efficiently and clearly than was previously possible. This system should be useful, especially in the laparoscopic anatomic resection of the sub-segment or a smaller area.

PL04-26

### THE DORSAL APPROACH TO LAPAROSCOPIC MAJOR HEPATECTOMY

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**Introduction:** This new technique, a modification of the caudal approach of Soubrane, involves a posterior to anterior transection of the liver for laparoscopic major hepatectomies. It was conceived to enable a standardised technique, and to broaden the indications for laparoscopic resection particularly for larger tumours and with anatomical variations of the porta.

**Methods:** As the initial step for a right hemihepatectomy the retrohepatic tunnel of Belghiti is developed and the caudate process divided as far superiorly as possible. Liver

parenchyma is dissected away from the posterior aspect of the right hepatic inflow from medial to lateral, enabling safe stapling. Development of the retrohepatic tunnel and division of the posterior parenchyma is continued as the leading edge of the parenchymal transection, maintaining good surgical orientation especially for tumours close to the midline or cava. Similar concepts apply for a left hemihepatectomy, with dissection beginning in the in the Arantius groove.

**Results:** 31 major resections (23 right +/- extended, 8 left +/- extended) have utilised this technique. 2 required conversion, and 1 required transfusion. R0 resection was achieved in 29 cases. Median hospital stay was 6 days. With this technique conversion rate has decreased from 29% to 6% (P = 0.032) and selection of a laparoscopic approach for major resections increased from 24% to 60% (P < 0.001).

**Conclusion:** The dorsal approach to laparoscopic major hepatectomy is a novel technical variation that enables a safe, standardised technique and an expanded set of indications for a laparoscopic approach.

PL04-27

### ASSOCIATING LIVER PARTITION AND PORTAL VEIN LIGATION FOR STAGED HEPATECTOMY (ALPPS) FOR LARGE HEPATOCELLULAR CARCINOMAS

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**Background:** ALPPS was developed to induce accelerated future liver remnant (FLR) hypertrophy in order to increase hepatic tumour resectability and reduce the risk of post hepatectomy liver failure (PHLF). The only means of achieving long-term survival in hepatocellular carcinoma is complete tumor resection or liver transplantation. Patients with large hepatocellular carcinomas are currently not considered for liver transplantation. So, ALPPS is indicated in selected patients to induce rapid hepatic hypertrophy.

**Methods:** Three patients initially presented with tumor measuring around 20-15 cm x 10-15cm in the right lobe of the liver. The liver was cirrhotic but liver function was normal in all 3 cases. CT volumetry done and future liver remnant volume (FLRV) is < 40%. So we did ALPPS procedure to induce rapid and maximum hypertrophy in FLRV. During the first part of the procedure the right portal vein was ligated with complete liver parenchymal transection 1cm right of falciform ligament. The second procedure performed after 10-14 days with the division of right hepatic artery, right bile duct, right hepatic vein and liver segments 4-8 with tumor were removed.

**Results:** >80% hypertrophy in FLRV was achieved in 10-14 days. Tumour was resected without developing PHLF. After 1 year follow up, patients are doing well with no signs of liver failure and recurrence

**Conclusion:** ALPPS leads to sufficient hepatic hypertrophy within 2 weeks, avoiding PHLF in most patients. ALPPS should be considered in selected patients with large hepatocellular carcinomas.

PL04-28

### FEASIBILITY OF HYALURONATE CARBOXYMETHYLCELLULOSE-BASED BIORESORBABLE MEMBRANE IN TWO-STAGED PANCREATOJEJUNOSTOMY

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**Background:** Two-staged pancreatoduodenectomy with exteriorization of pancreatic juice is a safe procedure for high-risk patients. However, two-staged pancreatoduodenectomy requires complex re-laparotomy and adhesion removal. We analyzed whether using hyaluronate carboxymethylcellulose-based bioresorbable membrane (HCM) reduced the time required for the second operation and facilitated good fistula formation in two-staged pancreatoduodenectomy.

**Methods:** Between April 2011 and December 2018, data were collected from 206 consecutive patients who underwent two-staged pancreatoduodenectomy. HCM has been used for all patients since 2015. Patients for whom HCM was used (HCM group; n=61) were compared to historical controls (before 2015) without HCM (Control group; n=145) in terms of feasibility of the second operation (operation time, adhesion grade, and complications) and optimal granulation around the external tube at second laparotomy.

**Results:** The HCM group showed significantly shorter median operation time [105 min (30-228 min) vs. 151 min (30-331 min);  $p < 0.001$ ] and smaller median blood loss [36 mL (8-118 mL) vs. 58 mL (12-355 mL);  $p < 0.001$ ] for the second operation. Neither overall postoperative complication rate ( $p=0.811$ ) nor severe-grade complication rate ( $p=0.857$ ) differed significantly. Both groups showed good fistula formation, with no significant difference in rate of optimal fistula formation (HCM group, 95.1% vs. control, 95.9%;  $p=0.867$ ).

**Conclusion:** HCM placement significantly improved safety and duration for the second operation, while preserving good fistula formation.

PL04-30

### TRANSRADIAL VASCULAR ACCESS AS AN OPTIMAL WAY FOR CHEMOEMBOLIZATION OF LIVER ARTERIES

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**Introduction:** The goal is to compare the effectiveness of vascular accesses in patients with unresectable liver metastases during the chemoembolization of liver arteries.

**Methods:** In 42 patients with unresectable liver metastases transradial and transfemoral accesses were used to provide chemoembolization of the liver arteries. Microcatheter technique was used to introduce the drug-saturated microspheres.

**Results:** According to our data we can conclude that the left radial access in the normal type of the liver blood supply demonstrated significantly shorter duration of chemoembolization of the hepatic arteries and fluoroscopy, which amounted to  $35 \pm 3.1$  min and  $10.9 \pm 1.8$  min, respectively ( $p < 0.05$ ). Use of the right femoral access for embolization of the right hepatic artery the above assessment criteria were the highest -  $72 \pm 9$  min and  $21.1 \pm 4.2$  min, respectively. The number of postoperative hospital days in case of femoral access was significantly higher in comparison with right radial access. It was  $5 \pm 0.5$  days, and  $2 \pm 0.7$  days respectively. Postembolization syndrome lasted  $1.43 \pm 0.5$  which was similar for radial access  $1.18 \pm 0.4$  days.

**Conclusion:** The use of microcatheter technique for hqTACE expanded the possibilities of transradial access. Significantly better tolerance and safety of transradial access was proven in 86.2% of the studied patients.

PL04-32

### RETROPERITONEOSCOPIC RESECTION OF A POSTERIOR TUMOR OF THE LIVER

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Laparoscopic surgery of the posterior segment of the liver is challenging.

We present a retroperitoneoscopic approach to resect a posterior tumor of the liver.

A 75-year-old man with hepatic cirrhosis had a hepatic tumor mimicking an adrenal tumor. Abdominal contrast CT scan revealed a 20mm mass in the right adrenal gland. On MRI scan, fat within the lesion was seen and the tumor was suspected to be an adrenal adenoma. One year later, the tumor increased to 32mm, and resection was undertaken. The patient was placed in the left decubitus position and the operation performed with four trocars using a retroperitoneal approach. First, the right adrenal gland was resected, but no tumor was found. The tumor showed extrahepatic development. We performed a partial resection of segment 7 of the liver. Liver dissection was performed with an ultrasonic energy device. The operative time was 167 min, and the estimated blood loss was minimal. The patient was discharged on postoperative day 11 following an uneventful postoperative course. Pathology of the specimen confirmed hepatocellular carcinoma with free surgical margins.

A retroperitoneal approach to the posterior segment of the liver does not require full mobilization of the right lobe. Although bleeding control may be difficult, this approach may be suggested as an additional therapeutic option, especially in patients needing partial resection of the posterior segments.

## PL04-33

### APPLICATION OF INDOCYANINE GREEN FLUORESCENCE IMAGING IN LAPAROSCOPIC LIVER SURGERY

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To study the clinical use of indocyanine green (ICG) fluorescence imaging in laparoscopic liver surgery, the clinical and pathological data of 68 patients who underwent laparoscopic hepatectomy using the ICG fluorescence imaging technique during the study period from September 2016 to October 2018 in Zhongnan Hospital of Wuhan University were retrospectively analyzed. Analysis was carried out on the surgical methods, fluorescence navigation methods, ICG injection time and dose, tumor characteristics, and pathological studies of the resected specimens. Of 68 patients, only 3 patients were converted to open surgery. 32 patients underwent ICG fluorescent guided laparoscopic anatomical resection of lower hepatic segment/hepatic hemilivers (positive staining in 17 patients, negative staining in 15 patients), with 19 patients successfully staining with ICG (59.4%). Postoperative histopathology showed primary hepatic solid tumors (n=31), secondary liver tumors (n=12), hepatic cysts (n=4), hepatic hemangiomas (n=5), hepatolithiasis (n=12) and hepatic focal nodular hyperplasia (n=1). These lesions were combined with hepatitis B liver fibrosis in 29 patients. ICG fluorescence imaging positively impacted on laparoscopic liver surgery. Proper preoperative ICG injection was helpful for the identification, localization and intraoperative surgical guidance of tumors, especially for patients with deep-seated and central tumors. As a consequence, oncological and surgical safety of laparoscopic liver surgery was improved. Targeted visualization of liver segments and surgical navigation using intraoperative ICG injections facilitated accurate and precise resection of anatomical liver segments or hemi-hepatectomies. The use of intraoperative ICG fluorescence technology for hepatic hemangioma, hepatic cyst, intrahepatic bile duct stones and other benign liver lesions, helped to improve safety of surgery.

## PL04-35

### THE COMPARISON OF POSTOPERATIVE PAIN BETWEEN UMBILICAL AND SUPRAPUBIC INCISION IN LAPAROSCOPIC LIVER RESECTION

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**Introduction:** In laparoscopic hepatectomy, wounds for specimen removal are indispensable. The umbilical incision is commonly used in laparoscopic colectomy and is familiar to gastroenterologists. On the other hand, it has been pointed out that the suprapubic incision method, which is often performed in the gynecological surgery, is superior in terms of postoperative pain, but there is no report comparing the two.

**Method:** From November 2007 to May 2019, 19 patients who underwent laparoscopic lateral segmental resection at

our hospital under complete arthroscopy were included. In 11 patients with umbilical incision and 8 patients with suprapubic incision, the operation time, bleeding volume, wound length, duration of continuous intravenous fentanyl infusion immediately after surgery and the number of flushes, and period of regular oral administration of NSAIDs were evaluated.

**Results:** There was no significant difference between the two groups in terms of patient background, age, operation time, and bleeding volume. However, suprapubic incision was significantly longer in wound length than in umbilical incision. Subsequently, for postoperative pain, the duration of continuous intravenous fentanyl administration was 1 day (1-2 days) for umbilical incisions and 1.5 days (1-2 days) for suprapubic incisions, with no significant difference. About the number of fentanyl, the result was comparable. In the period of regular NSAIDs administration, there was also no significant difference with POD14 (POD5-35) in umbilical incisions and POD8 (POD7-32) in suprapubic incisions.

**Conclusions:** In laparoscopic hepatectomy, extirpation of the specimen by umbilical incision is acceptable.

## PL04-36

### ALPPS AND SIMULTANEOUS SLEEVE GASTRECTOMY: A VALUABLE ASSOCIATION FOR OBESE PATIENTS WITH LIVER TUMOR

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**Introduction:** There are two ways to increase FLR / BW ratio: increase the FLR or decrease the body weight. In the present study, we present the first case combining both mechanisms by performing a simultaneous Tourniquet-ALPPS (T-ALPPS) and sleeve gastrectomy to further increase the FLR/BW ratio.

**Method:** 54-year-old woman with colorectal liver metastases, diabetes mellitus and morbid obesity (weight 150 kg, height 1.6 m, BMI 58.59). The FLR was 480 cc, representing 30.3% of the total liver volume, and the FLR/BW ratio was 0.31. We decided to perform an ALPPS-Tourniquet combined with a simultaneous sleeve gastrectomy during the first stage with interstage chemotherapy.

**Results:** Six months after the first stage, the FLR increased to 810 cc (figure 1a), with a weight loss of 51 kg (figure 1b) and 59.3% excess weight loss. The increase of the FLR was 68.8% and the FLR / BW ratio was 0.82 (Figure 1c). The second stage of T-ALPPS was finally performed completing the right trisectionectomy.

**Discussion:** To our knowledge, this is the first case in which a sleeve gastrectomy is performed during the first stage of ALPPS in order to reduce the body weight with the purpose of increase the FLR/BW ratio. The role of bariatric surgery in the oncological setting is not well established, and only a few clinical cases have been published. Considering the limitations of a clinical case report, we believe that perform a sleeve gastrectomy in the first stage

of ALPPS could be feasible and beneficial in selected obese patients.

PL04-37

### **SIGNIFICANCE OF ICG FLUORESCENT REAL-TIME NAVIGATION AND VISUALIZATION FOR INTERSEGMENTAL PLANE IN LAPAROSCOPIC LIVER RESECTION**

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**Introduction:** Advancements in laparoscopic liver resection (LLR) has revolutionized the field of liver surgery. Currently, indocyanine green (ICG) fluorescent image technology is developed as intraoperative navigation tool to detect tumors and demarcation line in LLR. We assessed significance and surgical outcomes of ICG fluorescent surgery in LLR for navigation of demarcation line and intersegmental plane.

**Methods:** We assessed 118 cases who had been performed LLR in our hospital. ICG fluorescent imaging was used with VECELA ELITE II® (Olympus) or PINPOINT® (Stryker). Preoperative 3D simulation was performed and evaluated glissonian pedicle feeding the tumor. After clamping glissonian pedicle, we injected 2.5 mg of ICG intravenously. Then, demarcation line was assessed to decide transection line. During parenchymal transection, visualization of intersegmental plane was also assessed. In eight cases (S6: 3patients, S5: 1patient, S3: 4patients), we performed this technique and assessed intraoperative navigation of transection line and surgical outcomes.

**Results:** In all cases, demarcation line could be detected by ICG navigation. New system of ICG fluorescent navigation could be detected intersegmental plane during parenchymal transection. In this series, surgical outcome was acceptable compared with other cases, and had no major complication and no mortality. However, it was difficult to recognize bleeding points from hepatic veins in ICG fluorescent mode of camera. To assure bleeding points, it is still needed to use normal-light mode of laparoscopy system.

**Conclusion:** The new system of ICG fluorescent navigation makes it possible to visualize not only superficial demarcation line but intersegmental plane during parenchymal transection in LLR.

PL04-38

### **APPLICATION OF INDOCYANINE GREEN FLUORESCENCE IMAGING IN LAPAROSCOPIC HEPATIC MIDDLE LOBE RESECTION**

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To investigate the clinical value of indocyanine green (ICG) fluorescence imaging technique in laparoscopic

mesohepatectomy. A retrospective analysis was performed on the clinical and pathological data of patients undergoing mesohepatectomy from September 2016 to November 2018, including surgical methods, ICG fluorescence navigation, pathological results, post-operative liver function, complications and length of hospital stay. Of the 24 patients with mesohepatectomy. 11 patients underwent open mesohepatectomy and 13 patients were given ICG fluorescence imaging guided laparoscopic mesohepatectomy. There were no peri-operative deaths. Clavien Dindo grade III complication occurred in 3 cases. The operation time was significantly longer ( $261\pm 80\text{min}$  VS  $201\pm 40\text{ min}$ ,  $P < 0.05$ ), but the liver function recovered significantly faster and the average hospital stay was significantly shorter in laparoscopic group ( $8.5\pm 3.3$  VS  $11.7\pm 4.0$  days,  $P < 0.05$ ) than those in open group. Mesohepatectomy is a safe and feasible treatment for central liver tumor. ICG fluorescence imaging technique can further improve the safety and effectiveness during laparoscopic hepatectomy.

PL04-39

### **ALPPS FOR HEPATOCARCINOMA UNDER CIRRHOSIS: A FEASIBLE ALTERNATIVE TO PORTAL VEIN EMBOLIZATION**

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**Introduction:** Hepatocellular carcinoma (HCC) is one of the most common and malignant tumors. Preoperative portal vein embolization (PVE) is currently the most accepted treatment before major hepatic resection for HCC in patients with liver fibrosis or cirrhosis and associated insufficient future liver remnant (FLR). In the last decade, ALPPS technique has been described to obtain an increase of volume regarding PVE and a decrease of drop out.

**Methods:** We provide a review about HCC in cirrhotic patients treated ALPPS or PVE utilizing EMBASE, Medline/PubMed, Cochrane and Scopus databases.

**Results:** In PVE postoperative hepatic liver failure was inferior than ALPPS (0-9% vs 0-50%, respectively). Major complications (11.7-62.5% vs 0-30%) and mortality (12.5-50% vs 0-7.1%) was higher in ALPPS. Volume of the FLR was higher in ALLPS (38.1-71.1% vs 31.1-41%). Drop out ranged 0-20% in ALPPS versus 8-14.2%. While all de PVE groups present drop out in ALPPS in 4 of the 7 studies all the patients achieved the second stage.

**Conclusion:** The initial excessive morbidity and mortality of this technique have decreased drastically due to a better selection of patients, the learning curve and the use of less aggressive variations of the original technique in the first stage. For both techniques a complete preoperative assessment of the FLR is the most important issue and only patients with and adequate FLR should be resected. ALPPS could be a feasible technique in very selected patients with HCC and cirrhosis.

## PL04-41

### LAPAROSCOPIC LEFT HEMIHEPATECTOMY USING “ARANTIUS-FIRST APPROACH”

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**Introduction:** Laparoscopic major hepatectomy is performed increasingly these days.

**Methods:** We have devised and standardized “Arantius-first approach” for laparoscopic left hemihepatectomy (LLH). We report our current procedures and short-term outcomes of 20 cases of LLH.

**Results:** Operative procedure; After the mobilization of the left lateral section, the Arantius plate is dissected from the liver parenchyma, holding the left lateral section to the ventral side. The parenchymal transection is initiated just above the Arantius duct. Then, the left and dorsal aspect of the root of the left Glissonian pedicle (Glt) is exposed. The dorsal side of the middle hepatic vein (MHV) can be also identified behind the LHV in the same view. After the dissection of the right side of the root of Glt from segment 4, Glt can be easily encircled and divided because a sufficient space has been already obtained behind Glt. The MHV is exposed continuously from the root side to the periphery in a dorsal view with the left lobe held up to the ventral side. Short-term outcomes; Three cases underwent extended LLH, and 7 did simultaneous resection of other lesions. The median operative time was 341 min (117-430 min), the blood loss was 110 mL (minimal-430 mL), and the postoperative hospital stay was 9 days (6-25 days). There were no cases of intraoperative transfusion, conversion to open surgery, severe mortality, or mortality. R0 resection was achieved in the all patients.

**Conclusion:** “Arantius-first approach” is useful procedure utilizing a laparoscopic magnified caudo-dorsal view.

## PL04-42

### HEPATECTOMY WITH CONCOMITANT ABLATION: COMPARISON OF RADIOFREQUENCY AND MICROWAVE TECHNIQUES

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**Introduction:** Hepatectomy with concomitant ablation expands the pool of patients who otherwise would be relegated to systemic chemotherapy alone. While radiofrequency ablation (RFA) has been utilized most often, microwave ablation (MA) has gained popularity. The aims of this study were to compare utilization over time and outcomes of RFA and MA in North American patients undergoing hepatectomy.

**Methods:** Patients undergoing hepatectomy with concomitant ablation were identified in the 2014-17 ACS-NSQIP procedure targeted database. Patients having concomitant biliary-enteric anastomoses or colectomy were excluded. Patients having RFA or MA were compared over time by control charts. RFA and MA patients were propensity score matched based on their age, race,

disseminated cancer, operative approach, hepatectomy extent and perioperative transfusions. Outcomes were compared by standard statistical tests.

**Results:** Of 1,589 patients undergoing concomitant hepatectomy and ablation, 964 (60%) had RFA and 635 (40%) received MA. Control chart analysis over 16 quarters demonstrated no change in the frequency of RFA (mean 60 procedures/quarter). In comparison, the quarterly frequency of MA increased from 21 to 79 ( $p < 0.05$ ). After matching, RFA and MA patients had similar mortality, serious morbidity, bile leaks, post hepatectomy liver failure, organ space infections, reoperations and length of stay. However, MA was associated with lower rates of deep vein thrombosis (DVT) and sepsis (each  $p < 0.05$ ).

**Table.** Comparison of Outcomes in Hepatectomy Patients Undergoing Concomitant RFA and MA

Outcome	RFA (n = 549)	MA (n = 549)	p-value
Mortality (%)	0.7	0.4	0.41
Serious Morbidity (%)	13.1	12.9	0.93
Bile Leak (%)	4.6	5.1	0.66
Post-Hepatectomy Liver Failure B/C (%)	1.3	0.7	0.36
Organ Space Infection (%)	5.6	4.0	0.21
Deep Venous Thrombosis (%)	1.8	0.5	0.05
Sepsis (%)	3.8	1.3	0.01
Reoperation (%)	2.2	2.6	0.69
Length of Stay (days)	5	5	0.39

**Conclusions:** In recent years, MA is being utilized more frequently in patients undergoing hepatectomy while concomitant RFA rates have not changed. MA is associated with fewer postoperative DVTs and lower rates of procedure related sepsis.

## PL04-43

### THE SIGNIFICANCE OF MICROWAVE ABLATION IN THE TREATMENT OF PRIMARY AND METASTATIC LIVER CANCER

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Extensive liver resection is the main method of treating patients with primary and metastatic liver cancer, which allows to achieve a significant prolongation of life. In patients with a reduced functional reserve of the liver or an insufficient volume of the remaining liver parenchyma, the applying of these interventions becomes impossible due to the increased risk of post-resection acute liver failure.

One of the most modern and promising ways to overcome this obstacle is the use of minimally invasive methods of tumor destruction. We present clinical observations of the use of the microwave ablator: liver resection and percutaneous microwave ablation of colorectal cancer metastases to the liver.

The presented experience demonstrates the justification for the use of microwave destruction of metastatic malignant tumors of the liver and demonstrates the possibilities of microwave thermal ablation therapy in patients who cannot be performed radical surgical treatment.

#### PL04-44

### LAPAROSCOPIC LEFT LATERAL SECTIONECTOMY USING THE GLISSON-FIRST APPROACH

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**Introduction:** Laparoscopic left lateral sectionectomy (Lap-LLS) is generally performed by transecting the liver parenchyma followed by Glisson dissection. However, in this method, it is difficult to perform liver parenchymal transection at the correct line toward the Glissonian pedicle. Particularly for tumors close to the Glissonian pedicle, very careful transection of the liver is needed. We report our standardized procedure of Lap-LLS using the Glisson- first approach, in which we can perform anatomically precise transection of the liver.

**Methods:** Between July 2019 and January 2020, 7 patients underwent Lap-LLS using our approach in our hospital. The mean patient age was 76 years (range 69-86 years), and they consisted of 3 male patients and 4 female patients. Four patients had metastatic liver tumor, 2 patients had hepatocellular carcinoma, and 1 patient had combined hepatocellular cholangiocarcinoma. All the patients' liver functions were Child-Pugh class A and liver damage A. Of the 7 patients, 3 patients underwent partial hepatectomy for the other lesions, 2 patients underwent cholecystectomy, and 1 patient underwent colostomy closure simultaneously.

**Results:** The mean operative time was 253 min (range 187-337 min), and the mean estimated blood loss was 4 g (range a little-11 g). No operation was converted to open surgery. Postoperative bleeding, bile leakage, hepatic failure, and mortality did not occur. The median postoperative hospital stay was 8 days.

**Conclusion:** Our standardized procedure of Lap-LLS using Glisson-first approach is feasible and provide an advantage for accurate anatomical hepatectomy.

#### PL04-45

### SINGLE INSTITUTE EARLY EXPERIENCE OF 22 CONSECUTIVE ROBOTIC LIVER RESECTION: THE FEASIBILITY AND SAFETY OF SHORT TERM SURGICAL OUTCOMES

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**Background:** Minimal invasive liver resection is a challenging procedure. However, the robotic surgery system enable to minimal invasive liver resection even for beginners.

**Methods:** From August 2016 to November 2019, 22 consecutive patients underwent robotic hepatectomy in our hospital. Among them, right hepatectomy was the

most common with 8 cases, followed by left hepatectomy was 7 cases using robotic surgical system (the *da Vinci Xi*® Surgical System (Intuitive Surgical®, Sunnyvale, CA)).

**Results:** 12 patients were female and the rest were male. The mean patient age was  $57.65 \pm 10.153$  (34-75). And 10 patients were diagnosed hepatocellular carcinoma (HCC), three were intrahepatic duct (IHD) stone, two were liver metastasis and MCN-liver. And biliary cystadenoma, cavernous hemangioma, IPNB-with high grade intraepithelial neoplasm were diagnosed in one case each. And the mean operation time was  $457.6 \pm 131.596$  (238-694) minutes and the mean estimated blood loss was  $455.5 \pm 564.041$  (30-2600) ml and there was only one transfusion case. And mean length of hospital stay was  $7.3 \pm 1.525$  (5-10) days. There was no major complication other than six grade I-II complications such as pleural effusion or abdominal fluid collection.

**Conclusion:** Robotic liver resection seems to be feasible and can be safely performed by beginners at both laparoscopic and robotic liver resection. Robotic liver resection is a fast-adjustable surgical technique, even for beginners. However, if you learn the surgical skill through a well-prepared training program, anyone will be able to jump over the learning curve in a short time.

#### PL04-49

### PNEUMATIC PACKING METHOD FOR HIGH-GRADE LIVER INJURIES

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The liver is the largest solid abdominal organ and is one of the most commonly injured organs in abdominal trauma. Patients with high-grade liver injuries have high rate mortality, between 40 to 80 %. There are many techniques to treat these injuries, like packing, liver resection, hepatectomy and liver transplantation. The usual method describe is the gauze packing, but have complications like re operations and bleeding when is removed.

We develop a novel technique using a pneumatic balloon, as a packing compressive method, for patient with hemodynamic instability. The patients selected for this technique were unstable patients that need blood transfusion and Intensive Care Unit manage. A midline incision made with abdominal exploration and liver mobilization was perform. Identification of the blunt trauma, we consider the use of the technique in liver injuries grade III to V. A Pringle maneuver, and liver mobilization is important, to have the lacerated area exposed. We use hem collagen as a film between the liver and the balloon, the balloon is insufflated until no bleeding is seen, and Pringle maneuver is removed.

The patients are observed in the intensive care unit, the pneumatic balloon was controlled in a daily basis, and air from the balloon is removed after 72 hrs. The balloon stays in situ for at least one week. Then, if no blood from drainages appear and hemodynamic stability is achieved, the balloon is removed, without need of another surgery for this reason. We consider this technique safe and suitable for instable patients.

## PL04-50

### RIGHT EXTENDED HEPATECTOMY AND CYST FENESTRATION IN A RARE SEVERE POLYCYSTIC LIVER DISEASE: HOW I DO IT SAFELY

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**Introduction:** Polycystic liver disease (PLD) is characterised by the presence of multiple fluid-filled liver cysts, >10 cysts. According to Gigot, type 3 (severe) is multiple cysts occupying >75% of TLV. Treatment options are limited, including surgical like aspiration-sclerotherapy, fenestration, hepatectomy, liver transplantation, and medical options such as somatostatin analogs. However, the efficacy of these treatments remains uncertain except liver transplantation which is curative especially in severe variety.

**Case:** 32 year old female with a BMI of 26 presented with history of abdominal pain and swelling since 5 years with post prandial fullness. Preoperative evaluation with CT scan showed Gigot Type 3 PLD. She opted for all treatments except transplant. Right-extended hepatectomy and fenestration of cyst in seg 2,3(remnant volume 21%) was done in this patient. Intra-operatively the liver was so large that mobilisation was difficult leading to compression of the heart leading to hypotension every time liver was pushed. Routine outflow control was not feasible. 10 mins Intermittent dissection and 10 mins intermittent stoppage gave time to anesthetist for proper resuscitation. Careful parenchymal transection along the cantles line using the Belghiti technique prevented blood loss since the portal tracts are completely distorted. Some cyst were decompressed along with wall cauterisation to prevent post-operative ascites and in some tetracycline was injected as a sclerosant to prevent recurrence.

**Conclusion:** Severe PLD is very rare. Extended hepatectomy and fenestrations are good palliative options for relieving patients symptoms. Few technical improvisations during hepatectomy along with energy devices can help HPB surgeons achieve these feats.

## PL04-51

### SURGICAL APPROACH FOR THE RESECTION OF TUMOUR-INVOLVED COMMON HEPATIC ARTERY DURING PANCREATODUODENECTOMY

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**Introduction:** In locally advanced pancreatic cancer resection of the common hepatic artery (CHA) for tumour involvement has been advocated after neoadjuvant therapy (chemotherapy +/- chemoradiation) for selected cases, more so for cases where aberrant anatomy is responsible for the locally advanced stage of the disease. Peri-operative morbidity has been reported 17-100% and post-operative

mortality 0-45%. We describe our approach to resection of replaced CHA (rCHA) when involved by tumour.

**Method:** The procedure follows the steps of a standard pancreaticoduodenectomy. During the hilar dissection, the rCHA is identified and dissected towards the pancreas until tumour involvement is identified. The uncinate process of the pancreas is dissected from the SMA. The origin of the rCHA is identified and dissected until tumour involvement is identified. When an arterial resection is deemed necessary the operation continues to a total pancreatectomy and splenectomy with preservation of the splenic artery. At the end of the resection, which includes the arterial resection, a decision is made on the appropriate reconstruction. If length is adequate for a tension-free repair, an end-to-end primary reconstruction is performed. Otherwise, transposition of the splenic artery is used.

**Conclusion:** In the context of periampullary tumours when resection of the common hepatic artery is required, our preference is reconstruction with the above described technique. A total pancreatectomy is always performed to avoid the risk for arterial-related complications from a potential pancreatic leak in the presence of an arterial reconstruction.



Replaced Common Hepatic Anastomosed to Splenic Artery After Total Pancreatectomy Splenectomy

## PL04-53

### THE LEAST AGGRESSIVE ALPPS VARIANT: PARTIAL-TOURNIQUET-ALPPS

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**Introduction:** The first variant reported was Tourniquet-ALPPS (T-ALPPS), which occludes the intrahepatic circulation by means of a tourniquet around the liver.

**Methods:** We present a modification of our surgical technique, T-ALPPS, named "partial Tourniquet-ALPPS" (pT-ALPPS) which avoids the pass of the tourniquet by hanging maneuver and the right extraglissonian approach. The first Stage of this variant is easier, quicker and less risky compared to ALPPS, p-ALPPS or T-ALPPS.

**Results:** In our HBP unit 65 T-ALPPS have been performed. Since February 2017 we underwent a prospective study comparing T-ALPPS with pT-ALPPS, including 6 patients with colorectal liver metastases (CRLM) in each group. The first case of pT-ALPPS, was performed in a patient with bilobar metastases and one of them was located in segment, in front of the inferior vena cava thus the tourniquet could not be passed by hanging maneuver. After clearing the future liver remnant (FLR) of CRLM, we ligate the right portal vein. Considering that the ventral portion of the liver to the right portal pedicle is a non-vascularized area, and with the aid of intraoperative ultrasonography, an Adson clamp was passed through the liver parenchyma. This clamp emerged between the right and middle

hepatic vein. A tourniquet was then passed and knotted under ultrasound control. In Stage 2, we used the tourniquet as hanging maneuver for right hepatectomy or right trisectionectomy depending on its location.

**Conclusion:** In selected patients P-T-ALPPS is an accessible technique easier than T-ALPPS as the clamp passes through an avascular area.

PL04-54

### HEPATECTOMY PROCEDURES WITH AWARENESS OF REPEATED RESECTION

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**Introduction:** Repeat hepatectomy is often performed for intrahepatic recurrence of primary and metastatic liver cancers. However, repeat hepatectomy requires complicated procedures due to adhesion and deviation of anatomical position. We present surgical techniques for repeat hepatectomy and its results.

**Method:** From January 2016 to November 2019, 317 cases of hepatectomy were performed at our hospital, and among them 50 cases of repeat hepatectomy were performed. At the initial hepatectomy, laparoscopic approach was preferably selected. The gallbladder was preserved if possible, and the round ligament and the falciform ligament of the liver were reconstructed. Adhesion barriers were placed around the hepatoduodenal ligament, the diaphragmatic surface of the liver, and at the left hepatectomy, the minor curvature of the stomach to prevent gastric rotation. At repeat hepatectomy, laparoscopic approach was attempted because pneumoperitoneum could be useful for the division of adhesion. To secure the hepatoduodenal ligament, we approached the hepatic hilum through the round ligament, and performed Kocherization if needed. Thoracotomy was used if adhesion was severe.

**Results:** All the 50 cases included metastatic liver tumor (n=30), hepatocellular carcinoma (n=8), intrahepatic cholangiocarcinoma (n=2), and peritoneal dissemination (n=1). Laparoscopic surgery was performed in 27 cases (54%). Extent of liver resection included partial resection (n=30), segmentectomy (n=6), sectionectomy (n=8), and hemihepatectomy (n=6). Median operation time was 241 minutes (39-519) and the median blood loss was 100 ml (0-1400). Postoperative bile leakage (Clavien-Dindo classification Grade IIIa or higher) occurred in 2 cases (4.0%).

**Conclusions:** Repeat hepatectomy can be performed safely by devising surgical techniques.

PL04-55

### BENEFITS OF HEPATIC RESECTION IN RECURRENT PYOGENIC CHOLANGITIS AMONG BANGLADESHI RESIDENTS

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**Introduction:** Surgery is the corner stone treatment strategy for Recurrent pyogenic cholangitis (RPC) with stones and stricture. Sepsis is often a grave complication. Identification of source of sepsis to delineate the extent of disease and resection of unhealthy segment is the key to successful management.

**Method:** This prospective study includes 523 cases of RPC surgically treated in a cohort of Bangladeshi patients, during January 2007 to January 2020. The study intended to analyze outcome of hepatic resection in RPC. Distortion of hepatic parenchymal architecture, stones, strictures and crowding of ducts were indications of hepatic resections with hepatolithotomy followed by T-tube or bilioenteric drainage with or without an access loop were treatment strategies.

**Result:** Patients presented were between 20-77 yrs, 301 male (57.55%) and 222 were female (42.44%). 374 patients (71.51%) from south eastern part of Bangladesh. 29.06 % patients presented with Recurrent abdominal pain, Jaundice and fever. Isolated left duct stone found in 329 patients (62.09%), right duct stone in 33 patients (6.03%), bilateral stones in 87 patients (14.91%) and both Intra-extrahepatic lithiasis in 74 patients (14.14%). Left Lateral Segmentectomy was the most common procedure in 387 cases. 184 patients required T-tube drainage, hepaticojejunostomy in 339 patients, Access loop in 34 patients (8.22%). Post-operative complications occurred in 15% cases.

**Conclusion:** Treatment strategy of RPC is tailored, depends on extent of disease and future remnant liver. Left ductal approach following left lateral segmentectomy ensure better approach to right ductal system for better ductal clearance to prevents recurrence.

PL04-56

### DELINEATION OF THE DEMARCATION LINE FOR LEFT HEPATIC TRISECTIONECTOMY USING ICG FLUORESCENCE-BASED IMAGING

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**Introduction:** Left hepatic trisectionectomy is a high-risk procedure. Conventionally, anatomical hepatic resection has been performed using the hepatic vein as a guidepost. However, the right hepatic vein (RHV) did not precisely define the border of the anterior and posterior sections. In order to more accurately recognize the transection line during surgery, we used an indocyanine green (ICG) fluorescent camera.

**Patients:** According to the preoperative CT simulation of 121 cases in our hospital, transected surface of the posterior section is

- 1) Plain (almost coincides with RHV: 64 cases (53%)),
- 2) Convex (anterior Glissonian head-side branch crossed RHV: 18 (15%)),

- 3) Concave (posterior Glissonian caudal branch crossed RHV: 14 (11%)),  
 4) Other: 25.

The boundary between the anterior and posterior segments is not always a plain along RHV. It was presumed that intraoperative color change and RHV could not accurately indicate the boundaries of left hepatic trisectionectomy.

**Methods:** After the treatment of hilar portal vein, 0.25 mg ICG was intravenously administered prior to the parenchymal resection. It was possible to confirm the liver parenchyma where blood flow remained by the ICG camera. Even when the condition of the liver surface was poor such as after PTCO or PVE, the planned incision line was described accurately.

**Conclusion:** By using the ICG fluorescence method, it was easy to recognize the posterior section that remaining blood flow, and the left hepatic trisectionectomy was completed more safely.

## PL05 - Liver: Miscellaneous

### PL05-01

#### OUTCOMES OF GAS-FORMING PYOGENIC LIVER ABSCESS (PLA) ARE COMPARABLE TO NON-GAS-FORMING PLA IN THE ERA OF MULTIMODAL CARE: A PROPENSITY SCORE MATCHED STUDY

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Gas-forming pyogenic liver abscess (GFPLA) occurs in 7-24% of all pyogenic liver abscess (PLA) and has been traditionally associated with high mortality. Studies suggest that use of a proactive approach of prompt resuscitation, parenteral antibiotics, percutaneous drainage and a dedicated multidisciplinary team may improve clinical outcomes. Hence, we aim to investigate if the clinical outcomes of PLA are determined by gas formation.

This is a retrospective study of patients with PLA from 2007 to 2011. A 1:2 propensity score matching (PSM) analysis was performed using age, co-morbid diabetes, presence of septic shock, haemoglobin levels, international normalized ratio, creatinine, total bilirubin, positive blood culture and pus culture, and the size of abscess. Demographics, clinical profile and perioperative data were compared.

213 patients had PLA: 41(19.2%) patients had GFPLA and 172(80.8%) patients had non-GFPLA. 1:2 PSM resulted in a total of 108 patients (36 GFPLA and 72 non-GFPLA). Clinical profile and microbiology are shown in Table 1. Median duration of parenteral antibiotics was significantly lower in the GFPLA group (9.5 days vs 14 days, p=0.044), but median total duration of antibiotics use was comparable (GFPLA 39 days vs non-GFPLA 37 days, p=0.634). Median length of stay (days) did not differ significantly between GFPLA and non-GFPLA (14 vs 15, p=0.299). There were no statistically significant differences between GFPLA and non-GFPLA in the need for percutaneous drainage (26/36(72.2%) vs 47/72(65.3%) respectively, p=0.467) and in-hospital all-cause mortality (4/36(11.1%) vs 7/72(9.7%), p=0.822).

Outcomes of GFPLA are comparable to non-GFPLA in the era of multimodal care.

**Table 1** Clinical profile and microbiology of patients with gas-forming pyogenic liver abscess (GFPLA) and non-GFPLA before and after matching

	Overall cohort (n=213)				Matched cohort (n=108)			
	GFPLA (n=41)	Non-GFPLA (n=172)	p-value	SMD (standardised mean difference)	GFPLA (n=36)	Non-GFPLA (n=72)	p-value	SMD
Age (interquartile range)	61 (53 - 69)	62 (51 - 74)	0.787	0.010	61.5 (52.3 - 68.8)	62.5 (53.3 - 73.8)	0.646	0.047
Gender, male (%)	27 (65.9)	104 (60.5)	0.524	-	24 (66.7)	45 (62.5)	0.671	-
Diabetes mellitus, yes (%)	18 (43.9)	56 (32.6)	0.170	0.233	13 (36.1)	24 (33.3)	0.774	0.058
Pus culture, yes (%)	21 (70)	61 (66.3)	0.708	0.307	17 (65.4)	37 (78.7)	0.214	0.083
<i>Klebsiella pneumoniae</i> (%)	17 (81)	51 (82.3)			13 (76.5)	33 (89.2)		
<i>Clostridium perfringens</i> (%)	1 (4.8)	1 (1.6)			1 (5.9)	1 (2.7)		
Others (%)	3 (14.3)	9 (14.8)			3 (17.6)	3 (8.1)		
Size of largest abscess (cm)	6.6 (4.9 - 8.3)	5.4 (3.6 - 7.0)	0.005	0.488	6.3 (4.5 - 7.5)	6.1 (5.0 - 7.6)	0.669	0.131

PL05-02

**ASTAXANTHIN ATTENUATES HEPATIC DAMAGES AND MITOCHONDRIAL DYSFUNCTION IN NONALCOHOLIC FATTY LIVER DISEASE BY REGULATING THE FGF21/PGC-1 $\alpha$  PATHWAY**

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**Introduction:** Non-alcoholic fatty liver disease (NAFLD) is considered to be one of the most common chronic liver diseases across worldwide. Inflammation, cell apoptosis and fibrogenesis are all typical lipotoxicity-associated changes during NAFLD. Beneficial effects of astaxanthin (Ax) have been identified, including anti-oxidative, anti-inflammatory, and anti-tumor activity. The present study aimed to elucidate the protective effect of Ax against NAFLD and its underlying mechanism.

**Method:** Mice were fed either a high fat or control diet, with or without AX, for up to 12 weeks. L02 cells were treated with free fatty acids combined with different doses of Ax for 48 h. Histopathology, expression of lipid metabolism, inflammation, apoptosis, and fibrosis-related genes were assessed.

**Results:** The results indicated that Ax attenuated HFD- and FFA-induced lipid accumulation and its associated oxidative stress, cell apoptosis, inflammation, and fibrosis both in vivo and in vitro. Ax upregulated FGF21 and PGC-1 $\alpha$  expression in damaged hepatocytes, which suggested an unrecognized mechanism of Ax on ameliorating NAFLD.

**Conclusions:** Ax prevented hepatic triglyceride accumulation, and attenuated hepatocyte damage and mitochondrial dysfunction. And Ax decreased the severity of experimental steatohepatitis via mechanisms likely to involve the up-regulation of FGF21/PGC-1 $\alpha$ .

PL05-03

**WHO CAN BENEFIT FROM ADJUVANT TRANSCATHETER ARTERIAL CHEMOEMBOLIZATION AFTER SURGICAL RESECTION OF HEPATOCELLULAR CARCINOMA? A SYSTEMATIC REVIEW AND META-ANALYSIS**

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**Background:** Although adjuvant transcatheter arterial chemoembolization (TACE) has been used to prevent postoperative recurrence after hepatocellular carcinoma (HCC) resection, the survival benefits of adjuvant TACE remain controversial. To evaluate the effectiveness of adjuvant TACE for HCC, as well as identify patient populations that might benefit from adjuvant TACE.

**Methods:** The PubMed, Embase and Cochrane library were systematically searched. The primary endpoints were overall survival (OS) and disease-free survival (DFS). Patients with large HCC ( $\geq 5$  cm), multinodular HCC, microvascular invasion (MVI), or portal vein tumor thrombosis (PVTT) were analyzed in subset analyses.

**Results:** Twenty-four studies with 6,912 patients were included. The pooled analysis demonstrated that adjuvant TACE was associated with a better OS and DFS (HR: 0.67, 95% CI 0.61-0.74 and 0.71, 0.61-0.84). In subgroup analyses, pooled results revealed that adjuvant TACE was associated with an improved OS and DFS in patients with multinodular HCC, MVI, or PVTT, but not among patients with single large HCC ( $\geq 5$  cm).

**Conclusion:** Postoperative adjuvant TACE may be effective to improve OS and RFS in selected patients with multinodular HCC, or HCC with MVI or PVTT. Future randomized controlled trials are needed to better define the benefit of adjuvant TACE.

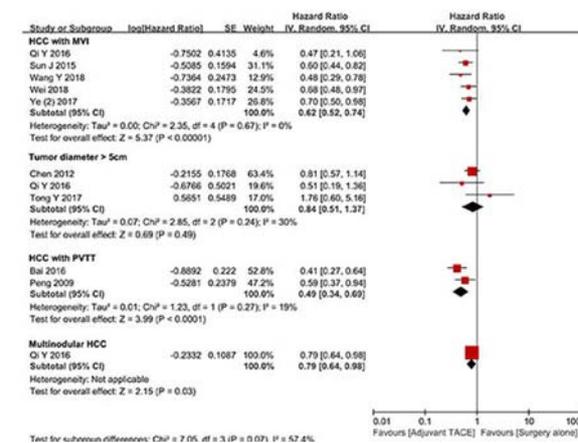


Figure. Forest plots comparing the overall survival stratified by different risk factors

PL05-04

**A NOVEL SCORING SYSTEM FOR THE DIFFICULTY LEVEL IN THE LYSIS OF ADHESIONS AROUND THE LIVER FOR SAFE REPEAT HEPATECTOMY IN PATIENTS WITH HEPATIC MALIGNANCIES**

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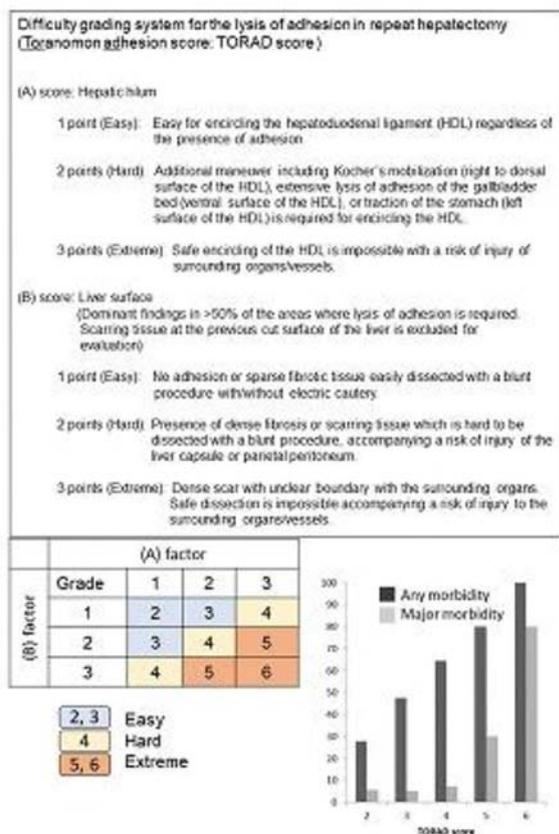
**Introduction:** Repeat hepatectomy (ReHx) for recurrent hepatic malignancies reportedly provides oncological benefit for patients. However, severe adhesions at ReHx may preclude safe and curative resection and there has been no reliable measure to estimate the surgical risk at ReHx. This study sought to create a new scoring system for evaluating the severity of adhesion after hepatectomy and tested its performance looking at the correlation with morbidity rate.

**Methods:** 66 operative videos of second hepatectomy were reviewed and the difficulty levels in lysis of adhesion around the hepatic hilum (A score) and surrounding the

liver (B score) were scored by two examiners and validated by additional two reviewers.

**Results:** Very high interobserver agreement was confirmed between the two examiners (k value, 0.960-0.963) and reproducibility of results were validated with weighted kappa values of >0.8 in both surgical resident and hepatobiliary surgery. Linear correlation was confirmed between the difficulty score and postoperative morbidity rate. Multivariate analyses confirmed that previous cholecystectomy or transection of visceral surface of segment 4 or 5 was independent factor predicting hard to extreme adhesions at the hepatic hilum regardless of the use of anti-adhesion materials.

**Conclusions:** The new difficulty scoring system for the lysis of adhesion at ReHx showed good interobserver agreement and reproducibility of the results. Given the strong correlation with postoperative morbidity rate, the present score could be used for evaluating the technical difficulties in ReHx and may offer a reliable measure for estimating the efficacy of anti-adhesion materials in future analysis.



TORAD score and morbidity rates

#### PL05-05

### DEVELOPMENT AND EXTERNAL VALIDATION OF PROGNOSTIC NOMOGRAMS IN HEPATOCELLULAR CARCINOMA PATIENTS: A POPULATION BASED STUDY

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**Background:** We attempted to construct and validate novel nomograms to predict overall survival (OS) and cancer-specific survival (CSS) in patients with hepatocellular carcinoma (HCC).

**Methods:** Models were established using a discovery set (n=10262) obtained from the Surveillance, Epidemiology, and End Results (SEER) database. Based on univariate and multivariate Cox regression analyses, we identified independent risk factors for OS and CSS. Concordance indexes (c-indexes) and calibration plots were used to evaluate model discrimination. The predictive accuracy and clinical values of the nomograms were measured by decision curve analysis (DCA).

**Results:** Our OS nomogram with a c-index of 0.753 (95% confidence interval (CI), 0.745-0.761) was based on age, sex, race, marital status, histological grade, TNM stage, tumor size, and surgery performed, and it performed better than TNM stage. Our CSS nomogram had a c-index of 0.748 (95% CI, 0.740-0.756). The calibration curves fit well. DCA showed that the two nomograms provided substantial clinical value. Internal validation produced c-indexes of 0.758 and 0.752 for OS and CSS, respectively, while external validation in the Sun Yat-sen Memorial Hospital (SYMH) cohort produced a c-indexes of 0.702 and 0.686 for OS and CSS, respectively.

**Conclusions:** We have developed nomograms that enable more accurate individualized predictions of OS and CSS to help doctors better formulate individual treatment and follow-up management strategies.

#### PL05-06

### LARGE BENIGN NON PARASITIC HEPATIC CYST: A CASE REPORT

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Large none parasitic hepatic cysts are an uncommon disease entity and often evade the clinical eye because majority will present with non-specific symptoms until the cyst is large enough to cause compressive symptoms. Patients will most often present with vague abdominal pain, palpable abdominal mass, jaundice with compression of the biliary ducts, or portal hypertension secondary to compression of the portal vein. This is a case of 63 year old male, known case of hepatic cyst presenting with vague abdominal pain. Patient was then advised to undergo surgery due to progressive enlargement of the hepatic cyst with the latest dimensions measuring 114 x 180 x 210 mm hence patient was admitted. Patient was scheduled for laparoscopic cystectomy and intraoperative findings were noted to include a large hepatic cyst containing approximately 3 liters serous fluid, completely replacing segment IVA, IVB and V with the cyst capsule noted to be adherent to the gallbladder wall. Patient underwent Laparoscopic resection of segment IVA, IVB and V, cholecystectomy and intraoperative cholangiogram. Histopath results revealed a simple biliary cyst with a fibrous cyst wall measuring 24.2 x 8.0 x 0.2 cm with 6 cystic tissues measuring from 0.3 x 0.3 x 0.3cm to 1.2x 1.6 x 0.6cm. Gallbladder was noted to have no pathologic changes. Patient tolerated the procedure

well and was discharged 2 days after with unremarkable post-operative course.

## PL05-09

### AGGRESSIVE CLINICAL BEHAVIOR OF PURE SQUAMOUS CELL CARCINOMA (SCC) OF THE LIVER

Y. Kadowaki, H. Fujii, Y. Okubo, S. Komoto, N. Kubota and N. Ishido

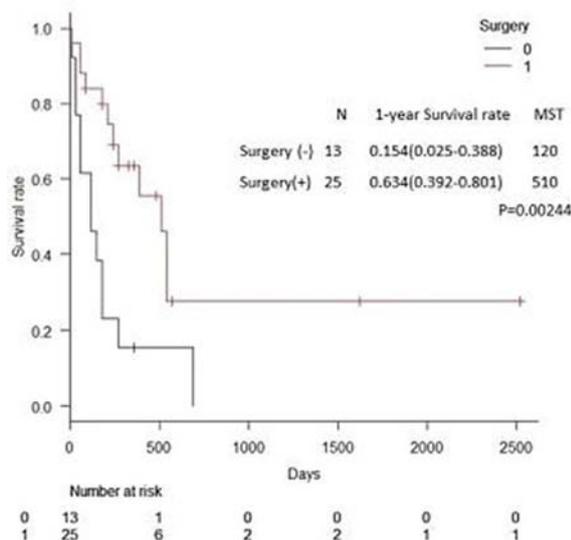
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**Introduction:** Primary SCC of the liver is extremely rare. According to a few sporadic reports, surgical resections seem to be selected as an initial treatment, if it resectable; however, the prognosis is universally unfavorable.

**Methods:** We presented one case of pure SCC of the liver. A total of 41 cases of primary SCC of the liver previously reported in the English literatures were reviewed.

**Results:** A 57-year-old man with history of right flank pain presented with 1 week of high grade fever. On physical examination, his abdomen was tender, with the most severe pain in the right upper quadrant. Contrast-enhanced computed tomography revealed that there was 14x10cm irregular mass with central necrosis at S4+5 of the liver and swollen nodes, which were compatible with his symptoms. The patient underwent S4+5 segmentectomy with extended resection of gall bladder, transverse colon, and diaphragm. Histological examination revealed pure squamous cell carcinoma of the intrahepatic biliary tract. On the POD 44 prior to discharge, relapse was found around the common bile duct and liver resection edge. Although chemotherapy was proposed, his severe fatigue refused it. He was died of multiple metastasis including bones on the 52<sup>nd</sup> day after discharge. We made Kaplan-Meier survival curves of the patients divided by with and without surgery from the review of previous reports. One year survival rate with surgery is better than without surgery (63.4% vs 15.4%,  $p=0.0024$ ).

**Conclusion:** Radical resection should be firstly recommended; however, case collections and data analysis may be needed to establish better treatments.



Kaplan-Meier

## PL05-11

### DISEASE CONTROL BIOMARKER TO PREDICT SORAFENIB SUSCEPTIBILITY IN ADVANCED STAGE HEPATOCELLULAR CARCINOMA

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**Background:** Hepatocellular carcinoma (HCC) has two first-line treatments, those are sorafenib and lenvatinib. But because of predictive biomarker's absence, these two agents have poor response rates and overall survival period. Disease control biomarker could be a method that potentially improves the effectiveness of sorafenib, one of two agents. Here, we aimed to develop a clinical useful biomarker that predicts disease control of sorafenib.

**Methods:** Using nanostring nCounter, we analyzed expression levels of 770 genes in 73 advanced-stage HCC patients with sorafenib treatment. With the 770 genes expression levels of 73 patients, we identified differentially expressed genes (DEGs) and computed combination of weighted gene expression for disease control biomarker. To validate gene signature, we analyzed cross validation and meta-analysis. For predicted poor responders, we listed up recommended medicine, analyzing individual DEGs by meta-analysis.

**Results:** 8-gene signature showed 0.90 of area under the curves (AUC), 91.78% of accuracy. In cross validation, 8-gene signature showed well-performance with 83.67% of cross validation accuracy. Also, when classification with 8-gene signature, median overall survival (median OS) was improved 27.3 months from 11.3months. In promising alternative agents for predicted poor responders, recommended agents were listed up individually based on individual gene expression.

**Conclusions:** 8-gene signature provides a best compromise between sorafenib effectiveness and coverage of sorafenib treatment patients. In perspective of precision medicine, our process of precision medicine recommendation can be drive the precision medicine one step forward.

## PL05-12

### RE-EVALUATION OF COUINAUD'S CLASSIFICATION FOR RIGHT LIVER SEGMENTAL ANATOMY WITH PARTICULAR ATTENTION TO THE RELEVANCE OF CRANIO-CAUDAL BOUNDARIES

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**Introduction:** Although the Couinaud's classification of liver segment has been challenged by several studies, whether the cranio-caudal boundaries can be delineated in the right liver has not yet been assessed. This study sought to scrutinize the third-order branching pattern of the portal vein in the right liver with particular attention to the validity of cranio-caudal segmentation.

**Methods:** Three-dimensional reconstruction of the portal vein and hepatic vein using non-contrast-enhanced MRI was performed in fifty healthy volunteers.

**Results:** In the right paramedian sector, the portal vein ramified into two thick P8s (P8vent and P8dor) in all the subjects. Additional thick P8s that ran laterally and/or medially (P8lat and/or P8med) were found in 18 (32%) subjects. In contrast, multiple thin P5s, ranging in number from 2-6 (median, 4), branched from the right paramedian trunk, the right portal trunk, and/or even from P8s. In the right lateral sector, an arch-like type in which multiple P6s ramified from a single thick P7 was observed in 26 (52%) subjects. A bifurcation type composed of a single P7 and a single P6 was found in 23 (46%) subjects, while a trifurcation type composed of P7vent, P7dor, and P6 was observed in one subject.

**Conclusion:** No clear cranio-caudal intersegmental plane could be delineated in the right paramedian sector of any of the subjects, nor was it observed in the right lateral sector in 52% of the subjects. The systematic resection of Couinaud's segment in the right liver might not be relevant in the majority of subjects.

### PL05-13

## SPHINGOSINE-1- PHOSPHATE(S1P) EXPORT IS ASSOCIATED WITH PROGRESSION OF HEPATOCELLULAR CARCINOMA(HCC)

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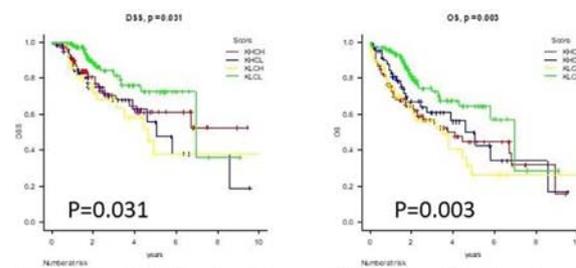
**Introduction:** Sphingosine-1-Phosphate (S1P), a lipid mediator, is generated by enzyme Sphingosine Kinase1 (SphK1) in cytosol, and is transported out of the cell by multidrug resistance transporter, ABCC1, working in autocrine/paracrine fashion. Thus tumor with high expression of both SphK1 and ABCC1 (high K1C1) are assumed to have higher levels of S1P. We hypothesize that high K1C1 will lead to progression of HCC and worse outcomes.

**Methods:** HCC cohorts of TCGA(The Cancer Genome Atlas) n= 371 were divided into high K1C1 expression(n=120) and low K1C1 expression(n=119). Kaplan Meir curves were used for disease specific and overall survival.

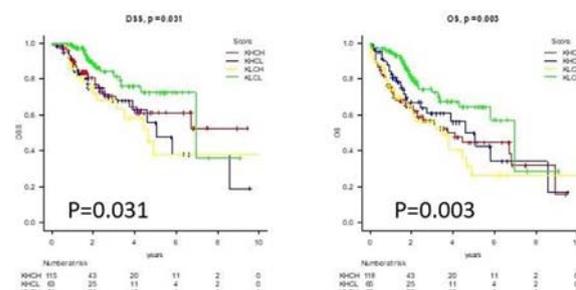
**Results:** We found significantly higher expression of SphK1 and ABCC1 in HCC versus normal liver and higher levels in clinically aggressive tumors. The Disease specific survival (p< 0.03) and overall survival (p< 0.003) were significantly worse in high K1C1 group. With regards to tumor immune microenvironment, high group had higher tumor associated lymphocytes, TCR Shannon and richness scores, with higher dendritic cells (anticancer activity), but also high Th2 cells and CD4 T memory activated cells (procancer activity). GSEA looking at mechanism of action, showed significantly enhanced cell proliferation(E2F targets, mTOR, G2Mcheckpoint, Myc) angiogenesis and increased aggressiveness(TGFβ, epithelial

mesenchymal transition, Wnt-βCatenin, IL6/JAK-STAT3). It also showed increased immune cell attraction, and anti-proliferation activity(increased apoptosis, p53).

**Conclusion:** S1P export is associated with both pathways of cancer progression and anti-proliferation. However, the pro-cancer pathways overwhelm the anticancer pathways, leading to HCC progression. We conclude that high S1P levels promote growth and proliferation of HCC.



SphK1/ABCC1 high group is significantly associated with better survival



SphK1/ABCC1 high group is significantly associated with better survival

### PL05-14

## IMPROVED SURGICAL OUTCOMES IN LIVER RESECTION UNDER ENHANCED RECOVERY AFTER SURGERY (ERAS) PROGRAM: IS BETTER PAIN CONTROL THE ONLY CONTRIBUTING FACTOR?

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**Introduction:** The association of Enhanced Recovery after Surgery (ERAS) Program and better surgical outcome has been shown in liver resection. Some may argue that better postoperative outcomes are a result of better pain control only. The aim of this study is to compare the surgical outcomes of open hepatectomy with and without ERAS protocol in patients who received continuous local anaesthesia wound infiltration (On-Q Pain Buster system) as postoperative pain control.

**Method:** Clinical data of patients receiving open hepatectomy following ERAS protocol (ERAS with On-Q) were compared to a historical cohort of patients that received open hepatectomy following conventional perioperative

programs supplemented with postoperative On-Q system for wound pain control (On-Q alone). The primary outcome was length of hospital stay. Secondary outcomes were complications and readmission.

**Results:** A total of 25 patients in ERAS with On-Q group and 35 patients in On-Q alone group were identified and studied. The ERAS with On-Q group was associated with a significantly shorter hospital stay ( $P < 0.05$ ). However, there was no significant difference in complication rate ( $P=0.301$ ) and post-operative readmission ( $P =0.708$ ) in ERAS with On-Q group when compared with On-Q alone group.

**Conclusions:** ERAS program is a multimodality program and ERAS with On-Q system as postoperative pain control provides better surgical outcomes than use of On-Q system alone in patients undergoing hepatectomy. The use of ERAS in hepatectomy should be encouraged and further studies should be done to optimize a standard ERAS programme specific for hepatectomy.

#### PL05-15

### MANAGEMENT OF A GIANT HEPATIC CYST BY TOTAL CYST ENUCLEATION IN UGANDA. A CASE REPORT AND REVIEW OF LITERATURE

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**Introduction:** Giant hepatic cysts are uncommon and cause symptoms due to compression effects. Symptoms include early satiety, abdominal discomfort, abdominal mass and rarely pain in case of haemorrhage, rupture or cyst infection. Aetiology is unknown but liver cysts are thought to be congenital. Management of liver cysts is debatable but options include sclerotherapy, fenestration or deroofting, open or laparoscopic partial or total cyst excision, cyst enucleation and rarely liver resection. There is paucity of data on management of Giant liver cysts in Uganda and the East African region and to the best of our knowledge, this is the first reported case in our country and region.

**Method:** We present a sixty one year old female Ugandan who was admitted due to an increasing abdominal mass with associated discomfort and early satiety. Contrast abdominal computed tomography (CT) scan revealed a 28 x 26 cm simple liver cyst.

**Results:** She underwent open total cyst enucleation after initial cyst decompression. Postoperative recovery was uneventful and she was discharged on the 8<sup>th</sup> postoperative day.

**Conclusion:** It is easier to perform a total cyst excision or enucleation for Giant liver cyst with a thick wall or cyst capsule.

Figure 1: Abdominal CT scan of the giant liver cyst (top left), intraoperative intact cyst (top middle), cyst dissection (top right), detaching cyst from inferior vena cava (bottom left), atrophied right lobe and hypertrophied left lobe

(bottom middle), after total cyst excision/enucleation (bottom right)

#### PL05-16

### SERUM METABOLIC BIOMARKERS OF LIVER FAILURE AFTER LIVER RESECTION

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**Introduction:** Even the combination of PT and total bilirubin, known for being the most reliable predictive conventional markers shows low sensitivity. Therefore we need to find more relevant biomarkers of liver failure after liver resection focused on the liver metabolites.

**Method:** A total of 20 pigs were divided into 3 groups sham operation (n=6), 70% hepatectomy group (n=7), and 90% hepatectomy group (n=7). Blood sampling was performed preoperatively and at 1, 6, 14, 30, 38, and 48 hours after the operation we systematically profiled 129 primary metabolites based on gas-chromatography time-of-flight mass spectrometry.

**Results:** Orthogonal projection to latent structures-discriminant analysis revealed that central carbon metabolism was the most significant factor in the 90% liver-resection group in contrast to the 70% and sham groups. Subsequent binary logistic regression analysis was used to develop a predictive model for the risk of mortality following hepatectomy. The recommended variables were malic acid, methionine, tryptophan, glucose, and  $\gamma$ -aminobutyric acid. The AUC of the linear combination of 5 metabolites was 1.000 (95% confidence interval: 0.940-1.000, sensitivity: 100.0, specificity: 94.87)

**Conclusions:** Systematic prioritization based on OPLS-DA and binary logistic regression analysis proposed robust biomarker panels that can accurately predict the risk of mortality associated with hepatectomy.

#### PL05-17

### INCLUSION OF THE BRISBANE 2000 TERMINOLOGY OF LIVER ANATOMY AND RESECTIONS WITHIN SNOMED CLINICAL TERMINOLOGY

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**Introduction:** At the IHPBA meeting in Brisbane in 2000 the Brisbane 2000 Terminology of Liver Anatomy and Resections was accepted as the official terminology of the IHPBA. SNOMED-CT (Systematized Nomenclature of Medicine - Clinical Terminology) is the most comprehensive, multilingual clinical healthcare terminology in the world, and is an important standard in the recording and interchange of coded clinical information. It was initially released in 2002, and is in use in over 80

countries. Up until now SNOMED-CT hasn't included all of the clinical terms and concepts contained within the Brisbane nomenclature.

**Methods:** The clinical terms and concepts contained within the Brisbane terminology are mapped to the current SNOMED-CT clinical terms. New SNOMED-CT terms and relationships are proposed to enable a full representation of the Brisbane terminology within SNOMED-CT.

**Results:** The new terms and relationships are presented and the process for endorsement by SNOMED International is discussed.

**Conclusions:** Clinical information is increasingly stored electronically. Standards for clinical information exchange such as FHIR (Fast Healthcare Interoperability Resources) depend heavily on SNOMED-CT for coded clinical information. It is important therefore that the consensus of wisdom encapsulated within the Brisbane terminology is represented in SNOMED-CT.

#### PL05-18

### CLINICAL IMPACT OF HERPESVIRUS ENTRY MEDIATOR (HVEM) IN MALIGNANT LIVER TUMORS

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**Background:** Herpes virus entry mediator (HVEM), also known as tumor necrosis factor receptor (TNFR) superfamily 14, regulates a variety of physiological and pathological responses in both innate and acquired immunity. Recently, HVEM is also suggested to be a critical regulator in tumor immunity. This study aimed to clarify clinical importance of HVEM in human hepatocellular carcinoma (HCC) and colorectal liver metastasis (CRLM).

**Methods:** This study examined 150 patients with HCC and 104 patients with CRLM who underwent curative liver resection at Nara Medical University between 2000 and 2014. Immunohistochemical staining was performed using antibodies against HVEM, CD4, CD8, and CD45RO.

**Results:** High HVEM expression was observed in 66 of 150 patients (44.0%) with HCC, and 49 of 104 patients (47.1%) with CRLM. Expression of HVEM was not associated tumor size, number of tumors, or histologic differentiation. The high-HVEM group exhibited significantly worse overall survival (OS) than the low-HVEM group (HCC:  $P=0.002$ , CRLM:  $P=0.002$ ). Multivariate analysis showed that independent poor prognostic factors of OS for HCC were high HVEM expression in HCC and tumor size  $>5$  cm, while in CRLM, high HVEM expression in CRLM, age of 70 years or older, and having five or more tumors were prognostic factors of OS. HVEM status was inversely correlated with tumor-infiltrating CD8+ and CD45RO+ lymphocytes in both HCC and CRLM.

**Conclusions:** Tumour-expressing HVEM might play a critical role in human HCC and CRLM, possibly through regulating immune evasion. Therefore, targeting HVEM may be a novel promising therapeutic strategy for HCC and CRLM.

#### PL05-19

### HYDATIDOSIS AND DUODENUM: A SYSTEMATIC REVIEW OF THE LITERATURE

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**Introduction:** The duodenum is exceptionally affected by hydatid cyst, either primarily or secondarily (compression or fistulization from hydatid cyst located in neighboring organs). Our aim is to perform a systematic review on fistulization of hydatid cysts to the duodenum.

**Methods:** Following PRISMA guidelines, an unlimited search on duodenal affected hydatid cyst was performed in PubMed, SCielo and EMBASE databases with no limits.

**Results:** Fourteen papers were found, all case reports, which recorded seven men and seven women, with a mean age of 53.14 years. Three patients had recurrent hydatid cyst.

The most frequent clinical manifestations were abdominal pain, and nausea and/or vomiting. In almost all cases several imaging studies were performed, but abdominal CT scan was the most used (10/14) (71%).

Twelve patients had a fistula between the hydatid cyst and the duodenum, one patient had incidental paraduodenal hydatid cyst and another had severe duodenal compression from liver hydatid cyst without a fistula.

Surgical treatment was performed in 12 patients; different surgical techniques were recorded in the different cases (9 conservative surgery versus 3 total cystectomy).

Post-operative morbimortality is scarcely described and only one dead and 3 uneventful postoperative were reported.

The follow-up period and recurrences could not be determined.

**Conclusions:** The most common symptoms were abdominal pain, nausea and vomiting; CT scan was the most used imaging technique; and hydatid cyst drainage and fistula closure was the most appropriate treatment.

All diagnostic and therapeutic options for hydatid cyst that fistulize the duodenum have a low level of evidence.

#### PL05-22

### A CASE OF HEPATIC ANGIOMYOLIPOMA TREATED WITH LAPAROSCOPIC PARTIAL HEPATECTOMY

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We report a case of hepatic angiomyolipoma (HAML) treated with laparoscopic partial hepatectomy. A 28-year-old man was referred to our hospital for further examination of a hepatic mass. History: tuberous sclerosis, epilepsy, developmental

disorders, renal angiomyolipoma. Abdominal ultrasonography revealed a 68 × 55 × 65 mm highly echogenic tumor in the segment 2 of the liver. Abdominal CT with contrast enhancement revealed a high density mass in the same segment. Core needle biopsy was performed, and the tumor was diagnosed as HAML since immunohistochemical stainings was positive for both human melanoma black-45 and  $\alpha$ -smooth muscle actin. The Ki-67 index was high, but there was no malignant findings. Abdominal CT revealed that the tumor grew to 75 mm over a 7-month observation period. We decided that an operation was necessary, given the possible danger of rupture or malignant transformation. Laparoscopic partial hepatectomy (S2) was performed. The post-operative period was uneventful, and the patient was discharged after 12 days. Histopathological study showed that the tumor had fatty tissue, spindle-shaped cells and the growth of vessels. Pathology confirmed HAML as the diagnosis. Although follow-up criteria and indications for surgery for HAML are being proposed, there is no established opinion on the surgical procedure. If HAML is diagnosed, minimally invasive laparoscopic partial hepatectomy is effective. HAML was positioned as a benign tumor, but metastasis and recurrence have been reported in some cases, and strict follow-up is necessary as a malignant potentially tumor.

PL05-24

### LAPAROSCOPIC RADICAL SURGERY FOR HYDATID LIVER CYSTS. PSM BASED ANALYSIS OF OUTCOMES IN COMPARISON WITH CONSERVATIVE LAPAROSCOPIC CYSTECTOMY

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**Introduction:** Laparoscopic approach became a common practice for surgery of hydatid liver cysts in many centers worldwide. Immediate outcomes have been shown to be better after laparoscopic procedures in comparison with open surgery. Radical treatment is rarely performed by laparoscopic approach, although it has been suggested that total and subtotal pericystectomy (PE) can contribute to even greater improvement in results compared to conservative cystectomy with partial PE. We aimed to compare immediate and long-term outcomes of laparoscopic conservative treatment and radical surgery.

**Methods:** Two centers were involved in the study. Radical surgery was performed in specialized HPB center expertized in laparoscopic surgery (group 1) while cystectomy without PE or with partial PE were implemented in the center of surgery located in hyperendemic area (group 2). Logistic regression was used for 1:1 propensity score matching (PSM). **Results:** The total number of laparoscopic procedures was 96 (40 in group 1 and 56 in group 2). Patients were matched for age, gender, ASA score, type of hydatid cyst (WHO classification), rate of jaundice at presentation, cysto-biliary fistula and recurrent cysts. Finally, 21 pairs were matched. Demographic data and outcomes presented in the table. The duration of radical procedures was significantly longer. The outcomes were significantly better after radical surgery.

**Conclusion:** Radical laparoscopic surgery when performed in high-volume HPB centers can improve treatment outcomes in selective patients with hydatid liver cysts. Due to the high rate of relapse conservative laparoscopic cystectomy is not justified in non-HPB centers.

#### [Perioperative data in groups]

Factors	Group 1 (n=40) before matching	Group 2 (n=56) before matching	P	Group 1 (n=21) after matching	Group 2 (n=21) after matching	P
Recurrent cyst, n (%)	0	19 (16)	0,007	0	0	1,00
Postero-superior segments, n (%)	24 (60)	19 (34)	0,011	14 (67)	5 (24)	0,005
Obstructive jaundice, n (%)	4 (10)	8 (14)	0,531	2 (10)	1 (5)	0,549
Cysto-biliary fistula, n (%)	13 (32)	9 (16)	0,059	4 (19)	2 (10)	0,377
Time of operation, min	340 (125-660)	95 (67-210)	<0,001	330 (125-600)	95 (67-210)	<0,001
Time of abdomen draining, day	9 (2-90)	16 (17-24)	<0,001	7 (3-37)	16 (11-24)	<0,001
Severe morbidity, n (%)	3 (8)	29 (52)	<0,001	2 (10)	12 (57)	0,001
Hospital stay, day	10 (3-90)	18 (11-25)	<0,001	8 (4-23)	18 (11-21)	<0,001
Relapse, n (%)	1 (3)	18 (32)	<0,001	0	10 (47)	<0,001

PL05-25

### VARIATION IN INPATIENT OPIOID CONSUMPTION FOLLOWING HEPATOPANCREATIC SURGERY

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**Introduction:** The variation in inpatient opioid consumption among patients undergoing Hepatopancreatic surgery are unknown. We sought to examine the variability in inpatient opioid consumption following Hepatopancreatic surgery.

**Methods:** All Hepatopancreatic cases performed at a single tertiary-care institution between 2015 and 2018 were identified. Only adults, who were prescribed an opioid during inpatient surgical admission and at time of discharge were included in the final cohort. High inpatient opioid consumption was defined as greater than the 75<sup>th</sup> percentile of average daily oral morphine equivalent (OME) intake.

**Results:** Overall 891 patients were identified. The majority underwent a pancreatectomy (n=488, 54.8%) whereas a minority underwent a hepatectomy (n=403, 45.2%). Overall, median age was 63 (IQR: 55-71) and median comorbidity burden was 7 (IQR 5-8). Overall, the average daily morphine equivalent was 53 (IQR 25-105). Patients with high inpatient opioid consumption were more likely to be younger (57, IQR 50-66 vs 65, IQR 57-72, p< 0.05) whereas the comorbidity burden (6 IQR 5-8 vs 7 IQR 5-8) and sex (male: 54.2% vs 50.9%) was similar among patients with and without high opioid consumption (p>0.05). Individuals with high inpatient opioid consumption were 1.69 as likely to be readmitted (n=90, 40.0% vs n=157, 23.6%). On multivariable analysis, after adjusting for age, sex, length of operation, comorbidity burden and type of operation, individuals with high inpatient opioid consumption had more than twice the odds of readmission within 30-days (OR: 2.17, 95%CI 1.55-3.05).

**Discussion:** High inpatient opioid consumption was associated with adverse post-discharge outcomes like readmission.

PL05-28

### TUMOR-TRIGGERED MICRORNA COCKTAIL THERAPY FOR HEPATOCELLULAR CARCINOMA

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**Introduction:** As one of the most malignant primary cancer worldwide, hepatocellular carcinoma (HCC) still lacks an efficient therapeutic strategy to date. We aim to develop a tumor-triggered therapy specific for HCC.

**Method:** We synthesized a pH-responsive nanoparticle PEI-βCD@Ad-CDM-PEG (PCACP) featuring PEGylation detachment and size transformation at tumor site, which was self-assembled from PEI-crosslinked cyclodextrins and functional adamantyl moieties. After evaluating PCACP pH-responsiveness, release profile, cellular uptake, and the subsequent co-delivery of miR-199a/b-3p mimics and antisense-miR-10b to Huh7 cells in culture as well as xenografts derived from cell-lines and patient's tumor (PDX models).

**Results:** We demonstrated that PCACP showed satisfied corona detachment and controlled release responding to acidic tumor environment, facilitated intracellular miRNA transfection with high specificity and efficiency, significantly inhibited HCC proliferation, migration and invasion both in vitro and in vivo. Meanwhile, cocktail therapy of miR-199a/b-3p and anti-miR-10b substantially improved tumor suppression to a greater extent than monotherapy.

**Conclusions:** Multitarget adjustment of endogenous miRNAs according to personalized miRNA deregulation based on our targeting delivery system, PCACP, could be a potential therapeutic strategy for future adjuvant therapy of HCC treatment clinically.

PL05-29

### MANIPULATION OF INTESTINAL MICROBIOME COMPOSITION AFFECTS LIVER REGENERATION AFTER 70% HEPATECTOMY IN A MURINE MODEL

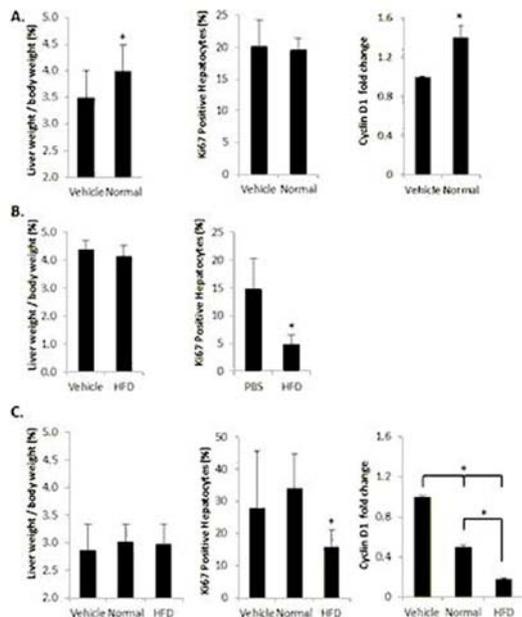
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**Background:** Previous studies demonstrated the effects of Intestinal microbiota composition on physiologic and pathologic processes in the liver. Our aim was to study the effect of the intestinal microbiota composition on the process of liver regeneration (LR) using a model of fecal microbiota transplantation (FMT) prior to partial hepatectomy (PH).

**Methods:** We used the 70% PH model in mice to induce LR. LR was assessed using liver to mouse weight ratio, KI67 staining, and RT-PCR for Cyclin D1. Intestinal microbiome was manipulated by aggressive antibiotic treatment followed by FMT. Normal, as well as obese mice received FMT by gavage from normal and obese mice, as well as vehicle saline.

**Results:** LR was not affected by the antibiotic treatment. FMT from healthy normal mice, compared to vehicle resulted in improved LR (Fig. 1 A), and that FMT from obese mice was associated with decreased LR and increased postoperative mortality (45% vs. 8%). Obese mice receiving FMT from obese mice had decreased LR (Fig. 1 B).

**Conclusions:** LR is affected by microbiome composition, and can be manipulated by FMT. Whereas microbiota transfer from healthy donor mice enhances LR, microbiota transfer of dysbiotic microbiota from HFD donor mice impairs LR, following PH.



Mice (C57bl6) were pre-surgically (PH) treated for 2 weeks with Atb-containing water followed by microbiome transplantation by oral gavage. Five days after treatment mice were operated. FMT was administrating in **(A and B) normal** recipients mice and **(C) obese** recipients mice. The percentage of the remaining liver to body weight ratio was evaluated at day four after surgery (left), quantification of Ki-67 positive nuclei of hepatocytes after PH (middle) and qRT-PCR showed relative messenger RNA expression in liver - Cyclin D1 fold-change levels compared to vehicle (right). \*p < 0.05

#### PL05-30

### MAJOR HEPATECTOMY IN A CHILD WITH EXTREMELY LOW FUTURE LIVER REMNANT WITHOUT POSTHEPATECTOMY LIVER FAILURE

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**Introduction:** The threshold value of future liver remnant volume (FLR-V)-25% for healthy liver is a standard in adults liver surgery. This method was translated in pediatric population without correlation to age, weight and liver function in children. Assessment of future liver remnant function (FLR-F) by means of hepatobiliary scintigraphy (HBS) is supposed to be more precise tool in children undergoing extended liver resection. An experience of major hepatectomy (MH), accomplished despite the extremely low FLR-V in a 27mo boy with advanced hepatoblastoma (HB) is discussed below.

**Method:** Since June 2017 in our Center investigation of both: FLR-V (CT-volumetry) and FLR-F by means of <sup>99m</sup>Tc-Mebrofenin HBS before liver resections became a standard practice. The cut-off value of FLR-F is 2.7%/min/m<sup>2</sup>. The decision about MH was made on the basis of received values.

**Results:** According to preoperative CT-volumetry, in patient with HB involving segments 4,7,8,1 (POSTTEXT III) the FLR-V in S2,3 came to 16.5%. <sup>99m</sup>Tc-Mebrofenin HBS showed the FLR-F 3.95%/min/m<sup>2</sup>. Taking into consideration the sufficient FLR-F, the extended right hepatectomy and caudate lobectomy was implemented instead of two-staged hepatectomy (TSH). The postoperative course was uneventful with no signs of posthepatectomy liver failure (PHLF). Patient was discharged on POD 12 and started adjuvant chemotherapy on time. The repeat FLR-F investigation on POD 30 came to 15.8%/min/m<sup>2</sup>.

**Conclusion:** The presented case depicts that FLR-F is more precise than FLR-V in prediction of PHLF. <sup>99m</sup>Tc-Mebrofenin HBS is a sensitive method in selection of pediatric patients for safe MH instead of TSH or liver transplantation.

#### PL05-32

### STUDY OF THE DYNAMICS OF MORPHOLOGICAL CHANGES IN LIVER TISSUE DURING IRREVERSIBLE ELECTROPORATION WITH INCREASING ELECTRIC FIELD INTENSITY

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**Introduction:** The purpose of this study is to evaluate morphological changes in liver tissue under the influence of increasing electric field intensity.

**Methods:** Studies were performed on 70 white outbred male rats. 4 needles were inserted into the liver segment at a distance of 1 cm, to a depth of 5 mm. The electroporation procedure was carried out. Animals were withdrawn from the experiment on the 1st; 3rd; 7th; 14th day. A sequential increase in the electric field was carried out from 400 to 1000 V / cm.

**Results:** As the voltage of the electric field increased, the necrotic changes increased respectively. Extensive ablation zone with pronounced signs of coagulation necrosis of hepatocytes, erythrocyte hemolysis in destroyed sinusoids, moderately pronounced uneven diffuse and focal lymphocytic leukocyte infiltration. The area of necrotic changes increases with increasing of the electric field strength. The prevalence of necrotic changes over apoptotic changes is noted in case of voltage of 1000 V/sm.

**Conclusion:** Tissue damage by IRE is a dynamic process with significant differences in morphological manifestation in increasing electric field intensity. In the studied samples, the presence of tissue that underwent both necrosis and signs of apoptotic changes was noted. A further increase in tension leads to the predominance of necrotic changes over apoptotic and seems inappropriate. Based on the morphological assessment, an exposure regimen with 900 V/sm is determined that is sufficient to ensure the devitalization of

the tissue segment at the same time while preserving the vascular structures by non-thermal electrocoagulation.

#### PL05-34

### LIPIDOMIC SIGNATURES OF POST-HEPATECTOMY LIVER FAILURE USING PORCINE HEPATECTOMY MODELS

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**Introduction:** Clinical diagnosis of post-hepatectomy liver failure (PHLF) can only be made on or after 5th post-operative day. Biomarker for early diagnosis is considered as a critical unmet need.

**Method:** Pigs underwent sham operation (n=6), 70% (n=7) and 90% (n=7) partial hepatectomy (PH). A comprehensive lipidomic analysis was conducted using sera collected at pre-operation (PO), 14 h, 30 h, and 48 h after PH using nanoflow ultrahigh performance liquid chromatography-electrospray ionization-tandem mass spectrometry.

**Results:** Of the 184 quantified lipids, 14 lipids showed significant differences between the two resection groups starting at 30 h after surgery. Four phosphatidylcholine (PC) plasmalogen species (p-16:0/16:0, p-18:0/18:2, p-18:0/20:4, and p-18:0/22:6) and PC 32:2 significantly increased in the 90% PH group while these returned to PO level after 30 h in the 70% PH group, presumably implying the failure markers. However, eight triacylglycerol (TG) species (40:0, 42:1, 42:0, 44:1, 44:2, 46:1, 46:2, and 48:3) and sphingomyelin d18:1/20:0 showed an opposite trend, wherein they significantly decreased in the 90% PH group while these in the 70% PH group were abruptly increased until 30 h but returned to near PO levels at 48 h, implying the recovery markers. Same trends were also observed in PC plasmalogen and TG classes in addition to selected individual lipid species.

**Conclusions:** Characteristic lipidomic signatures of PHLF could be identified using large animal models. These candidates have potentials to serve as a tool for early diagnosis and may open new path to the study to overcome PHLF.

#### PL05-35

### AUSTRALIA'S FIRST CASE SERIES OF ICG DIRECTED LIVER RESECTION

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**Introduction:** Indocyanine Green (ICG) can be used in assessing liver function and more recently has been employed in liver surgery. ICG uptake by tumours allows intraoperative visualisation with an infrared camera (Stryker SPY-PHI) and may assist in achieving clear

resection margins, especially in laparoscopic surgery. Although ICG directed liver surgery was pioneered in Japan in 2009 and later reported in North America and Europe; to our knowledge there have been no reported cases in Australia. Here we report the first three cases in Australia.

**Method:** Three patients were prospectively consented prior to liver surgery. Each had a different pathology (NET, HCC, and CRCLM). ICG was administered and a Stryker SPY-PHI camera was used intraoperatively to identify tumour extent and guide resection.

**Results:** The histological resection margins were clear (>10mm) for all three cases. There were no drug allergy events. The equipment was easy to setup and use by the surgical staff. Two of the cases were performed open and one case (HCC) laparoscopically. All three patients made an uneventful postoperative recovery.

**Conclusions:** ICG directed liver resection can assist in achieving clear resection margins. Here we report the first successful cases of its use in Australia. It has a very low risk profile and can add to the armamentarium of the liver surgeon to assist with achieving clear margins and possibly increase rates of parenchymal preserving surgery.

#### PL05-36

### A CASE OF PENETRATING HEPATIC TRAUMA CAUSED BY SECONDARY BLAST INJURY

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**Introduction:** The damages of the explosion are classified as four-phases and secondary damage is penetrating trauma by flying objects. Here, we illustrate a rare case of penetrating hepatic trauma caused by secondary blast injury.

**Case:** The patient was a 58-year-old man. When he was walking in the park, an explosion occurred behind him. Although his consciousness was clear and vital signs were almost normal, he had an about 2cm wound on right 6<sup>th</sup> intercostal space and bleeding.

Imaging showed a right hemopneumothorax, a fracture of the 7<sup>th</sup> rib, a circular foreign body near the right diaphragm, free air and hemorrhage due to liver injury.

Hepatic hemorrhage was stopped by IVR. However, we decided to perform laparotomy. This is because we had to confirm intestinal damage and remove the foreign body which was doubt to cause the the chemical substance.

We performed laparotomy with J-incision and thoracotomy at the 7<sup>th</sup> intercostal space. We found the foreign body in the thoracic cavity. It suggested that the foreign body passed and damaged from ribs, lungs, diaphragm, liver, diaphragm and lungs, sequentially. The foreign body was 3cm metallic washer. With regarding to the two hepatic injuries, collagen hemostat was placed into liver damaged area and Felt was put on the sutured line by using 2 PDS. There was a bile leak after surgery, which gradually settled down with endoscopic treatment, and he was discharged 43 days after the operation.

**Conclusion:** In blast injury, accurate diagnosis and the timing of operation were important.

PL05-37

### INTER-SURGEON VARIABILITY IS ASSOCIATED WITH LIKELIHOOD TO UNDERGO MINIMALLY INVASIVE HEPATECTOMY AND POST-OPERATIVE MORTALITY

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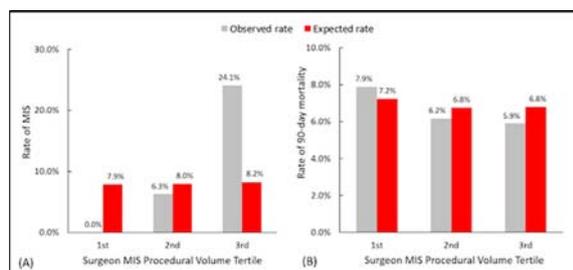
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**Introduction:** While minimally invasive surgery (MIS) has become increasingly adopted for liver resection, factors associated with receipt of MIS have not been well-defined. We sought to characterize inter-surgeon variability in operative approach (MIS vs. open) as well as the impact of seeing a specific provider on the likelihood of undergoing MIS liver resection.

**Methods:** Medicare Standard Analytic Files were used to identify patients who underwent hepatectomy between 2013-2017. Surgeon-specific operative variation (number of MIS/total hepatectomies) was stratified into tertiles. Multilevel, multivariable logistic regression was used to determine the association of surgeon specific variation in operative approach on the likelihood of MIS using median odds ratios (MOR).

**Results:** Overall 5,135 (92.0%) patients underwent open liver resection, while 446 (8.0%) patients had MIS. Surgeons in the lowest MIS tertile performed 0% of cases using a MIS technique; in contrast, surgeons in the highest tertile used an MIS approach in nearly one-fourth (24.1%) of all hepatic resections (Figure 1a). While females (OR=1.23, 95% CI: 1.00-1.51) were more likely to undergo MIS, patients with a higher Charlson comorbidity score were less likely (>5 OR=0.60, 95% CI: 0.44-0.81). On multivariable analysis, after controlling for patient and procedure characteristics, there was over a two-fold variation in the odds that a patient underwent MIS versus open hepatectomy based on the individual surgeon provider (MOR=2.79, 95% CI: 2.42-3.16). Patients who had a hepatectomy performed by a low-volume MIS surgeon had 29% higher odds of death within 90-days (OR=1.29, 95% CI: 1.00-1.65) (Figure 1b).

**Conclusion:** The likelihood of undergoing MIS liver resection and post-operative mortality were heavily influenced by the individual surgeon provider rather than patient or procedure factors.



PL05-38

### PREDICTION OF LIVER HISTOLOGY USING SKIN AUTOFLUORESCENCE MEASUREMENT IN PATIENTS UNDERGOING LIVER RESECTION

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**Introduction:** Skin autofluorescence (sAF) is an indirect measure of advanced glycation end-products (AGEs), which are associated with liver injury. The study aimed to assess the utility of sAF in preoperative prediction of non-tumoral liver status in patients undergoing liver resection.

**Methods:** This prospective study comprised 120 patients undergoing liver resection in the Department of General, Transplant and Liver Surgery of the Medical University of Warsaw between September 2018 and November 2019. Liver fibrosis and steatosis was the primary and secondary end-point, respectively. Patients with cirrhosis were excluded from the study. sAF was assessed preoperatively in all patients using a device based on photodiodes (measurements were expressed in arbitrary units [AU]).

**Results:** Liver fibrosis was found in 28.3% (34 of 120) and steatosis >10% in 29.2% (35 of 120) patients. There were no differences in sAF between obese or overweight patients and those with BMI < 25 (p=0.276). sAF ≥ 2.4 AU was an independent predictor of liver fibrosis (odds ratio [OR] 2.94; 95% confidence interval [95% CI] 1.288 - 6.731; p=0.011) with positive (PPV) and negative (NPV) predictive values of 40.0% and 81.5%, respectively. The median sAF was higher in patients with liver steatosis >10% (p=0.024). The optimal cut-off for sAF in prediction of steatosis >10% was ≥ 2.5 AU (area under the curve 0.631, 95% CI 0.520-0.742; p=0.021), with PPV and NPV of 42.9.2% and 80.3%, respectively.

**Conclusion:** Skin autofluorescence as non-invasive and clinically applicable test can potentially be used to initially predict the presence of hepatic fibrosis and steatosis in patients scheduled for liver resection.

PL05-41

### COMPARISON OF IMMEDIATE AND LONG-TERM OUTCOMES AFTER LAPAROSCOPIC AND OPEN RADICAL SURGERY FOR HYDATID LIVER CYSTS

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**Introduction:** According to latest meta-analyses, radical surgery of liver hydatid cysts provides better immediate and long-term outcomes in comparison with conservative

cystectomy. Laparoscopic approach also contributes to improvement of treatment outcomes. Nevertheless, there are limited number of studies analyzed outcomes of laparoscopic radical surgery. We aimed to compare immediate and long-term outcomes of laparoscopic and open radical cystectomy for hydatid liver cysts.

**Methods:** Two centers were involved in the study. Laparoscopic radical surgery was performed in specialized HPB center expertized in laparoscopic surgery (group 1) while open radical procedures were implemented in the center of surgery located in hyperendemic area (group 2).

**Results:** The total number of patients was 77 (40 in group 1 and 37 in group 2). Demographic data and outcomes presented in the table. The duration of laparoscopic procedures was significantly longer. Open cystectomy significantly more often was performed in patients with obstructive jaundice, recurrent disease and with large number of cysts (>2). Immediate outcomes (rate of severe morbidity, wound infection, duration of abdominal drainage, hospital stay) were significantly better after laparoscopic radical cystectomy. No differences were found in relapse after radical surgery between groups.

**Conclusion:** Radical laparoscopic surgery improves treatment outcomes in selective patients with hydatid liver cysts in comparison with open radical cystectomy. Laparoscopic approach for radical cystectomy is justified in high-volume HPB centers specialized in minimally invasive liver resection. Further accumulation of experience is needed to overcome the heterogeneity of compared groups.

#### Perioperative data in groups

Factors	Group 1 (n=40)	Group 2 (n=37)	P
Recurrent cyst, n (%)	0	5 (12)	0,016
Number of cysts >2, n (%)	4 (10)	17 (46)	<0,001
Obstructive jaundice, n (%)	18 (49)	4 (10)	<0,001
Time of operation, min	340 (125-660)	87 (67-119)	<0,001
Time of abdomen draining, day	8 (2-90)	17 (9-24)	<0,001
Wound infection, n (%)	0	12 (32)	<0,001
Severe morbidity, n (%)	3 (8)	20 (54)	<0,001
Hospital stay, day	10 (3-90)	19 (13-25)	<0,001
Relapse of disease, n (%)	1 (3)	4 (11)	0,139

#### PL05-42

### SURGICAL PORTOSYSTEMIC SHUNTS - STILL AN IMPORTANT TOOL IN THE CURRENT MANAGEMENT OF PORTAL HYPERTENSION

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**Background:** Historically, surgical portosystemic shunts (PSS) were lifesaving procedures for variceal bleeding and

ascites management in patients with portal hypertension (PHT), but currently are rarely utilized with the advent of Interventional Radiology (IR) decompressive procedures. We present two recent cases of patients managed with surgical PSS.

**Methods:** Two patients on the liver transplant waiting list with nodular regenerative hyperplasia (NRH) induced PHT who suffered from life threatening variceal bleeding were identified. Their clinical course, surgical intervention, pathology and recovery were reviewed.

**Results:** Patient 1 is a 41yo male who presented with life threatening variceal bleeding and underwent unsuccessful IR TIPS placement, Sengstaken Blakemore (SB) tube placement who then required a life-saving surgical central spleno-renal shunt for decompression. Post-operatively he required IR shunt stent placement due to shunt stenosis from compression by the SB tube. 5.5 years post procedures his varices have resolved, he has had no additional complications and is thriving. Patient 2 is a 59yo female with refractory variceal bleeding not amenable endoscopic therapy and anatomy precluded IR decompression. She underwent a surgical central spleno-renal shunt with unremarkable post-operative course and at 1 year has resolution of her varices. Both patients had pathologic features of NRH and were subsequently removed from the transplant waiting list.

**Conclusions:** While IR techniques to manage sequelae of cirrhosis and PHT have become standard practice, surgical PSS remain an important tool in the management of refractory variceal bleeding and can provide durable results that obviate the need for liver transplantation in select cases.

#### PL05-43

### 3D PRINTED MODELS FOR PLANNING AND INTRAOPERATIVE ASSISTANCE IN COMPLEX HEPATIC SURGERIES

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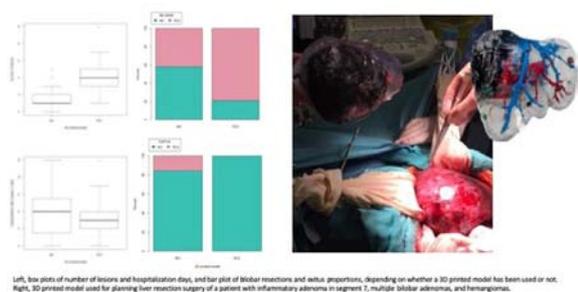
We evaluate the usefulness of 3D-printed models generated from registered CT and MRI images in order to plan liver resection surgery and to locate lesions during surgery.

The segmentation of anatomical structures and lesions is performed, and a different 3D-model is generated for each part to be printed. In this stage, hepatic parenchyma molds are designed. Finally, anatomical structures, lesions and molds are 3D-printed, and molds are filled with transparent resin.

Our prospective case and control series included 19 cases in which surgery was planned by using a 3D printed model and another 19 cases whose planning was carried out without a 3D printed model. The cases in which a 3D liver model was used showed more complex surgeries than in the control cases. The number of lesions were statistically higher, and there was a statistically significant greater

predisposition to request a printed model when there was vascular involvement or a bilobar resection was going to be performed (Figure). Despite this greater complexity, the use of 3D printed models allowed to reduce average surgery and hospitalization days, and to decrease mortality to zero (Figure).

In our experience, 3D printing is a useful tool for the preoperative planning of complex hepatic resections, leading to a safer surgery. During the intervention, the 3D printed model makes the identification and location of all lesions easier for the surgeon, reducing intraoperative complications. Given its increasingly common use and the results obtained, 3D printing is changing the way surgeons plan liver resection surgeries.



#### PL05-45

### FACTORS RELATED TO PROLONGED HOSPITAL STAY IN PATIENTS WITH PYOGENIC LIVER ABSCESES

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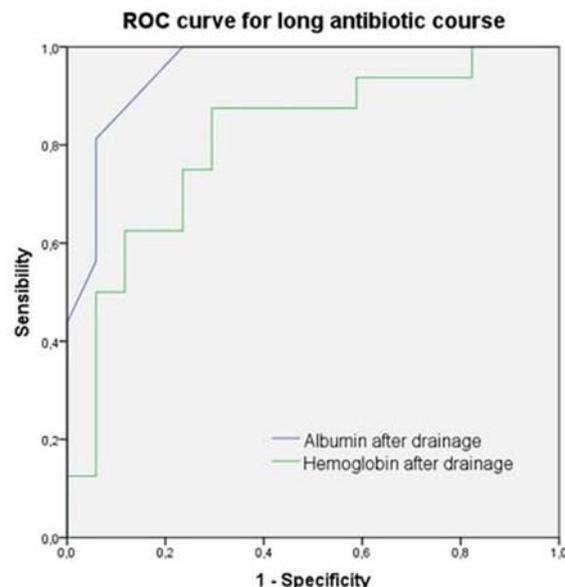
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**Background:** Pyogenic liver abscesses (PLA) are an uncommon source of intra-abdominal infection which is usually associated with prolonged length of hospital stay (LHS). We aimed to identify factors that could be associated with a prolonged LHS in patients with PLA.

**Methods:** All patients admitted to our institution with the diagnosis of PLA between 2013 and 2018 were retrospectively reviewed. Predictors that could influence treatment results and LHS were analyzed.

**Results:** A total of 72 patients were included in the study. The most common presenting symptoms were abdominal pain (71%) and fever (63%). C-reactive protein (CRP) and neutrophil to lymphocyte ratio (NLR) on admission were generally elevated, being >100 mg/L and >5 in 93% and 95,8% of the patients respectively. Most patients (83%) underwent abscess drainage. Median length of hospital stay was 17 days (range 2-89). A total of 9 patients (12,5%) needed more than one drainage procedure. *In hospital* mortality rate was 4,2%. LHS was independently associated with time until abscess drainage ( $p=0,005$ ), length of antibiotic therapy ( $p=0,012$ ) and the need for a second drainage procedure ( $p=0,001$ ). Low hemoglobin levels on admission ( $p=0,01$ ), before drainage ( $p=0,033$ ) and after drainage ( $p=0,014$ ), as well as low albumin levels after drainage ( $p < 0,001$ ) were associated with longer inpatient antibiotic courses and LHS.

**Conclusions:** Early diagnosis is essential in PLA management as effective and timely drainage may lead to shorter hospital stays. Early identification of patients at risk for delayed/inadequate treatment response may be of utility for the future development of treatment guidelines.



Decreased albumin and hemoglobin values after drainage and length of inpatient antibiotic course

#### PL05-46

### GENERALIZED HYDATOSIS OF THE LIVER - WHEN ALMOST ALL SEGMENTS ARE AFFECTED - A CASE REPORT

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**Introduction:** Although we live in the 21<sup>st</sup> century, hydatidosis is still a common disease Eastern Europe, especially in families with precarious economic and health status.

**Methods:** We present a rare case of a voluminous hepatic hydatid cyst disseminated in both hepatic lobes with peritoneal hydatosis. After the anti-parasitic oral treatment, we performed a laparotomy with the excision of the cysts from segments 7-8, 4A and 4B, 5 and 2, partial omentectomy and cholecystectomy. The patient developed a large volume biliary fistula and although we performed an ERCP procedure with papillosfinterotomy and stenting with a significant decrease of the flow, the hospitalization period was still very long (8 weeks).

**Results:** Patient never came for postoperative follow-up control and presented herself 5 months later, with a segment 7-8 hepatic abscess, that needed reoperation. Paradoxically, no biliary leak was developed after the second procedure, with smooth postoperative evolution.

**Conclusion:** Managing such an advanced disease is challenging for the surgeon, not only technically, but also strategically, with a lot of costs for the hospital and treatments for all the postoperative complications. Difficult

patients from rural areas are sometime difficult to manage, with fluctuant follow-up and an increase risk of complications.

#### PL05-47

### **SURGERY FOR HEPATIC CYSTS: ROBOTIC IS EQUIVALENT TO LAPAROSCOPY**

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**Introduction:** Minimally invasive approaches are increasingly utilized for surgical treatment of nonmalignant hepatic cyst disease. We evaluated the characteristics and surgical outcomes for patients with nonmalignant hepatic cysts treated at our institution.

**Methods:** Patients undergoing surgical treatment of nonmalignant hepatic cysts at our institution between January 2008 and July 2019 were identified. Demographic data, preoperative symptoms, cyst characteristics, surgical details, and postoperative outcomes were determined retrospectively. Patients undergoing open surgery were infrequent (n=6), and excluded from analysis. Patients undergoing laparoscopic and robotic surgery were compared.

**Results:** 114 patients were treated with minimally invasive surgery (MIS), with 23 (20.2%) undergoing robotic and 91 (79.8%) laparoscopic surgery. Age and sex were similar between groups (p>0.05). Rate of polycystic kidney disease (21.7% vs 3.3%; p=0.0002) and ASA class 3 (65.2% vs 41.8%; p=0.044) were higher in the robotic group. Cyst size was similar between groups (p=.485). The robotic cohort had higher rate of preoperative symptoms (100% vs 83.5%; p=0.037) with abdominal pain the predominant symptom (100% vs 80.2%; p=0.020). EBL was similar (p=0.124) while robotic had higher operative time (156 min vs 112 min; p< 0.001). Rate of simultaneous hepatectomy was higher in the robotic group, but not statistically significant (34.8% vs 17.6%; p=0.071). Postoperative outcomes (LOS, complications, and recurrence requiring reoperation) were similar between groups (p>0.05).

**Conclusions:** For surgical treatment of non-malignant hepatic cystic disease, robotic surgery has similar outcomes compared to laparoscopy. Robotic surgery is an effective treatment for large hepatic cysts and polycystic liver disease, especially if hepatectomy is required.

#### PL05-48

### **EFFECT OF HEPATIC CYST SIZE ON POSTOPERATIVE OUTCOMES: SIZE IS IRRELEVANT**

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**Introduction:** Simple hepatic cysts may present with a wide range of sizes and symptomatology. Previous studies have used various cut-offs to define a “giant” hepatic cyst

but there are few studies of the clinical implications of hepatic cyst size.

**Methods:** Patients undergoing surgical treatment of simple hepatic cysts between January 2008 and July 2019 were identified retrospectively. Demographics, preoperative symptoms, cyst characteristics, surgical details and outcomes were collected. Cyst size was defined as greatest measured diameter of the largest cyst on axial imaging. Correlations between variables was performed with linear or logistic regression.

**Results:** 120 patients were identified for analysis. Average cyst size was 12.0±5.5 cm, 85.8% of patients were symptomatic, and pain (83.3%) was the predominant symptom. 114 (95%) patients were treated with minimally invasive surgery, mean EBL was 193±413mL, mean operative time was 123±59min, open conversion rate was 1.8%, and rate of simultaneous hepatectomy was 23.3%. Rate of reoperation for recurrence was 4.2%. Size was weakly correlated with operative time (R<sup>2</sup>=0.0683; p=0.0056) but not with EBL, simultaneous hepatectomy, LOS, complications, Clavien-Dindo complication grade, or reoperation for recurrence (all p>0.05). Using size cutoff of 10th, 25th, 50th, 75th, and 90th percentile did not demonstrate correlation with operative time, EBL, hepatectomy, LOS, complications, or Clavien-Dindo complication grade (all p>0.05).

**Conclusions:** Despite weak correlation between cyst size and operative time, there is no correlation with clinically relevant patient outcomes. For patients with simple hepatic cysts, cyst size does not predict patient outcomes. Traditional definitions of “giant” simple hepatic cysts appear irrelevant.

#### PL05-50

### **IMPORTANCE OF PLATELET - ENDOTHELIAL CELL INTERACTION DURING POSTOPERATIVE LIVER REGENERATION**

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**Introduction:** Interleukin-6 (IL-6) is a well-known regulator of liver regeneration, specifically during the early period. Within this project, we wanted to identify the time course of IL-6 production within the human liver during the early phase of liver regeneration as a result of the potential interaction of platelets and liver sinusoidal endothelial cells (LSECs).

**Method:** Electron microscopy was used to determine the behavior of platelets in the liver sinusoids shortly after induction of liver regeneration. IL-6 mRNA was analyzed in liver tissue at the same time point. Further, IL-6 serum levels were evaluated preoperatively.

**Results:** Platelets were shown to adhere to LSECs and even translocated in the space of Disse early after induction of liver regeneration. Circulating IL-6 levels significantly increased after liver resection. Within liver tissue we observed a significant induction of IL-6 expression (mean: 13 fold). Intriguingly, patients developing postoperative

liver dysfunction (LD) displayed a significantly higher induction of IL-6 (LD: 25 fold, no LD 9.3 fold,  $P=0.001$ ) already two hours after induction of liver regeneration. Ultimately, IL-6 induction by platelets could also be observed in co-culture experiments with LSECs.

**Conclusion:** Platelets adhere to LSECs early after induction of liver regeneration in humans and might be the central trigger for induction of IL-6 expression. This initial burst of IL-6 might be crucial for induction of liver regeneration. Nevertheless, an overshooting IL-6 production seems not to be beneficial for patients undergoing liver resection.

PL05-53

### USE OF BNP IN MANAGEMENT ALGORITHM OF CONGENITAL AND INFANTILE HEPATIC HEMANGIOMA

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**Background:** Pediatric Hepatic hemangiomas mostly responsive to propranolol treatment and USS are done to follow up the trend of its involution. In this study a correlation is found between the decreasing levels of BNP with the decreasing size of hepatic hemangiomas.

**Methods:** Clinical notes of 63 patients in last 20 years was analyzed retrospectively. Among them 13 patients with hepatic hemangioma had pre and post treatment BNP level measured. BNP level was determined using immunoassay and the size of the lesion was assessed by USS.

**Results:** All the patients were diagnosed in post-natal period presented with shortness of breath (69.35%), feeding difficulty (76.9%), jaundice (23%), heart failure (30%) and abdominal distension (23%). Nine patients had multiple hepatic hemangiomas and four patients had hemangiomas involved in other organs. The pre-treatment BNP level is 2762.2 pg/ml (range: 291-38784) and the post treatment BNP level is 83 pg/ml (range: 21-148) ( $P<0.01$ ). The size of lesion (largest lesion in multiple hemangiomas) was 6.7x5.7x3.9 cm (Range 2.3x2.2x1.5-12.6x13.4x13.4) which decreased in size in response to treatments (e.g. propranolol, vincristine and embolization of feeding vessels) 0.97x0.58x0.44 cm (range no visible lesion to 1.2x1.1x0.88) ( $P<0.01$ ). The serum BNP level shows positive correlation with the size of the lesion in hepatic hemangiomas ( $r=0.529$ ,  $P<0.01$ ).

**Conclusion:** BNP level is related with the regression of size of hemangioma. Measurement of BNP level can be a sensitive indicator in evaluation congenital and hepatic hemangioma.

PL05-54

### LAPAROSCOPIC RESECTION OF IDIOPATHIC NECROTIZING GRANULOMA OF THE LIVER

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**Introduction:** Isolated Hepatic Granulomas are hard to diagnose and can be mistaken for Cholangiocarcinoma or Metastasis.

**Methods:** This is a retrospective review of a Laparoscopic Liver Lesion resection which surprisingly turned out to be a hepatic granuloma.

**Results:** A 50 yo female presented with vague abdominal pain, nausea and vomiting. A 16 mm lesion was found on CT abdomen in segment IVA adjacent to Falciform ligament. Patient proceeded to a Laparoscopic US-guided resection of the lesion. Histology revealed a large lesion surrounded by numerous epithelioid Histiocytes/Macrophages mixed with multinucleated giant cells, consistent with necrotizing granuloma of the liver. Mycobacterium Tuberculosis testing on the specimen was negative as was serum Interferon, Hep B and Hep C serology. No other infectious cause was found. Patient made an uneventful recovery.

Hepatic granulomas are uncommon. They can be associated with TB, Hep B or C, Brucellosis, Sarcoidosis, Schistosomiasis, Leishmaniasis and other rare infections. However, 10-20% remain idiopathic. Preoperative diagnosis is difficult as US / CT / MRI may be unable to differentiate benign from malignant lesions such as Cholangiocarcinoma and Liver metastases. Preoperative Biopsy may be inconclusive as Necrotic cells can be found in both benign and malignant conditions. Laparoscopic surgery with Ultrasound guidance can be safely used in en bloc resection for these uncommon lesions.

**Conclusions:** Hepatic granulomas are uncommon and should be considered as a differential diagnosis for lesions unclear on CT /MRI. Checking for Tuberculosis, Hepatitis and serology for other chronic infections is helpful but a minority remain idiopathic.

PL05-55

### LEIOMYOMATOSIS PERITONEALIS DISSEMINATA MIMICKING LIVER TUMOR

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Leiomyomatosis peritonealis disseminata (LPD) is a rare entity characterized by the presence of multiple, small nodules of smooth muscle on the peritoneal and omental surfaces. We report a case of huge tumor (27x18cm) which compressed the liver medially.

Thirty three year-old woman was brought here for vague abdominal discomfort and palpable mass in right upper abdomen for 2 months. She had the history of the laparoscopic myomectomy 5 years ago and then laparotomy for removal of disseminated myomatosis peritonealis 2 years ago. Abdominal CT showed 27x18 cm abdominal mass compressing the liver medially and multiple nodules in abdominal cavity. So she underwent multiple resection showing leiomyomatosis peritonealis disseminata with positive desmin, positive smooth muscle actin, positive endothelial cell. She had smooth postoperative course and discharged on postoperative 8th day.

## PL05-56

**LIVER GAS GANGRENE AFTER BILIARY SURGERY**

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**Introduction:** Liver gas gangrene is a rare condition with a highly mortality rate. It is mostly associated with host factors, such as malignancy and immunosuppression. Here we report three cases of liver gas gangrene after biliary reconstruction surgery.

**Method:** Three cases diagnosed as liver gas gangrene were retrospectively analyzed. All cases had malignant diseases such as pancreas cancer and biliary cancer, and received curative surgery with biliary reconstruction. After diagnosis was made by CT scan, two patients had open drainage surgery for liver gas gangrene and a patient selected conservative therapy such as intensive antibiotics infusion.

**Results:** All patients had the cardio-vascular risk such as hypertension and diabetes mellitus. Two cases (57y/o female and 71 y/o female) died within 2 days after diagnosis although intensive care was performed. One case (82y/o male) survived after open drainage surgery. This patient's condition improved immediately after surgery and he was discharged on the 28 th post-operative day.

Enterocococcus species and Klebsiella species was detected in the blood and drainage samples in two thirds cases. Clostridium species were not recognized.

**Conclusion:** Hepatic gas gangrene progresses rapidly and has a high mortality rate. Malignant disease and reconstructive surgery may be predisposing factors. Open surgical drainage may be a crucial treatment for this dismal disease.

## PL05-57

**SINGLE UNIT EXPERIENCE OF SIMPLE HEPATIC CYST MANAGEMENT OVER TWENTY YEARS PERIOD**

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**Introduction:** Hepatic cysts are common with prevalence of 2.5 to 10% of general population. It has different classifications ranging from benign to malignant conditions. It varies in its origin, aetiology, manifestations and treated approaches. Generally, majority of affected patients are asymptomatic and required no interventions. Laparoscopic fenestration is a well described treatment for benign hepatic cysts. We aimed to assess the outcome of hepatic cysts patients who underwent intervention in our unit over twenty years' period

**Methods:** Retrospective study of adult patients who were diagnosed with symptomatic benign hepatic cysts and received intervention in our unit between 1998 and 2018. Outcome of the management included clinical and radiological recurrence, re-intervention, and malignant

transformation. In surgical intervention we analysed operative time, hospital stay, intraoperative blood loss and postoperative complications.

**Results:** 68 out of the 120 patients underwent intervention and were followed up for at least 18 months' post intervention. Symptoms included pain (54/68), pressure/distention (41/68), haemorrhage (7/68), and infection (6/68).

30 and 12 patients had cyst fenestration; laparoscopic and open respectively, 12 had radiological percutaneous aspiration and 6 underwent open cyst excision. 21 patients had symptomatic and radiological recurrence and 11 required repeat intervention. Complications included bleeding, intra-abdominal collection and chest sepsis and those were reported in older, higher BMI and patients who had open surgery.

**Conclusions:** Laparoscopic cyst fenestration is recommended in managing symptomatic patients provided careful patient selection and stratification. In morbid patients repeated radiological aspiration can provide symptomatic relieve with small risk of iatrogenic bleeding or infection.

## PL05-59

**PELIOSIS HEPATIS IN MARROW TRANSPLANT PATIENT: A CASE REPORT**

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**Introduction:** Peliosis hepatis (PH) is a rare condition defined by multiple blood-filled cysts in liver parenchyma. The etiology of PH remains unclear, however it has been associated with autoimmune mechanisms, malignancies and infections. Drugs including steroids have been associated as well. The presentation of PH is often non-specific, such as vague recurring abdominal pain. However it can also rarely have a potentially fatal presentation.

**Results:** We report a case of a 22 year-old Malay man who came with acute onset of abdominal pain and hemorrhagic shock. He has a background of dyskeratosis congenita, which was complicated by bone marrow failure. He has undergone allogenic bone marrow transplant 2 years prior. Relevant history of note is patient's previous steroid therapy for immunosuppression post-marrow transplant which was completed 1 year ago.

Computed tomography (CT) showed hemoperitoneum at time of presentation and widespread hepatic lesions, largest one measuring 8x5cm. On angiography, multiple blushes of contrast were seen with dilated vascular channels suggestive of PH. Angioembolization was done patient was resuscitated with blood products to good effect after.

**Conclusion:** Peliosis hepatis is a condition that can be easily overlooked due to its rarity, and is potentially fatal. In patients with complex haematological issues, this is particularly dangerous as there may be increased risk of bleeding. PH should be considered in patients with relevant medical or drug history presenting with atypical widespread liver lesions seen on imaging.



CT image showing the largest hepatic lesion with haemoperitoneum

PL05-62

### ANATOMICAL VARIATIONS IN INTRAHEPATIC BILE DUCTS: A SYSTEMATIC REVIEW, META-ANALYSIS, AND CREATION OF A PREVALENCE-BASED CLASSIFICATION SYSTEM

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**Introduction:** In the current era of advanced liver surgery, awareness of intra- and extrahepatic biliary anatomical variants is becoming increasingly crucial. If a surgeon is unaware of these variants, hepatic surgery may result in otherwise avoidable complications. We aim to construct a systematic review and meta-analysis of intrahepatic biliary anatomical variants and their prevalence.

**Methods:** We performed a literature search of the MEDLINE and EMBASE databases on September 10<sup>th</sup>, 2019. We performed a meta-analysis using a multinomial logistic mixed effect model, with study heterogeneity captured by a random intercept, to estimate the overall proportion of each anatomical type across all studies. Additionally, we carried out a population analysis. We also constructed a novel prevalence-based classification system.

**Results:** The literature search resulted in 1709 individual studies. Thirty-five studies were included in this analysis, covering 11706 patients. The meta-analysis showed an estimated average type 1 proportion of 64.1 %, a type 2 proportion of 14.4 %, a type 3 proportion of 11.6 %, a type 4 proportion of 6.5 %, a type 5 proportion of 1.4 %, and an 'Other' proportion of 2.5 %. Our populational analysis based on ethnic and geographical backgrounds demonstrated different anatomical distributions between regions.

**Conclusion:** This systematic review represents the most comprehensive overview of intrahepatic biliary anatomical variants to date, taking into account the different anatomical prevalence between populations. Based on our

summative findings, we propose a prevalence-based classification system which if widely adopted, may serve as a unifying descriptive system internationally.

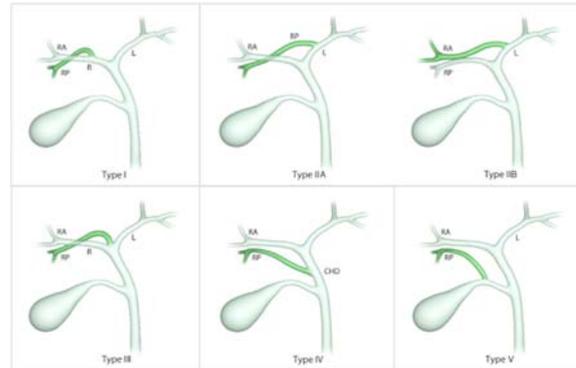


Figure 1. Novel prevalence based classification system

PL05-63

### SRC-PHOSPHORYLATION AT THE $\alpha$ 1-NA/K-ATPASE MODULATES LIVER CELL SENESCENCE AND MICROBIOTA COMMUNITY CHANGES ON DIET INDUCED NASH IN THE RODENT

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**Background:** The global incidence of chronic liver disease and its sequels ESLD and HCC are increasing due to obesity and increase in life expectancy. We hypothesized Western diet accelerates aging cell processes inducing liver cell portfolio to senescence/apoptotic activity with altered metabolic cycles and disturbed gut-microbiota communities mainly through a Src pathway.

**Methods:** Mice were exposed to NMC or HFD. Livers and plasma were collected at weeks 12, 24 and 48. Body compartments were determined by MRI spectroscopy. The terminal ileum (TI) and its microbiota were collected. Total DNA was extracted from contents of ileum and microbial community profiling was achieved by sequencing 16S rRNA v3-v4 hypervariable regions. Quantitative protein expression of Tp53, mTOR1, Src, SIRT7, FOXO1, Grb2 were determined by Western Blots. Principal component analyses (PCA) was conducted.

**Results:** TBW increases with aging mainly due to an increase in the fat compartment with decreased lean mass and total body water ( $p < 0.05$ ); changes that correlated with an increased proportion of liver cells in senescence/apoptosis ( $p < 0.05$ ). Morphological changes correlated with Src peak gene expression. A significant increase in Verrucomicrobia was observed in the HFD group when compared to the NMC group ( $p < 0.05$ ). Additionally, a significant decrease in Bacteroidetes was noted ( $p < 0.05$ ). pNaKtide, a 33 amino-peptide that blocks the activation of Src at the  $\alpha$ 1-Na/K-ATPase subunit abrogated metabolic, genetic and morphologic changes establishing a wild phenotype.

**Conclusions:** Blockage of the  $\alpha$ 1-Na/K-ATPase//Src amplification loop restored both physiological liver cell aging, and wild type gut-microbiota communities.

#### PL05-64

### INCIDENCE OF NEOPLASM IN A COMPLEX CYST IN LIVER - CAN WE PREDICT PREOPERATIVELY?

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**Introduction:** Liver cysts are reported in around 10% of population and increasingly picked up by cross sectional imaging. Simple cysts need treatment only if symptomatic. However, complex cyst needs to be treated irrespective of symptoms because of the risk of malignancy or a pre-malignant condition. We analysed our database to explore this further.

**Methods:** We analysed retrospectively a prospective liver database from January 2004 to December 2019 for all patients operated for liver cysts at the Cardiff Liver unit. Demography, type of cyst, liver function, imaging findings and histology was recorded. We excluded patients with polycystic liver disease. Patients with multiple cysts but do not belong to the spectrum of polycystic liver were considered. Cross sectional imaging was CT scan and most cases MRI liver. Complex cyst was defined by septations, debris within cyst or nodules in the wall.

**Results:** There were 63 patients. 53 females. Median age 63 (40-92). 12 patients with polycystic liver, 27 simple cysts and 24 complex cysts. Among patients with complex cysts 9 (38%) had a neoplastic lesion (7 cystadenoma, 2 malignancy). The imaging findings of solid nodule and thick septations did not differentiate patients with malignancy.

**Conclusion:** Our results show that we should continue to offer resectional surgery for all patients with complex cysts (enucleation or resection). If at surgery the anatomy precludes safe resection, deroofting with frozen section of the wall and internal contents may help avoid missing a neoplasm. Imaging cannot safely predict a neoplastic pathology.

#### PL05-66

### INFLUENCE OF PLATELET DEGRANULATION ON POSTOPERATIVE LIVER REGENERATION

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**Introduction:** Recently, we reported on the association of site-specific alpha-granule release in patients undergoing liver regeneration and in the development of liver dysfunction. While platelets were shown to have a central role in liver regeneration, the causal interaction of platelet

degranulation and liver regeneration has not been investigated as far. Thus, we aimed to provide evidence for an effect of platelet activation on liver regeneration in genetically altered mice undergoing partial hepatectomy (pHx). **Method:** Two mouse stems were used for this study: While fl-IKK2-fl/PF-4-Cre mice showed a tendency towards more reactivity of platelets, Nbeal-2 knock-out mice (Nbeal2<sup>-/-</sup>) were found to have unfunctional alpha-granules, while other compartments of platelets are not functionally altered. PHx was performed in 8 mice per group and litter mate wild-type mice served as controls. Liver regeneration was assessed via liver-to-body-weight ratio and immunohistochemically in liver tissue.

**Results:** fl-IKK2-fl/PF-4-Cre mice were found to have a tendency towards increased liver regeneration at 48 hours after pHx (p=0.077). However, mortality rates were equal in genetically altered and in wild-type mice. Interestingly, Nbeal2<sup>-/-</sup> mice showed a higher incidence of postoperative mortality, while none of the wild-type controls died after pHx. In regard to liver regeneration, Nbeal2<sup>-/-</sup> mice tended to show lower liver-to-body-weight ratios at 72 hours after pHx.

**Conclusion:** In conclusion, a role of platelet degranulation was found within this study. While higher platelet reactivity was found to contribute beneficially to liver regeneration, depletion of alpha-granules as seen in Nbeal2<sup>-/-</sup> mice, lead to decreased liver regeneration and was even associated to postoperative mortality.

#### PL05-67

### REMNAANT HEPATOCELLULAR UPTAKE INDEX (RHUI) AS A NOVEL FUNCTIONAL ASSESSMENT OF THE FUTURE LIVER REMNANT AFTER MAJOR HEPATECTOMY

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**Background:** The aim of this study was to identify whether quantitative measurements with gadoxetate disodium-enhanced magnetic resonance imaging (EOB-MRI) could predict post-hepatectomy liver failure (PHLF) after major hepatectomy.

**Methods:** This study included 105 patients (including 58 biliary malignancies and 47 liver tumors) who underwent EOB-MRI before major hepatectomy. On preoperative MR images, future remnant liver (FRL) volume (FRLV) and mean signal intensities of FRL (rL20) and spleen (S20) were obtained. The remnant hepatocellular uptake index (rHUI) was calculated with following formula:  $FRLV \times [(rL20/S20) - 1]$ . We evaluated ability of rHUI to predict PHLF which was graded PHLF grade B or C according to the criteria proposed by ISGLS and compared its accuracy with that of conventional indices, including proportion of FRLV (FRLVR) and ICGK-F (calculated as ICG-K x FRLVR).

**Results:** Among 105 patients, 11 met the criteria for PHLF. In entire cohort, rHUI was accurately predict PHLF with AUROC 0.89 (p< 0.01). The univariate analysis revealed rHUI (< 0.41), ICGK-F (< 0.08) and FRLVR (< 0.50) significantly associated with PHLF. But in multivariate analysis, only rHUI (< 0.41) was detected as independent

risk factors for PHLF (OR 7.3x10<sup>7</sup>, 95%CI N/A, p< 0.01). In patients with regional heterogeneity in liver function, FRLVR (< 0.50) and ICGK-F (< 0.08) could not predict PHLF, but only rHUI (< 0.41) accurately predict PHLF (portal vein embolization; p=0.018, pre-operative biliary drainage; p< 0.001).

**Conclusion:** The rHUI obtained from EOB-MRI could be a useful predictor of the future liver remnant after major hepatectomy.

PL05-69

### 13 YEARS EXPERIENCE OF LAPAROSCOPIC MANAGEMENT OF HYDATID DISEASE AT A TERTIARY CARE CENTRE

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**Introduction:** Human echinococcosis is a global parasitic zoonosis endemic in sheep raising countries like the Indian subcontinent, Australia, New Zealand etc. Surgery is the main stay of treatment and minimally invasive techniques offer similar outcomes with faster recovery, shorter hospital stay and lesser overall mortality and morbidity. We aim to report our experience in laparoscopic management of hydatid disease of the liver and lung over a period of 13 years at a tertiary care center.

**Methods:** A cohort of fifty eight patients of hydatid cyst disease who were managed by laparoscopic techniques between 2006 and 2019 were retrospectively reviewed. Surgical strategy, operative complication, operative time, postoperative morbidity and recurrence was evaluated.

**Results:** Of the 58, there was a male preponderance with mean age of 37 years. 8 patients had thoracic hydatidosis, 43 had abdominal disease and 7 involved both thoracic and abdominal involvement. 38 patients underwent deroofting and pericystectomy was performed in 12 patients and 8 patients underwent pericystectomy of lung hydatid in combination with deroofting of liver hydatid. 7 patients had spillage during the procedure. The mean operative time was 130+/-4 minutes with open conversion in 13 cases. The mean hospital stay was 4 +/- 1 days. In post op period 5 patients had bile leak, 1 underwent re exploration.

**Conclusion:** Laparoscopic management of hydatid disease is feasible and results are comparable to that of open surgery with faster recovery and lower morbidity and should be the standard of care provided.

PL05-71

### HEPATOTOXICITY FROM DENGUE VIRAL INFECTION: TREATMENT AND OUTCOME: EXPERIENCE FROM THE PACIFIC ISLAND COUNTRY OF TUVALU

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**Introduction:** Small island pacific countries are often faced with health dilemmas. Limited health resources, unique disease burdens admix with incidences of public health diseases outbreaks often challenges the already health constraints. Recent Dengue Viral infection in children of Tuvalu has highlighted this issue. In this report, we aim to highlight on clinical management of hepatotoxicity from dengue infection.

**Methodology:** A prospective study was done using case audit of patients with sero-positive for dengue. Charts were assessed for age, gender, duration of admission. Continuous assessment for clinical progression and type of complication including hepatotoxicity. Treatment for complications and overall outcomes including mortality were assessed.

**Result/discussion:** There were 132 patients seen at outpatients with symptoms of Dengue. Febrile illness was the most common. About 27 % were confirm sero-positive on admission. The average age was five years and more common among male. Ten had severe elevated liver enzymes or hepatotoxicity with prolonged hospital stay (average of 14 days), two had fatality and one had severe hepato encephalopathy and needed overseas referral. There were no delayed complication after discharge.

**Conclusion:** Clinical management of severe complications from Dengue infection can be difficult and challenging in small developing countries in the Pacific.

PL05-72

### INFLAMMATORY PSEUDOTUMOR OF THE LIVER, A DIAGNOSTIC DILEMMA WITH THERAPEUTIC UNCERTAINTY IN A COHORT OF BANGLADESHI PATIENTS

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**Background:** Inflammatory pseudotumor (IPT) is a benign lesion seldom encountered in clinical practice. It's mysterious in origin and remains ambiguous. Infection, stone, autoimmune disease, systemic inflammatory response, trauma, foreign body and neoplasm attributed to be the etiological factors. Advanced imaging modalities help in increased detection of focal liver lesion.

**Material and methods:** The objective of this retrospective observational cohort study is to analyze its clinical significance. Thirty-three patients with focal liver lesions were evaluated and treated surgically as hepatic neoplasm consecutively from July 2013 to January 2020.

**Results:** There were 14 male (42.42%) and 19 female (57.58%) subjects in our study, mostly in the 3<sup>rd</sup> decade of life. Clinically only 21% of the patients presented with fever. In 24 patients (73%) the lesions were located in left lobe of liver. The operative procedures were: wedge resection in 3 patients (9.09%), limited resection in 05 patients (15.15%), Left Hepatectomy 07 patients (21.21%), Left lateral hepatic segmentectomy in 17 patients (51.51%), right hepatectomy in 02 patients (6.06%) and central

hepatectomy in one patients (3.03%). Only 8 patients (24.24%) required bilioenteric anastomosis as additional procedure. Histopathological study revealed Tuberculosis in 7 patients (21.21%), fungal granuloma in 03 patients (9%), foreign body granuloma in 03 patients (9%), ductal calculi with abscess in 9 patients (27.27%) and idiopathic in 7 patients (21.21%).

**Conclusions:** Inflammatory pseudotumor of liver represents a rare entity usually mistaken as malignant lesion. Despite the low prevalence of hepatic inflammatory pseudotumors, it often creates a diagnostic dilemma resulting into therapeutic uncertainty.

PL05-75

### IMAGING BIOACTIVATED HEPATIC SPHEROIDS, AN IDEAL MODEL SYSTEM FOR DRUG HEPATOTOXICITY EVALUATIONS

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**Introduction:** Drug-induced liver injury (DILI) is a leading cause of acute liver failure. A major obstacle in prediction or evaluation of DILI is lack of an experimental model(s) that recapitulates stable and physiologically relevant liver

functions and reflects accurately the level of drug hepatotoxicity. A hepatic spheroid model system, aggregates of Hepatic cells, which were treated with cryopulverized liver biomatrix scaffolds (LBSs), has been established for DILI investigations.

**Methods:** We obtained the LBS by a perfusion method to decellularize rat liver. The model was established with LBS treatment. We compared the liver specific functions and metabolic activity of spheroids with or without LBS treatment using flow cytometry, qRT-PCR, Elisa, and immunohistochemistry. The drugs with known hepatotoxicity were used to study sensitivity of spheroids. Multiparametric high-content imaging and analysis (HCA) was used to analyze the possible mechanisms of hepatotoxicity triggered by different drugs.

**Results:** The LBS-bioactivated hepatic spheroids were maintained for up to 4 weeks and demonstrated enhanced liver specific functions, CYP3A4 metabolic activity, bile excretion, and increased expression of metabolism enzymes, collectively hypothesized to result from increased cell-cell and cell-matrix interactions. Using established staining procedures with 10 fluorescence molecular probes, we achieved multiparametric confocal readouts, including marker-specific cell numbers, on viability, apoptosis, cholestasis, steatosis, oxidative stress and mitochondrial damage. By tracking key cell events, we could deduce the possible liver injury type.

**Conclusion:** This simple and robust high-throughput-compatible imaging hepatic spheroid model may have potential for use in toxicity screening, and represents an alternative to animal models for studying DILI.

**PP01 - Pancreas: Pancreatitis**

PP01-01

**LAPAROSCOPIC CHOLECYSTECTOMY IN ACUTE MILD GALLSTONE PANCREATITIS: HOW EARLY IS SAFE?**

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**Introduction:** There is still controversies about which surgical strategy is most appropriate to resolve the underlying biliary pathology in patients with Acute Gallstone-Pancreatitis (AGP). The aim was to evaluate the safety and effectiveness of Early Laparoscopic Cholecystectomy (ELC) in patients with Mild-AGP.

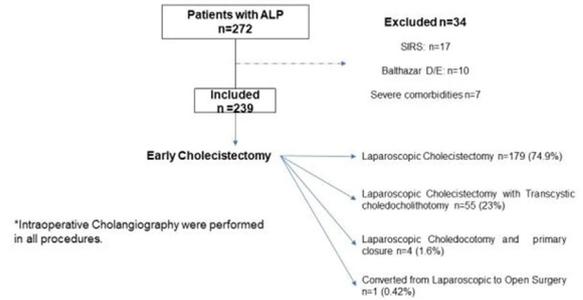
**Methods:** Retrospective cohort of consecutive patients diagnosed with mild-AGP according to the Atlanta Guidelines from January 2009 to July 2019. Patients were assigned to surgery on the first available shift after 48 hours after symptoms onset. Univariate analysis was performed to determine association between AGP and Grades of Balthazar (A, B and C) with time to surgery, days of hospitalization and postoperative complications.

**Results:** From 239 patients evaluated, 238 (99.58%) were operated by laparoscopic approach. Intraoperative cholangiogram (IOC) was performed routinely. Common bile duct stones, if present, were simultaneously and successfully treated. Significant association were found between Balthazar-Grades and time to surgery (median of 3 days, p=0.003), with length hospitalization and from surgery to discharge, with median of 4 days (p=0.0001) and 2 days (p=0.003) respectively. Of the entire cohort, 118 patients (49.3%) were operated at 48 hours since the symptoms onset. Mild postoperative complications (CD I/II) were observed in 22/239 patients (9.2%). This represents 2% of patients with Grade A of Balthazar, 9% of grade B and 14% of grade C (p=0.016). No severe and deaths were observed.

**Conclusions:** ELC with routine IOC and common bile duct exploration performed on the first available surgical shift after 48h since onset of pancreatitis symptoms, is a viable, effective and a safe strategy for the resolution Mild-AGP and its underlying biliary pathology.

**Postoperative complications according to Balthazar Grades. Times and variables associated with Balthazar Grades.**

Baltazar Grade	Clavien-Dindo I/II n=22	Length of stay(range)	Days from surgery to discharge (range)	p
A	n = 2/72	3 (3 - 5)	2 (1 - 2)	
B	n = 6/65	4 (4 - 5)	2 (1 - 2)	0.001
C	n = 14/97	4 (4 - 5)	2 (1 - 3)	



Flowchart of study participants

PP01-03

**WORLD-WIDE VARIATION IN REPORTING OF THE LONGITUDINAL PANCREATOJEJUNOSTOMY WITH PARTIAL PANCREATIC HEAD RESECTION (FREY PROCEDURE)**

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**Introduction:** The Frey pancreatojejunostomy combines a longitudinal decompression of the main pancreatic duct with a partial, duodenum-preserving head resection. Although widely adopted and reported since its original description the procedure is not standardized. For example, although the amount of parenchyma excised from the head of the pancreas is clearly defined in the original report this is interpreted differently in subsequent papers. This study assesses the reports of the Frey procedure to identify areas of concordance and discordance in reporting.

**Methods:** A computerized search of the literature using the Scopus database (Scopus; Elsevier B.V Amsterdam, The Netherlands) was undertaken covering the period between January 1970 and January 2019. 36 articles reporting the Frey pancreatojejunostomy were identified. Data were extracted on clinical demographics, operative detail and outcome.

**Results:** The median (range) number of patients per series is 35 [6-141]. Median (range) accrual time is 9 [2-18] years. Weight of resected pancreas was reported in 4 (11%) studies and varied between 2gr and 78gr. 33 studies (92%) report postoperative mortality of 0.8%. Opiate independence was reported in 31%. Heterogeneity of reporting does not permit correlation between opiate independence and extent of parenchyma removed.

**Conclusions:** The published literature demonstrates that there is substantial variation between centres in reporting of the Frey operation. Under-reporting of critical parameters regarding the operation itself and the outcome was also observed. This variance compromises the value of

comparative outcomes of this procedure and highlights the need for better standardization of the reporting of outcomes of surgery for chronic pancreatitis.

#### PP01-05

### CONTEMPORARY MANAGEMENT OF PANCREATIC TRAUMA IN A TERTIARY HEPATO-PANCREATO-BILIARY CENTRE

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**Aims:** Pancreatic trauma accounts for 0.2- 1% of all trauma-related injuries worldwide. Traditionally, operative management was advocated for major pancreatic injuries. However, advances in interventional radiology and gastroenterology techniques have increased non-operative options. The aim of this study is to evaluate the management of a series of patients presenting with pancreatic injury.

**Methods:** Between 2015 to 2019, patients presenting to a specialist Hepato-Pancreato-Biliary (HPB) centre, with pancreatic trauma, were identified using hospital databases. Severity of injury was assessed from operative notes and radiological studies. Management and outcomes were recorded from clinical notes. These were compared with American Association for the study of Trauma (AAST) guidelines to evaluate.

**Results:** There were 20 patients with pancreatic trauma admitted from 2015 to 2019. 13 (65%) were male. Median (range) age was 22 (2-65) years. 10 patients were children below 18 years of age. 16 (80%) sustained blunt trauma and 4 (20%) penetrating trauma. There were no AAST Grade 5 injuries. 8 (40%) were Grade 4; 5(25%) were Grade 3 and 7(35%) were Grade 1. Overall, 16 (80%) were managed non-operatively. Of the 4(20%) who had surgery, there were 3 that underwent distal pancreatectomies and 1 pancreatoduodenectomy. 10 (50%) patients had blood or blood product transfusions on admission. Complications were due to infected collections- 9 (45%); upper GI bleed- 3(15%) and hypocalcaemia- 1(5%). There were no deaths.

**Conclusions:** This is a small series but the results demonstrate that a conservative policy of management of pancreatic trauma is associated with acceptable outcomes.

#### PP01-06

### FOUR CASES OF IGG4-RELATED PANCREATITIS PREOPERATIVELY DIAGNOSED AS MALIGNANCY

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IgG4-related pancreatitis is known to be difficult to distinguish from pancreatic or bile duct cancer. Though endoscopic ultrasound-fine needle aspiration is useful for diagnosis, it is not easy to completely rule out malignancy. Four cases IgG4-related pancreatitis who underwent resection were enrolled at our institute from 2000 to 2019 in the study. Preoperative diagnoses of two cases were bile

duct cancer and the two others were pancreatic cancer. Preoperative diagnosis was made by dynamic images of CT, MRI, ERCP, and/or subsequent cytology. These examinations couldn't rule out malignancy because biliary cytology demonstrated positive in one case and class III in another one. As a result, the resections were performed under the enough informed consent. In all four cases, the histological diagnoses were IgG4-related pancreatitis. Fortunately, all patients discharged on foot. If precise preoperative diagnosis of IgG4-related pancreatitis could be made, conservative therapy such as steroid administration might have been taken. The combination of CA 19-9 and IgG4 is considered to be useful for distinguishing patients with autoimmune pancreatitis from those with cancer. But, when malignancy such as pancreatic or bile duct cancer couldn't be ruled out, serious consequence after overlooking the possibility of malignancy should be considered. Therefore, resection could be an option for treatment under the surgeons who are familiar with such a difficult operation. Precise diagnostic method and throughout recognition seemed to be essential for IgG4-related pancreatitis.

#### PP01-07

### A NETWORK META-ANALYSIS OF SURGERY FOR CHRONIC PANCREATITIS: IMPACT ON PAIN AND QUALITY OF LIFE

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**Background:** The surgical operation associated with improved pain and quality of life (QoL) in patients with chronic pancreatitis (CP) is unknown.

**Method:** The Scopus, EMBASE, Medline and Cochrane databases were systematically searched until May 2019 and all randomised trials (RCTs) comparing surgical operations for CP pain were included in a network meta-analysis (NMA).

**Results:** Four surgical operations for treating CP were directly compared in eight RCTs including 597 patients. Patients were mainly male (79%, 474/597) with alcoholic CP (85%, 382/452). Surgical operations included were pancreatoduodenectomy (224, 38%), Berne procedure (168, 28%), Beger procedure (133, 22%), and Frey procedure (72, 12%). NMA revealed that the Beger procedure ranked best for pain relief, while the Frey procedure ranked best for postoperative QoL, postoperative pancreatic fistula rate and postoperative exocrine insufficiency rate. Overall the Frey procedure ranked best for the combination of primary outcome measures based on surface under cumulative ranking curve scores.

**Conclusions:** Overall the Frey procedure is the best operation for both pain relief and postoperative QoL in patients with CP. New validated tools to assess CP pain and the influence of various types of pain patterns on QoL will allow future trials to better stratify patients. Given the different inclusion criteria, pain and QoL assessment and duration of symptoms, and increasing uptake of enhanced

recovery protocols, further trials are required to investigate the role of surgery for different CP phenotypes, timing of surgery and in defining the role of surgery in relation to endotherapy.

PP01-08

### **A CASE OF INTRAHEPATIC PANCREATIC PSEUDOCYST DEVELOPED AS A COMPLICATION OF PANCREATITIS**

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**Introduction:** Pancreatic pseudocyst is located usually in lesser sac and peripancreatic space and is rarely developed in the liver. The intrahepatic pancreatic pseudocyst(IHPP) following acute pancreatitis is extremely rare with very limited number of clinical reports about IHPP.

**Methods:** A 70-year-old woman was referred because of upper abdominal pain of 3 days' duration. An abdominal CT scan revealed 11x10 cm sized cystic mass in the left lateral section of liver. On EUS findings, a huge hypo-echoic lesion with internal echogenicity was noted in the lesser sac. EUS-guided gastrocystostomy was performed and analysis of cystic fluid showed a high level of amylase (21,200 U/L). After the endoscopic procedure, severe abdominal pain developed and physical examination showed peritoneal irritation sign. An emergency operation was performed.

**Results:** On operation findings, a huge cystic tumor was located in the left lateral section of liver without direct communication with pancreas. However, mass-like necrotic tissue was filled with in the hepatoduodenal ligament, hepatogastric ligament, and Glisson sheath of the left hepatic lobe. Left lateral sectionectomy was performed. Pathologic examination confirmed the pseudocyst with findings of non-epithelialized granulation tissue of the cystic wall.

**Conclusion:** IHPP should be considered when a huge intrahepatic cystic lesion is found in patients with recent episodes of pancreatitis. The high level of amylase on cystic fluid analysis plays a key role in the diagnosis of IHPP. Drainage procedure or surgical resection can be considered, if necessary, for the treatment of IHPP.

PP01-09

### **SPLenic ARTERY EMBOLIZATION FOR THE TREATMENT OF GASTRIC VARICEAL BLEEDING CAUSED BY SPLenic VEIN THROMBOSIS IN NECROTIZING PANCREATITIS: REPORT OF A CASE**

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**Introduction:** Splenic vein thrombosis(SVT) is a relatively common finding in pancreatitis and SVT associated gastric variceal bleeding(GVB) could be sometimes a life-threatening complication. Traditionally splenectomy is

considered the treatment of choice for SVT, however, surgical procedure in necrotizing pancreatitis is difficult and risky because of severe inflammation, adhesion, and bleeding tendency. Herein, we report a case of GVB secondary to SVT complicated by necrotizing pancreatitis which was successfully treated with splenic artery embolization(SAE).

**Methods:** A 42-year-old man was referred to our hospital for treatment of a necrotizing pancreatitis. Initial intensive medical treatment was performed and following operative necrosectomy was done after 8 weeks from admission. On postoperative day 13, hematemesis developed and abdominal CT scan revealed extravasation of contrast media at gastric cardia and fundus. Emergency EGD was fail to control the bleeding due to ongoing active bleeding. Emergency angiography was performed and celiac arteriography revealed no active bleeding from arterial system. Under suspicion of GVB SAE was performed.

**Results:** After SAE, splenic blood flow was remarkably decreased and bleeding stopped immediately, and no more episode of gastrointestinal bleeding was observed. An abdominal CT scan 2 days following the SAE showed no more active bleeding and small splenic infarction less than only 10% of total splenic volume was observed.

**Conclusion:** SAE could be the best treatment option for gastric variceal bleeding when splenectomy is difficult such as in case associated with severe acute pancreatitis or associated with severe adhesion, or when in patients with high operation risk.

PP01-10

### **CROSSTALK BETWEEN INFLAMMATION AND COAGULATION IN ACUTE KIDNEY INJURY IN EXPERIMENTAL AND CLINIC ACUTE PANCREATITIS**

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**Background:** Acute pancreatitis (AP) is an inflammatory syndrome with unpredictable progression to systemic inflammation and MODS. Acute renal failure (ARF) is an early severe complication of AP.

**Materials and methods:** AP was induced in 42 Wistar albino rats by intraperitoneal injection with 3 g/kg L-ornithine-HCl in 26 rats - control group. In experiment we determined the levels of amylase, creatinine, H<sub>2</sub>S, fibrinogen and time of recalcification in serum, activity of NO-synthase and myeloperoxidase in pancreas, the pathological changes of pancreas and kidneys were shown by hematoxylin and eosin staining.

We examined 98 patients with moderate AP and 57 patients with severe AP. Disorders of kidney function were in 48 patients. We determined the creatinine level, indicators of hemostasis and inflammation.

**Results:** In rats ARF was proved by histology. The concentration of creatinine in serum increased at 86.86%. The level of creatinine directly correlated with myeloperoxidase and activity of iNOS in the pancreas, amylase in serum, reverse with H<sub>2</sub>S in serum. ARF was accompanied by hypercoagulation.

Relationship of inflammation and hemostasis in patients with AP and ARF is accompanied by decreased of aPTT,

increased of TT, fibrinogen, D-dimers and level of SFMC, lack of activity of antithrombin III, increased of CRP, IL-2, IL-6, and TNF- $\alpha$ .

There was also direct correlation between severity of renal failure and concentrations of IL-6 CRP, D-dimers, SFMC and TT.

**Conclusion:** The inflammatory cascades and hypercoagulative state initiate ARF following ANP. Understanding of this process is important for the treatment of patients with severe AP.

#### PP01-11

### LAPAROSCOPIC AND OPEN FREY PROCEDURE

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**Introduction:** To compare the efficiency of open and laparoscopic Frey procedure.

**Materials and Methods:** From November 2004 to December 2019 Frey procedure were performed in 77 patients with chronic pancreatitis type C (classification of M.Buchler). All patients were divided for 2 group: I group - laparoscopic approach (n-49), II group - open approach (n-28). The age of the patients was 47 (23-69) years in I group and 47 (32-67) years in II group (p 0,8). The median size of the pancreatic head was 32 (17-65) mm in I group and 40 (22-73) mm in II group (p 0,005), the median diameter of the main pancreatic duct was 9 (4-16) mm and 8 (4-14) mm (p 0,18), respectively.

**Results:** Totally laparoscopic Frey procedure was successfully performed on 44 patients (89.8%). Conversion was needed in 4 cases (8.1%). The operating time was 420 (290-685) minutes in I group and 320 (179-515) minutes in II group (p< 0,01). Blood loss was 100 (30-700) and 250 (50-1200) ml (p< 0,01), respectively. The postoperative stay period was 6 (3-25) days in I group and 9 (5-31) days in II group (p< 0,01). There were 11 (25%) complications in I group and 7 (25.9%) in II group (p 0,07). The follow-up was 36 (2-68) months in I group and 48 (6-60) months in II group. Pain relief was complete in all groups.

**Conclusions:** Laparoscopic Frey procedure are safe and feasible and can be considered as a possible alternative to the open procedure.

#### PP01-12

### PANCREATIC PSEUDOCYSTS LOCATED IN THE SPLEEN: DIAGNOSTICS AND MINIMALLY INVASIVE TREATMENT

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Pancreatogenic pseudocysts (PP) located in the spleen are rare. Intra-splenic PP localization is dangerous due to the possibility of massive hemorrhage and rupture of the organ.

**Objective:** To analyse the experience of diagnostics and treatment of PP located in spleen.

**Materials and methods:** 34 patients with PP located in spleen were estimated (ultrasound, MSCT or/and MRI) and treated (1985-2019). Men prevailed (88,2%), average age 45 $\pm$ 6,6 years.

**Results:** Ultrasound, besides characteristics of spleen PP, allowed to define manifestations of pancreatitis and its prevalence also, that was important criteria in definition of treatment tactics. Additional examination (MSCT/MRI) in order to clarify the pancreas state and the prevalence of the lesion needed to be performed in 7 (20.6%) cases.

Pus-like contents in spleen PP was in 85,3%. External drainage under US-control, as the only treatment, is executed to 11 (32,4%) patients, distal resection with splenectomy against calculous pancreatitis with primary damage of the pancreas tail executed to 23 (69,6%) cases.

High level of amylase was revealed in pseudocysts contents in all cases of minimally invasive treatment.

**Conclusion:** PP located in spleen come to light not at once more often as their clinical manifestations mask manifestations of the main disease - pancreatitis. Ultrasound, MSCT or/and MRI, allows to estimate a condition of the patient and define treatment tactics.

Using of the external minimally invasive manuals under US-control allows to improve the results of treatment at this group of patients as preoperative sanitation, and also as a final type of treatment, in an optimum case.

#### PP01-13

### NECROSECTOMY? AN OLD FASHIONED IDEA IN THE ERA OF INTERVENTIONAL RADIOLOGICAL DRAINAGE?

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Necrotising pancreatitis is a life threatening complication which has traditionally been managed with surgical resection. Radiological drainage (IR) had been offered as a replacement or adjunct to necrosectomy (PN).

**Aim:** Review of 15 year experience of all patients with pancreatitis with necrosis/symptomatic peri-pancreatic collections.

Retrospective review of patients with biochemical/radiological diagnosis of acute pancreatitis (December 2004 - December 2017). Data was obtained from coding and was cross referenced with patient records. IT systems and correspondence were reviewed for patients that underwent IR or PN.

A total of 3323 admissions were identified with 80 patients requiring intervention. 47 (58.8%) (Median age 62) (32Male, 15Female) underwent only IR. 33(41.2%) (Median age 60) (20Male, 13Female) patients received PN. Of these 33, 17(51.5%) patients received no IR with 16 patients (48.5%) receiving a combination of IR and PN.

26/47(55.3%) (IR group) and 11/33 (33.3%) (PN group) were admitted to ITU (Pvalue 0.52). 10/47(21.2%) (IR group) and 5/33 (15.2%) (PN group) did not survive to three months or 1 year (Pvalue 0.48). Median length of stay was 25 (Range 4-131) for the IR group and 10 (Range 4-131) for the PN group.

No difference in the survival outcomes between patients requiring IR and PN was demonstrated. Overall mortality in patients with severe necrotizing pancreatitis remains high. A significant difference in the mortality at 3 months or 1 year was not observed. However, comparison of radiological drainage and necrosectomy is challenging due to the variable patient journey, severity of illness and clinician preference.

#### PP01-14

### ENDOSCOPIC DRAINAGE OF WALLED-OFF PANCREATIC NECROSIS: IS NECROSECTOMY AND DELAYED DRAINAGE NECESSARY?

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**Introduction:** While studies have suggested that endoscopic step up approach with delayed drainage (more than 28 days from symptom onset) produce the best outcome in the treatment of walled-off pancreatic necrosis (WOPN), we assessed our single centre experience with endoscopic drainage of WOPN, in particular, the necessity of necrosectomy and delayed drainage.

**Methods:** Patients who underwent endoscopic drainage for WOPN between October 2011 and June 2019 in Monash Health were identified. They were excluded if follow up data were missing. The included patients' medical records, pathology results, imaging findings and procedure reports were retrospectively reviewed. The outcomes were then compared between early drainage (within 28 days of symptom onset) and delayed drainage cohorts.

**Results:** 38 patients were included for analysis. The population underwent an average of 2.45 endoscopic drainages per patient with none requiring endoscopic necrosectomy. 31.58% of patients required percutaneous drainage for distant collections and 2 patients received surgical necrosectomy. A disease related mortality of 15.8% and an average length of stay (LOS) of 75.71 days were reported. No statistically significant difference was shown in disease-related mortality (27.3% vs. 11.1%,  $p = 0.215$ ) or LOS (90.9 vs 69.5,  $p=0.2905$ ) between early and delayed drainage cohorts, but patients who received early drainage were more unwell at day 18 of symptom onset (qDOFA score 1 vs. 0.3,  $p=0.033$ ).

**Conclusion:** Endoscopic drainage in combination with selective percutaneous drainage is effective in the management of walled-off pancreatic necrosis. Early drainage should be considered for patient who remained unstable despite conservative management.

#### PP01-15

### COMBINED MINIMALLY INVASIVE MANAGEMENT OF INFECTED PERIPANCREATIC NECROSIS: TWO CASES REPORT

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Infected peripancreatic necrosis (IPN) is the most threatening complication of severe acute pancreatitis. Surgical necrosectomy is still the procedure of choice in the treatment of IPN and debridement is usually performed through laparotomy.

**Case 1:** A 40-year-old man was referred for the complication of the acute pancreatitis after endoscopic ampullectomy due to tubular adenoma with severe dysplasia. CT scans revealed a diffuse acute necrotic collection (ANC) involving the body and tail of the pancreas which extended anterior and inferior to the pelvic cavity. The patient received maximal conservative treatment including intensive fluid replacement, enteral and parenteral nutrition after endoscopic pancreatic duct insertion. The patient's clinical condition deteriorated during the 4 week of the disease with fever and increased serum C-reactive protein of 28.mg/dL despite of antibiotics, endoscopic pancreatic drainage and two times of ultrasono-guided PCD. He underwent laparoscopic pancreatic necrosectomy through mesocolic window. The postnecrosectomy cavity was thoroughly irrigated and closed suction drains were left for negative pressure drainage. Patient was discharged on the 35th days after laparoscopic surgery and patient remains asymptomatic for 4 years.

**Case 2:** Fifty six year-old man was admitted for abdominal pain after heavily alcoholic drinking. An abdominal CT showed diffuse infiltrating inflammation around the pancreas suggesting acute pancreatitis. Despite of conservative treatment, follow up CT showed huge infected peripancreatic necrotic abscess. He received multiple procedures for percutaneous cavity drainage(PCD) but failed in persistent fever. So he underwent laparoscopic peripancreatic necrosectomy and multiple drainages. He was improved with almost complete resolution during 3 month period.

#### PP01-16

### SHOULD WE REVISIT TREATMENT ALGORITHM FOR THE GROOVE PANCREATITIS? PANCREAS-PRESERVING DUODENAL RESECTIONS VS PANCREATODUODENECTOMY FOR THE CYSTIC DYSTROPHY OF THE DUODENAL WALL (GROOVE PANCREATITIS)

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**Background:** Management of the cystic dystrophy of the duodenal wall (CDDW), or groove pancreatitis (GP), remains controversial. Although pancreatoduodenectomy (PD) is considered as the most suitable operation for CDDW, pancreas-preserving duodenal resection (PPDR) has also been suggested as an alternative for pure form of

GP (isolated CDDW). There are no studies comparing PD and PPDR for this disease.

**Aim:** To compare the safety, efficacy, short- and long-term results of PD and PPDR in 85 patients with CDDW.

**Methods:** A retrospective analysis of prospectively collected clinical, radiologic, pathologic, intra- and postoperative data in 85 patients with CDDW (2004-2019) and comparison of safety and efficacy of PD and PPDR was performed.

**Results:** Symptoms: abdominal pain (100%), weight loss (76%), vomiting (30%) and jaundice (18%). The diagnosis was established by CT, MRI, and EUS. CDDW was treated conservatively (n13), by pancreatico- or cystoenterostomies (n8), by duodenum-preserving pancreatic head resections (DPPHR) (n6), by PD (n43), and PPDR (n15) without mortality. Weight gain was significantly higher after PD or PPDR compared to other treatment modalities. Complete pain control was achieved after PPDR (93%), PD (83%), DPPHR and draining procedures (18% each). New onset diabetes mellitus (23%) and severe exocrine insufficiency (12%) were not uncommon after PD, but never occurred after PPDR.

**Conclusion:** Pure form of CDDW is a duodenal disease and PD is an overtreatment for it. PPDR is similar in safety and better in efficacy compared to PD in patients with CDDW and may be the optimal operation for the isolated form of CDDW. Early detection of CDDW saves pancreas.

#### PP01-17

### DUODENUM-PRESERVING SURGICAL APPROACH TO THE TREATMENT OF PARADUODENAL PANCREATITIS

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**Introduction:** Paraduodenal pancreatitis (PDP) is an uncommon form of chronic pancreatitis. To date, no consensus exists regarding surgical timing and technique for the treatment of PDP. The aim of our study was to investigate the role of duodenum-preserving pancreatic head resections (DPPHR) in the treatment of PDP.

**Methods:** Retrospective analysis of the 1409 patients with chronic pancreatitis treated in our clinic from 2015 to 2019 was performed, out of which 112 patients with PDP were identified. Results of the treatment of patients who required DPPHR were analyzed. Such modifications of DPPHR as Berne's, Beger's and Frey's procedures were used depending on the extent of the inflammation and anatomical variations. Pain was assessed preoperatively and at 18 months after surgery using visual analogue pain scores (VAS) and results were converted to values from 0 to 100.

**Results:** A total of 45 DPPHR were performed. Mean duration of operative procedure was 144 min with mean blood loss of 122 ml. Hospital length of stay was  $14,2 \pm 1,5$  (95% CI) days and complication rate was 11,1%. No mortality was recorded. Preoperative and postoperative VAS results for pain were 86 and 17 respectfully.

**Conclusion:** DPPHR is safe (complication rate 11,1%) procedure for the treatment of paraduodenal pancreatitis. It achieved good results in terms of pain control at 18 months after surgery with the results of VAS pain assessment dropping from 86 to 17.

#### PP01-19

### KYNURENINE MONOOXYGENASE REGULATES INFLAMMATION DURING CRITICAL ILLNESS AND RECOVERY IN EXPERIMENTAL ACUTE PANCREATITIS

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**Introduction:** Kynurenine monooxygenase (KMO) inhibitors are a promising new class of medicine to treat acute pancreatitis (AP). Metabolic flux through KMO correlates with severity in human AP, and KMO blockade protects against organ failure during experimental AP. Our aim was to define the molecular mechanisms that link KMO metabolism and systemic inflammation.

**Methods:** Genetically-altered KMO wildtype, global KMO knockout, and novel hepatocyte-restricted KMO knockout (*Kmo<sup>alb-cre</sup>*) mice underwent experimental AP by intraductal taurocholate infusion. Kynurenine metabolites were measured in plasma by LC-MS/MS. RNAseq transcriptomics were measured in liver homogenate. Physiology and sickness behaviour were monitored by implanted telemetry. A novel highly-selective KMO inhibitor (GSK898) was given by osmotic mini-pump for 7-day AP studies. Kynurenine metabolite  $\pm$  cytokine potency *in vitro* was tested by caspase activation in HMVEC-L endothelial cells.

**Results:** The KMO product 3-hydroxykynurenine (3HK) primed inflammatory gene pathway transcription and exacerbated systemic inflammation during AP. A hepatocyte-restricted role for KMO was observed, wherein mice lacking *Kmo* solely in hepatocytes (*Kmo<sup>alb-cre</sup>*) had elevated plasma 3HK levels, reduced <sup>13</sup>C<sub>6</sub>-3-hydroxykynurenine tracer clearance, and also had altered inflammatory signalling pathway gene transcription. 3HK synergised with interleukin-1 $\beta$  to induce cellular apoptosis. *Kmo<sup>alb-cre</sup>* mice succumbed fatally earlier and more readily to experimental AP. Therapeutically, systemic administration of the KMO inhibitor rescued the *Kmo<sup>alb-cre</sup>* phenotype by reducing 3HK to undetectable levels and protected against early critical illness.

**Conclusions:** These findings establish the KMO product, 3HK, as a regulator of inflammation and the innate immune response to sterile inflammatory injury which can be rescued by systemic KMO blockade.

#### PP01-20

### BILIARY - PANCREATIC - DIGESTIVE BYPASS FOR CHRONIC OBSTRUCTIVE PANCREATITIS

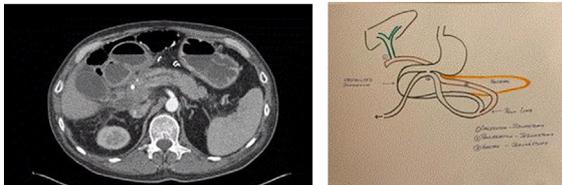
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**Introduction:** In patients with chronic pancreatitis, common bile duct obstruction is reported in 3.2-45.6% of patients, of whom only 5-10% require operative decompression. Obstruction of the duodenum is much less common occurring in less than 1-2% of patients. Pancreaticoduodenectomy with or without a drainage procedure or isolated bypass procedures to the biliary tract or stomach are common procedures in the algorithm to treat this disease. Also, improvement in endoscopic techniques have decreased the need for surgical intervention overall. That being said, triple bypass (biliary-pancreatic and digestive) in patients with chronic pancreatitis causing pancreatic duct obstruction, biliary stricture and duodenal stenosis should be part of the armamentarium.

**Methods:** This case reports the treatment of a 59 year old male who underwent a Roux-en-y choledocho-jejunostomy, lateral pancreatico-jejunostomy (Puestow) and gastro-jejunostomy to bypass the biliary stricture, duodenal stenosis and pancreatic duct obstruction due to alcoholic pancreatitis not amenable to endoscopic therapy. CT imaging demonstrated severe narrowing of the portal vein with possible cavernous transformation. Also, intra-operative pancreatic abscess and inflammation involving the head of the pancreas precluded a safe pancreaticoduodenectomy.

**Results:** The surgery lasted 302 minutes with no intra-operative complications or blood transfusion. Hospital stay was 7 days. The patient has done well with improved nutrition, decreased pain and narcotic use 6 months after surgery.

**Conclusions:** The triple pancreas bypass is a useful surgical procedure in patients with chronic pancreatitis presenting with biliary, duodenal and pancreatic duct obstruction not amenable to endoscopic treatment or conventional surgical resection or drainage procedures.



Bypass and Imaging

PP01-22

## RECURRENT PANCREATITIS IN THE SETTING OF GALLBLADDER AGENESIS, ANSA PANCREATICA AND SANTORINICOELE

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Gallbladder agenesis is a rare condition. Patients with gallbladder agenesis can present with biliary type symptoms and rarely pancreatitis. We present the case of a 35-year-old gentleman who was admitted and treated for recurrent pancreatitis on a background of gallbladder agenesis, ansa pancreatica and Santorinicoele.

Whilst these anatomical variants have been described to result in pancreatitis in their own respective ways, this case study describes a patient who has had concurrent anatomical variants. The hypothesis is that the common finding with these variants of hindering adequate excretion of bile and pancreatic juice through their respective mechanisms, ultimately results in recurrent acute pancreatitis from raised intraductal pressure.

Figure 1: Magnetic Resonance Cholangiopancreatography (MRCP) image confirming an absent gallbladder and defining the biliary anatomy. The main pancreatic duct (hollow red arrow) is shown. There is a dilated duct of Santorini draining into the minor papilla (solid red arrow) and an ansa pancreatica (yellow solid arrow) connecting the main pancreatic duct and duct of Santorini.

Figure 2: MRCP showing mild intrahepatic duct dilatation and a dilated common bile duct which measures 8 mm at the porta hepatis and 15 mm at the mid CBD with smooth distal tapering. The main pancreatic duct (hollow red arrow) is prominent at 3 mm, there is a Santorinicoele (solid red arrow) draining into minor papilla and an ansa pancreatica (yellow solid arrow) between the main pancreatic duct and Santorinicoele which is more prominent and dilated compared to Figure 1 which was the MRCP the month prior.

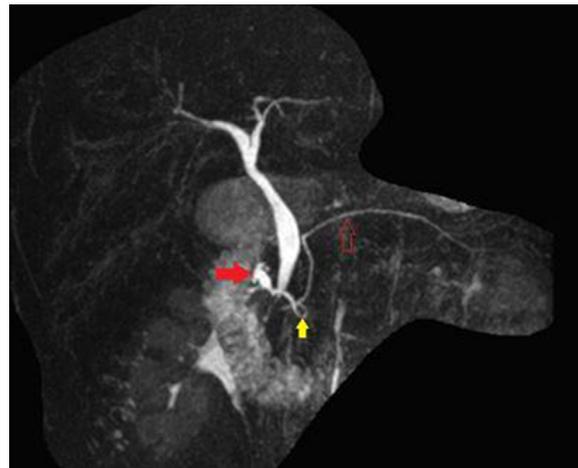


Figure 1

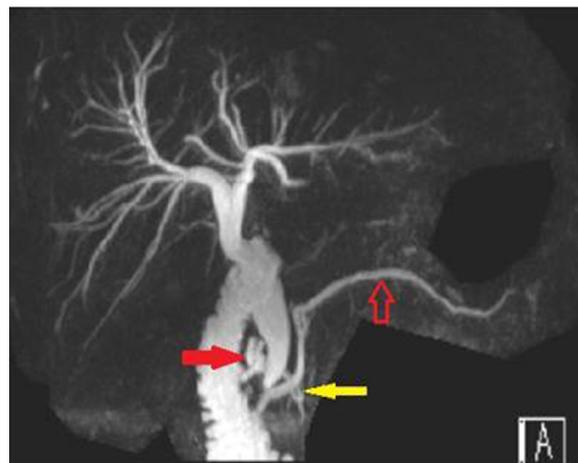


Figure 2

PP01-23

### LAPAROSCOPIC NECROSECTOMY FOR ACUTE NECROTIZING PANCREATITIS: RETROSPECTIVE ANALYSIS OF A DECADE LONG EXPERIENCE FROM A TERTIARY CENTRE

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**Introduction:** To evaluate the role of minimally invasive surgery for management of necrotizing pancreatitis in the acute setting and to propose tailor made approaches to deal with various locations of pancreatic necrosis.

**Methods:** A total of 112 patients (75 males, 37 females) with mean age of 41.5±10.3 years, with necrotizing pancreatitis underwent minimally invasive necrosectomy between January 2009 and May 2019. Laparoscopic necrosectomy was performed by transperitoneal approach in 81 patients, by retroperitoneoscopy in 18 patients and combined approach in 13 patients. Out of 81 patients treated by transperitoneal approach, 21 were approached through lesser sac, 48 through mesocolic route and 12 through paracolic route. In cases of retroperitoneoscopy, all cases were accessed through the left flank.

**Results:** All patients tolerated the procedure well. Mean BMI was 26.45±3.78 kg/sqm.

Mean operating time was 56.40±20.48 minutes and mean blood loss was 120±31.45 ml. Eight patients required reoperation (6 underwent open procedure and 2 underwent laparoscopic redo necrosectomy). Six patients died of multi-organ failure. The mean duration of return of bowel function was 5±1.8 days. The mean length of hospital stay after surgery was 8.19 ±4.09 days. There were no major wound related complications.

**Conclusion:** Minimally invasive approach to pancreatic necrosectomy is safe and feasible with good outcomes in centres with adequate expertise. In addition to careful case selection, proper timing and optimal route of access determines the outcome. Minimally invasive procedures are suitable alternatives especially in critically ill patients providing lower morbidity and mortality rates.

PP01-24

### OUTCOME OF OPEN NECROSECTOMY VERSUS MINIMALLY INVASIVE RETROPERITONEAL NECROSECTOMY FOLLOWING PERCUTANEOUS DRAINAGE IN INFECTED NECROTISING PANCREATITIS

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**Introduction:** Percutaneous drainage is the first step in the well established “step - up” approach in management of infected necrotising pancreatitis. This study intended to compare the outcome of open necrosectomy and minimally

invasive retroperitoneal necrosectomy (MIRP) following percutaneous drainage.

**Method:** Single centre, retrospective analysis of 32 patients between 2016-2019 who underwent further necrosectomy procedure following percutaneous drainage for infected necrosis, were included in this study.

**Result:** Among 32 patients, 21(65.63%) patients underwent open necrosectomy. The most common etiology was due to alcohol intake (71.88%). Mean interval of necrosectomy following acute episode was 25.31±12.72 day. Overall procedure mortality was 31.25%, while 33.33% (p= 0.705) following open necrosectomy. 46.88% patients developed major complications other than organ failure (n=5). Pancreatic fistula was the most common complication (15.63%). Open necrosectomy causes more blood loss (216.66±184.88 ml, p=0.463) and takes more time (161.90±58.61 mins) than MIRP.

**Conclusion:** Initial percutaneous drainage decreases the infective and others pro-inflammatory mediators load, resulting in decrease inflammatory cascade and delaying the need for further surgical necrosectomy. In this study there was no significant difference in morbidity or mortality between open necrosectomy and MIRP in patients of infective necrosis following initial percutaneous drainage.

PP01-25

### EFFICACY OF MRCP IN GALLSTONE PANCREATITIS

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**Background/Aims:** Latest BSG guidelines from 2016 in the management of acute gallstone pancreatitis(GSP) in combination with jaundice and/or dilated common bile duct(CBD) warrants an ERCP within 72 hours of presentation. Literature suggests that 50% of CBD stones will pass spontaneously and do not need CBD intervention. This study assesses the use of MRCP in the management of GSP.

**Methodology:** This is a retrospective study of patients presenting with GSP from April 2010 to July 2019. Data collected included age, sex, serum bilirubin levels at presentation, ultrasound(US) findings, MRCP and ERCP investigations and severity of pancreatitis. Factors were analysed for significance predicting presence of gallstones(GS) in the CBD on admission. Statistical analysis was conducted using SPSSv20.

**Results:** There were 440 patients with GSP in this study. 416 patients had US confirming GS. Amongst them, the trend for the presence of either dilated CBD on US (p=0.068) with stone seen in CBD (p=0.063) or bilirubin>22µmol/L(p=0.071) to predict the presence of CBD stones on MRCP. Severe pancreatitis(p=0.034) and presence of stones on MRCP(p< 0.001) predicted presence of stones on ERCP. On multivariate analysis, presence of stones on MRCP was predictive of stones on ERCP(p=0.006).

**Conclusions:** Patients who present with GSP should have further investigations to confirm the presence of GS in the CBD to assess the necessity for ERCP or CBD exploration.

PP01-27

### ROUX-EN-Y FISTULOJEJUNOSTOMY AS A SALVAGE PROCEDURE FOR DISPLACED PANCREATIC STENT IN DISCONNECTED PANCREATIC DUCT SYNDROME WITH REFRACTORY EXTERNAL PANCREATIC FISTULA

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**Introduction:** Disconnected Pancreatic Duct Syndrome (DPDS), is the circumferential discontinuity of pancreatic duct such that the distal pancreas does not drain downstream into the duodenum as a result of severe acute or necrotising pancreatitis and can present either as pancreatic ascites or as external pancreatic fistula.

**Method:** 37year old male, Post Necrotising Pancreatitis presented with Disconnected Pancreatic Duct Syndrome (DPDS) with left sided portal hypertension. He was initially managed with pig tail drainage which resulted in an controlled External Pancreatic Fistula. ERCP and Pancreatic stenting was done but failed in closure of the fistula. CECT abdomen showed features suggestive of displaced pancreatic duct stent. He underwent EXPLORATORY LAPAROTOMY WITH ROUX-EN-Y FISTULOJEJUNOSTOMY. Intraoperatively there was complete disruption of the pancreatic duct with an intrapancreatic collection of 2x2 cm, tip of the pig tail drain and pancreatic duct stent could be seen outside the parenchyma. Post operatively patient recovered satisfactorily.

**Result:** ERCP with trans-papillary stenting or surgery remain the two pathways oftreatment but with high recurrence rates. When nonsurgical measures fail, surgical intervention may be warranted and roux en y internal drainage has been considered as optimal therapy. Surgical intervention may involve debridement, resection or drainage procedure. In patient with concomitant left sided portal hypertension drainage procedure may be a safer option.

**Conclusion:** DDS needs multidisciplinary approaches to mend it and can be challenging and time consuming. Roux-en-Y Fistulojejunostomy is a good salvage procedure for Displaced Pancreatic Stent in Disconnected Pancreatic Duct Syndrome with Refractory External Pancreatic Fistula.

PP01-31

### SPECTRUM OF VASCULAR COMPLICATIONS IN ACUTE PANCREATITIS - CHALLENGES IN MANAGEMENT

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**Background:** Vascular complication of pancreatitis is a rare entity. Due to its rarity, the diagnostic and therapeutic

strategy for the management of this potentially life threatening problem remains undefined. The objective of our study is to highlight the spectrum of manifestations, challenges in the diagnosis and management of vascular complications of acute pancreatitis.

**Methods:** Patients who were managed for vascular complication of acute / chronic pancreatitis were retrospectively analysed from the year 2000 to 2019.

**Results:** There were a total of 79 patients ( 71 Male:8 Female) with a mean age of 34.8 years . 27 patients had chronic alcoholic pancreatitis 27- Tropical pancreatitis , 18- acute pancreatitis , 3- idiopathic and 1 had post traumatic pancreatitis. 8 patients were managed conservatively. Selective arterial embolization was attempted in 55 of 70 (78.5%) patients and was successful in 44 of the 55 (80 %). 27 of 76 (31.5%) patients required surgery. Overall mortality was 7.8 %.

**Conclusion:** Upper gastrointestinal bleeding in a patient with a history of chronic pancreatitis could be caused by HP. All hemodynamically stable patients with HP should undergo prompt initial angiographic evaluation, and if possible, embolization. Hemodynamically unstable patients and those following unsuccessful embolization should undergo emergency haemostatic surgery. Centralization of GI bleed services along with a multidisciplinary team approach and a well-defined management protocol is essential to reduce the mortality and morbidity of this condition.

#### Table showing the statistics of the patient managed

Table showing Vascular complications :

Source of Bleed :	N=75
Splenic artery	35
Gastroduodenal artery	15
Unnamed Intracystic artery	15
Superior Pancreaticoduodenal artery	5
Inferior pancreaticoduodenal artery	5
<b>Rare complications :</b>	
Pseudocyst portal vein fistula with portal pyemia	1
Pseudo Pseudocyst IVC fistula	1

Table Showing Surgery Performed :

Distal pancreatectomy + Splenectomy	16
Distal pancreatectomy + splenectomy + cystocolic repair	1
Freys procedure with intracystic aneurysmal ligation	2
Central pancreatectomy	1
Intracystic ligation of blood vessel	5
Aneurysmal ligation + bypass graft	1
Cystogastrostomy for Pseudocyst Portal vein fistula	1

PP01-32

### A NOVEL TECHNIQUE OF INTRAPANCREATIC CHOLEDOCHOPLASTY DURING FREY'S PROCEDURE FOR CHRONIC PANCREATITIS INDUCED BILIARY STRICTURES

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**Introduction:** Biliary stricture is a well-known complication of chronic pancreatitis which may require surgical drainage in the form of bilioenteric anastomosis. We report a novel technique for surgical management of such strictures - intrapancreatic choledochoplasty during Frey's procedure (FP), where we lay open the intrapancreatic CBD and fix it to the pancreatic tissue/capsule in the head to keep it patent.

**Methods:** The study was carried out at a tertiary care centre in India from January 2017 to December 2019. Patients of chronic pancreatitis with associated biliary strictures who were candidates for FP were evaluated for suitability for the procedure. Strictures confined to the intrapancreatic CBD requiring biliary drainage underwent choledochoplasty in addition to FP.

**Results:** 10 patients underwent choledochoplasty (8:2 - males:female). The mean age was 39 years. Pain was reported for a median duration of 36 months (6 - 96 months) and jaundice for a median of 12 months (1 -36 months). 80% patients had at least one episode of cholangitis. Exocrine and endocrine insufficiency was present in 60% and 80% patients respectively. Preoperative stent was placed in the CBD/MPD in 40% patients each. Mean duration of surgery was 300 minutes and mean blood loss was 300 ml. The mean post-operative hospital stay was 8.5 days with no grade III - V complications. On followup, LFT was normal in all patients.

**Conclusions:** We describe our technique of intrapancreatic choledochoplasty during FP, which is an effective substitute to bilioenteric anastomosis in surgical management of chronic pancreatitis induced intrapancreatic CBD strictures.

#### PP01-33

### OBSERVATION AND SPONTANEOUS REGRESSION OF ASYMPTOMATIC WALLED PANCREATIC NECROSIS

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**Introduction:** WON is a late complication of acute pancreatitis, usually occurs four weeks after remission, with necrosis and liquefaction of pancreatic tissue, can cause mass effect or become infected. Management depends on the symptoms and location of the collection, and in 40% they resolve spontaneously, conservative treatment may be appropriate in asymptomatic patients. We present two cases of WON, conservative management, with asymptomatic observation over a long period of time.

**Case1:** female, 37 years old, history of severe acute biliary pancreatitis, 4 weeks after the acute condition presents extrinsic compression of the gastric antrum in the endoscopy and collection image in the pancreatic body. Remains clinically asymptomatic, and 2 months later cholecystectomy is scheduled, without inconvenience. At 2 months after surgery, favorable evolution, asymptomatic and with reduced collection size.

**Case2:** female, 31 years old, history of severe acute biliary pancreatitis, 3 weeks after the acute condition, presents a collection image in the body and pancreatic tail, extrinsic

compression of the gastric body in endoscopy. In asymptomatic clinically controls, with persistence of collection. After 10 months of observation, cholecystectomy is programmed, without problems. At 4 months after surgery, favorable evolution, asymptomatic and with reduced collection size.

**Conclusion:** careful observation of patients with clinically asymptomatic WON can be an efficient and safe treatment. In these two cases, long-term observation demonstrated a spontaneous regression of asymptomatic WON without the need for interventional treatment.

#### PP01-34

### SAFETY OF EARLY CHOLECYSTECTOMY IN ACUTE BILIARY PANCREATITIS

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**Introduction:** The worldwide incidence of pancreatitis is 4.9 to 35 / 100,000 inhabitants, whose numbers are increasing. In Chile, the most common cause is that of biliary origin, ranging from 60% to 80%. Classically, cholecystectomy was contraindicated before the 7th day of onset of pancreatitis. Multiple works support this claim, however, no clear consensus has been established.

**Objective:** To determine the safety of cholecystectomy in patients with mild acute pancreatitis of biliary origin.

**Methods:** Retrospective, descriptive study of patients with mild acute pancreatitis of biliary origin surgically operated before 48 hrs.

**Results:** The sample was 112 patients, 5 were excluded with 107 patients remaining. Two groups were established based on ultrasound findings and liver profile. Group 1: 69 patients with ultrasound showing cholelithiasis and normal bile duct and group 2: 38 patients with ultrasound showing dilated bile duct, suggestive magnetic cholangioresonance choledocholithiasis, cholestatic liver profile. Both groups underwent laparoscopic cholecystectomy before 48 hours. According to the finding, ERCP was performed. Without surgical complications .. without average readmissions of hospitalization was 3.3 days. 12-month follow-up . No mortality was reported.

**Conclusions:** It was shown that laparoscopic cholecystectomy at 48 hrs is safe with decreased days of hospitalization and low morbidity.

#### PP01-35

### SURGICAL TREATMENT OF STENT MIGRATION TO PANCREATIC DUCT: CASE REPORT

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Endoprotheses are common in the treatment of biliary system disorders. Long term biliary plastic stent placement is known to cause several complications, 1.7-6 % of stents migrate. Treatment is mostly done by conventional endoscopic procedures, however 10 % will require surgical intervention. One reason for the failure of the endoscopic treatment is the de novo stent stone complex formation.

In this case we are reporting a stent migration to the pancreatic duct and the de novo stent stone complex formation caused failure of the endoscopic treatment.

We report the case of a 48-year-old Hispanic female who presents to the emergency department with abdominal pain for the last 72 hours. In her past medical history she reported recurrent abdominal pain similar to the actual episode. She also reported choledocholithiasis treated with ERCP and stent two years ago with no follow up. Pancreatitis was documented, diagnostic studies show a dilated Wirsung duct with three images that correspond to stones and a migrated stent in the lumen of the pancreatic duct. She was diagnosed with chronic pancreatitis. ERCP was unable to remove the stent. A pancreaticojejunostomy (Puestow procedure) and a stent removal was performed.

The patient had an uncomplicated post operative course with complete resolution of abdominal pain. She remains asymptomatic three months after surgery.

Follow up after stent placement is important to avoid unintentional retention. In the case this occurs, first line treatment is the endoscopic approach, occasionally surgery is needed for resolution.



Stent removal from pancreatic duct



Stent removal from pancreatic duct

#### PP01-38

### CLINICAL PRESENTATION AND MANAGEMENT AND OUTCOMES OF DISCONNECTED PANCREATIC DUCT SYNDROME: A SYSTEMATIC REVIEW AND META-ANALYSIS

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**Background:** This systematic review and meta-analysis aimed to review the clinical presentation, definitions and treatment outcomes for DPDS.

**Methods:** The PubMed, EMBASE, MEDLINE and SCOPUS databases were systematically searched until June 2019 using the PRISMA framework.

**Results:** Twenty-six studies were included in the quantitative analysis comprising 1057 patients. Acute pancreatitis was the most common aetiology (92.8%, 596/642) followed by chronic pancreatitis (4.7%, 30/642). DPDS commonly presented with pancreatic fluid collections (PFC) (516/614, 84.0%) followed by external pancreatic fistulae (EPF) (14.7%, 90/614) and pancreatic ascites (1.3%, 8/614). Seven studies defined DPDS as the presence of extravasation or total cut-off of contrast material injected into main pancreatic duct (MPD) and a viable upstream

pancreas, five studies further included either >2cm necrotic pancreatic segment or persistent PFC/EPF as a criteria, two studies defined DPDS intraoperatively and five studies lacked a definition. The success of endoscopic or surgical intervention was defined as resolution of symptoms without recurrence of PFC, EPF or ascites. The weighted success rate among those undergoing a transmural drainage (91.6%, 95%-CI 81.2-96.5) was significantly higher than transpapillary drainage (58.5%, 95%-CI 36.7-77.4). Pairwise meta-analysis showed comparable success rates between endoscopic and surgical drainage which were 82% (weighted 95%-CI 68.6-90.5) and 87.3% (95%-CI 79.2-92.5) respectively, (P=0.389).

**Conclusion:** Transmural drainage was superior to transpapillary drainage for management of DPDS. Both surgery and endoscopy have comparable success rates. There remains a significant variability in the definitions and treatment strategies for DPDS.

**Keywords:** Pancreatic duct disruption, DPDS, complete duct disruption

#### PP01-40

### A STUDY OF CBD EVALUATION IN CASES OF MILD GALL STONE PANCREATITIS

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**Introduction:** Gall stones as an aetiology represent 40-60% cases of acute pancreatitis with variations due to diagnostic efforts and availability of imaging tools. Accurate diagnosis of acute biliary pancreatitis (ABP) is of utmost importance because clearance of lithiasis (gallbladder and common bile duct, CBD) rules out recurrences, very frequent otherwise, with 30% to 50% of the patients developing recurrent acute pancreatitis relatively soon after discharge (average time 108 d), some of them maybe more severe than the previous episode. Therefore, All patients should undergo specific imaging, preferably MRCP, to exclude choledocholithiasis as LFTs and ultrasonography are inaccurate in predicting common bile duct stones.

**Methods:** An analytical observational study was carried out at an eastern indian Tertiary care centre from January 2012 to October 2019. All patients with mild acute gall stone pancreatitis were included in the study. MRCP was done at the time of index admission. All patients underwent laproscopic cholecystectomy. Additional ERCP was done for those with CBD stones on MRCP

**Results:** 70% (56 out of 80) patients came to the hospital within 1 week of onset of symptoms. The cumulative rate of choledocholithiasis was 12.5% that is 10 out of 80 patients at index admission, of which 60% were within the 1<sup>st</sup> week of onset of symptoms

**Conclusion:** Early performance of MRCP can help in selecting patients for ERCP before cholecystectomy. Therefore routine CBD evaluation should be encouraged in cases of mild biliary pancreatitis.

### PP02 - Pancreas: Pancreatic Cysts

#### PP02-01

### ASSESSMENT OF THE SENDAI CRITERIA FOR LONG-TERM FOLLOW-UP OF BRANCH-DUCT INTRADUCTAL PAPILLARY MUCINOUS NEOPLASMS. OUTCOMES OF A TERTIARY REFERRAL CENTER

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**Background:** The management of Branch-Duct Intraductal Papillary Mucinous Neoplasm (BD-IPMN) is still controverted. Our objective was to assess the long-term follow-up of patients with "low risk" BD-IPMN using the Sendai International Consensus Guidelines (ICG-I) to establish the safety of doing so and to evaluate factors associated to the development of pancreatic ductal adenocarcinoma (PDAC).

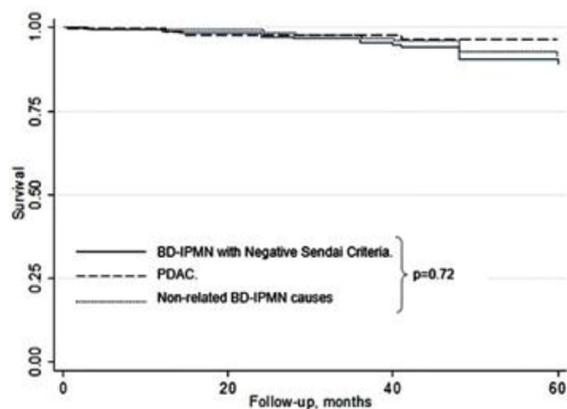
**Methods:** We analyzed a retrospective cohort since January 2004 to December 2017. Only patients with BD-IPMN and Sendai-negative Criteria were included. A univariate analysis was performed for factors associated with conversion to positive Sendai Criteria and PDAC. Positive predictive value and negative predictive value of the ICG-I were assessed for the presence of PDAC.

**Results:** From a total of 219 patients selected for analysis, five (2.2%) developed cancer and seven (3.19%) developed lesions with high grade dysplasia. During a median follow-up of 49 months, 182 patients (83%) didn't develop PDAC. The NPP and PPV of ICG-I for the presence of cancer were 100% and 13.5% respectively. Patients older than 65 years developed cancer more often (OR: 3.57; p=0.015) and their CA-19.9 values were higher (OR: 5.27; p=0.007).

**Conclusion:** The absence of positive Sendai criteria excludes a malignant disease and the ICG-I were safety for the follow-up of patients with BD-IPMN. In our series, progression to cancer occurred only in 2.2% of the total population and cancer-related mortality was 1.36%. Such risk is similar to the mortality rate of pancreatic surgery. However, with our approach, in 83 % of patients an unnecessary surgery could be avoided.

#### Demographic Analysis and Cyst Characteristics

Demographic Analysis	Value
Patients with negative Sendai criteria, n (%)	219 (74.7)
Patients who converted to positive criteria at follow-up, n (%)	37 (17)
Female sex, n (%)	160 (73)
Age at diagnosis, years Median (range)	71 (61-79)
Cyst Characteristics	Value
Location, n (%) Head Body Tail	89 (40) 85 (38)
Diffuse involvement	34 (15) 11 (7)
Initial size, mm, median (range) of total population (n=219) with negative criteria	15 (10-22)
Single cysts, n (%)	128 (58.5)
Multiple cysts, n (%)	91 (41.5)



Survival Curve

PP02-04

### CANCER-DERIVED IMMUNOGLOBULIN G: A NOVEL MARKER FOR RISK STRATIFICATION IN INTRADUCTAL PAPILLARY MUCINOUS NEOPLASMS

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**Objectives:** Cancer-derived immunoglobulin G (CIgG) is a novel molecule plays important roles in carcinogenesis. Previous studies showed that the expression of CIgG was closely related to tumor differentiation of pancreatic cancer. This study aimed to evaluate the expression and potential significance of CIgG in intraductal papillary mucinous neoplasms (IPMNs) of the pancreas.

**Methods:** Eighty-eight pathological tissues diagnosed with different grades of IPMN were enrolled in the study. The expression of CIgG was assessed by immunohistochemistry. ROC analysis was used to test CIgG's significance in the differential diagnosis between LG-IPMN patients and HG/inv-IPMN patients

**Results:** CIgG was expressed in both IPMN and pancreatic ductal adenocarcinoma, but not expressed in normal pancreas tissue. The expression of CIgG was significantly elevated during the malignant progression of IPMN (LG-IPMN vs. HG-IPMN,  $P=0.001$ ; HG-IPMN vs. inv-IPMN,  $P=0.004$ ; LG-IPMN vs. inv-IPMN,  $P<0.001$ ). The AUC for CIgG expression was 0.765 (95% confidence interval (CI), 0.663-0.849;  $P<0.001$ ). The sensitivity and specificity of CIgG in discriminating LG-IPMN from HG/inv-IPMN was 61.4% (95% CI 0.455 to 0.756) and 90.9% (95% CI 0.783 to 0.975), respectively.

**Conclusions:** This study demonstrates that CIgG participates in the malignant progression of IPMN and could serve as a potential diagnostic biomarker for IPMN.

PP02-05

### EVALUATION OF CURRENT CONSENSUS GUIDELINES FOR THE MANAGEMENT OF MUCINOUS CYSTIC LESIONS OF THE PANCREAS

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**Introduction:** Over the years, several guidelines have been introduced to guide management of mucinous cystic lesions of the pancreas (mCLP). Presently, there have been limited studies in the literature comparing the 4 main guidelines for the management of Intraductal Papillary Mucinous Neoplasms (IPMN) and Mucinous Neoplasms (MCN). In this study, we aimed to evaluate and compare the clinically utility between the 2006 Sendai (SG06), 2012 Fukuoka (FG12), 2017 updated Fukuoka (FG17) and 2018 European guidelines (EG18).

**Methods:** One hundred and eighty-eight patients with MCN or IPMN who underwent surgical resection were retrospectively reviewed and classified under the 4 guidelines.

**Results:** The presence of symptoms, obstructive jaundice, pancreatic, raised CA19-9 >37 U/ml, raised CA 19-9 >47U/ml, enhancing solid component, main pancreatic duct  $\geq 5$ mm, main pancreatic duct 5-9.9mm, main pancreatic duct >6mm, main pancreatic duct  $t \geq 10$ mm, increasing number of high risk (HR) features: HR (SG06), HR (FG12), HR (FG17), absolute indications (EG18) were associated with a significantly increased likelihood of malignancy. The positive predictive value (PPV) of HR (SG06), HR (FG12), HR (FG17), Absolute indications (EG18) for high grade dysplasia/invasive carcinoma was 54%, 76%, 78% and 56% respectively. The negative predictive value of low risk (LR); LR (SG06), LR (FG12) and LR (FG2017) was 100%, while that of LR (FG2018) was 95%. Only EG18 had 1 malignant (HGD) lesion in the LR group.

**Conclusion:** All 4 guidelines were useful in the risk stratification and management of mCLP.

PP02-07

### WHY IS IMPORTANT TO KNOW HOW SPLEEN SURVIVES AFTER SPLEEN-PRESERVING DISTAL PANCREATECTOMY WITH SPLENIC VESSELS RESECTION? EXPERIENCE OF 51 OPERATIONS WITHOUT SPLENECTOMIES

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**Background:** Knowledge of spleen collaterals is important as for distal spleen-preserving pancreatotomy with splenic vessels resection (DSPPSVR), so as for possible upper GI surgery for these patients.

**Objective:**

**Primary:** To clarify the sources of spleen blood supply after DSPPSVR.

**Secondary:** morbidity and mortality after DSPPSVR.

**Methods:** Retrospective analysis of case histories and CT angiograms (CTA) before and after DSPPSVR (n51).

**Results:** Indications for surgery: MCN (37), bd-IPMN (7), CSA(3), NEN(4). Open(41) and laparoscopic (10) surgery were used. No mortality, morbidity - 15(29%), fistula Grade B - 4 (8%), Spleen infarctions- 7 (14%), clinically significant spleen infarctions and splenectomies- 0. CT and CTA revealed three types of splenic blood supply after DSPPSVR: with gastro-epiploic arcade (GEA) as a main collateral artery (n8, 16%), with short gastric arteries (SGA) as a main collateral (n6, 12%) and intermediate type (n36, 72%).

**Conclusion:** In SPDP SVR in 1/3 of cases only GEA or only SGA are the main collaterals, supplying the spleen, in 2/3 of cases both ways are involved. CT and CTA are mandatory before abdominal surgery for patients after SPDP SVR.

#### PP02-09

### DIAGNOSIS AND TREATMENT OF A SOLID PSEUDOPAPILLARY TUMOR OF THE PANCREAS. A RARE TUMOR IN A FEMALE PATIENT

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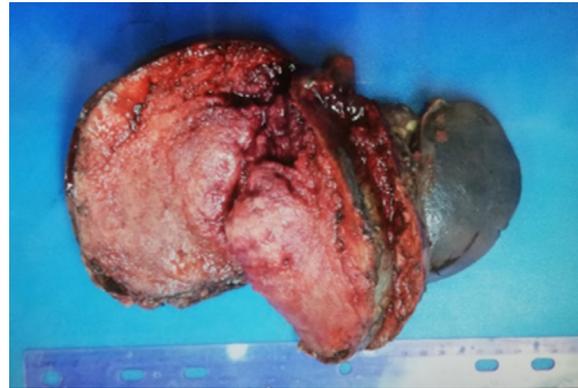
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**Introduction:** Cystic tumors of the pancreas represent the second most common exocrine pancreatic neoplasm, less than 10%, the pseudopapillary tumor is considered a rare form of neoplasm, first described in 1934, predominantly presented in women, with a mean age of presentation at 22-30 years, clinically with abdominal pain and palpable abdominal tumor. The diagnosis is based on imaging, clinical and histopathological studies of the tumor, surgical resection remains the treatment of choice, requiring vascular or en block reconstructions in some cases, with very low recurrence rates.

**Methods:** We present a 21-year-old female patient with pain and presence of a two-year-old abdominal tumor, requiring a distal pancreatotomy with splenectomy, the tumor being present at the body of pancreas of approximately 15 x 15 x 20 cm, head, neck and uncinate process with free margins, splenic vein and artery with severe dilation, free hepatic artery, free superior mesenteric artery, spleen of approximately 10 x 8 x 4 cm.

**Results:** Patient with complete resection of franc tumor without evidence of metastasis, with development of biochemical leakage detected by biochemical and clinical parameters, with conservative management, with favorable response, leaving asymptomatic and stable discharge 8 days after surgery.

**Conclusions:** The complete surgical resection of dangerous pseudopapular tumors has been described as an effective and safe treatment without evidence for the benefit of adjuvant therapy.



Macroscopic cystic tumor

#### PP02-10

### PANCREATIC MUCINOUS CYSTIC NEOPLASMS LOCATED IN THE DISTAL PANCREAS: A MULTICENTER STUDY

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**Introduction:** The rise in the number of abdominal radiological tests performed has increased the diagnosis of pancreatic cystic lesions. Mucinous cystic neoplasms are infrequent, usually unilocular, occurring in postmenopausal women, located in the pancreatic body/tail. The risk of malignancy is 4-12%. The guidelines recommend observation for asymptomatic neoplasms below 4 cm, with no risk factors such as mural nodules.

**Methods:** Retrospective multicenter observational study of prospectively recorded data regarding distal pancreatometomies carried out at seven Hepato-Pancreato-Biliary Units between 01/01/08 and 31/12/18 (ERPANDIS Project).

**Results:** 444 distal pancreatometomies were recorded, 47 with mucinous neoplasm (10.6%). Thirty-five were non-invasive tumors (74.5%). 83% were female, 60 % were ASA II. The mean preoperative size was 46 mm. Only 32% were biopsied. Patients with invasive tumors were older (54 vs 63 years). Invasive tumors were larger (6 vs 4 cm), though the difference was not significant (p=0.287). 59.6% were operated laparoscopically. The laparoscopic approach was used in 74.6% of non-invasive tumors and in 16.7% of invasive ones. There was no spleen preservation in the 93.6% of the patients. Postoperative results are in Table 1. R0 resection was obtained in all patients. Two patients with local recurrences of invasive tumors were exitus.

**Conclusion:** In our series, the laparoscopic approach proved feasible and safe. It was mainly used in non-

invasive tumors and rarely in invasive ones. Morbidity rates were high, but the mortality was zero. Prospective studies are needed to define risk factors that can guide the decision whether to administer conservative or surgical treatment.

#### PP02-12

### ROBOTIC ASSISTED DRAINAGE OF PANCREATIC AND PERIPANCREATIC FLUID COLLECTIONS. IS IT THE RIGHT PATH?

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**Background:** Peri pancreatic fluid collections (PFC), are one of the most common complications in patients with acute pancreatitis. In more than half the cases, the fluid collections will resolve by itself. Surgical management, either endoscopic or minimally invasive treatment, is reserved for patients with systemic or abdominal symptoms or complications.

**Aim:** To briefly describe our surgical technique with robotic assistance, as well as the morbidity, mortality and length of stay, as well as the clinical success of the robotic assisted cystogastrostomy in the treatment of peripancreatic fluid collections at our institution.

**Methods:** We included patients with peripancreatic fluid collections, mainly pancreatic necrosis as well as pseudocyst, that required surgical drainage, from October 2016 to October 2019. We determined the morbidity and mortality associated with the procedure, along with the clinical success and recurrence.

**Results:** We included 28 patients who were diagnosed with PFC, within the last 3 years, who required surgical treatment. Robotic assisted retro gastric cystogastrostomy was performed in all cases, with a primary drainage success rate of 96%, with morbidity of 11%, mortality of 0.%, with a 36 month follow up.

**Conclusions:** The results that were obtained with the robotic assisted technique, applied at our practice, showed that the approach so far, seems safe, feasible and reproducible, when it comes to the surgical management of peripancreatic fluid collections.

#### PP02-13

### LONG TERM SURVEILLANCE OF PANCREATIC CYSTS AND ITS VALUE

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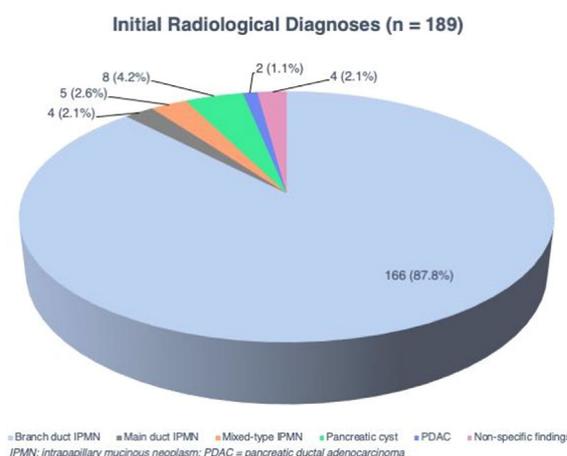
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Tsunami of pancreatic cyst detection and referrals has fueled reports and guidelines advocating surveillance strategies due to malignancy risk. Majority of recommendations are opinion-based as evidence is lacking. We report our experience of managing pancreas cysts.

1905 patients with pancreas cyst were investigated over a six-year period from 2010-2016. 212 patients had follow-up of >2 years and 189 patients had complete data. Demographics, radiological findings, histopathology and mortality were studied.

Median age was 70 years and 47.6% (n=90) were male. 77 (40.7%) patients had type 2 diabetes mellitus. Sixty-one (32.3%) had a history of previous and/or current malignancy. Ten (5.3%) and one (0.5%) patient(s) had previous acute and chronic pancreatitis respectively. Ca 19-9 was performed for 149 patients (78.8%): median was 16(IQR 8 - 33) units/mL. Initial radiological diagnoses are shown in Figure 1. Median number of scans and median time interval from first scan to last scan was 5 (IQR 4 - 8) and 32 (16.8 - 58.7) months respectively. Twenty-seven patients (14.8%) developed changes from initial scan: 21 had increase in lesion size (median time 26.6 months), 2 had increase in pancreatic duct diameter (median time 43.4 months) and 1 developed solid component (37.2 months). Twenty-one patients (11.1%) developed other malignancies on interval scans. Surgery was offered to 30 patients (15.9%) but only six underwent. Histology revealed intrapapillary mucinous neoplasm (IPMN)(n=4), mucinous non-cystic adenocarcinoma(n=1) and well-differentiated neuroendocrine tumour(n=1).

Long term surveillance of IPMN detects possible malignant transformation not only in pancreas but other abdominal viscera too.



**Figure 1:** Initial radiological diagnoses of all patients with pancreatic cysts detected on imaging

#### PP02-15

### LONG-TERM QUALITY OF LIFE AFTER RESECTION OF PANCREATIC NEUROENDOCRINE TUMORS

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**Background:** Survival after curative intent surgery for pancreatic neuroendocrine tumors (PNET) is high, yet

long-term outcomes including pancreatic insufficiency (EPI), new-onset diabetes (DM) and quality of life (QoL) are poorly investigated. Long-term QoL may vary depending on the type of resection performed.

**Method:** PNETs who underwent curative intent surgery between 1993-2018, with >1-year of follow-up were included. QoL was assessed using 3 validated questionnaires: the EQ-5D-5L, QLQ C-30 and QLQ GI-NET21. QoL was analysed among subgroups based on type of surgery, pancreatoduodenectomy (PD), distal pancreatectomy (DP), or enucleation (EN), and compared to a reference population. Sensitivity analyses included complications Clavien-Dindo grade  $\geq 3$  and follow-up duration ( $\leq 5$ , 5-10,  $\geq 10$  years).

**Results:** 93/138 patients responded to the questionnaires. Median follow-up duration was 99 (5-307) months. Thirty (33.7%) patients underwent PD, 29 (32.6%) patients DP, and 29 (32.6%) patients EN. Twenty-five (28.0%) patients had severe postoperative complications, 28 (20%) developed new-onset DM, and 55 (40%) developed EPI. Mean daily-health status and index scores (EQ-5D-5L), and all domains of the QLQ-C30 except for pain, were significantly lower for PNETs than for the general population (change in QoL of >10%,  $p < 0.05$ ). EN patients had highest over-all QoL in most EQ-5D-5L, QLQ-C30, and GI-NET21 domains. No differences in QoL were seen in the sensitivity analyses.

**Conclusion:** QoL of resected PNETs was significantly lower than in the general population and this reduction remained stable until more than 10 years after surgery. EN patients had better QoL compared to other types of resections.

PP02-17

## TWO CASES OF LAPAROSCOPIC RESECTION OF EPITHELIAL CYST IN AN INTRAPANCREATIC ACCESSORY SPLEEN

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**Background:** A cystic tumor of the intrapancreatic accessory spleen is rare. Only 52 patients have been reported in the English literature (PubMed keywords: epithelial cyst, epidermoid cyst and intrapancreatic accessory spleen) from 1980 to 2018.

**Objectives and methods:** We present a literature review and two cases of epithelial cyst in an intrapancreatic accessory spleen (ECIAS) that were performed laparoscopic pancreatectomy.

**Case presentation:** The first patient was a 70-year-old man with a 12 mm enhanced cystic tumor in the tail of pancreas on abdominal computed tomography (CT) underwent a laparoscopic spleen preserving distal pancreatectomy. The second patient was a 51-year-old man with a 34 mm enhanced cystic tumor in the tail of the pancreas on CT underwent hand-assisted laparoscopic distal

pancreatectomy due to obesity. Pathological evaluation revealed an ECIAS in both patients.

**Results:** Forty-three articles that reported on 52 patients have been published in the English literature. Including the present cases, 22 cases were men and 32 cases were women. The mean age of the patients was 45.4 years (range 12-70 years). Most ECIAS cases were diagnosed after surgical resection based on the pathological characteristics. Only 5 cases (9.2%) among the 54 reported cases were diagnosed preoperatively.

**Conclusions:** Although the preoperative diagnosis of ECIAS is very difficult, the possibility of ECIAS should be considered in detecting an asymptomatic intrapancreatic mass. Laparoscopic distal pancreatectomy might be a safe and effective procedure in ECIAS cases. We herein report two cases of ECIAS with some literature review.

## PP03 - Pancreas: Tumours

PP03-003

### RESECTED PANCREATIC DUCTAL ADENOCARCINOMA: UNDERSTANDING TUMOUR TROPISM TO MAXIMISE BENEFIT FROM SURGERY

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**Objectives:** Relapse-rate in pancreatic ductal adenocarcinoma (PDAC) remains high. We aimed to describe patterns of disease relapse in PDAC and to identify modifiable factors which could improve patient selection for surgery.

**Methods:** Consecutive PDAC patients undergoing curative surgery (Jan'05-Sep'17) were retrospectively analysed. Patients without follow-up or relapse information were excluded. Disease relapse patterns were classified as "local-only", "distant-only" or "combined". Recurrence Free Survival (RFS) and Overall Survival (OS) were estimated (Kaplan-Meier analysis). Logistic-regression (LR) and Cox-regression (Cox) univariate/multivariable analyses were applied used as appropriate.

**Results:** One-hundred-eighty-two patients were eligible: microscopically involved resection-margins (R1) 65.7%; adjuvant chemotherapy (adj) 62.1%. Median follow-up 17.9 months. Relapse events 143 (78.6%). Median RFS 11.4 months (95%CI=9.4-13.7) and OS 21.6 months (95%CI=17.9-18.9). Relapse patterns: "local-only" 30.1%, "distant-only" 40.5%, "combined" 29.4%; distant metastases: 69.9% (liver 41.3%; median time-to-liver recurrence 6.64 months (95%CI 4.99-8.56)). Factors impacting on risk of relapse: R1 ((any-pattern) (LR-multivariable: OR=4.02; 95%CI=0.02-0.23)), pre-adj CA19.9>normal limit (NL) (('local-only') (LR-univariate: OR=0.23; 95%CI=0.08-0.62)) and adj (('combined') (LR-univariate: OR=0.46;

95%CI=0.22-0.96)). R1 associated with shorter OS (Cox-multivariable: OR=1.90; 95%CI=1.13-3.19) while pre-adj CA19.9>LN implied shorter RFS (Cox-multivariable: OR=2.28; 95%CI=1.38-3.76) and OS (Cox-multivariable: OR=1.84; 95%CI=1.08-3.14). Preoperative magnetic resonance imaging (MRI) liver reduced the risk of relapse (any pattern) (LR-multivariable: OR=0.06; 95%CI=0.02-0.23) and was prognostic for longer OS (LR-multivariable: OR=0.27; 95%CI=0.09-0.74).

**Conclusion:** Two thirds of patients treated with curative surgery for PDAC will have recurrent disease affecting distant organs, predominantly liver; integrating preoperative imaging with MRI liver to patients pathway may improve patient selection and maximise benefit from surgery. Confirmatory studies are required.

PP03-006

### PREOPERATIVE RADIOTHERAPY IMPROVES OVERALL SURVIVAL OF PT4 PANCREATIC DUCTAL ADENOCARCINOMA PATIENTS AFTER SURGICAL RESECTION

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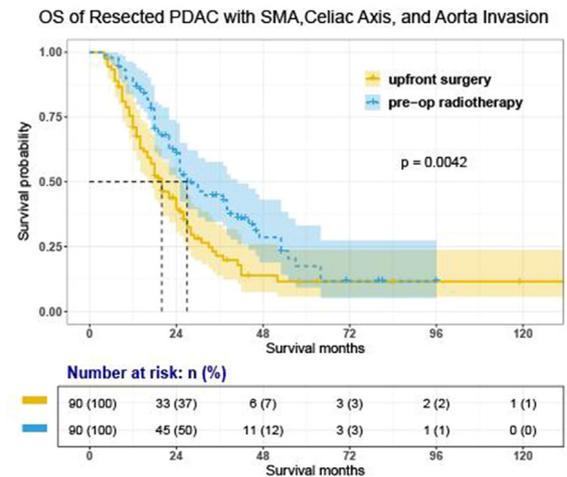
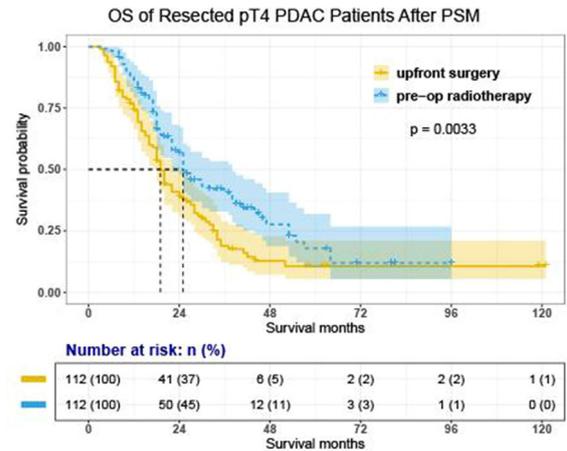
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**Purpose:** Aim of delivering radiotherapy for pancreatic ductal adenocarcinoma (PDAC) patients was to sterilize vessel margin, increase R0 resection rate, and delay local progression. Whether preoperative radiotherapy (PR) could prolong overall survival (OS) of surgical candidates remained unknown.

**Methods:** PDAC patients receiving radical resection from surveillance, epidemiology, and end results (SEER) database were enrolled. Propensity score matching (PSM) was conducted to balance difference in baseline characteristics and survival analyses was performed to compared OS between PR and upfront resection (UR) groups. Cox proportional hazards regression model and subgroup analyses were utilized to identify prognostic factors.

**Results:** 11,665 and 597 PDAC patients receiving UR and PR followed by resection from 2004 to 2016 were identified respectively, while baseline characteristics were distinct between groups. After PSM, PR was not associated with better OS (UR vs PR, 26 vs 27 months). Subgroup analyses showed that PR was a protective factor in pT4 (hazard ratio (HR) = 0.64, 95% confidence interval (CI): 0.47-0.88) but a negative predictor in pT1 (HR = 1.79, 95% CI: 1.08-2.97) patient populations. Survival analyses showed that PR improved OS of patients with pT4 stage (UR vs PR, 19 vs 25 months) and involvement of celiac axis (CA), superior mesenteric artery (SMA), and aorta (UR vs PR, 20 vs 27 months), while PR was associated with worse OS in patients with pT1 tumor (UR vs PR, 39 vs 24 months).

**Conclusion:** PR could improve survival of resected PDAC patients with pT4 stage or with CA, SMA, and aorta invasion.



Survival of Resected PDAC With(out) Preop-radiation

PP03-007

### PROTEOGENOMIC ANALYSIS DEMONSTRATES NOVEL POTENTIAL TARGETS OF PANCREATIC DUCTAL ADENOCARCINOMA IN AFRICAN PATIENTS

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Pancreatic ductal adenocarcinoma (PDAC) accounts for 2.8% of new cancer cases worldwide and is projected to become the 2<sup>nd</sup> leading cause of cancer-related deaths by 2030. Patients of African ancestry appear to be at increased risk for PDAC with the worst severity and outcome. This proposed study sought to determine and integrate proteomic and genomic profiles of PDAC patients of African ancestry to identify potential markers and better understand

molecular mechanisms of the disease, especially in our population cohort.

Thirty tissues (15 tumours and 15 corresponding normal tissues) were obtained from consenting South African PDAC patients undergoing Whipple procedure at Chris Hani Baragwanath Hospital in Johannesburg, South Africa (HREC-M150778). Protein and DNA were extracted from tissue samples and SWATH Mass Spectrometry and OncoArray analysis performed. Network and functional analysis were conducted using STRINGv11.0 and REACTOMEv70. We also used the Variant effect predictor (VEPv98) tool to predict consequences of the SNPs observed.

We found 55 upregulated and 36 downregulated proteins in tumour samples which were mostly involved in key biological processes, including haemostasis, signal transduction, neuronal system and developmental biology. These aberrant processes are known to exacerbate tumour aggressiveness, invasion and metastasis. Furthermore, we observed 219 SNPs covering key gene regions such as those observed to be upregulated by SWATH-MS analysis. They include genes such as *PALLD*, *AVL9*, *BPGM*, *SERPINB8* and *MYPN*.

We have shown the dysregulation and simultaneous mutations of several key genes/proteins highlighting their roles as plausible biomarkers and therapeutic targets. Validation studies are required to confirm these results.

#### PP03-009

### THE SATAN'S APPLE: LNCRNAS PLAY THE CRITICAL ROLE OF PANCREATIC DUCTAL ADENOCARCINOMA

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**Introduction:** We attempted to build a clinical model to predict the prognosis of PDAC patients by the quantification of the lncRNA and explore the biofunctional mechanism.

**Method:** We downloaded RNA-Seq profiles from the TCGA and GTEx databases of PDAC patients and normal samples. Moreover, we identified the differential expression lncRNAs, and used the K-M curves, the univariate Cox analysis, the lasso regression model, and the hierarchical clustering to establish a pancreatic cancer risk assessment model. Finally, GO and KEGG analyses were conducted to explore the underlying mechanism of the lncRNAs.

**Results:** We found that the low expression of lncRNA AC093010.3, LINC01089, AL049840.4, AC005261.1, and high expression of AL513314.2, UNC5B-AS1 are associated with PDAC patients' poor prognosis. Every PDAC patient with lncRNA quantitation produced a risk score and will be divided into different groups. High-risk group two-year OS is 21.28% (vs. low-risk group is 49.32%), and the five-year OS is 9.12% (vs. low-risk group is 28.77%). The AUC of the ROC curve was 0.747. The hierarchical clustering divided patients into two clusters derived for RNA-Seq, and samples in the UNC5B-AS1 enriched cluster had

significantly worse OS than patients in the AC093010.3 upregulated cluster (median OS of 15.8 months vs. 20.3 months,  $p=0.008$ ). The GO and KEGG analyses showed that the most significant biological function is cell adhesion molecule binding, while the cell cycle pathway was the core pathway of the entire prognostic model.

**Conclusions:** We constructed a reliable prognostic model for pancreatic cancer and identified potential therapeutic targets of lncRNA.

#### PP03-011

### RISK FACTORS ASSOCIATED WITH RECURRENCE OF PANCREATIC SOLID PSEUDOPAPILLARY NEOPLASMS: A SINGLE INSTITUTION EXPERIENCE

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**Background:** Pancreatic solid pseudopapillary neoplasms are rare and low-grade tumors. The milestone of treatment is surgical resection, however, some patients relapse after surgery. The aim of this study is to analyze the clinical and pathological features associated with increased risk of recurrence in SPN.

**Methods:** Between 2000 and 2019 seventy-four patients with SPN underwent surgical resection and then were followed up periodically. Clinicopathological data were statistically analyzed.

**Results:** Of the 74 total patients, 70 (94.6%) were women and 4 (5.4%) were men. The median age was 25.1 (range, 7-68 years). The median tumor size was 8.7 (range, 2-20 centimeters) and the tumor localization was: head (n= 35), body (n=16) and tail (n= 23). The surgical treatment was: duodenopancreatectomy (n=32), central pancreatectomy (n=9) and distal pancreatectomy (n= 33). For patients with R0 resection, the Kaplan Meier five years survival was 87%. The five-year rate of locoregional tumor recurrence was 6.7%. The presence of larger tumors size (diameter >5cm), perineural invasion, lymph node metastasis, positive margins, and multi-visceral resection were significant factors for locoregional recurrence and cancer-related survival.

**Conclusions:** Factors including a larger tumor size (diameter > 5cm), perineural invasion, lymph node metastasis, positive margins, and multi-visceral resection may increase the risk of recurrence of resected SPNs.

#### PP03-012

### CONSERVATIVE SURGERY FOR LOW GRADE HEAD PANCREATIC TUMORS: A CASE REPORT

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**Introduction:** Conservative pancreatic surgery is a major concern mainly in young patients. Many technics have been described on medical literature, and most of them depend on the type, size, localization and clinical manifestation of the tumor.

**Case report:** A woman 27 years old, with epigastric pain and palpable abdominal mass as initial symptomatology. The Ct scan reveal a 11.5 x 8.5 cm tumor in head of pancreas (Image 1), clinically no endocrine neither exocrine deficiencies were presented. The clinical evaluation and radiologic expansive patron of the lesion suggests the possibility of conservative surgery and the patient was operated with surgical loupes. A marginal inferior head pancreatectomy was performed, the Wirsung duct was identified and preserved. The patient remained hospitalized without major complication during five days and the closed drainage took out at the third week on a regular post-operative medical visit. No perioperative Morbidity was present. The final histopathology study reported a low-grade pseudopapillary tumor. At two years of follow up the patient remains asymptomatic without pancreatic dysfunction or local recurrence. (Image 2).

**Conclusion:** Conservative surgery for low grade malignant tumor of pancreatic head should be considered any time it seems feasible with good result at moderate term.

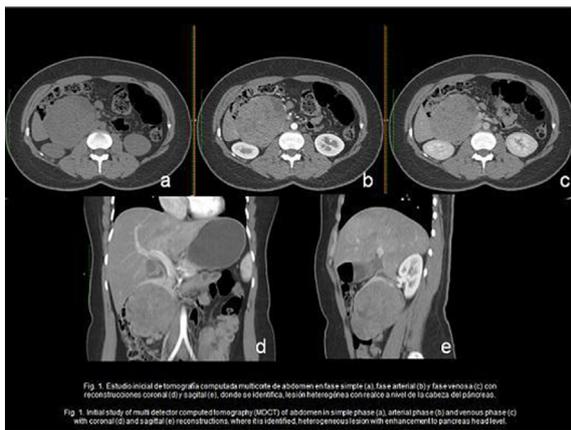


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### PP03-013 PREDICTIVE NOMOGRAM FOR EARLY RECURRENCE AFTER PANCREATECTOMY IN RESECTABLE PANCREATIC CANCER: RISK CLASSIFICATION USING PREOPERATIVE CLINICOPATHOLOGIC FACTORS

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**Purpose:** The purpose of the present study was to develop a risk prediction model to predict early recurrence after surgery in pancreatic ductal adenocarcinoma (PDAC) using only preoperative factors in classification of patients with resectable disease.

**Methods:** Between January 2007 and December 2016, data from 631 patients with all considered preoperative factors

without omission were classified as training set and used to develop a nomogram.

**Results:** When a p-value estimated from univariable Cox's proportional hazard regression analysis was less than 0.05, the variables were included in multivariable analysis and used for establishing a nomogram. The established nomogram predicts the probability of early recurrence after surgery in resectable PDAC. A thousand of bootstrap resampling was used to validate the nomogram. A concordance index was 0.665 (95% confidence interval [CI], 0.637 - 0.695), and incremental area under the curve was 0.655 (95% CI, 0.631 - 0.682). We developed a web-based calculator, and the nomogram is freely available at <http://pdac.smchbp.org/>. In order to optimize the predictive value of the designed nomogram, we looked for the cutoff value. When cutoff value was set to 0.71, estimated sensitivity and specificity were 54% and 91%, respectively. The likelihood ratios of positive and negative test results were calculated as 5.9 and 0.51, respectively.

**Conclusion:** This is the first nomogram to predict the early recurrence after surgery for resectable PDAC in the pre-operative setting, and is expected to provide a way to advance to customized treatment considering the risk according to individual patient by predicting early recurrence.

### PP03-014 THE DECREASE OR NORMALIZATION OF CARBOHYDRATE ANTIGEN 19-9 HAVE COMPARABLE PROGNOSTIC PERFORMANCE IN PATIENTS WITH BORDERLINE RESECTABLE AND LOCALLY ADVANCED PANCREATIC CANCER AFTER NEOADJUVANT CHEMOTHERAPY

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**Background:** Optimal carbohydrate antigen (CA) 19-9 value after neoadjuvant chemotherapy (NACT) was not confirmed in patients with borderline resectable (BRPC) or locally advanced pancreatic cancer (LAPC).

**Methods:** BRPC (n = 81) and LAPC (n = 36) patients who underwent surgery after NACT were included from 2012 to 2017 in a tertiary referral center. Prognostic models were established based on carbohydrate antigen (CA) 19-9 regression rate (CRR) and prognostic performance was compared using C-index and Akaike information criterion (AIC).

**Results:** Prognostic significance was found in patients with  $37 \text{ U/ml} \leq \text{pre-NACT CA 19-9} \leq 1000 \text{ U/ml}$ , and prognostic model was established in this subgroup. CRR was the independent prognostic factor for better survival (hazard ratio [HR]; 0.112, 95% confidence interval [CI]; 0.035-0.358,  $p < 0.001$ ) and recurrence (HR; 0.195, 95% CI; 0.067-0.565,  $p = 0.003$ ) as well as R0 resection ( $p = 0.002$ ) and non-transfusion during surgery ( $p = 0.002$ ). Especially,  $\text{CRR} \geq 65\%$  was related with better survival compared with  $\text{CRR} < 65\%$  (HR; 0.166, 95% CI; 0.067 - 0.410,  $p < 0.001$ ). Prognostic performance showed no significant difference among CRR (C-index; 0.728, AIC; 164.174), normalization of CA 19-9 after NACT (C-index;

0.688, AIC; 169.569), or surgery (C-index; 0.688, AIC; 162.871) ( $p = 0.652$ ).

**Conclusion:** CRR<sup>3</sup> 65 % was the independent prognostic factor for better prognosis after NACT in patients with BRPC or LAPC. Decrease of CA19-9 after NACT was prognostic indicator as well as normalization of CA 19-9 after NACT or surgery.

### PP03-015

#### THE MEANING OF POST-OPERATIVE 5 YEARS IN PATIENTS WITH PANCREATIC DUCTAL ADENOCARCINOMA

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Pancreatic ductal adenocarcinoma (PDAC) is regarded as incurable, since its survival rate is still limited even after curative resection. Factors that predict long-term survival are controversial. Also, it is uncertain that 5 disease-free years means cure of PDAC. The aim of this study is to identify factors associated with long-term survival and determine if 5-year period means confirmation of cure.

Between January 2007 to December 2014, a total of 625 patients underwent resection for PDAC. The clinicopathological data of the patients were retrospectively reviewed. Risk factor analyses were performed to identify the factors associated with actual 5-year overall and disease-free survival. The characteristics of patients who had recurrent disease after postoperative 5 years were reviewed separately.

The actual 5-year overall and disease-free survival rates of total patients were 19.4% and 19.3%, respectively. Long-term survivors ( $n=89$ ) had a median survival of 84 months. Age and lymph node metastasis were related to long-term survival. In patients with disease-free survival beyond 5 years ( $n=68$ ), age, tumor size, and lymph node metastasis were associated factors. Among those, recurrent cancer had occurred in 6 patients: 3 loco-regional recurrences, 3 distant metastases. There was no statistically significant factor in these patients comparing to the other 62 patients.

In this study, 89 of total 625 patients have survived longer than 5 years. There still remains risk of recurrence after 5 disease-free years, but no specific factor was identified to be predict the risk. This demonstrates that 5-year period may not guarantee cure of PDAC.

### PP03-017

#### UNUSUAL PRESENTATION OF PANCREATIC TUMOR

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A 47 year-old female presented with a reducible bulging mass at umbilicus. Physical examination showed no jaundice, no abdominal pain, but the abdomen was distended due to obesity. Under the impression of umbilical hernia, herniorrhaphy was arranged. However, a large cystic mass was observed through the fascia defect during operation.

Pancreatic cystic tumor was suspected and CT was arranged after herniorrhaphy. CT demonstrated a giant (28x26cm) lobulated cystic mass was found mainly in central abdomen with internal septa. Distal pancreatectomy with splenectomy was performed and pathology showed mucinous cystic neoplasm (MCN) with low-to intermediate grade dysplasia. The post-operative course was uneventful and her body weight decreased from 90 to 75 kilograms.

Pancreatic tumor usually presented with symptoms such as abdominal pain, back pain, or jaundice. Umbilical hernia is an unusual presentation of pancreatic tumor, and it might be neglected in obese patient. Sophisticated investigation of the etiology of increased intraabdominal pressure and careful inspection during herniorrhaphy may help us not to lose the diagnosis of pancreatic tumor in such an unusual presentation.

### PP03-019

#### COMPARISON OF CONVENTIONAL DISTAL PANCREATECTOMY AND SPLENECTOMY WITH RADICAL ANTEGRADE MODULAR PANCREATOSPLENECTOMY, MULTICENTER, RETROSPECTIVE STUDY

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**Introduction:** Radical antegrade modular pancreatosplenectomy (RAMPS) has been reported to achieve better negative margin and to retrieve more lymph node compared with conventional distal pancreatectomy. Until now, many studies were historical control and the results remain controversial. In this study we evaluated surgical outcomes and long-term prognosis of RAMPS compared with conventional resection through multicenter in recent period.

**Methods:** A total 106 patients who underwent curative resection for left side Pancreatic cancer in two hospitals (Gangnam Severance Hospital, St Mary's hospital) from 2012 to 2017 were reviewed. Overall survival and recurrence-free survival rates were compared using Kaplan-Meier estimates.

**Results:** Before propensity scores matching, in RAMPS group had more advanced T and N stage and larger tumor size than conventional group (T stage,  $p = 0.04$ ; N stage,  $p = 0.02$ ; tumor size,

$p = 0.04$ ) After propensity scores matching based on T stage and N stage, 37 patients (RAMPS) and 37 patients (Conventional DP) were included in the analysis. There was no difference in disease free survival ( $p = 0.463$ ) and overall survival ( $p = 0.383$ ) between the two groups in survival analysis. On multivariate analyses, completion of chemotherapy was identified as independent factors for disease-free survival ( $p < 0.001$ ) and overall survival ( $p < 0.001$ ).

**Conclusions:** In advanced tumors, RAMPS procedure may be one option for R0 resection. However, the two procedures compared showed no difference in disease free survival and overall survival. The role of postoperative chemotherapy in pancreatic cancer seems to be more important.

PP03-020

### IS NEOADJUVANT CHEMOTHERAPY ALWAYS JUSTIFIED IN CLINICAL T1 PANCREATIC DUCTAL ADENOCARCINOMA?

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**Introduction:** Recently, several studies using neoadjuvant treatment have been actively conducted in patients with resectable pancreatic cancer. Neoadjuvant treatment usage in Stage I-II pancreatic cancer increased. These cases are needed to determine its effectiveness, especially clinical T1 stage. So we need to compare the survival benefit of preoperative neoadjuvant treatment in early T stage of pancreatic cancer.

**Methods:** Two institutional data were included in our analysis (Gangnam severance hospital, Nara medical university hospital). Overall survival and disease-free survival was measured as primary outcomes. 36 patients underwent upfront surgery and 10 patients underwent neoadjuvant treatment between January 2010 and December 2017.

**Results:** Total patients were 46 patients. However, two patients in the neoadjuvant treatment group did not undergo surgery due to distant metastasis after neoadjuvant treatment. Therefore, 44 patients underwent pancreatectomy in clinical T1 stage of pancreatic cancer. Neoadjuvant regimen consisted of gemcitabine and concomitant radiation of 54 Gray. There was no difference in overall survival between the two groups in patients. (Neoadjuvant group: 5 year overall survival rate = 75%, upfront surgery group: 5 year overall survival rate = 42.7%,  $p = 0.07$ ). However, the neoadjuvant group tended to have a better survival rate than upfront surgery group. On multivariate analyses, age > 65, perineural invasion, R1 resection were identified as independent factors for poor overall survival.

**Conclusions:** Our results showed more better oncological outcomes in neoadjuvant treatment group. Large scale prospective study will be needed to determine the survival benefits of neoadjuvant treatment for early stage pancreatic cancer.

PP03-021

### EFFICACY AND SAFETY OF NAB-PACLITAXEL PLUS GEMCITABINE IN THE TREATMENT OF ADVANCED PANCREATIC CANCER BY TRANSCATHETER ARTERIAL CHEMOTHERAPY

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**Objective:** To evaluate the efficacy and safety of Nab-paclitaxel combined with gemcitabine (AG) regimen in the treatment of advanced pancreatic cancer by transcatheter arterial chemotherapy/chemoembolization (TAC/TACE).

**Method:** Retrospective analysis of 72 advanced pancreatic cancer patients who were treated at Fudan University

Shanghai Cancer Center from 2016 to 2018. The TAC regimen consisted of Nab-paclitaxell 125mg/m<sup>2</sup> combined with gemcitabine hydrochloride 1000mg/m<sup>2</sup>, perfusion 10 minutes, pancreatic head and neck tumor perfused through the gastroduodenal artery. If accompanied by liver metastasis, embolization was implemented.

**Result:** Among the 72 patients, 8 patients received treatment once, 11 patients received treatment twice, 14 patients received treatment three times, and 39 patients received treatment more than four times with an interval of 2145 days. The survival rates of 1-year and 2-year were 36.11% and 8.33%, respectively. Median survival time was 8.77 months. The PFS rates of 3-month and 6-month were 72.22% and 45.83% respectively. Multivariate analysis showed that KPS  $\geq$  80, III stage was associated with longer survival, and that surgery and TAC/TACE treatment suggested a good prognostic factor. The median progression-free survival time was 4.5 months. Treatment-related grade III and above hematologic adverse reactions and non-hematologic adverse reactions were decreased compared with intravenous chemotherapy. All adverse reactions improved after treatment, and there were no treatment-related deaths.

**Conclusions:** Nab-paclitaxell combined with Gemcitabine has better safety in the treatment of pancreatic cancer by transarterial infusion chemotherapy. Compared with intravenous chemotherapy, Nab-paclitaxell combined with gemcitabine can reduce the adverse reactions, effectively control the disease and prolong patients' survival.

PP03-022

### CIRCULATING CYTOKINE LEVELS AS BIOMARKERS FOR RESPONSE TO FOLFIRINOX CHEMOTHERAPY IN PANCREATIC CANCER PATIENTS

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**Introduction:** FOLFIRINOX chemotherapy is currently standard treatment in patients with advanced pancreatic cancer (PDAC) and is being investigated as neoadjuvant treatment in resectable disease. However, patient stratification is essential, because of the low response to FOLFIRINOX and severe side effects. The balance of tumor-promoting and tumor-suppressing components of the immune system plays a crucial role in cancer progression and treatment response. Cytokines are key players in immune cell signaling. The aim of this study was to identify circulating cytokines as potential biomarkers for FOLFIRINOX response.

**Methods:** Serum samples of 88 PDAC patients were prospectively collected before and after one cycle of FOLFIRINOX chemotherapy. Patients were categorized as disease control patients (DC) or progressive disease patients (PD), based on the RECIST criteria. Cytokine detection rates and concentrations were measured using a 34-plex Luminex immunoassay (Procarta).

**Results:** Before start of treatment, the detection rate of IL-2 was higher in DC compared to PD (21.1% vs 0%,  $p=0.031$ ), but not after chemotherapy. Only after chemotherapy, the detection rate of IL-1RA was higher in DC compared to PD (50.9% vs 21.1%,  $p=0.032$ ). The IL-1RA detection rate increased during chemotherapy in DC

patients only (1.8% before, 50.9% after,  $p < 0.001$ ). Moreover, absolute IL-1RA concentrations increased in DC patients (0.00 pg/mL before, 16.85 pg/mL after,  $p < 0.001$ ), but not in PD patients.

**Conclusions:** IL-2 and IL-1RA are differentially expressed in serum of PDAC patients with DC and patients with PD after FOLFIRINOX chemotherapy. Cytokines are promising biomarkers to aid chemotherapy decision making in PDAC patients.

PP03-023

### MIXED NEUROENDOCRINE-NON-NEUROENDOCRINE NEOPLASMS (MINEN) OF PANCREAS: A RARE ENTITY

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**Introduction:** Mixed neuroendocrine-non-neuroendocrine neoplasms (MiNEN) comprise of both epithelial and neuroendocrine component in which each element has to comprise at least 30% of the tumor. MiNEN usually involve various gastrointestinal organs, however it is very infrequent in pancreas.

**Case Presentation:** We encountered an 81-year-old male patient who presented with pain in upper abdomen since 3 months. He noticed jaundice with cholestatic features for last 15 days which was associated with anorexia and weight loss. Liver function test revealed: Bilirubin-3.8mg/dl; AST- 76 U/L; ALT- 163 U/L; Alkaline phosphatase- 826 IU/L, while carbohydrate antigen 19-9 was 46.9 U/ml. CECT abdomen reported a mass in the pancreatic head with dilated common bile duct and pancreatic duct. He underwent pancreatoduodenectomy (PD) with uneventful post-operative course. Histopathological examination revealed two different tumours: ductal adenocarcinoma admixed with neuroendocrine tumour of pancreas which was confirmed with immunohistochemistry (CK-7, Chromogranin and Synaptophysin positive). He received adjuvant chemotherapy and at the end of six months follow up, he has no recurrence.

**Conclusion:** MiNEN is a rare malignancy of pancreas for which pancreatoduodenectomy was performed and diagnosis confirmed on histopathology with immunohistochemistry. It is important to share all individual experience-based information of such anecdotal cases to get knowledge about their clinical and biological behaviour and to standardize optimal therapy.

PP03-024

### PD-L1 INDUCED BY LIPOPOLYSACCHARIDE VIA TLR4/MYD88/NF- $\kappa$ B PATHWAY PROMOTES IMMUNE ESCAPE IN PANCREATIC CANCER

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**Background:** The programmed death ligand 1 (PD-L1) is coinhibitory molecular to induce immunosuppression in pancreatic ductal adenocarcinoma (PDAC). However, the regulatory mechanism of PD-L1 in PDAC is still unclear. Previous study had reported that Toll Like Receptor4 (TLR4) have co-expression with PD-L1 in lung cancer but the underlying mechanism is unclear. In this study, we used LPS as TLR4 specific agonist to explore the underlying mechanism of how TLR4 inducing PD-L1 expression in PDAC.

**Method:** TLR4 and PD-L1 expression were analyzed in pancreatic tumor tissue and cell lines. TLR4 and MyD88 sh-plasmid, NF- $\kappa$ B pathway inhibitors were used to explore the potential mechanism. Orthotopic pancreatic cancer animal model were established to further demonstrate regulatory mechanism. The correlation of plasma LPS activation and tumoral PD-L1 level were analyzed in PDAC patient.

**Results:** TLR4 had higher expression in pancreatic cancer tissues and had positive correlation with PD-L1 expression. LPS activated TLR4/MyD88/ NF- $\kappa$ B pathway and further induced PD-L1 in two pancreatic cancer cell lines. Intervening this pathway could eliminate the effect of LPS. Intraperitoneally injecting LPS could also induce tumoral PD-L1 in orthotopic pancreatic tumor animal model. A positive correlation between circulating LPS activity and tumoral PD-L1 was also observed in PDAC patients.

**Conclusions:** Our findings demonstrate that LPS can induce PD-L1 expression and promoted immune escape in pancreatic cancer via TLR4/MyD88/ NF- $\kappa$ B pathway. This revealed a potential target for pancreatic PD-1/PD-L1 immunotherapy.

PP03-027

### TISSUE BIOMARKER PANEL AS A SURROGATE MARKER FOR SQUAMOUS SUBTYPE OF PANCREATIC CANCER

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**Introduction:** Pancreatic ductal adenocarcinoma (PDAC) has been recently classified into four subtypes based on the gene expression levels, with squamous subtype having worst prognostic outcomes. However, gene expression analysis for each individual patient is not clinically feasible due to very high associated cost. We previously reported that levels of three biomarkers (S100A4, Ca-125 and Mesothelin) can be used to classify PDAC patients based on their survival outcomes. This project aimed to determine if this novel biomarker panel can be used as a surrogate to identify squamous PDAC subtype.

**Methods:** Using the Nanostring gene expression platform, tumor tissue from 24 PDAC patients were analysed for our novel biomarkers and markers associated with four PDAC subtypes.

**Results:** Gene expression of our biomarker panel (S100A4, Ca-125 and Mesothelin) closely clustered together with markers for squamous PDAC subtype.

**Conclusion:** These results highlight the potential of our biomarkers to be utilized for identification of squamous PDAC subtype.

PP03-030

### PATIENT-DERIVED PANCREATIC TUMOURS IN A DISH: IMPLICATIONS FOR REAL-TIME PRECISION MEDICINE

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**Introduction:** The poor prognosis of pancreatic cancer (PC) is attributed to the highly fibrotic stroma and complex microenvironment that is difficult to fully recapitulate in preclinical models. Mouse models are often derived using human tumour cells without stromal and immune cells, can take months to establish and are confounded by mouse host with human tumour. To fast-track translation of new drugs and to inform PC personalised medicine, there is an unmet need for pre-clinical models that closely mimic the biology of human disease.

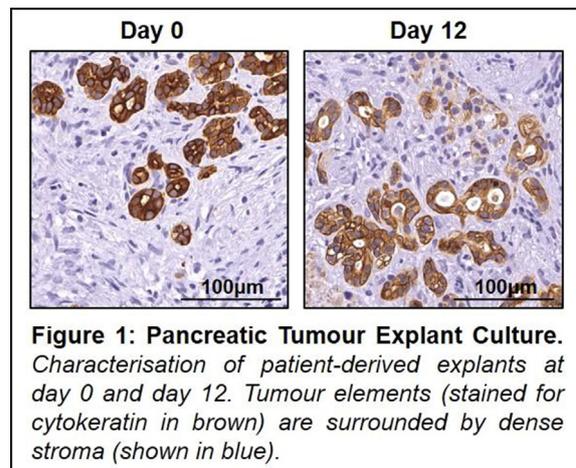
**Aim:** To develop a model that maintains viable human PC tissue in culture for testing therapeutics.

**Methods:** Patient-derived PC tumour tissue was obtained from patients undergoing pancreaticoduodenectomy, cut into 2mm explants, and grown using specialised media on a support scaffold for 12-days ±Abraxane®. Immunohistochemistry was performed for markers of viability, cancer/stromal cell populations and fibrosis.

**Results:** Explants maintained histological tumour and stromal architecture for 12-days of culture. Immunohistochemistry confirmed viable and proliferating cancer and stromal cells that were dispersed throughout dense fibrosis, consistent with day 0 (Figure 1). As proof-of-principle, patient-x explants responded to a clinical dose of Abraxane® with increased cell death.

**Conclusion:** Our novel model retains the 3D architecture of human pancreatic tumours. Our technique has several

advantages over standard organoids: 1) no manipulation or digestion of tissue, 2) no artificial propagation of organoids, and 3) presence of functional multi-cellular stroma, fibrosis and vascularity. This provides an unprecedented opportunity to study PC biology, rapidly assess therapeutic response, and could drive personalised treatment for PC.



**Figure 1: Pancreatic Tumour Explant Culture.** Characterisation of patient-derived explants at day 0 and day 12. Tumour elements (stained for cytokeratin in brown) are surrounded by dense stroma (shown in blue).

**Figure 1:** Pancreatic Tumour Explant Culture

PP03-031

### PANCREATIC METASTASES CRYOSURGERY

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**Materials and methods:** Since 2016, three unresectable patients with metastatic pancreatic cancer have undergone cryodestruction (CD) of secondary foci.

- 62 years old man, About metastasis of melanoma in the brain 25 months. complex treatment was performed back. 10 months ago- extended lobectomy on the left + resection of the lower lobe of the left lung. Metastasis up to 2 cm in the body of the pancreas.
- 62 years old man, 72 months ago underwent nephrectomy on the left for renal cell carcinoma, 32 months back was performed laparoscopic resection of the right kidney. Metastasis in the head of the pancreas- 2x3 cm.
- 58-year-old patient, 26 months ago was given a combined pneumonectomy on the left with a graduated resection of the pulmonary trunk and plastic surgery with autoderompericardium for squamous cell carcinoma. 6x5 cm metastasis was located in the body tail of the pancreas with the involvement of the celiac trunk and aorta.

Cryodestruction of metastases was performed in all patients.

**Results:** In all patients, the postoperative period was uneventful. The pain syndrome is stopped. There were no signs of relapse in any case. 2 patients are still alive (1st - 26 months, 2nd -15 months). A patient with lung cancer metastasis died after 10 months.

**Conclusions:** In patients with metastatic damage to the pancreas, when radical surgery cannot be performed, the use of local cryodestruction is justified. With modern combination treatment, there is an improvement in quality and an increase in life expectancy in these patients.

### PP03-032

#### EFFICACY OF LIVER METASTASECTOMY IN PANCREATIC CANCER

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**Background:** Standard treatment for metastatic pancreatic cancer is systemic chemotherapy. Significance of liver metastasectomy in pancreatic cancer remains unknown. This study aims to investigate efficacy of liver metastasectomy in pancreatic cancer.

**Methods:** Between 2001 and 2019, 14 cases who underwent liver metastasectomy for pancreatic cancer at Tohoku University Hospital, including 7 synchronous metastasis cases and 7 metachronous metastasis cases, were retrospectively investigated.

**Results:** Synchronous metastasis: Simultaneous resection of primary pancreatic tumor and liver metastases was performed in 5 cases, including 4 cases with neoadjuvant therapy and one cases with upfront surgery. Two-stage resection, which means prior metastasectomy and subsequent resection of primary tumor after chemotherapy, was performed in 2 cases. The number of metastatic tumors was within 3 in 6 cases. Median survival time (MST) after surgery, which was calculated from the primary tumor resection date in two-stage resection, was 12.5 months. One case with two-stage resection has been alive without recurrence for 81 months after surgery.

Metachronous metastasis: The median time between primary tumor resection and liver metastases was 10.7 months. All cases were treated with systemic chemotherapy before liver metastasectomy. Duration of chemotherapy before metastasectomy was 3 months in 1 case, 6-12 months in 4 cases, and 12-24 months in 2 cases. The number of metastatic tumors was within 2 in all cases. MST after metastasectomy was 19.8 months.

**Conclusion:** There are cases who has benefit of metastasectomy in liver metastasis of pancreatic cancer.

### PP03-033

#### DIFFERENTIAL RADIOLOGY DIAGNOSTICS OF METASTASISES OF RENAL CELL CARCINOMA IN THE PANCREAS

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Metastatic lesion of the pancreas is an extremely rare disease, which occupies 2-5% of all pancreatic tumors, and these figures rise to 11% according to autopsies of patients with malignant tumors. Metastatic lesion of the pancreas from primary renal cancer occurs most often (65-74%).

**Materials and Methods:** 12 patients with histologically confirmed diagnosis - metastatic renal cell cancer in the pancreas were treated in A.V. Vishnevsky National Medical Research Center of Surgery in 2009-2019 (synchronous metastases were in 1 patient, metachronic - in 11). The lesions of both kidneys with metastases to the pancreas and lungs were revealed at synchronous case. In the period from 2 to 18 years (after an average of 8.3 years) nephrectomy in history was performed in 9 (75,0%) patients (in combination with resection of the contralateral kidney in 1), kidney resection was in 2 patients.

**Results:** Solitary metastases were detected in 8 (66,7%) patients. Multiple pancreatic lesions were in 4 (33,3%) patients, multifocal - in 2 of them (pancreatectomy was performed). Sizes of metastases ranged from 10 to 56 mm.

The most informative diagnostic method in detecting of pancreas focal lesions is computed tomography with bolus contrast enhancement. Significant difficulties for interpretation are small tumors that are similar in structure to hormonally active neuroendocrine neoplasm.

In case of difficulties with the visualization of metastases, it is intraoperatively advisable to use contrast-enhanced ultrasound.

**Conclusion:** Revealed pancreas solitary or multiple focal lesion in patients after nephrectomy for renal cell carcinoma should be regarded primarily as secondary.

### PP03-034

#### CARCINOSARCOMA OF THE PANCREAS: COMPREHENSIVE CLINICOPATHOLOGICAL AND MOLECULAR CHARACTERIZATION

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**PP03-034** Clinicopathological characteristics of 9 pancreatic carcinosarcoma cases

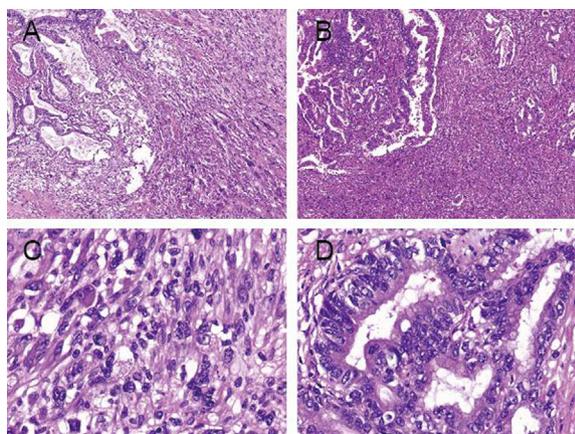
Case	Age /Sex	Tumor Location	Size (mm)	Symptoms	CA19-9 (U/ml)	PD dilation	Operation type	RFS (mo)	OS (mo)
1	60/M	Tail	75	Abdominal pain	NA	No	Total pancreatectomy	NA	2
2	66/M	Head	40	Painless jaundice	12000	Yes	Whipple	2.5	10.5
3	69/M	Head	25	Incidental finding	30	Yes	Whipple (T3N1M0)	13	18.5
4	56/F	Head	100	RUQ pain, jaundice	143	Yes	Total pancreatectomy	2.5	39
5	51/F	Head	45	Epigastric pain, jaundice	358	Yes	Whipple (T3N0M0)	10	16.5
6	48/F	Tail	80	Epigastric pain	44	No	Total pancreatectomy	NA	NA
7	67/F	Head	64	Epigastric pain	9	No	Whipple	3	3.5
8	59/M	Head	53	Abdominal pain	NA	Yes	Whipple	NA	NA
9	49/F	Body	80	LUQ pain	5000	NA	Distal pancreatectomy	NA	NA

**Introduction:** Carcinosarcoma of pancreas is a rare subtype of pancreatic cancer. The aim of this study was to comprehensively elaborate the clinicopathological and molecular features of this rare malignancy.

**Methods:** Patients who were diagnosed with carcinosarcoma of the pancreas were retrospectively identified from an institutional pathology database between 2012 and 2018.

**Results:** A total of nine patients were identified. Pathological examination of tumor tissues from patients who were included in this study showed coexisting carcinomatous and sarcomatous components. The recurrence rate is 100% and the median OS is 13.5 months. These two components were distinguished by mutually exclusive expression of cytokeratin and vimentin. The sarcomatous tissue exhibited more exuberant proliferation, as revealed by Ki67 staining, and necrosis compared with the carcinomatous counterpart. Genomic analysis of tumor tissues for two individuals demonstrated hotspot mutation at *KRAS* and *TP53*. Carcinomatous and sarcomatous components were separately obtained via laser captured microdissection in one patient, and mutations of driving genes were highly concordant between these two components. In line with genomic characterization, immunostaining of frequently-altered tumor suppressor genes suggested consistent outcomes.

**Conclusion:** Carcinosarcoma of the pancreas represent a rare malignancy with distinct histological characteristics. Genomic analysis suggested monoclonal origin of pancreatic carcinosarcoma.



Histopathological features of pancreatic carcinosarcoma

### PP03-036 SOLID-PSEULOPAPILLARY TUMORS: POSSIBILITIES OF PREOPERATIVE VERIFICATION

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**Objective:** To determine the possibilities of preoperative verification of pancreatic solid-pseudopapillary tumor (SPPT) on the basis of own experience.

**Materials and methods:** In A.V. Vishnevsky NMRC of Surgery 50 patients with morphologically verified pancreatic SPPT were treated (2005-2019), women prevailed (96.0%), average age -  $33.6 \pm 1.3$  years. Preoperatively study: ultrasound, MSCT, MRI. All patients were operated on.

**Results:** There are three types of SPPT MRI-images (Yu C.-C. et al., 2007): 1st - completely solid neoplasms; 2nd - combination of solid sites with hemorrhages; 3rd - extensive hemorrhages and cystic formations. It's appropriate to apply this classification in the diagnosis of SPPT as a whole.

The greatest difficulties caused by the 1st type lesions diagnostics.

Ultrasound: it's almost impossible to differentiate individual microcavities in solid lesion. SPPT is well-vascularized, however, for the lesion up to 3.0 cm, data of bloodflow at DS can't obtained.

MSCT: high indicators of HU in the liquid component of the 1st type are possible, because of the cystic cavities are very small and a "trimmed" solid component can get to the measurement point on CT-scans.

MRI makes it possible to identify small liquid lesion gaps and to differentiate their hemorrhagic contents (which is explained by the significant paramagnetic effect of methemoglobin).

Preoperative verification: 56.0%. Misdiagnosis (32.0%): neuroendocrine (5), cystic (5), retroperitoneal (3) tumors, adenocarcinoma (2); pseudocyst with hemorrhage (1). Differential diagnosis was made in 12.0%.

**Conclusion:** It's advisable to consider MRI as the method of choice for SPPT diagnosis. Immunohistochemistry is of decisive importance in SPPT diagnosis.

PP03-037

### SUBTYPE CLASSIFICATION OF PANCREATIC DUCTAL ADENOCARCINOMA BASED ON MICROENVIRONMENTAL NICHE FACTORS DEPENDENCY AND CHEMOTHERAPY RESISTANCE

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**Introduction:** Abundant stroma of pancreatic ductal adenocarcinoma (PDAC) produces various microenvironmental < niche > factors. PDAC organoids have different dependencies on niche factors; while there are PDAC subtypes independent of niche factors as represented by conventional pancreatic cancer cell lines, there are also PDAC subtypes that strongly depend on niche factors. We performed the PDAC subtype classification based on niche dependency and their morphological phenotypes and investigated the correlation between niche dependency and drug treatment response.

**Methods:** PDAC organoids were validated the morphology compared with the primary tissue. The proliferation assay was performed in medium supplemented with fetal bovine serum (serum medium) or with niche factors (niche medium), respectively. Niche dependent organoids and pancreatic stellate cells (PSCs) were cocultured in serum medium to evaluate their organogenesis. Gemcitabine was administered to niche dependent/independent organoids, and the drug sensitivity was compared.

**Results:** All eight PDAC organoids retained the morphological features in the primary tumors and were classified into poorly, moderately, and well differentiated subtypes. While all the poorly differentiated subtypes showed significantly higher proliferation in serum medium, all the well differentiated subtypes showed significantly higher proliferation in niche medium. When directly cocultured with PSCs, niche dependent organoid strongly formed the organoid structure in serum medium. The viability assay using Gemcitabine showed niche dependent organoids had more resistance to Gemcitabine than the independent organoids.

**Conclusion:** The niche dependency was correlated with the tumor differentiation. Niche dependent PDAC organoids had more resistance to chemotherapy than the independent organoids.

PP03-038

### CLINICAL IMPLICATION OF PIN1 EXPRESSION IN PANCREATIC DUCTAL ADENOCARCINOMA

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**Purpose:** The prognosis of pancreatic ductal adenocarcinoma (PDAC) is poor even after curative surgical resection. Therefore, discovering new important factors controlling

PDAC progression is essential. Pin1 overexpression is seen in several malignancies and is reported to promote tumor progression through activation of transcriptional factors such as NF-kappaB, STAT3, and FOXC1. However, no reports have focused on the expression levels of Pin1 in PDAC. Therefore, we thought to evaluate Pin1 expression in PDAC, investigate the correlations with clinicopathological variables, and determine whether Pin1 is a promising therapeutic target in PDAC patients.

**Experimental Design:** The expression levels of Pin1 and related factors were evaluated by immunohistochemical staining. Moreover, the relationship between Pin1 expression and clinicopathological features or prognosis in 120 PDAC patients were investigated.

**Results:** Pin1 expression was increased in some cases of PDAC, and was associated with vascular invasion in PDAC. The univariate and multivariate analyses revealed that high Pin1 expression in PDAC was an independent factor for poor prognosis. Pin1 enhanced activation of transcriptional factors such as STAT3 and FOXC1, resulted in aggressive tumor progression. Increased Pin1 expression induced tumor growth by accelerating cell proliferation and inhibiting cell apoptosis. Moreover, Pin1 overexpression promoted tumor invasion by enhancing EMT. As these results, the incidence of hematogenous recurrence was significantly higher in PDAC with high Pin1 expression.

**Conclusions:** Pin1 overexpression is associated with aggressive tumor progression and poor prognosis in PDAC; therefore, Pin1 is an excellent biomarker for predicting its malignant status and is a promising therapeutic target in patients with PDAC.

PP03-039

### ROUNDAABOUT HOMOLOG 1 INHIBITS PROLIFERATION VIA THE YY1-ROBO1-CCNA2-CDK2 AXIS IN HUMAN PANCREATIC CANCER

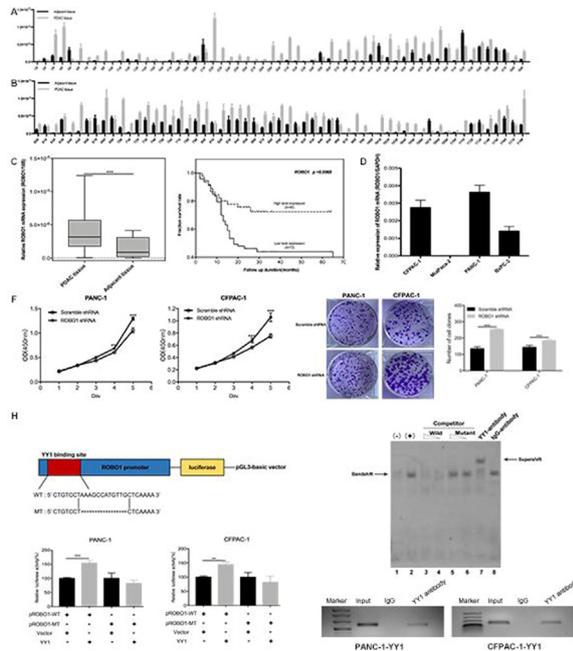
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**Introduction:** Pancreatic cancer (PC) is highly malignant and has a high mortality with a 5-year survival rate of less than 8%. As we know, ROBO1 plays an important role in embryogenesis and organogenesis and also inhibits metastasis in PC. Our study was designed to explore whether ROBO1 has effects on the proliferation of PC and its specific mechanism.

**Methods:** The protein and mRNA levels of ROBO1 in clinical PC specimens were determined by IHC and qRT-PCR. In vivo and in vitro experiments were used to verify the effects of ROBO1 on PC proliferation. CHIP sequencing revealed that YY1 can be used as an upstream target for ROBO1.

**Results:** The expression of ROBO1 was higher in cancer tissues than in matched adjacent tissues. Overexpression of ROBO1 can inhibit the proliferation of PC cells in vitro, and the S phase fraction can also be induced. Further subcutaneous tumor formation in nude mice showed that ROBO1 overexpression can significantly inhibit tumor growth. YY1 was found to directly bind to the promoter

region of ROBO1 to promote transcription by a luciferase reporter gene assay, ChIP and EMSA. Mechanistic studies showed that YY1 can inhibit the development of PC by directly regulating ROBO1 via the CCNA2/CDK2 axis. **Conclusion:** Our results suggest that ROBO1 may be involved in the development and progression of PC by regulating cell proliferation and shows that ROBO1 may be a novel and promising therapeutic target for PC.



Correlation between ROBO1 expression and pancreatic cancer

### PP03-043

## NON-HODGKIN LYMPHOMA PRESENTING WITH OBSTRUCTIVE JAUNDICE - DIAGNOSTIC DILEMMA

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**Introduction:** Obstructive jaundice is seldom a presenting feature of non-Hodgkin lymphoma (NHL). Indeed, several case reports suggest that only 0.2-2.0% of patients with NHL have biliary tract obstruction. Adenocarcinoma arising from the pancreas, bile duct, duodenum are among the common cause of obstructive jaundice worldwide. Hence NHL is rarely considered among differential diagnosis of obstructive jaundice.

**Methods:** We present a case series of 4 patients with NHL presenting with obstructive jaundice as an initial manifestation. The aim was to evaluate the clinical and imaging findings, management, and outcome of biliary obstruction caused by lymphoma.

**Results:** All 4 patients presented with obstructive jaundice with duration ranging from 2 weeks to 4 months. 3 patient had pancreatic mass with lower CBD block and one had

hilar block on CECT abdomen. All cases were diagnosed by endoscopic and biopsy. 2 patients presented with cholangitis and stented to relieve sepsis. One patient had poor ECOG status so only stenting was offered but succumbed within a month of diagnosis. 2 patient died of sepsis and multiorgan failure before initiating chemotherapy and only one patient had undergone chemotherapy.

**Conclusion:** Biliary obstruction is a sign of poor prognosis. The diagnosis of NHL needs to be considered in patients presenting with biliary obstruction. It can be associated with high mortality and poses treatment dilemma. Treatment of biliary obstruction due to lymphoma is controversial regarding chemotherapy alone versus biliary drainage preceded by chemotherapy. Biliary drainage is recommended in patients with infectious complication.

### PP03-045

## PANCREATIC RESECTIONS OF METASTASES FROM RENAL CELL CARCINOMA

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**Introduction:** Literature data on pancreatic resections for metastatic renal cell carcinoma (mRCC) are limited to small series. The aim of this study is to report our initial experience in treatment these patients with a combination therapy that consisted of applying peri-operative chemotherapy and radical pancreatic resection.

**Methods:** Between 2011 and 2019, nine patients bearing pancreatic metastases from left mRCC including 5 males (55.6%) and 4 females (44.4%) were treated in our HPB Oncological Centre. Tumoral locations were: 4 in head (44.4%), 4 in body and tail (44.4%) and 1 (11.2%) in head, body and tail. Number of lesions ranged from 1 to 4 and size average was 47.3 mm (35-60). Two cases were synchronous and the other 7 were metachronous with a median time between resection of the primary and diagnosis of the metastasis of 74 months (6.2 years). All patients received 6 cycles of neoadjuvant chemotherapy, pancreatic resection (4 pancreatoduodenectomy, 4 distal pancreatectomy and 1 total pancreatectomy) and 3 cycles of adjuvant chemotherapy. The 2 synchronous cases also underwent a left nephrectomy simultaneously.

**Results:** No postoperative mortality occurred and morbidity rate was 33.33%. Histopathological examination confirmed that all specimens were mRCC with free surgical margins. With a median follow-up of 62.5 months. Seven patients are alive, 1 developed bone metastases at 49 months and 2 patients died with 16.4 and 50.1 months of survival respectively.

**Conclusions:** Combined therapy with an aggressive surgical approach, even in patient with locally advanced tumors may confer a survival benefit for patients with mRCC.

PP03-046

### SIMULTANEOUS RESECTION FOR SYNCHRONOUS DOUBLE PRIMARY ADENOCARCINOMAS OF THE HEAD OF PANCREAS AND RECTUM. CHALLENGES AND RESULT OF AN AGGRESSIVE SURGICAL APPROACH

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**Introduction:** Pancreatic ductal adenocarcinoma is a malignant disease with poor prognosis and high mortality due to its late presentation. Synchronous double primary tumours of the head of pancreas and rectum is a rare occurrence and scarcely reported in the literature.

**Case presentation:** A 67-year-old man presented with fever for 10 days associated with anorexia and weight loss for three weeks. He denied abdominal pain, jaundice or altered bowel habit. His co-morbidities included diabetes mellitus and hypertension. Physical examination was unremarkable. His biochemistry showed obstructive jaundice features and non-reactive viral hepatitis infection. Abdominal sonography and contrasted tomography scan meanwhile revealed grossly dilated intra- and extra-hepatic bile ducts. The endoscopic ultrasound demonstrated distal common bile duct mass and fine needle biopsy was performed. A biliary stent was inserted via ERCP to relieve the biliary obstruction. Subsequently, a colonoscopy was performed following his positive fecal occult blood test which unveiled a polypoidal upper rectal mass. Biopsy of both the ductal and rectal lesions revealed adenocarcinoma. He underwent simultaneous pancreaticoduodenectomy and anterior resection but complicated by pancreaticojejunostomy leak postoperatively, which was treated conservatively. The final histology reaffirmed adenocarcinomas of pancreas and rectum. He recovered well and completed adjuvant chemotherapy with no tumour recurrence detected a year later.

**Conclusions:** Simultaneous resection for synchronous double primary adenocarcinomas of the head of pancreas and rectum is an aggressive approach with considerable perioperative morbidity that necessitates multidisciplinary discussion. We report the surgical management of this rare case, discuss its challenges and present a review of the literature.

PP03-047

### EIGHTY-SIX CASES OF TOTAL PANCREATECTOMY FOR PANCREATIC NEOPLASMS

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**Background:** Although frequency of total pancreatectomy (TP) indicated for pancreatic neoplasm has increased, surgical outcome and nutrition was still unclear.

**Objective:** To clarify the outcome of TP.

**Methods:** Patients with pancreatic neoplasms who underwent between 1990 and 2018 were analyzed. Surgical variables and outcome were compared between subjects who underwent simple TP [group A], TP followed by pancreaticoduodenectomy (PD) or distal pancreatectomy (DP) according to intraoperative pathological diagnosis of pancreatic margin [B], TP followed by past PD or DP for another disease [C].

**Results:** A total 86 patients, 64 [36-80] year-old 44 males and 42 females, underwent TP. Operative time and blood loss were 520 [155-1070] minutes and 1095 [85-8155] ml, respectively. Mortality rate [n=2(2%)] and morbidity rate [ $\geq$ Clavien-Dindo grade IIIa; n=4(5%)] were acceptable. Sixty-one cases were indicated for ductal adenocarcinoma (PDAC), 7 for neuroendocrine tumor, 7 for metastatic tumor from renal cell carcinoma, 11 for others. Although overall survival of patients with PDAC in group A (n=25), B (n=30), C (n=5) were statistically comparable respectively, the survival (3-5 years survival/ median survival time) of group A (29-29%/15.5 months) tended to be worse than that of group B and C (53-29%/ 46.9 months and 60-30%/ 56.6 months). PDAC patients with CA19-9 level less than 500 U/ml (56-41%/ 48.6 months) survived statistically more than those with CA19-9 level more than 500 U/ml (18-0%/ 16.4 months, P=0.011).

**Conclusions:** Because of recent advance of surgical technique and management of TP, TP for wide-spread non PDAC or less advanced PDAC provides acceptable prognosis.

PP03-048

### STRATEGY OF THERAPIES IN RECURRENCE TYPE OF PANCREATIC CANCER AFTER SURGERY

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Pancreatic cancer is known as a poor prognostic cancer, it has high rate of recurrence even though performed curative surgery. The aim of this study is to evaluate prognosis in each recurrence type of pancreatic cancer after surgery, then consider adequate treatment between recurrence type.

Sixty-eight pancreatic cancer patients who had recurrence after pancreatic resection in our hospital from August 2006 to December 2016 were enrolled. The average age was 70.6, 45 were male, and 23 were female. We compared prognosis between local recurrence group, and any distant recurrence group.

A local recurrence has occurred in 22 patients (32.4%), any distant recurrence is in 46 patients (67.6%). In any distant recurrence group, liver metastasis is in 21 patients (30.9%), and lung metastasis is in 9 patients (13.2%).

When we compared recurrence free survival (RFS) and overall survival (OS) between the groups, there was no difference (RFS: 13.6 vs 12.6 months,  $p=0.732$ , OS: 27.3 vs. 27.1 months,  $p=0.705$ ). Then, we divided distant recurrence into each type of recurrence. The liver recurrence has significant worse RFS and OS than others (RFS: 7.9 vs 15.3 months,  $p=0.004$ , OS: 19.6 vs 37.1 months,  $p=0.014$ ). On the other hand, single lung recurrence has favorable prognosis than multiple lung recurrence (RFS:

31.0 vs 4.5 months,  $p=0.015$ , OS: 58.6 vs 11.0 months,  $p=0.003$ ).

As a conclusion, liver recurrence patients are required a systemic care including palliative care and chemotherapy. On the other hand, single lung recurrence can be considered curative surgery because of their favorable prognosis.

#### PP03-050

### INSULIN UPREGULATES FHOD1 EXPRESSION AND PROMOTES THE INVASION AND MIGRATION OF PANCREATIC CANCER CELLS VIA INSULIN RECEPTOR-DEPENDENT EMT ACTIVATION

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**Background:** Pancreatic ductal adenocarcinoma (PDAC) is one of the most deadly cancers in the world and hyperinsulinemia has been considered to be associated with the risk of pancreatic cancer. Our study is to explore the effect of insulin on the migration and invasion of pancreatic cancer cells and possible mechanism.

**Results:** Insulin could enhance the invasion and migration of pancreatic cancer cells through the transwell assay. Insulin receptor (INSR) is the major membrane receptor in this process. Based on digital gene expression sequencing and cell line confirmation, formin homology 2 domain containing protein 1 (FHOD1) was determined to be positively involved in insulin-induced migration and invasion. In addition, insulin and the downstream molecule FHOD1 could promote epithelial-mesenchymal transition in pancreatic cancer cells, which may subsequently promote malignant biological behaviour.

**Conclusion:** We reported that INSR is the major receptor involved in insulin-induced pancreatic cell mobility alterations. Epithelial-mesenchymal transition, which was regulated through FHOD1, participated in this INSR-dependent phenotypic modification. This study provided a theoretical explanation for previous epidemiological research and new clues for further exploration of the diagnosis and treatment of T2DM pancreatic cancer patients.

#### PP03-051

### PANCREATICOUDENECTOMY IN A TERTIARY REFERRAL CENTER IN INDONESIA, CIPTO MANGUNKUSUMO HOSPITAL (CMH): A SINGLE CENTER EXPERIENCE

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Pancreaticoduodenectomy (PD) as a treatment of choice for periampullary tumors is associated with significant risk of morbidity and mortality even in a developed HPB center. Resectable cases are found only in 10% to 20% of cases.

Indonesia due to its geographical characteristics make it arduous to treat patients in tertiary referral center only. We are presenting our experience of PD from 1993-2019.

A retrospective review was conducted of patients who underwent PD from 1993-2019.

From 1998 to 2019, 188 patients underwent PD. Of these we were able to provide the medical records of 178 only. The mean age was 55 (range 17-73), 84 (47.1%) males and 94 (52.8%) females. The most common presenting symptom was jaundice 70% and abdominal pain in 18% of patients. Patients required pre-operative bile duct compression was 83.2%. There were 59.5% patients underwent Pyloric preserving PD and 40.5% underwent standard Whipple procedure with mean operative time was 393 min (240-640) and estimated blood loss was 450 cc. Re-laparotomy was experienced by 16% of patients. The commonest post operative morbidity was pancreatic fistula 21.7%. Surgical mortality rate was 19%.

PD provides only chance of cure in periampullary tumors in our set-up. Further improvement is needed to manage complexity of the procedure that may help curtail the postoperative morbidity and mortality rate.

#### PP03-052

### PROGNOSTIC IMPACT OF THE RATIO OF PREOPERATIVE CA19-9 TO LIVER ENZYME LEVELS IN PANCREATIC CANCER PATIENTS WITH JAUNDICE

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**Introduction:** CA19-9 has been reported as a significant predictor for poor prognosis of PDAC but the degree of its elevation could be interfered by obstructive jaundice. To evaluate the predictability of CA19-9 for OS of PDAC patients, we adjusted preoperative serum CA19-9 with liver enzyme levels.

**Methods:** 563 patients undergoing surgery for PDAC in our center were reviewed. Preoperative parameters were recorded as well as OS, which began from the date of operation to that of death or last follow-up. Kaplan-Meier survival curves with log-rank test was applied.

**Results:** The MST was 17.767 months. We used 39/390/1000 as cutoff values of preoperative CA19-9 and Kaplan-Meier survival analysis illustrated significantly different prognosis among patients with TBIL < 102.6  $\mu\text{mol/L}$  ( $P < 0.001$ , MST = NR/19.533/15.067/11.200 months). However, this tendency disappeared ( $P = 0.086$ ) when TBIL  $\geq 102.6 \mu\text{mol/L}$ . We adjusted the CA19-9 level by dividing it by the value of preoperative serum  $\gamma\text{-GGT}$  and AST. The optimal cut off values of CA19-9/ $\gamma\text{-GGT}$  and CA19-9/AST were 0.4 and 0.5, respectively. Value 0 was assigned to the ratio lower than the cutoff value while value 1 to the higher. Add up the values and we found that patients who got 0 tended to have significantly better survival than those valued 1, and patients scored 2 showed the worst survival ( $P < 0.001$ , MST = 33.467/17.867/9.800 months).

**Conclusion:** Preoperative serum CA19-9 is a defective predictor for survival of PDAC patients with TBIL  $\geq 102.6 \mu\text{mol/L}$  but this could be adjusted well by the ratio of CA19-9 to  $\gamma\text{-GGT}$  and AST.

PP03-053

### WHEN ARTERIAL RESECTION IS JUSTIFIED IN PANCREATIC CANCER? RESULTS OF 38 PANCREATIC RESECTIONS WITH RESECTION OF TRULY INVOLVED CELIAC AND/OR COMMON HEPATIC ARTERY

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#### Background:

1. It is believed that arterial involvement in pancreatic cancer (PC) is a sign of so far advanced disease that pancreatic resection (PR) is meaningless;
2. Distal pancreatectomy (DP) with celiac artery resection (DPCAR) is justified option for locally advanced PC

**Aim:** Assessment of the rates of morbidity, mortality, true pathological artery involvement and R0-resections, overall and disease-free survival after PRs with celiac (CA) and/or common hepatic artery (CHA) resections (AR).

**Patients and methods:** Patients with pancreatic ductal adenocarcinoma (n33) and neuroendocrine cancer (n5) underwent 38 PRs with AR without preoperative occlusion of CHA, 36 without arterial reconstructions (2009-2019). Age 54-76y. ECOG-0-1. Adjuvant chemotherapy, n19, neoadjuvant, n11 with better tendency. IOUS and vascular fluorescence (ICG) were there main methods for assessment of liver and stomach ischemia.

**Results:** The rate of pathological CA/CHA involvement - 100%. Overall rate of R0-resections 87%, for PDAC 85%, vein resections during DPCAR - 12(35%). Morbidity: 18 (47%), pancreatic fistula Grade B/C - 14(41%), mortality - 2 (5,3%), median OS - 24 months, median DFS - 18 months, overall 5-y survival - 41%, actual 5-y survival - 13%. No liver and bowel ischemia, gastric ischemia - 15% (1 perforation). All the relapses were distant.

**Conclusion:** Neoadjuvant treatment and R0-resection with acceptable morbidity and mortality rates justifies arterial resections for PDAC.

PP03-054

### IN SILICO INVESTIGATION AND FUNCTIONAL ENRICHMENT ANALYSIS OF THE HUMAN MAJOR INTRINSIC PROTEINS AND VOLTAGE-GATED CHLORIDE CHANNEL PROTEINS REVEAL ELEVEN PROGNOSTIC BIOMARKERS FOR PANCREATIC CANCER

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**Introduction:** Pancreatic ductal adenocarcinoma (PDAC) is associated with poor prognosis. In this context, the identification of biomarkers regarding the PDAC diagnosis, monitoring, and prognosis is crucial. The purpose of the present study was to investigate the differential gene expression profile of the major intrinsic proteins and chloride channel proteins in patients with PDAC, in order to suggest novel biomarkers.

**Methods:** In silico techniques were facilitated to construct the interactome of the investigated genes, identify the differentially expressed genes (DEGs) in PDAC as compared to healthy controls, and evaluate their potential prognostic role.

**Results:** Transcriptomic data of three microarray datasets were included, incorporating 114 tumor and 59 normal pancreatic samples. Forty DEGs were identified; nine were up-regulated and thirty-one were downregulated. A molecular signature of eleven genes (Chloride Intracellular Channel 1-CLIC1; Chloride Intracellular Channel 3-CLIC3; Chloride Intracellular Channel 4-CLIC4; Ganglioside Induced Differentiation Associated Protein 1 - GDAP1; Ganglioside Induced Differentiation Associated Protein 1 Like 1-GDAP1L1; Glutathione S-Transferase Pi 1 - GSTP1; Prostaglandin E Synthase 2 - PTGES2; Aquaporin 7 - AQP7; Archain 1 - ARC1; Exocyst Complex Component 3 - EXOC3; Coatamer Protein Complex Subunit Epsilon - COPE) were identified as prognostic markers associated with overall survival. Correlations were reported regarding the expression level of CLIC1-CLIC3, CLIC4-CLIC5, and CLIC5-CLIC6. Finally, gene set enrichment analysis demonstrated the molecular functions and miRNA families (hsa-miR-122, hsa-miR-618, hsa-miR-425, and hsa-miR-518) relevant to the seven prognostic markers.

**Conclusion:** These outcomes demonstrate an eleven-gene molecular panel that predicts the patients' prospective survival following pancreatic resection for PDAC.

PP03-055

### SPORADIC VS. MEN-ASSOCIATED PANCREATIC NEUROENDOCRINE TUMORS: MULTI-INSTITUTIONAL CLINICOPATHOLOGIC COMPARISON

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**Introduction:** Clinicopathologic distinctions of Multiple Endocrine Neoplasia (MEN) associated Pancreatic Neuroendocrine Tumor (PNET) are not well established. We sought to improve surgical decision making in MEN-associated PNET.

**Method:** We reviewed a multi-institutional international PNET database for patients with MEN-associated or sporadic PNET. Clinicopathological characteristics were compared. Overall(OS) and disease-free survival(DFS) were analyzed. Propensity score matching reduced bias based on tumor size, t-stage, and age.

**Results:** 651 patients were included(45 MEN1, 606 sporadic). Patients with MEN were diagnosed at a younger age (46vs58 years, $p < 0.01$ ), and were more often female (60vs49%, $p < 0.01$ ), multifocal (71vs19%, $p < 0.01$ ) and higher t-stage (76vs55% stage 4, $p = 0.034$ ). Lymph node involvement and the presence of metastasis were similar between groups. The rate of total pancreatectomy was 5x higher in the MEN cohort (16vs3%, $p = 0.004$ ). Median follow-up was 46 months. Survival analysis did not show significant differences between groups. DFS was 126 months in the MEN cohort vs.198 months in the sporadic cohort, but these curves were not statistically different (Figure). After matching was performed, survival remained similar between cohorts (OS median was not reached in either cohort, DFS 126 (MEN) vs 198 (Sporadic) months,  $p > 0.5$ ). Matched patients did not demonstrate differences in lymph node positivity (28vs25%, $p = 0.913$ ) or presence of metastatic disease (22vs13%, $p = 0.29$ ).

**Conclusion:** MEN-associated PNET occurs more frequently in younger, female patients, and is associated with multi-focality and high t-stage. Survival for patients with MEN-associated PNET is excellent. Consideration should be given to active surveillance and/or parenchymal-sparing surgical interventions to preserve pancreatic function given the indolence of this disease.

#### PP03-056

### MINIMALLY INVASIVE VERSUS OPEN PANCREATECTOMY FOR RIGHT-SIDED AND LEFT-SIDED NON-FUNCTIONING PANCREATIC NEUROENDOCRINE TUMORS; A MULTICENTER, MATCHED ANALYSIS WITH INVERSE PROBABILITY OF TREATMENT WEIGHTING METHOD

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**Objective:** To evaluate the safety and oncologic efficacy of minimally invasive surgery (MIS) in comparison with open surgery (OS) in the treatment of right-sided and left-sided non-functioning pancreatic neuroendocrine tumors (NF-PNETs).

**Background:** There is no sound evidence for the safety and efficacy of MIS for NF-PNETs according to tumor location.

**Methods:** Data of patients who underwent curative intended surgery for NF-PNET from August 1991 to July 2017 were collected from 14 institutions. Short-term outcomes and long-term prognosis were analyzed with inverse probability of treatment weighting method using the propensity score.

**Results:** A total of 904 patients were enrolled (OS, n=510; MIS, n=394). After matching analysis in each tumor location, no differences were noted in resection

margin, intraoperative blood loss and postoperative complication including pancreatic fistula. However, MIS was associated with longer operation time than OS (318.9 vs. 401.9 min,  $p < 0.001$ ) in right-sided tumors and shorter postoperative hospital stay (13.0 vs. 8.9 days,  $p < 0.01$ ) in left-sided tumors. The disease-specific and disease-free survival rates of MIS were equivalent or significantly higher compared with OS in right-sided and left sided tumors. In the multivariate analysis, the surgical approach (OS vs. MIS) did not affect the disease-free survival in both sides.

**Conclusion:** MIS had comparable short-term outcomes with OS except longer operation time in right-sided NF-PNETs and did not compromise the oncologic outcomes in right-sided and left-sided NF-PNETs. These findings suggest that MIS can be safely applied in selected patients with localized NF-PNETs regardless of tumor location.

#### PP03-057

### LAPAROSCOPIC ENUCLEATION AND SPLEEN SAVING DISTAL PANCREATECTOMY FOR SYNCHRONOUS INSULINOMA AND NESIDIOBLASTOSIS IN AN ADULT PATIENT

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**Introduction:** Insulinoma is the most common functional neoplasm of the endocrine pancreas. Patients typically present with features known as Whipple triad. 90% of insulinomas are found to be benign solitary adenomas amenable to surgical resection.

**Method:** We present a case of a lady who had endogenous hyperinsulinism with two DOTATATE avid nodules in the pancreatic body and tail who subsequently underwent laparoscopic enucleation and spleen saving distal pancreatectomy.

**Results:** The patient presented initially with features suggestive of Whipple triad. Further workup by the endocrinologist showed results consistent with endogenous hyperinsulinism. Computed Tomography (CT) scan and DOTATATE scan showed that she had one intensely DOTATE-avid exophytic nodule arising from the pancreatic body that is suspicious for a neuroendocrine tumour while the second DOTATATE-avid nodule is close to the pancreatic tail. There is no suspicious nodal or distant DOTATATE-avid metastasis detected. Her case was discussed in the multidisciplinary meeting and the decision was to proceed with laparoscopic enucleation of both lesions. She subsequently underwent laparoscopic enucleation of pancreatic body lesion with spleen saving distal pancreatectomy. She was discharged well on post operative day 3 and remained symptom free during subsequent follow-ups. Final histology came back as grade 1, well differentiated insulinoma of the pancreatic body and incidental pancreatic nesidioblastosis in the pancreatic tail.

**Conclusion:** Laparoscopic enucleation of pancreatic neuroendocrine tumour is feasible and safe method to resect pancreatic neuroendocrine tumour with less morbidity.

PP03-058

### RELATIONSHIP BETWEEN PROGNOSIS OF PANCREATIC TAIL CANCER AND LYMPHOCYTE-MONOCYTE RATIO

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**Background:** It is difficult to illustrate the relationship between inflammation and prognosis in pancreatic cancer. This is due to preoperative cholangitis and pancreatitis caused by the cancer. Recently, it has been reported that the neutrophil-lymphocyte ratio (NLR) and platelet-lymphocyte ratio (PLR) are useful biomarkers to reflect cancer prognosis and the lymphocyte-monocyte ratio (LMR) is the latest reported marker. In this study, we focused on pancreatic tail cancers which are not affected by inflammation and aimed to explore the relationship between prognosis and LMR.

**Methods:** Forty patients who were diagnosed invasive ductal carcinoma of the pancreatic tail underwent radical resection of our institute from 2010 to 2018 as having. The cut-off values of preoperative LMR, PLR, and NLR were estimated on the basis of ROC curve. We statistically compared their median overall survival by using the figures.

**Results:** With regard to ROC curve, area under the curve was 0.54 in LMR ( $p=0.72$ ), 0.55 in PLR ( $p=0.65$ ) and 0.59 in NLR ( $p=0.38$ ). These revealed each parameter did not work as the sufficient predictable markers statistically in terms of prognosis. However, by using 3.64 as the cut-off value in LMR, the median overall survival month in the group having higher figures was 10.4 months compared with 30.8 months in the group being smaller numbers (Log-rank  $p = 0.04$ ). There were not significant statistical differences in the results of PLR and NLR.

**Conclusion:** In pancreatic tail cancer, preoperative LMR could possibly be an easily measurable inflammatory marker in order to predict the prognosis.

PP03-060

### SOLID PSEUDOPAPILLARY NEOPLASM IN THE PANCREATIC HEAD WITH FAT REPLACEMENT OF THE PANCREAS

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Fat replacement of the pancreas is rare. Obstruction of the main pancreatic duct by a tumor in the head of the pancreas may cause fatty degeneration of the pancreatic parenchyma. We describe the case of a pancreatic solid pseudopapillary neoplasm, associated with fat replacement of the remaining pancreas. A 44-year-old woman presented with epigastric discomfort since one week and was admitted to our hospital. Computed tomography (CT) and magnetic resonance imaging (MRI) revealed a 4cm sized tumor in the head of the pancreas with calcification and fatty replacement of the parenchyma in the body and tail. During laparotomy, the tumor was a hard to firm mass and was well capsulated; the pancreatic duct and parenchymal tissue could not be

discerned. Therefore, pancreaticoduodenectomy was performed without pancreaticojejunostomy. Also, the fat replacement of the remaining pancreas wasn't resected. Microscopic examination revealed a solid pseudopapillary neoplasm and distal fat tissue; no pancreatic parenchymal tissue was observed in its entirety. The parenchyma was completely replaced by fat tissues, containing scattered viable islets of Langerhans. A routine CT performed on postoperative 7<sup>th</sup> day revealed no local fluid collection. Although pancreaticojejunostomy was not performed, there was no evidence of a postoperative pancreatic fistula (POPF), and she did not develop diabetes. Serum C-peptide and insulin levels were maintained within the normal range. The case demonstrates that in cases of tumors of the pancreatic head with fat replacement of the remaining pancreas, pancreaticojejunostomy is not essential. In addition, avoiding resection of the pancreatic remnant prevents postoperative diabetes.

PP03-061

### PROGNOSTIC IMPACT OF INFLAMMATORY NUTRITIONAL FACTORS DURING SHORT-TERM NACRT FOR PATIENTS WITH R OR BR PDAC

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We evaluated the prognostic values of inflammatory nutritional scores (NLR, GPS, mGPS, and CRP/Alb) in patients with R or BR PDAC treated with short-term NACRT (sNACRT).

**Methods:** A total of 49 patients who underwent pancreatectomy after sNACRT from September 2009 to May 2016 were enrolled. The sNACRT consisted of hypofractionated external-beam radiotherapy (30 Gy in 10 fractions) with concurrent S-1 (60 mg/m<sup>2</sup>) delivered 5 days/week for 2 weeks before pancreatectomy. The inflammatory nutritional scores were determined before and after sNACRT in this series.

**Results:** The median observation period of patients was 33 months. The 1-, 3-, and 5-year overall survival (OS) rates were 89.6%, 52.5%, and 39.4%, respectively. The median NLR significantly increased after sNACRT (from 2.067 to 3.302  $p < 0.001$ ). In multivariate Cox regression analysis, high pre-sNACRT mGPS (2 or 1;  $p=0.0478$ ) and significant increase in CRP/Alb ratio during sNACRT ( $\geq 0.077$ ;  $p=0.0036$ ) were independent parameters of short OS. The patients were divided into two groups according to the  $\Delta$ CRP/Alb ratio during sNACRT: the group with high  $\Delta$ CRP/Alb ratio ( $\geq 0.077$ , Group H,  $n=13$ ) and the group with low  $\Delta$ CRP/Alb ratio ( $< 0.077$ , Group L,  $n=36$ ). After sNACRT, the group H had higher CRP ( $p < 0.001$ ) and lower Alb ( $p=0.002$ ) compared to the group L. Patients in the group H lost more body weight during sNACRT ( $p=0.03$ ).

**Conclusion:** In addition to pre-sNACRT mGPS,  $\Delta$ CRP/Alb during sNACRT could provide prognostic value in the patients with R and BR PDAC treated by NACRT.

PP03-063

### HUMAN MACROPHAGES-DERIVED CAF-LIKE CELLS LEAD THE INVASION OF PANCREATIC CANCER

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**Introduction:** Pancreatic cancer is characterized by a desmoplastic reaction, which provokes treatment resistance. Recently, it has been reported that CAFs have heterogeneity, tumor-promoting or tumor-suppressive CAFs. The origin of CAFs on tumor progression and its mechanism remains unclear. In the pancreatic tumor, there are macrophages, but its origin is also unclear. Our previous data showed bone marrow-derived macrophages accumulated in the pancreatic tumor. Therefore, we aimed to investigate the involvement of peripheral blood (PB)-derived macrophages with CAF in pancreatic cancer microenvironment.

**Methods:** Human pancreatic cancer cells (PCCs) were co-injected with PB-derived macrophages into immunodeficient mice to evaluate tumor development. Invaded or migrated PCCs were counted to investigate the involvement of PB-derived macrophages untreated or treated with PCCs-conditioned medium (CM) in the invasive and migratory capability of PCCs. We examined changes in phenotype and function of PB-derived macrophages treated with PCCs-CM.

**Results:** PCCs co-injected with PB-derived macrophages grew invasively in xenotransplantation models. Invasive and migratory capability of PCCs increased significantly when they were co-cultured with PB-derived macrophages untreated or treated by PCCs-CM. Some PB-derived macrophages treated by PCCs-CM expressed CAF marker. PB macrophages-derived CAF-like cells produced tumor-promoting cytokines, increased their own migratory activity, and led the invasion of PCCs.

**Conclusion:** These data revealed that PB-derived macrophages were interacted with PCCs and transformed into CAF-like cells and induced the invasion of pancreatic cancer. Therefore, it was indicated that there is a subset of CAFs derived from macrophages although the origins of CAFs is thought to be pancreatic stellate cells or MSCs.

PP03-064

### SOLID PSEUDOPAPILLARY NEOPLASM OF THE PANCREAS: A REVIEW OF THE OUTCOMES OF SURGICAL RESECTION OVER A 10-YEAR PERIOD IN TERTIARY HOSPITALS IN SOUTH AUSTRALIA

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**Introduction:** Solid pseudopapillary neoplasms (SPNs) of the pancreas are rare tumours of low malignant potential. Owing to their rarity, limited data is available on surgically resected SPNs. Our objective was to identify all cases of SPNs that were surgically resected from 2009 to 2019 in tertiary hospitals in South Australia (SA).

**Methods:** A comprehensive search was undertaken across SA pathology databases. 10 cases with SPN of the pancreas were found, 9 underwent surgical resection. Information regarding their presentation, surgery, pathology, post-surgical outcomes and overall prognosis were extracted.

**Results:** Among the 10 patients, 7 were female and 3 were male. At the time of presentation, patients ranged from 13 to 61 years old (median 34.5 years old). The most common location of SPN was the tail of the pancreas (70%). They measured from 2cm to 8cm (mean diameter of 4.5cm). 5 patients presented with abdominal pain and the other 5 had an incidental finding of a pancreatic lesion on imaging. None had metastases. 6 patients with a tail of pancreas lesion underwent distal pancreatectomy and splenectomy, and 3 with a head of pancreas lesion underwent pancreaticoduodenectomy. 1 patient had an endoscopic ultrasound with fine needle biopsy confirming SPN of the pancreas, however, opted for active surveillance over surgical resection. All patients who had surgical resection of their SPN had clear margins (R0) on their pathology reports and no disease recurrence on their follow-up scans.

**Conclusion:** Complete surgical resection with clear margins is generally curative with patients demonstrating excellent long-term survival.

PP03-068

### AN ANALYSIS OF UNUSUAL INDICATIONS FOR PANCREATICODUODENECTOMY: A SINGLE CENTRE EXPERIENCE

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**Introduction:** Pancreaticoduodenectomy (PD) is a highly morbid surgery and has specific indications. For select cases, it is performed due to critical tumor location, involvement of pancreatic duct or as part of other surgery. This study highlights our unusual indications and outcomes for PD.

**Methods:** This retrospective evaluation of a prospectively maintained data includes 18 consecutive patients who underwent PD alone or as a part of another surgery from January 2004 to December 2018 at our centre.

**Results:** Of 18 patients, 11 were males and 7 females with median age of 51 years. Indications include duodenal GIST in 6 patients with 4 upfront surgeries and 2 after Imatinib, 3 metastatic colorectal cancer to head of pancreas (HOP), 2 type 1 autoimmune pancreatitis (AIP), two RCC metastasis and one choledochal cyst. Two underwent PD with gastrectomy for carcinoma stomach whereas two underwent whipple with transverse colectomy for carcinoma colon. All pancreaticojejunostomies were performed by a modified Blumgart technique. There were 3 ISGPF Grade B pancreatic fistulas, 2 after PD and one after colo-whipple. One AIP patient had rectus sheath hematoma and incisional hernia which was repaired 2 years after surgery. One AIP patient had postoperative exocrine insufficiency. Patient with metastatic RCC is on sunitinib. The colo-whipple patient expired after 3 years and gastro-whipple expired at 1 1/2 years of surgery.

**Conclusion:** Careful selected indications for PD can give good outcomes in unusual cases when performed at high volume centres.

PP03-069

### ADJUVANT CHEMOTHERAPY IS BENEFICIAL IN BIOLOGICALLY FAVORABLE PANCREATIC ADENOCARCINOMA: A PROPENSITY SCORE WEIGHTED STUDY

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Despite low representation of biologically favorable pancreatic adenocarcinomas in randomized control trials (RCTs), guidelines recommend all early pancreatic cancers undergo resection and chemotherapy. With inherently longer overall survival (OS) and unclear evidence from RCTs, risk-benefit ratio of chemotherapy in favorable cancers remains unclear. We used propensity score weighting (PSW) to examine association of adjuvant chemotherapy on OS in patients with negative nodes, low-grade histology, and tumors < 2cm.

Data from National Cancer Database was used to identify stage I/II pancreatic adenocarcinoma that underwent surgery. PSW was implemented from logistic regression for adjuvant chemotherapy while controlling for demographic and biological variables. The survival benefit of chemotherapy in negative lymph nodes, low-grade histology, and tumor size < 2cm was examined using Cox proportional hazard ratio (HR) model with PSW.

Within the cohort undergoing resection (22,131), subgroups with favorable pathology included 7,082 with negative nodes, 13,880 with low-grade histology, and 2,420 with tumors < 2 cm. PSW were well balanced (absolute standardized differences less than 10%). All subgroups had a significant benefit in OS with receipt of adjuvant chemotherapy, including those with negative lymph nodes (HR 0.802, p< 0.0001), low-grade histology (HR 0.727, p< 0.0001), and tumors < 2cm (HR 0.773, p=0.0004).

This study demonstrates improved OS with adjuvant chemotherapy in patients with negative lymph nodes, low-grade, and tumors < 2 cm. Results serve as evidence that all early pancreatic cancers, including biologically favorable tumors, benefit from guideline concordant care and that omission of chemotherapy in these subgroups results in decreased OS.

PP03-070

### INCIDENCE AND IMPACT OF TEXTBOOK OUTCOME AMONG PATIENTS UNDERGOING RESECTION OF PANCREATIC NEUROENDOCRINE TUMORS: RESULTS OF THE US NEUROENDOCRINE TUMOR STUDY GROUP

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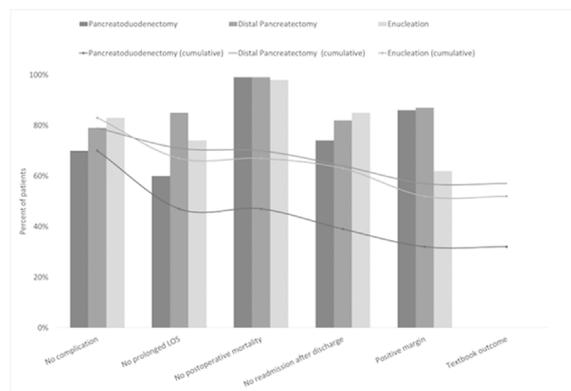
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**Introduction:** Textbook outcome (TO) is an increasingly recognized composite measure of quality. We sought to define the incidence and impact of TO on conditional disease-free survival (cDFS) among patients undergoing resection of pancreatic neuroendocrine tumors (PNET).

**Methods:** Patients undergoing resection of PNET between 2000-2018 were identified using an international multi-institutional database. TO was defined as no postoperative  $\geq 3$  grade complication, no 90-day mortality, no prolonged length-of-hospital stay(LOS)(ie. LOS > 75<sup>th</sup> percentile), no 90-day readmission after discharge, and R0 resection. 3-year cDFS was calculated and the association of TO with cDFS was examined.

**Results:** Among 821 patients with PNET, median tumor size was 2.1 cm (IQR:1.4-14.6) with a median Ki-67 index of 2.4 (IQR:1.4-5.0). Resection consisted of pancreatoduodenectomy (PD)(n=231, 28.1%), distal pancreatectomy (DP)(n=492, 59.9%) and enucleation (EN)(n=98, 11.9%). Incidence of TO varied by procedure type (PD, 32.5% vs. DP, 56.7% vs. EN, 52.0%; p< 0.001). While certain TO factors such as no 90-day mortality (PD: 99.1% vs. DP: 99.0% vs. EN: 99.0%) was comparable among surgery subtypes, other factors such as avoidance of prolonged LOS (PD: 59.7% vs. DP: 85.4% vs. EN: 73.5%), no complications (PD: 70.1% vs. DP: 78.9% vs. EN: 82.7%), and readmission (PD: 74.0% vs. DP: 81.7% vs. EN: 84.7%) were all achieved more often following DP and EN versus PD (all p< 0.05)(Figure). TO was independently associated with improved cDFS (HR:0.54, 95%CI 0.35-0.81; p=0.003).

**Conclusions:** Many patients undergoing resection of PNET did not experience a TO, which varied markedly based on procedure type. Achieving TO was associated, however, with improved cDFS.



PP03-071

### THE ELUCIDATION OF INTERACTION BETWEEN AUTONOMIC NERVOUS SYSTEM, IMMUNE SYSTEM AND PANCREATIC CANCER

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**Background and aim:** Catecholamine is secreted by stress and was reported that would effect to pancreatic cancer progresses (Renz et al. Cancer Cell, 2018). However interaction between autonomic nervous system, immune system and pancreatic cancer is not well elucidated. In this study, we examined the relationship on pancreatic cancer progression and immune system under the stress load in mice.

**Methods:** LTPA( $3 \times 10^3$  cells), a mouse-derived pancreatic cancer cell line, was cultured in media containing various concentrations of noradrenaline for 4 days, and the number of viable cells was measured using WST-8. Mice (C57BL/6J) were divided into a stress group (N = 17) restrained for 6 hours and a nonstress group (N = 7), and blood catecholamine was measured. In addition, blood immune cells in the long-term stress group (8 weeks, N = 14) and the nonstress group (N = 10) were measured using flow cytometry.

**Results:** LTPA proliferated significantly in culture media containing 0.01  $\mu$ M to 1  $\mu$ M noradrenaline compared to media alone ( $p < 0.01$ ). In mice, blood noradrenaline increased significantly in the stress group compared to the nonstress group (5102.3 vs 1980.1pg/mL  $p < 0.05$ ). In the long-term stress group, B cells decreased (29.0 vs 9.6%,  $p < 0.01$ ) and myeloid derived suppressor cells increased significantly compared to the nonstress group (13.9 vs 43.4%,  $p < 0.01$ ).

**Conclusion:** Stress may promote the growth of pancreatic cancer and have an immunosuppressive effect in pancreatic cancer development. Examination in mice with pancreatic cancer as in vivo study would be needed.

PP03-075

### THE DYNAMIC IMMUNE LANDSCAPE REVEALS SUBSTANTIAL DIFFERENCES DURING PDAC DEVELOPMENT

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Pancreatic ductal adenocarcinoma (PDAC) has been recognized as an immunologic-cold tumor. That partly explains why PDAC is not reactive to the currently available immunotherapies. Taking an insight into the characteristics of the PDAC immune microenvironment is fundamental to generate more effective strategies. Here, using mass cytometry (CyTOF), we identified the dynamic changes of tumor-infiltrating immune cells from healthy pancreas to spontaneous PDAC in the KPC mouse model. We observed two significant immunosuppressive stages with few T/B cell infiltrate. One is the acinar-ductal metaplasia (ADM) stage with transiently increased Tregs, the other is metastatic tumor stage with a large amount of myeloid suppressive cells. Surprisingly, tumors in an early stage still have a prominent presence of T/B cells. Trajectory analysis of monocyte/macrophage showed that the differentiation/activation branch of Ly-6C+ monocyte changes from a BST2+/MHC-II+ M1-like phenotype to an Arg-1+ M2-like phenotype over time during PDAC carcinogenesis and progression. The temporal immune characteristics were also confirmed in patient specimens. Our study demonstrates the coevolution of histopathology and immunology

of developing PDAC and highlights that immunotherapy strategy exploitation should base on specific tumor stage.

PP03-077

### MALIGNANT HYPERCALCEMIA CAUSED BY PTHrP-SECRETING PANCREATIC NEUROENDOCRINE TUMOR (PNET) - DIAGNOSIS AND TREATMENT OF A VERY RARE TUMOR ENTITY

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**Introduction:** Hypersecretion of parathyroid hormone-related peptide (PTHrP) by gastroenteropancreatic NETs is very rare. We present the case of a 41-year-old female suffering from a hepatic metastatic pancreatic NET with consecutive malignant hypercalcemia undergoing surgical treatment combining extensive local resection and staged right hepatectomy.

**Case report:** A 41-year-old female was admitted with persisting nausea and vomiting. Clinical chemistry assays revealed severe hypercalcemia of 4.9mM and acute renal failure with elevated serum creatinine of 2.75mg/dL. Dialysis and administration of calcitonin/pamidronate led to temporary normalization of serum calcium levels. Further investigations showed severe elevation of PTHrP accompanied by normal levels of PTH and vitamin D. Imaging studies confirmed the presence of a distal pancreatic tumor and a large mass in the right hepatic lobe. An octreotide scan and liver biopsy led to the final diagnosis of a hepatic metastatic pNET. The initial surgical treatment included distal pancreatectomy, en-bloc splenectomy, partial gastrectomy, segmental colonic resection (R0 locally) and right portal vein ligation. During the postoperative phase the hypercalcemia persisted and showed resistance to all drug treatment including somatostatin. After three weeks, a CT scan confirmed sufficient growth of the future liver remnant, and the right hepatectomy was performed (R0). Within days, the serum calcium levels finally declined and the patient was discharged. 3- and 12-month follow-up were unremarkable.

**Discussion:** Controlling malignant hypercalcemia is challenging. In the few similar cases reported, agents like somatostatin analogue were administered with palliative intent. In face of the nature of well-differentiated GEP-NET however, surgery is the preferred therapy.

PP03-078

### LONG TERM ONCOLOGICAL OUTCOMES OF LAPAROSCOPIC PANCREATODUODENECTOMY

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**Background:** Two hundred and fifty laparoscopic pancreatoduodenectomies (LPDE) were performed in single center in patients with periampullary area diseases.

**Objective** is to assess the long-term oncological outcomes of LPDE performed in patients with pancreatic head and ampullary carcinoma

**Methods:** 250 patients underwent LPDE during 2007-2018 years. 216 patients had malignancies (125 had pancreatic cancer, 44 patients had ampullary carcinoma) and 34 had benign diseases. Patients were followed up by control examination and phone calls every year. Kaplan-Maier survival analysis was performed in order to analyze long term results of treatment.

**Results:** 119 patients with PDAC and 44 patients with ampullary carcinoma were followed up. 114 patients with PDAC were referred to adjuvant. Only 63 patients received chemotherapy, 26 patients had no chemotherapy and data about 25 patients was not available. Median overall survival rate (OSR) of patients with PDAC was 21 months. 5-years OSR was 24%. Patient who did not receive adjuvant had significantly worse results with median OSR of 16 months vs 24 months. 5-years OSR of patients received chemo was significantly higher (27% vs 17%,  $p < 0.05$ ). Another predictor of better survival was lymph nodes negativity, N+ patients had lower median OSR (26 months vs 18 months,  $p < 0.05$ ) and 5-years OSR (27% vs 15%,  $p < 0.05$ ). Patients with ampullary carcinoma had better oncological outcomes. Median OSR was 44 months and 5-years OSR was 52%.

**Conclusion:** Lymph nodes positivity and non-receiving of adjuvant chemotherapy are predictors of lower survival rates in patients with pancreatic adenocarcinoma.

#### PP03-079

### ZIP CODES DRIVE OVERALL SURVIVAL FOR PATIENTS DIAGNOSED WITH PANCREATIC CANCER

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**Introduction:** The purpose of this study was to determine if a patient's zip code is affecting patient overall survival (OS) when diagnosed with pancreatic cancer. Our hypothesis was that socio-economic status (SES) is associated with this outcome.

**Methods:** We interrogated a convenience sample from our cancer center registry and obtained 479 subjects diagnosed with pancreatic cancer between 2010-2018. We selected subjects (328) by zip code, representing the plurality of the cases in our catchment area. Outcome variables were overall survival and socio-economic status; predictor variables were recurrence, insurance, type of treatment, gender, cancer stage, age, and gender. We converted zip code to municipality and culled data using Adjusted Gross Income (AGI, FY 2017). We then created groups using a cutoff at filings of  $> \$100,000$  of AGI; Low SES = municipalities where  $\leq 5\%$  of the filings were over  $\$100,000$ , Mid SES = municipalities where between 5%-40% of the filings were over  $\$100,000$ , High SES = municipalities where  $\geq 40\%$  of returns were over  $\$100,000$ . Comparative statistical analysis was performed using Chi-square for nominal and ordinal variables, a two-way ANOVA test was used for continuous variables, p-value was set at 0.05.

**Results:** We found a statistical significant difference in OS in patients with low SES, Table 1.

**Conclusion:** We believe that our findings are multifactorial. Access to care, optimal nutritional status, overall fitness, co-morbidities could play a major role and confound the results. Our study suggests low SES has a negative impact on overall pancreatic cancer survival and deserves additional study.

Socio-economic status	OS* (in months)	St. Dev.	N
High	18.7	37.5	30
Mid	13.5	25.2	95
Low	8.3	14.5	203
*p = 0.014			

#### PP03-080

### THE NUTRITION STATUS DURING PREOPERATIVE CHEMORADIOTHERAPY AFFECTS THE POSTOPERATIVE PROGNOSIS FOR THE PATIENT WITH UNRESECTABLE PANCREAS CANCER

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**Background:** Conversion surgery (CS) is promising option to improve the prognosis for unresectable pancreatic cancers (UR-PC). However, it remains unclear whether the nutrition status in preoperative chemoradiotherapy affects the postoperative prognosis.

**Purpose:** To evaluate the relation of the nutrition during preoperative therapy with post-operative prognosis.

**Methods:** Between 2007 and 2017, 40 patients with UR-PC were underwent conversion surgery. 42.5/52.5/5.0/0.0% of the patients before preoperative therapy and 10.0/55.0/27.5/7.0% after preoperative therapy were defined as Normal/Light/Moderate/Severe levels by the CONUT score. Nutrition group (N: n=25) is the patient who maintained Normal/Light and Malnutrition group (M: n=13) is people whose nutrition was getting worse (Normal/Light  $\rightarrow$  Moderate/Severe) during preoperative therapy. The clinical factors and the prognosis were analyzed between these two groups.

**Results:** The serum nutrition biomarkers, such as transferrin (226vs204 mg/dl:  $p=0.045$ ), prealbumin (21.3vs15.4 mg/dl:  $p=0.019$ ), retinol binding protein (2.8vs1.7mg/dl:  $p=0.019$ ) and PNI (42.63vs36.71:  $p < 0.0001$ ) were significantly lower in M group, compared to N group. Intraoperative blood loss was significantly higher and R1 resection was highly occurred in group M (1105vs2432ml,  $p=0.0002$  and 8.7vs46.2%,  $p=0.002$ , respectively). No significant differences were detected in TNM classification, the post-operative nutrition status and the time to the postoperative chemotherapy. In survival analysis, M group showed the worse prognosis than N group (median overall survival: 30.6vs11.5 months,  $p=0.062$ ; median disease free survival: 16.3vs6.1 months:  $p=0.027$ ).

**Conclusion:** Decreased preoperative nutrition status is significantly correlated with increased intraoperative blood lost and R1 resection, resulting in poor prognosis.

PP03-081

### ADJUVANT CHEMOTHERAPY IS NOT GUIDED BY PATHOLOGIC TREATMENT EFFECT AFTER NEOADJUVANT CHEMOTHERAPY IN PANCREATIC CANCER

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**Introduction:** Neoadjuvant chemotherapy for pancreatic cancer is increasingly utilized. However, no guidelines exist for optimal adjuvant therapy after pancreatectomy with a partial or poor response to neoadjuvant therapy. This qualitative study seeks to describe our institution's patterns of adjuvant chemotherapy regimen selection after neoadjuvant therapy.

**Methods:** All patients at a single institution from January 2013 through June 2019 receiving neoadjuvant chemotherapy followed by pancreatectomy for pancreatic cancer were reviewed. Patients enrolled in trials limiting chemotherapy or with missing medical oncology notes were excluded. Chemotherapy regimen, the College of American Pathologists pathologic tumor response, and medical oncology plans were recorded.

**Results:** Fifty-three patients were reviewed and 41 patients met inclusion criteria. Neoadjuvant chemotherapy regimen are shown. Twenty-nine (70.7%) underwent pancreatoduodenectomy, 10 (24.3%) distal pancreatectomy, and 2 (4.8%) total pancreatectomy. Pathologic review of treatment effect demonstrated that 3 (7.3%) patients had complete pathologic response (cPR), 3 (7.3%) had near cPR, 16 (39%) had partial response, and 14 (34.1%) had poor/no response to neoadjuvant chemotherapy. Treatment effect was missing in 5 (12.2%) patients. Thirty-three (80.5%) patients received adjuvant chemotherapy, with 15 (45.5%) switching regimen adjuvantly. Pathology results guided therapy in 53.6% of patients and tumor response specifically guided therapy in 11 (30.5%) patients.

**Table 1** Neoadjuvant Chemotherapy

Chemotherapy Regimen	N (%)
FOLFIRINOX	22 (53.7)
CAPIRINOX	1 (2.4)
gemcitabine/nab-paclitaxel	13 (31.7)
FOLFIRINOX, gemcitabine/nab-paclitaxel	3 (7.3)
FOLFIRINOX, gemcitabine	1 (2.4)
FOLFIRINOX, gemcitabine, bevacizumab	1 (2.4)

**Conclusions:** Despite 73.1% of patients having partial or poor response to neoadjuvant chemotherapy, only 45.5% switched chemotherapy adjuvantly. Medical oncologists rarely considered treatment effect when choosing adjuvant therapy. Future trials should be designed to determine the

optimal adjuvant regimen guided by pathologic treatment effect of neoadjuvant therapy.

PP03-083

### OBSTRUCTIVE JAUNDICE IN PANCREATIC MALIGNANCY - PRIMARY BILIARY DRAINAGE WITH STENTING OR UPFRONT SURGERY?

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**Introduction:** There is currently no clear consensus whether to proceed for pre-operative biliary drainage for malignant obstructive jaundice versus upfront pancreatoduodenectomy (PD). This study seeks to compare pre-operative biliary drainage with stenting vs upfront PD for jaundiced patients with a resectable pancreatic malignancy. The primary outcome measure was overall postoperative complications.

**Method:** A prospectively maintained database was used to identify jaundiced patients with a resectable pancreatic malignancy from January 2014 to July 2019 at a single centre. Categorical data were analysed by difference in binomial proportions using exact tests. Overall complication rates between stenting and upfront surgery groups were analysed using the Cochran-Mantel-Haenszel test to adjust for potential confounders. A summary odds ratio was generated and presented graphically as a Forest plot. Two-sided P values of < 0.05 was accepted as statistically significant.

**Results:** Overall post-operative complications occurred in 37% (10/27) of the stented group and in 72% (13/18) of the upfront PD group (P = 0.02). Univariate analysis for age > 65 years, gender, ASA  $\geq$  3 and histopathology were not associated with overall complications. Despite a bilirubin < 50 on the day-of-surgery showing a significant reduction in post-operative complications (26% vs 69%, P = 0.005), the summary odds ratio revealed stented patients were associated with 77% lower odds of overall complications relative to those receiving upfront PD (odds ratio: 0.23; 95% confidence interval: 0.12 - 0.47).

**Conclusion:** Pre-operative biliary drainage with stents in obstructive jaundiced patients with resectable pancreatic cancers did not have increased overall complications.

PP03-084

### SURGERY OF PANCREAS TUMORS IN CHILDREN AND ADOLESCENTS: A SINGLE INSTITUTION EXPERIENCE

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**Purpose:** The aim of this study is the surgical management and the clinical and pathological features of patients who underwent pancreatic resection for benign and malignant pancreatic tumors in childhood and adolescence and described the morbidity and mortality of this group of patients.

**Methods:** This is a retrospective review of medical reports of patients  $\leq 19$  years with pancreatic tumors who underwent surgery in National Cancer Center, Lima, Peru from January 2000 to January 2019.

**Results:** Thirty-two patients underwent surgery, the mean age was 13.65 years (3-18), 26 patients were women and 6 men. The tumor location was in the head ( $n = 18$ ), tail ( $n = 9$ ) and body ( $n = 5$ ), the mean tumor size 7.34cm (2-13.5cm). The histological types were: solid pseudopapillary tumor (SSP) ( $n = 27$ ), pancreatoblastoma ( $n = 3$ ) and neuroendocrine tumor ( $n = 2$ ) of which one was neuroendocrine carcinoma and another insulinoma. All tumors had R0 in bloc resection, surgical treatment was: pancreaticoduodenectomy ( $n = 18$ ), distal pancreatectomy ( $n = 9$ ), central pancreatectomy ( $n = 4$ ) and tumor enucleation ( $n = 1$ ). The survival rate according to 5-year Kaplan Meier analysis was 74%. The median duration of follow-up was 33 months. The postoperative mortality was 0%.

**Conclusions:** Radical surgery is a safe treatment in patients with primary tumors of the pancreas with a low mortality rate and postoperative complications. The SSP is the most frequent pathology with a good prognosis.

### PP03-085

## BLOOD BASED MOLECULAR PROFILING: THE FUTURE OF PANCREATIC ADENOCARCINOMA DETECTION

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**Introduction:** Molecular profiling is currently being explored as a tool for selecting patients in targeted therapy clinical trials and to determine prognosis for patients with pancreatic adenocarcinoma (PDAC). Noninvasive molecular profiling strategies are critical given the invasiveness of obtaining tissue biopsies. Here we characterize the landscape and therapeutic implications of blood-based circulating tumor DNA (ctDNA) in PDAC.

**Methods:** We retrospectively analyzed blood samples from eighty-two patients with PDAC using comprehensive genomic testing of ctDNA.

**Results:** A total of 42/82 (51%) were men, median age being 66 years (range 40-85). A total of 42/82 patients had one or more alteration. The total number of alterations was 140 (non-unique), and median number of alterations/patient was 3. Median mutant allele frequency (% ctDNA), was 0.5% (range 0.09-75.2). KRAS was the most common altered gene (>25 alterations), followed by TP53, SMAD4, and BRCA2 (23, 7, 6 alterations). Of the patients with alterations, 24% (20/83) had one or more potentially actionable alterations, most commonly KRAS. In these genes, mutations occurred most frequently.

**Conclusion:** This study analyzes blood-derived ctDNA in PDAC in Denver, Colorado. Genomic distinction based on PDAC risk factors and the high percentage of potentially actionable genomic alterations suggests potential clinical utility for patient selection onto clinical trials. Further research is required to determine if this data is being utilized for trial enrollment, whether drugs are available to target these markers, and whether these

markers are associated with response to therapy on trials.

### PP03-086

## PATTERNS AND QUALITY OF CARE FOR PATIENTS DIAGNOSED WITH PANCREATIC CANCER IN VICTORIA, AUSTRALIA FROM 2016 - 2018

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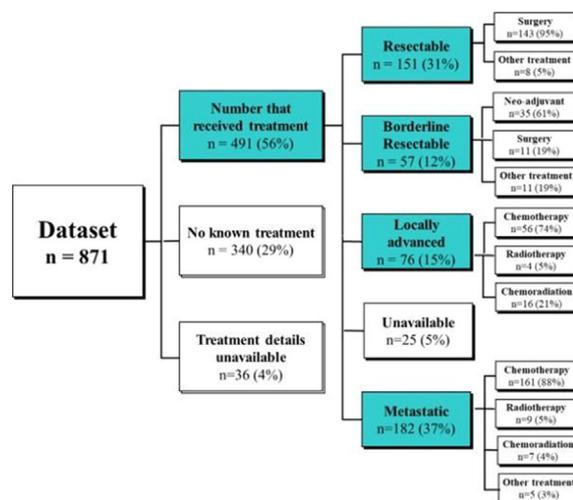
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**Introduction:** A core set of quality indicators (QIs) was developed in 2017 using a modified Delphi approach to monitor quality of care, and optimise quality of life and survival in patients diagnosed with pancreatic cancer (PC). This study (1) describes the patterns of care based on disease stage at diagnosis and (2) assesses the association between meeting the QI and survival.

**Methods:** Data were collected from hospitals and consulting rooms for patients recruited to the Upper Gastrointestinal Cancer Registry (UGICR). Associations between 23 QIs and patient and health service characteristics were tested using linear regression and survival analysed using Kaplan-Meier and Cox proportional hazards models.

**Results:** A total of 871 patients were eligible for this study with 52% male, 74% over the age of 65 27% potentially resectable and 47% with metastatic disease at diagnosis. A third of patients had no known treatment, and 56% received treatment according to their operability at diagnosis (Figure 1). Half the patients were deceased within 6 months from diagnosis. Meeting the following QIs was associated with improved patient survival at 6 months (1) imaging using a pancreatic protocol CT or MRI ( $OR=3.1$ , 95%  $CI=2.2 - 4.4$ ); (2) documentation of performance status (ECOG or ASA) at presentation ( $OR=2.1$ , 95%  $CI=1.5 - 2.9$ ); (3) disease management discussion at a multidisciplinary team meeting ( $OR=6.4$ , 95%  $CI=4.3 - 9.6$ ) and (4) being included in a clinical trial ( $OR=5.0$ , 95%  $CI=2.7 - 9.1$ ).

**Conclusion:** Adherence to QIs can optimise care and may improve survival in PC.



**Figure 1** Patterns of treatment for patients diagnosed with pancreatic cancer (UGICR dataset)

PP03-087

### CHOLINE METABOLISM IS ASSOCIATED WITH PATHOLOGICAL RESPONSE AND RECURRENCE OF PATIENTS WITH PANCREATIC CANCER AFTER NEOADJUVANT CHEMORADIATION THERAPY

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**Introduction:** Pancreatic ductal adenocarcinoma (PDAC) has poor prognosis even if it is resectable. Although the efficacy of neoadjuvant therapies for PDAC are reported in recent years, it is still unclear the optimal target of neoadjuvant therapy. We investigated the metabolic changes in PDAC to identify mechanisms of treatment effect of neoadjuvant chemoradiation therapy (NACRT).

**Methods:** Frozen tissue of tumor and normal pancreas were obtained from 49 patients with PDAC who underwent surgery. There were 30 patients who received NACRT (NACRT group) and 19 patients who did not receive any neoadjuvant therapy (control group). Metabolites levels of tumor and normal pancreatic tissue were measured by capillary electrophoresis-mass spectrometry (CE-MS). In NACRT group, pathological responses were classified according to Evans grade (evans grade IIIA; resistant group (n=19), IIB/IV; response group (n=10)). RNA microarray was also performed for NACRT group (10 patients) and control group (5 patients).

**Results:** In comparison of metabolite levels of tumor, there were significant differences in 22 metabolites between NACRT group and control group. There were significant differences in 9 metabolites between response group and resistant group. Among these 9 metabolites, only phosphocholine was associated with recurrence in NACRT group. RNA microarray showed marked gene suppression of choline transporter in PDAC tissue of NACRT group.

**Conclusion:** Present study, identify new metabolic consequences of PDAC and potential target of NACRT. Choline metabolism is associated with pathological responses and prognosis in patients with PDAC who received NACRT.

PP03-089

### PREOPERATIVE EVALUATION OF SYSTEMIC INFLAMMATORY AND IMMUNE RESPONSE INDEXES IN POTENTIALLY RESECTABLE PANCREATIC CANCER: PROGNOSTIC ROLE AND CORRELATION WITH HISTOPATHOLOGICAL FEATURES

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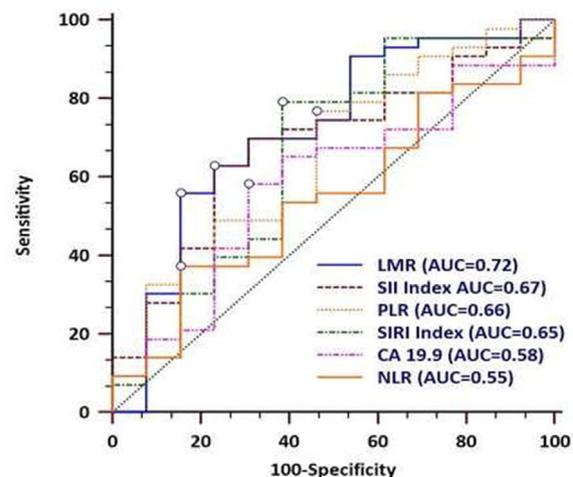
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**Introduction:** The systemic inflammation and immune response indexes seems to be associated to tumor aggressiveness and poor prognosis in patients affected by pancreatic ductal adenocarcinoma (PDAC); however, their ability in discriminating the best candidates for surgery is still unclear.

**Methods:** From 2015 to 2019, 57 (median age: 69.5; M/F: 29/28) patients underwent pancreatic resection for pathologically confirmed PDAC. Baseline clinical and radiological characteristics, CA19-9 levels and preoperative blood cell count were collected in order to calculate the lymphocyte-to-monocyte ratio (LMR), platelet-to-lymphocyte ratio (PLR), neutrophil-to-lymphocyte ratio (NLR), systemic inflammation response (SIRI) and systemic immune-inflammation (SII) index. The cut-offs for continuous variables were established from the analysis of the receiver operating characteristics curves (ROC), setting the specificity value at 80%. The prognostic impact of each preoperative variable on recurrence-free (RFS) and cancer-specific survival (CSS) was explored using multivariate Cox-regression analysis. The diagnostic performance of each index in identifying the unfavorable histopathological characteristics was evaluated by ROC curves analysis.

**Results:** Preoperative  $LMR \leq 1.96$  [Exp(b):2.90; 95% C.I.:1.28-6.58;  $p=0.0112$ ] and  $CA\ 19-9 > 521\ U/mL$  [Exp(b):3.20; 95% C.I.:1.35-7.57;  $p=0.0086$ ] were independent prognostic factors for RFS. The Resectability Status according to NCCN guidelines [Exp(b):2.80; 95% C.I.:1.10-7.13;  $p=0.0315$ ] and  $CA\ 19-9 > 521\ U/mL$  [Exp(b):2.80; 95% C.I.:1.11-7.05;  $p=0.0301$ ] were predictors of cancer-related death. LMR was the best preoperative index in identifying lymph node involvement (AUC=0.72; C.I.:0.59-0.83;  $p=0.0125$ ).

**Conclusions:** Given its prognostic value and ability in predicting pathological tumor stage, preoperative LMR is useful to identify high-risk patients and individualize treatment strategy for potentially resectable PDAC.



ROC-curve comparison of best six preoperative predictors of lymph node pathological status

PP03-090

### SOLID PSEUDOPAPILLARY TUMOR OF THE PANCREAS: OUR EXPERIENCES OF 36 CASES AT BANGABANDHU SHEIKH MUJIB MEDICAL UNIVERSITY, BANGLADESH & REVIEW OF LITERATURE

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Solid pseudopapillary tumor (SPT) of the pancreas is rare, accounting for 0.13-2.7% of all pancreatic tumors. Another name is Frantz tumour. It was first described in 1959. It is unique, has low malignant potential and predominantly affects young women. Radiological and pathological studies have revealed that the tumor is quite different from other pancreatic tumors. But the cell origin of SPT and tumorigenesis are still enigmatic. Abdominal mass is the most common presenting symptom. Our study was undertaken to examine the clinico-pathological characteristics of the disease and to evaluate the outcome of surgical intervention in dept. hepatobiliary and pancreatic surgery unit in Bangabandhu Sheikh Mujib Medical University, Bangladesh.

In our hospital we reported 36 cases. About 30 patients were female and 6 patients are male. Age ranges about 18-45 year. Most common clinical feature is abdominal lump having abdominal pain and discomfort. Among them 26 patients had undergone whipple's procedure and 10 patients had undergone distal pancreatectomy. All are alive and postoperative recovery was uneventful. Postoperatively all patients histopathology confirmed SPT.

Thus our experience is SPT is rare, but treatable pancreatic tumor. While clinical signs and symptoms are relatively nonspecific, characteristic findings on imaging and histology separate these tumors from the more malignant pancreatic tumors. The prognosis is favorable even in the presence of distant metastasis. Although surgical resection is generally curative, a close follow-up is advised in order to diagnose a local recurrence or distant metastasis.



solid pseudopapillary tumour

PP03-091

### STANDARD UPTAKE VALUE OF THE PRIMARY TUMOUR ON FDG-PET CORRELATES WITH THE PRESENCE OF METASTASIS IN PANCREATIC AND PERI-AMPULLARY MALIGNANCIES

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**Introduction:** Our aim was to determine if an association exists between the standard uptake value (SUV) of the primary lesion on FDG-PET and resectability in patients with pancreatic and peri-ampullary cancer.

**Methods:** This was a prospective clinical study in which patients from a single institution thought to have resectable pancreatic or peri-ampullary cancer underwent compulsory pre-operative FDG-PET. Uptake at the site of the primary tumour was distinguished from uptake around the biliary stent if present, and SUV of the discrete tumour was determined where possible. The presence of metastasis or local invasion, as well as the outcome of attempted resection were audited for each patient.

**Results:** SUV of the primary tumour was not able to be determined in 4 of 53 enrolled patients. Distant metastasis discovered either on FDG-PET or at operation was associated with higher measurable SUV (6.0 vs 4.2,  $p=0.03$ ). There was no association between SUV and presence of local invasion (4.6 vs 5.2,  $p=0.31$ ). In the group who underwent surgery SUV was not associated with the discovery of unresectable features intra-operatively (5.1 vs 4.1,  $p=0.17$ ). No difference in SUV was found between R0, R1 and R2 margin status ( $p=0.52$ ). Multi-variate analysis of patient and tumour factors did not identify any likely confounders.

**Conclusion:** SUV of the primary tumour as measured on FDG-PET appears to be associated with distant metastasis in pancreatic and peri-ampullary cancers. A higher powered study may determine if this association extends to surgical outcome in those proceeding to attempted resection.

	Mean SUV	P
R0 (n=14)	4.4	0.52
R1 (n=7)	4.2	
R2 (n=4)	2.8	
Completed resection (n=25)	4.1	0.17
Aborted intra operatively (n=7)	5.1	
Metastasis (n=13)	6.0	0.03*
No Metastasis (n=36)	4.2	
Local invasion (n=8)	5.2	0.31
No local invasion (n=41)	4.6	

SUV of the primary tumour according to margin status and the presence of unresectable features.

PP03-092

### FACTORS ASSOCIATED WITH ACCESS TO TREATMENT FOR PANCREATIC CANCER IN NEW ZEALAND

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**Introduction:** Pancreatic ductal adenocarcinoma (PDAC) is a large contributor towards cancer mortality, and there is limited literature on access to care for PDAC in New Zealand. The aim of this study was to identify factors associated with access to treatment for PDAC in New Zealand.

**Methods:** De-identified data were obtained from linked New Zealand Ministry of Health datasets. All patients diagnosed with PDAC from 2011-2014 were included in the study, with follow-up until December 2016. Socio-economic deprivation was defined using the NZDep2013. Orthodromic distances were calculated to each patient's treatment facilities. Treatment was categorised as meeting current standard (TMS), below standard (TBS) or no treatment (NT).

**Results:** 1282 patients were included, with a median age of 71.2 years. Age standardised PDAC incidence and mortality rates were higher in Māori than non-Māori (11.9 vs. 7.0/100,000; 9.4 vs. 5.3/100,000). For potentially resectable disease, age and deprivation index were associated with lower likelihood of receiving treatment. Survival was shorter in those with TBS or NT (HR 0.30,  $p = 0.0001$ ) compared to TMS. For metastatic disease, deprivation index ( $p = 0.002$ ) and distance from treatment facility ( $p = 0.006$ ) were associated with lower likelihood of receiving treatment. Survival was shorter for those with NT (HR 0.64,  $p=0.0001$ ) compared with TMS.

**Conclusion:** Access to PDAC treatment in New Zealand are affected by age and socioeconomic deprivation. Age, stage of disease, treatment received and distance to nearest oncology center affect overall survival. Understanding this may inform strategies to increase treatment uptake and improve survival.

PP03-093

### LONG TERM SURVIVAL AND OUTCOMES FROM SURGERY IN PATIENTS WHO HAVE UNDERGONE PRE-OPERATIVE FDG-PET FOR PANCREATIC OR PERI-AMPULLARY CANCER

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**Introduction:** Our aim was to determine if compulsory pre-operative FDG-PET resulted in different long-term outcomes in patients who proceeded to attempted resection for pancreatic or peri-ampullary cancer.

**Methods:** This was a prospective clinical study that enrolled patients from a single institution with apparently

resectable pancreatic or peri-ampullary cancer. All patients underwent compulsory FDG-PET prior to surgery. Survival statistics, completion of surgery, margin status, lymph node status and uptake of post-operative chemotherapy were determined for the cohort who proceeded to attempted resection.

**Results:** 35 of 53 enrolled patients undergoing FDG-PET proceeded to an operation. Median overall survival and disease-free survival were similar at 15.9 months. 1 and 5-year survival were 55% and 8.6% respectively. 8 patients (23%) had resection abandoned intraoperatively. Of the remaining cohort 16 patients (59%) had R0 margin status, while 7 patients (26%) had R1 and 4 patients (15%) had R2 margin status. 21 patients (75%) had positive resected lymph nodes. 26 (75%) proceeded to post-operative chemotherapy. Comparison with similar cohorts reported in the literature is displayed in table 1. Patient and tumour characteristics were similar to other large cohorts of potentially resectable pancreatic cancer.

**Conclusion:** Compulsory pre-surgical screening with FDG-PET for apparently resectable pancreatic or peri-ampullary cancer does not appear to improve survival or surgical outcome within the group who proceed to an operation.

Table 1. Survival, surgical outcome and uptake of chemotherapy in those who underwent attempted resection following FDG-PET, compared with other reported cohorts that underwent surgery without compulsory FDG-PET.

	OS	DFS	Alive at 1 year (%)	Alive at 5 years (%)	R0 (%)	R1 (%)	R2 (%)	Resection not completed (%)	LN+ positive (%)	CTx uptake (%)
Attempted resection following PET (n=35)	15.9	15.9	18 (54.6)	3 (8.57)	16 (59.2)	7 (25.9)	4 (14.8)	8 (22.9)	21 (75.0)	26 (74.3)
Wylie et al. <sup>1</sup> (n=121)	18	-	(68)	-	(77)	-	-	(36)	(64)	-
Burmeister et al. <sup>2</sup> (n=369)	-	-	-	-	-	-	-	(24)	-	(76)
Allen et al. <sup>1</sup> (n=3085)	23	-	-	(20)	(76)	(23)	(1)	-	(67.0)	-
Petrelli et al. <sup>3</sup> (n=4888)	25	13	-	-	-	-	-	-	-	-

PP03-094

### PRIMARY PANCREATIC EWING'S SARCOMA: DREADFUL YET TREATABLE ALIEN

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**Background:** Ewing's sarcoma is a highly aggressive malignant tumour most commonly affecting long bones in children and adolescents. Approximately 30% of Ewing's sarcoma are extraosseous and Pancreas is considered to be an extremely uncommon site. We report the case of a 26-year-old man with immunohistochemically confirmed primary pancreatic Ewing's sarcoma.

**Case details:** A 26-year-old man was evaluated for upper abdominal pain. CECT abdomen revealed 3.7 x 3.1cm heterogenous cystic mass lesion in pancreatic head, with a probable diagnosis of neuroendocrine tumour or Solid pseudopapillary neoplasm of pancreas. Serum tumour markers were within normal limits. DOTONAC whole body PET CT and Endoscopic ultrasound could not rule out

high grade neuroendocrine tumour. Hence, he underwent laparoscopic pancreaticoduodenectomy. He was re-explored on 2<sup>nd</sup> POD for intra-peritoneal bleed and haemostasis secured and patient was managed in ICU for 4 days and subsequently his general condition improved and discharged on 15<sup>th</sup> Postoperative day. Histopathology and Immunohistochemistry confirmed the diagnosis of Ewing's sarcoma of pancreas. Currently, the patient is receiving regular follow-up care and received 3 cycles of adjuvant chemotherapy till now and has no evidence of cancer at six months post-surgery.

**Conclusion:** Primary pancreatic Ewing sarcoma is a very rare highly aggressive malignant tumour that should be considered in differential diagnosis of an unusual pancreatic tumour especially in young adults. There are only 32 cases reported in literature. Complete surgical excision with adjuvant chemotherapy and with or without radiation therapy is the standard of care.

PP03-095

### LAPAROSCOPIC DISTAL PANCREATECTOMY OF SOLITARY METASTATIC COLON ADENOCARCINOMA TO THE PANCREAS

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**Introduction:** Laparoscopic liver resection for metastatic colorectal cancer has demonstrated good long term survival outcomes. In order to achieve this, case selection is paramount. Blood borne metastasis to the pancreas are uncommon and rarely reported. We report 2 cases of laparoscopic distal pancreatectomy for metachronous solitary metastatic colon adenocarcinoma to the pancreas.

**Method:** A retrospective analysis of consecutive patients undergoing laparoscopic distal pancreatectomy for solitary metastatic colon adenocarcinoma to the pancreas was performed. Operative characteristics, perioperative morbidity, and pathological data were described.

**Results:** 2 patients underwent laparoscopic distal pancreatectomy for this indication. One was a 58 year old women, the other was a 59 year old man. Both had minimal other comorbidities. Mean LOS was 3.5 days. 1 patient developed a pancreatic fistula, which was treated successfully with an intra-abdominal drain. Both are alive and disease free at 22 and 23 months follow-up.

**Conclusion:** We have demonstrated that laparoscopic surgery for isolated intrapancreatic metastasis is warranted and feasible in selected cases.

PP03-096

### LOCAL RECURRENCE FOLLOWING CURATIVE SURGERY FOR PERIAMPULLARY CANCERS - INCIDENCE, FACTORS ASSOCIATED AND OUTCOMES

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**Introduction:** The study was aimed to examine the incidence, factors associated and long-term outcomes following local recurrences (LR) after curative resections for periampullary cancers.

**Methods:** A retrospective analysis of a prospectively maintained database was undertaken comprising of all patients of periampullary cancers who underwent curative resections from January 2012 to January 2018, at Tata Memorial Hospital, Mumbai. The incidence, patterns of recurrences and factors associated with LR were studied.

**Results:** A total of 424 patients underwent resections for periampullary cancers. With a median follow up of 42 months, 23 patients (5.4%) developed isolated LR, 50 patients (11.8%) developed LR with distant metastases (DM) and 103 patients (24.3%) developed isolated DM. The median OS for patients with LR was 47.9 months, and 24.8 months for patients with DM (p=0.000).

On multivariate analysis of all patients with LR, tumour subsite (distal CBD), and nodal positivity (p=0.000) were independently associated with higher rates of LR, and advanced T stage (p=0.060) reached near statistical significance.

The most common site for LR was SMA nodal region (52.2%).

**Conclusions:** Incidence of LR after resection for periampullary cancers is 5.4%; however, they have significantly better OS compared to systemic recurrences. Nodal involvement and higher tumour stage, especially in distal CBD tumours are associated with increased risk of LR. Strategy to prevent LR should involve radical surgery with complete lymphadenectomy along the SMA, celiac and periportal region, especially in advanced T and N stage disease. Also, management of LRs should involve aggressive approach in the form of radiotherapy or ablation and possibly re-surgery.

PP03-097

### SUSTAINED ELEVATION OF CA19-9 AFTER RESECTION IS A STRONG PROGNOSTIC FACTOR FOR RESECTABLE PANCREATIC CANCER

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**Introduction:** Although standard therapy for resectable pancreatic ductal adenocarcinoma (R-PDAC) is discussed to perform upfront surgery, surgical outcomes still remain poor and predictors of recurrence are not to be determined. The aim of this study is to investigate the prognostic significance of pre-/post-operative CA19-9 status.

**Methods:** A total of consecutive 176 patients with R-PDAC underwent upfront pancreatectomy between April 2007 and June 2019 were analyzed retrospectively. Among the 151 patients enrolled, we divided into 3 groups by CA19-9 status, group A (without elevation of preCA19-9; n=54), group B (with normalized postCA19-9; n=60) and group C (with elevation of postCA19-9; n=37). The relationship between CA19-9 status, survival and other clinicopathological features were analyzed.

**Results:** PostCA19-9 were measured within 3 months after surgery (20-88 days, median; 43 days). Group C patients showed significantly poorer survival (group A/B/C; 3-year OS 61.9% /53.4% /12.4%; median survival time 44.2m /37.3m/ 13.6m;  $p < 0.001$ ). The early recurrence rate within 6 month ( $p < 0.001$ ) and the frequency of liver metastasis ( $p = 0.009$ ) were significantly higher in Group C. Multivariate analysis revealed that without adjuvant chemotherapy (HR=3.29;  $p < 0.001$ ), preoperative-CT tumor size  $> 20$ mm (HR=2.76;  $p < 0.001$ ) and sustained elevation of postCA19-9 (HR=2.49;  $p = 0.0017$ ) were the independent significant prognostic factors for poor survival. The ROC curve analysis revealed that the optimal cut-off value of preCA19-9 which predict postCA19-9 normalization was 116 U/ml.

**Conclusion:** Sustained elevation of postCA19-9 is a strong prognostic factor for R-PDAC. Patients with preCA19-9  $> 120$  could be considered the existence of potential distant metastasis (especially liver metastasis).

### PP03-098

#### PRE-TREATMENT NEUTROPHIL TO LYMPHOCYTE RATIO AS A PREDICTIVE MARKER FOR PATHOLOGICAL RESPONSE TO PREOPERATIVE INTENSITY-MODULATED CHEMORADIOTHERAPY IN PANCREATIC HEAD CANCER

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**Introduction:** The pre-treatment neutrophil to lymphocyte ratio (NLR) was reported to be a predictive indicator of pathological response of pancreatic cancer to neoadjuvant chemoradiotherapy (NAC-RT). The reported cut-off value of NLR is 2.2. Intensity modulated radiotherapy (IMRT) has shown to be able to improve pathological response by escalating radiological dose intensity.

The aim of this study is to clarify the association between pre-treatment NLR and the pathological response to NAC-IMRT in pancreatic cancer patients.

**Methods:** The consecutive 17 borderline resectable pancreatic cancer patients who underwent pancreaticoduodenectomy after NAC-IMRT between December 2017 and December 2019 were studied. Predictive factors, including NLR, platelet to lymphocyte ratio (PLR), and prognostic nutrition index (PNI), and CRP/albumin ratio (CAR) were measured prior to treatment. A comparison was made between those with a good response (Evans classification IIb/III) and those with a poor response (Evans I/IIa).

**Result:** The 17 patients comprised 7 males and 10 females, and the median age was 66 (range, 57-86). The mean NLR value was significantly higher in the poor response group than in the good response group (3.39 vs 1.92;  $p = 0.02$ ), whereas the other examined factors demonstrated no significant differences between the two groups. From the ROC curve, the optimal cut-off level of the pretreatment NLR for predicting pathological non-responders (Evans I/IIa) was determined to be 3.06 (AUC=0.929).

**Conclusion:** NLR was a best predictive indicator among various nutritional indexes. The cut-off level of the pre-treatment NLR between might be different between NAC-IMRT and NAC-RT because of the difference of effective radiation dose.

### PP03-099

#### PANCREATIC SOLID PSEUDOPAPILLARY NEOPLASM: NOT SO BENIGN PATHOLOGY. A LATIN AMERICAN CENTER EXPERIENCE

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**Introduction:** Pancreatic Solid Pseudopapillary Neoplas (SPN) is a unfrequent tumor, malignant by definition but considered with very good prognosis. We evaluate the metastatic burden in a Cancer Center in Colombia.

**Methods:** a retrospective cohort of adult patients treated at Instituto Nacional de Cancerologia in Bogota, Colombia, a reference center. We include patients surgically treated from January 2009 to December 2019, including demographic and clinical variables, stage, treatment and follow up. Dissemination time and organ were registered.

**Results:** in this period 17 patients were included, all were women, age median 30 years (range 19-61y), median tumor size was 8cm (Range 2-25cm). Two patients presented with synchronous liver metastasis and a third patient arrives 21 years after a distal pancreatectomy relapsing in pancreas, peritoneum and liver. Surgical resection was a Pancreaticoduodenectomy in 42% of patients, 46% distal pancreatectomy and 12% central pancreatectomy. 29% were operated by laparoscopic approach. In 2 cases resection includes other organs (liver, stomach, colon) because of metastasis. All but 1 patient were R0 resection. In the follow up a patient required 2 liver resection of metastasis and resection of peritoneal perisplenic relapse and is living without disease. Another patient required 1 resection of liver metastasis.

**Conclusion:** SPN is considered with good prognosis, however in our center 4 of 17 patient had metastasis. Even with the reference center bias, metastasis are not so unfrequent. Then, we recommend a long follow up in the patients resected for SPN.

### PP03-100

#### TOTAL PANCREATECTOMY FOR NET PANCREAS: EARLY EXPERIENCE WITH THE 'ARTERY-FIRST' APPROACH AT A TERTIARY CARE CENTRE IN INDIA

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**Introduction:** Total pancreatectomy (TP) is indicated for multi focal PNETs. The complexity of this surgery, and morbidity related to brittle diabetes and exocrine insufficiency have prevented TP from gaining popularity in India. This report highlights the use of the 'artery first' approach to TP and subsequent outcomes in patients with multifocal PNETs at a tertiary care centre in India.

**Methods:** A retrospective analysis of all records was done for the patients who underwent TP and they were followed up to assess the present status.

**Results:** TP was performed in 3 patients (2 males; 22, 42, 46 years) with MEN 1 who presented with hypercalcemia and episodes of hypoglycemia for a duration between 8 - 192 months. Following multidisciplinary assessment, parathyroidectomy and thymectomy was done to achieve normocalcemia before undertaking TP. Intraoperative ultrasound was used to confirm multifocality (2-6 tumors). Pancreatic resection was approached by identifying the SMA as the first step and the pancreata were removed en bloc with the spleens. The mean duration of surgery was 430 minutes with blood loss ranging between 750 - 1800 ml. A prolonged postoperative stay (23, 35 and 40 days) was required to establish glycemic control. All 3 patients are asymptomatic on follow up (at 2, 4 and 21 months). They are on pancreatic enzyme supplements, and are euglycemic with an insulin requirement of 15, 33 and 49 units respectively.

**Conclusions:** The 'artery first' approach is a safe and effective technique to achieve en bloc total pancreatectomy in patients with multifocal NETs.

PP03-101

**PRIMARY SIGNET RING CELL CARCINOMA OF THE PANCREAS IN THE ELDERLY WITH INDISTINCT IMAGING CHARACTERISTICS: A CASE REPORT**

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Signet ring cell carcinoma occur in < 1% of pancreatic cancers with few reported cases worldwide. Commonly, it arises in the stomach (96%). Early diagnosis is vital due to its poor prognosis. Further studies are needed to understand this type of malignancy.

A 69/F, with 4 wks epigastric discomfort w/ jaundice & weight loss, came for 2nd opinion. No cause of obstruction on previous Ct scan. On MRCP, biliary tree dilatation & a vague mass at pancreatic head was seen. Normal tumor markers, no evidence of metastasis. Underwent Whipples procedure. Histopathology: SIGNET RING CELL ADENOCARCINOMA, R0 resection. Chemotherapy was planned, but patient opted alternative treatment. 5 months later, recurrence documented by CT scan.

Etiology of SRCC is still unknown, most researchers consider a genetic mutation in the pancreatic parenchyma secondary inflammation. EUS-FNA only provides cytologic sample with inadequate cellularity that is needed for

proper identification. Reliability of tumor markers such as Ca 19-9 and CEA can still be in question since clinicopathologic behavior of SRCC especially in pancreas.

High index of suspicion should prompt the search of cause for biliary obstructive diseases especially in the elderly where malignancy is common. Risk factors should always be considered in profiling a patient. Utilization of a high yield imaging is vital in decision making process whether to proceed with surgical treatment that has a high morbidity percentage. Further studies are needed to understand the clinicopathologic character of this rare subtype.

PP03-105

**ZIP CODES ARE ASSOCIATED WITH DISEASE RECURRENCE IN PATIENTS DIAGNOSED WITH PANCREATIC CANCER**

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**Introduction:** The purpose of this study was to determine if patient's zip codes are associated with disease recurrence in patients diagnosed with pancreatic cancer. Our hypothesis was that low socio economic status (SES) is associated with worse outcome.

**Methods:** We interrogated a convenience sample from our cancer center registry and obtained 479 subjects diagnosed with pancreatic cancer between 2010-2018. We selected subjects (328) by zip code, representing the plurality of the cases in our catchment area. Outcome variables were overall survival and socio-economic status; predictor variables were recurrence, insurance, type of treatment, gender, cancer stage, age, and gender. We converted zip code to municipality and culled data using Adjusted Gross Income (AGI, FY 2017) We then created groups using a cutoff at filings of >\$100,000 of AGI; Low SES = municipalities where ≤5% of the filings were over \$100,000, Mid SES = municipalities where between 5%-40% of the filings were over \$100,000, High SES = municipalities where ≥40% of returns were over \$100,000. Comparative statistical analysis was performed using Chi-square for nominal and ordinal variables, a two-way ANOVA test was used for continuous variables, p- value was set at 0.05.

**Results:** Recurrence was associated with gender and overall survival (Table 1, in months). However, the association between SES and recurrence was not strong.

**Conclusion:** Access to care, tumor's grading and staging, all play a major role in determining the length of the disease free survival. Our study shows that the poor are at disadvantage when diagnosed with pancreatic cancer.

Socio economic status	Recurrence – NO*	Recurrence – Yes*	Total
High	2	28	30
Mid	11	84	95
Low	15	188	328

\*p = 0.45

PP03-106

### THE IMPORTANCE OF SARCOPIENIA AS A PREDICTOR OF POSTOPERATIVE COMPLICATIONS AND IT IMPACT ON SURGICAL OUTCOMES AFTER PANCREATODUODENECTOMY IN PATIENTS WITH PANCREATIC ADENOCARCINOMA

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**Introduction:** To evaluate the impact of sarcopenia on postoperative complications, pancreatic fistula, mortality and survival after pancreatic resection in patients with pancreatic adenocarcinoma.

**Methods:** Retrospective study of treatment of 127 patients with pancreatic adenocarcinoma, who underwent pancreaticoduodenectomy in the period from 2016 till 2018, was performed. Sarcopenia was quantified using Total Psoas Index (TPI) after preoperative computed tomography (CT). The measurements were conducted at the level of the third lumbar vertebral body (L3).

**Results:** Sarcopenia was diagnosed in 55 (43.3%) patients. Postoperative complications occurred in 30 (54.5%) patients, in patients without sarcopenia postoperative complications occurred in 18 (25%) patients ( $c^2=11.5$ ,  $p=0.0007$ ). Mortality was 3 (5.4%) and 2 (2.8%) respectively ( $c^2=0.6$ ,  $p=0.44$ ).

In patients with sarcopenia infections complications occurred in 6 patients, pancreatic fistula Grade B or C in 16 patients, haemorrhage - in 8. In patients without sarcopenia infections complications occurred in 8 patients, pancreatic fistula Grade B or C in 4 patients, haemorrhage - in 6. We didn't find any significant difference in the number of infections complications ( $c^2 = 3.2$ ,  $p=0.07$ ) and haemorrhage ( $c^2 = 0.2$ ,  $p=0.6$ ), but the level of pancreatic fistula Grade B or C was significant higher ( $c^2 = 4.5$ ,  $p=0.03$ ) in patients with sarcopenia. The overall survival in patients with sarcopenia was significantly lower than those without sarcopenia (23 and 35 month respectively,  $c^2 = 4.1$ ,  $p=0.04$ ).

**Conclusions:** Using of TPI may enhance prediction of postoperative complications, pancreatic fistula and surgical outcome and may help surgeons guide preoperative and intraoperative clinical tactics.

PP03-107

### METAANALYSIS OF RECURRENCE AND SURVIVAL AFTER RESECTION FOR PANCREATIC NEUROENDOCRINE TUMOURS (PNETS)

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**Introduction:** There is paucity of data regarding recurrence patterns after resection of PNETs. This systematic review aimed to appraise the literature regarding the recurrence

rates and survival outcomes for various grades of resected PNETs.

**Method:** A systematic search was performed in PUBMED, MEDLINE, and EMBASE databases using the PRISMA frame work. The data analysis included weighted disease free survival (DFS); overall survival (OS) and weighted median recurrence rates for various grades of PNETs.

**Results:** Following the literature search, 18 studies with a total of 3588 patients met the inclusion criteria. The number of patients with Grade 1, 2, 3 PNETs respectively was 57, 97 and 27. The DFS and OS at 10 years for the entire cohort was 88.6% (CI 76.6-94.9) and 65.7% (CI 52.7-76.6) respectively. The mean time to recurrence was 41 months and overall recurrence rate was 18 %. 14 studies reported site of recurrence with liver being the most common site with recurrence rate of 11%. The weighted mean estimate for loco-regional recurrence was 2.7%. 9/17 studies reported grade specific recurrence. The overall recurrence rate for G1, G2 and G3 tumours was 6 %, 33 % and 85% respectively.

**Conclusion:** Liver recurrence is more frequent than loco regional recurrence after surgery for PNETs. In spite of good survival outcomes, the risk of recurrence persists even after 10 years warranting ongoing surveillance.

PP03-108

### RETROSPECTIVE INVESTIGATION OF OPTIMAL DURATION OF NEOADJUVANT TREATMENT IN LOCALLY ADVANCED PANCREATIC CANCER PRIOR TO RESECTION

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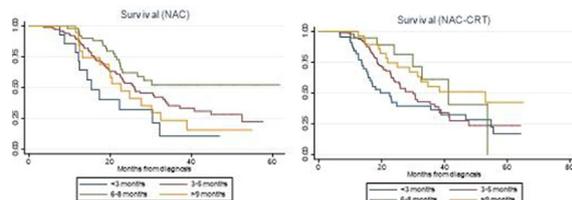
**Introduction:** Patients with locally advanced pancreatic cancer (LAPC) often undergo neoadjuvant treatment with the goal of eventual resection. Though recent advances in chemotherapeutic regimens have demonstrated improved efficacy, optimal duration of neoadjuvant therapy is undefined. The aim of this study was to determine whether duration of neoadjuvant therapy prior to definitive resection influenced survival.

**Method:** The National Cancer Database (2011-2014) was queried for Stage III pancreatic ductal cancer with definitive surgery after neoadjuvant chemotherapy (NAC) or neoadjuvant chemotherapy followed by radiation therapy (NAC-CRT). Duration of chemotherapy was defined as time of chemotherapy initiation to time of resection or initiation of radiation, and characterized as < 3, 3-5, 6-8 or  $\geq 9$  months. Survival analyses were conducted with Kaplan-Meier curves and multivariate Cox proportional hazards models.

**Results:** 383 patients met inclusion criteria; median overall survival (OS) of the entire cohort was 29.9 months. 189 patients received NAC with median OS of 26.1 months; 194 received NAC-CRT with median OS of 30.8 months ( $p=0.21$ ). Compared to NAC duration of < 3 months, duration of 3-5 months (Hazard Ratio [HR] 0.31,  $p<0.05$ ) and 6-8 months (HR 0.19,  $p<0.05$ ) were associated with decreased risk of death, while NAC-CRT duration of 6-8

months (HR 0.26,  $p < 0.05$ ) and  $\geq 9$  months (HR 0.28,  $p < 0.05$ ) were associated with decreased risk of death.

**Conclusions:** Our results suggest that in patients with LAPC who proceed to resection, duration of chemotherapy between 6-8 months prior to resection or radiation conferred the most survival benefit.



**Figure 1.** Kaplan-Meier curves for NAC or NAC-CRT by duration of neoadjuvant chemotherapy

PP03-109

### PYLORUS PRESERVING VERSUS CLASSIC PANCREATODUODENECTOMY: A SINGLE CENTER RETROSPECTIVE REVIEW OF TOTAL LYMPH NODE YIELD

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**Objective:** Pylorus preserving pancreaticoduodenectomy (PPPD) has been promoted for its ability to preserve the entire gastric reservoir and pyloric sphincter, however, some surgeons favor classic pancreaticoduodenectomy (PD) with distal gastrectomy as it encompasses pyloric and peri-gastric lymphadenectomy. We evaluated patients undergoing PD for pancreatic cancer and total lymph node yield (LNY) to determine if this reflects any difference in lymphadenectomy yield.

**Methods:** This is a retrospective review of 216 patients undergoing PD for pancreatic ductal adenocarcinoma (PDAC) between 2009 to 2015 at a high volume institution. LNY and pathology specimen outcomes associated with poor prognosis were evaluated by univariable and multivariable analysis between patients undergoing classic PD versus PPPD.

**Results:** There were 18 patients who underwent PPPD with mean LNY 18.3 (SD 6.70). This was found to be significantly lower than for classic PD (mean 25.7; SD 13.6) ( $p < 0.001$ ). Mean survival was 18.9 months with no difference in overall survival between patients who underwent PPPD or classic PD ( $p = 0.120$ ). Adequate LNY which is defined by AJCC as  $\geq 12$  total lymph nodes and is associated with higher survival was achieved in 88.9% (16/18) of patients undergoing PPPD in comparison to 90.4% (179/198) of patients undergoing classic PD.

**Conclusions:** Preservation of the pylorus in pancreaticoduodenectomy specimens does result in significantly lower LNY, however, this has no impact on other pathological outcomes (lymph node involvement, margin status) or overall survival. This suggests that PPPD is valid for adequate lymph node sampling in PD specimens and does not affect overall survival.

PP03-110

### A COMPARISON OF LYMPH NODE RATIO WITH AJCC LYMPH NODE STATUS FOR SURVIVAL AFTER RESECTION FOR PANCREATIC ADENOCARCINOMA

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**Background:** Pancreaticoduodenectomy (PD) is a complex surgical procedure used to resect pancreas adenocarcinoma (PDAC). Metastatic lymph node involvement is a strong predictor of survival after resection for PDAC. Lymph node ratio (LNR) has been suggested as a marker of poor outcome. We compared LNR with the current stratification of lymph node (LN) status by AJCC criteria (7<sup>th</sup> edition and 8<sup>th</sup> edition) for predicting prognosis.

**Methods:** We identified 216 patients from a retrospective surgical database who underwent pancreatic resection for PDAC from January 2009 to December 2015. The predictive value of LNR for 2-year survival using a Cox proportional hazards model was calculated. Clinicopathological risk factors for survival were evaluated by univariable and multivariable analyses. Receiver operating characteristic (ROC) curve and area under the curve (AUC) were used to determine accuracy of the test to estimate survival according to LNR greater than 25% and nodal status as defined by the AJCC 7<sup>th</sup> and 8<sup>th</sup> editions.

**Results:** Mean LNR was 0.183 (range 0-0.883) with mean overall survival of 568 days (range 10 - 2262). Comparative analysis using receiver operating characteristic (ROC) curves established that patients with 4 or more positive LN had the highest accuracy for overall survival (AUC 0.6015). LNR  $> 25\%$  and any LN positive had similar accuracy (AUC 0.556 and 0.553 respectively).

**Conclusions:** The presence of 4 or more positive LN has the highest accuracy in predicting overall survival in node positive patients with resected PDAC. The recent changes in nodal staging in AJCC 8<sup>th</sup> edition have improved prognostication.

PP03-111

### CHARACTERISTICS OF PATIENTS WITH PANCREATIC ACINAR CELL CARCINOMA IN COMPARISON WITH PANCREATIC DUCTAL ADENOCARCINOMA

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**Introduction:** Acinar cell carcinoma is a rare subtype of pancreatic cancer, accounting for 1% to 2% of exocrine adenocarcinomas of the pancreas.

**Methods:** The NCDB was analyzed from 2004 to 2016.

**Results:** Between 2004 and 2016, 1,060 patients were diagnosed with acinar cell carcinoma (ACC) while 330,578 were diagnosed with pancreatic ductal adenocarcinoma (PDAC). ACC patients were younger than PDAC patients

(66; 56-75 vs. 70; 61-78 yo,  $p < 0.001$ ) and predominantly males (70% vs 50%,  $p < 0.001$ ). ACC were less common in the head (41% and 52%,  $p < 0.001$ ), and more common in the tail (23% and 12%,  $p < 0.001$ ) with similar rates in the body (10% and 12%,  $p = 0.055$ ). ACC presented more frequently with stage I disease than PDAC (17 vs 11%), with stage II comprising 20% and 17%, stage III 7% and 11%, and stage IV 39% and 43% ( $p < 0.001$ ). A total of 41% of the ACC patients had surgery, in comparison with 19% in the PDAC group ( $p < 0.001$ ). Mortality within 30 days of the primary site surgery was 2.79% and 3.46% ( $p = 0.41$ ) and within 90 days 5.58% and 7.36% ( $p = 0.16$ ). Long term survival differs significantly with 5 years survival rates of 22.4% vs 5.25% ( $p < 0.001$ ).

**Conclusion:** Patients with ACC were typically younger, more commonly male, presented at an earlier stage, and were more often submitted to surgical treatment.

#### PP03-112

### AN INNOCENT BYSTANDER OR A HARBINGER OF DOOM? - IMPACT OF DIABETES MELLITUS ON PERIOPERATIVE OUTCOMES AND SURVIVAL IN PANCREATIC AND PERIAMPULLARY ADENOCARCINOMA

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**Background:** Though diabetes mellitus (DM) is a known risk factor for pancreatic adenocarcinoma, its impact on long-term survival after surgical resection is controversial.

**Methods:** This is a retrospective analysis of prospectively maintained database of 141 patients with periampullary and pancreatic head adenocarcinoma. Clinical records, histopathological reports and survival data were retrieved. Patients were compared taking Diabetes mellitus as grouping variable.

**Results:** Location of tumor was in pancreatic head in 25.0%, ampulla in 33.3%, lower-third bile duct in 24.3%, and duodenum in 17.4%. DM was present in 31 (21.9%) patients with 16 (11.3%) being new onset DM. There was no significant difference in morbidity between diabetics and non diabetics. there was no difference in tumor size, differentiation, lymphovascular invasion, perineural invasion, lymph node positivity, R0 resection rate and TNM stage among patients with and without DM. ON univariate analysis patients with DM and New onset DM (NODM) had worse survival compared to non-diabetic patients at 3 years and 5 years (OS: HR, 3.32 (1.46 - 7.53)  $p = 0.004$ , DFS: HR, 2.87 (1.29 - 6.41)  $p = 0.009$ ).

**Conclusions:** Preoperative diabetes mellitus (new-onset or long-standing) has a negative impact on 3-year and 5-year overall survival and disease-free survival among surgically resected patients of pancreatic and periampullary adenocarcinoma. This difference is not attributable to worse tumor stage, as tumor characteristics and adequacy of resection were similar to those of non-diabetics. Further investigation of this phenomenon is warranted.

#### PP03-113

### SURGICAL MANAGEMENT AND OUTCOMES FOR ACINAR CELL CARCINOMA OF THE PANCREAS

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**Introduction:** Pancreatic acinar cell carcinomas (pACC) are rare, solid, exocrine neoplasms. Surgical resection with clear margins offers improved long-term outcomes compared with pancreatic ductal adenocarcinoma (pDAC). Diagnosis of pACC is difficult due to similar imaging characteristics to other solid pancreatic lesions.

**Methods:** A surgical and pathological review of a prospectively maintained pathology database across the Royal Brisbane, St. Vincent Northside and Wesley Hospital from 2008 to 2019 was carried out for patients who underwent operative management of pACC.

**Results:** Twelve patients underwent surgical resection for pACC. Six patients underwent a Whipple's procedure (1 requiring portal vein resection) and six had distal pancreatectomy with splenectomy (1 requiring gastrectomy, 1 with partial left nephrectomy). Mean tumour size was 44mm (22-190mm). 83.3% of patients had R0 resections, and 25% had lymph node involvement. Seven patients were disease free at last follow up. The two patients who had R1 resections had 7/15 and 7/23 lymph nodes involved with survival of 0.65 and 2.56 years respectively. Of the overall cohort, mean follow-up was 4.27 years (0.82 - 18.2). Mean overall survival was 5.32 years (1.1 - 18.2 years) with a mean disease-free survival of 3.65 years (0.37 - 12.72).

**Conclusion:** This series adds to the limited literature regarding aggressive surgical resection of pACC. Overall survival is significantly better than that seen with pDAC, despite the need for multi-organ resection to obtain clear margins. Clinicians should consider the role for aggressive surgery.

#### PP03-117

### PANCREATIC GROOVE CANCER

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**Background:** Pancreatic groove cancer is very rare and could be masqueraded as groove pancreatitis. This study is to clarify the characteristics, clinical features, managements and survival outcomes of this rare tumor.

**Methods:** Brief descriptions were made for each case of pancreatic groove cancer encountered at our institute. Individualized data of pancreatic groove cancer cases described in the literature were extracted and added to our database to expand the study sample size for a more complete analysis.

**Results:** A total of 33 patients with pancreatic groove cancer were included for analysis, including 4 cases from our institute. The median tumor size was 2.7 cm. The most common symptom was nausea or vomiting (89%), followed by jaundice (67%). Duodenal stenosis was noted by endoscopy in 96% of patients. The histopathological examination revealed well differentiated tumor in 43%.

Perineural invasion was noted in 90%, and lymphovascular invasion and lymph node involvement in 83%. Overall 1-year survival rate was 93.3%, and 3-year or 5-year survival rate was 62.2%, with a median survival of 11.0 months. Survival outcome for the well-differentiated tumor was better than that for moderate/poorly differentiated ones.

**Conclusions:** Early involvement of duodenum with vomiting is often the initial presentation, and obstructive jaundice is not always inevitable until the disease progresses. The possibility of pancreatic groove cancer should be carefully excluded before making the diagnosis of groove pancreatitis for any questionable case.

### PP03-118

#### HEPATOID CARCINOMA OF THE PANCREAS

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**Background:** Hepatoid carcinoma of the pancreas is extremely rare. This article tries to summarize the clinical features and outcomes of pancreatic hepatoid carcinoma.

**Methods:** Data pool for analysis includes the case we encountered with hepatoid carcinoma of the pancreas and reported cases in the literature.

**Results:** Twenty-three cases of hepatoid carcinoma of the pancreas were recruited. The most common symptom was epigastric pain (36.4%). When the tumor locates at pancreatic head, nausea/vomiting (62.5%) is more common, followed by jaundice and epigastric pain (50.0%). For those at pancreatic body-tail, 42.9% of the patients presented no symptom. *Alpha-fetoprotein (AFP)* was abnormally elevated in 60% cases. Hepatoid carcinoma in the pancreas could be either pure form or mixed form with other malignancy (40.9%). Metastasis occurred in 36.4% cases at the diagnosis of this tumor, including liver metastasis in 31.8% and lymph node metastasis in 21.1%. The overall 1-year survival rate was 71.1% and 5-year 40.4%. Irresectability, hepatic and lymph node metastasis are associated with poor survival outcome.

**Conclusions:** Elevation of serum AFP may be a clue leading to the diagnosis of pancreatic hepatoid carcinoma. This tumor could be mixed form with other malignancy. Surgical resection should be the treatment of choice whenever possible.

### PP03-119

#### PROGNOSIS AFTER SURGICAL RESECTION IN PATIENTS WITH SMALL NF-PNET: INTERNATIONAL RETROSPECTIVE STUDY

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**Background:** Incidence of non-functioning pancreatic neuroendocrine tumor has increased recently. Treatment of pancreatic neuroendocrine tumor is surgical removal. However, indications of surgery are still debating. The

purpose of this study was to investigate prognostic factors of non-functioning pancreatic neuroendocrine tumor.

**Methods:** We retrospectively analyzed prognostic factors of patients who underwent surgical resection for non-functioning pancreatic neuroendocrine tumor between November 2000 and December 2017 in Korea and China. Three hundred thirty-one Korean patients and 157 Chinese patients were analyzed separately and integrally.

**Results:** Age more than 65 years (HR: 2.871, 95% CI: 0.999-8.251, p=0.05), Ki-67 index more than 3% (HR: 21.64, 95% CI: 5.863-79.871, p< 0.0001), and vascular invasion (HR: 5.571, 95% CI: 1.91-16.247, p=0.002) were negatively affecting overall survival in Korean and Chinese patients.

**Conclusion:** Age, Ki-67 index, and vascular invasion were significant risk factors for non-functioning pancreatic neuroendocrine tumor.

### PP03-120

#### CURRENT SITUATION IN POSTOPERATIVE ADJUVANT CHEMOTHERAPY AND PERIOPERATIVE NUTRITIONAL MANAGEMENT FOR THE TREATMENT OF PANCREATIC CANCER

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**Introduction:** We have standardized the operative procedures and perioperative managements for pancreaticoduodenectomy (PD) and performed "Step-by-step" renovations to improve surgery-associated outcomes. In case of invasive pancreatic ductal carcinoma (IPDC), post-operative adjuvant chemotherapy with S-1 has been applied together with strengthened nutritional management. In this study, we examine the efficacy of our treatment and compare it with the results of JASPAC 01 trial (the induction within 70days after operation, completion rate:72%, no dose-reduction rate:59%).

**Methods:** Forty-eight patients underwent PD from November 2015 to November 2018. Nineteen patients with IPDC, excluding IPMN and stage0 were selected.

**Results:** The patients who had been treated with S-1 within 70days after operation were 16 patients(84%) and median postoperative day was 42(22-89). The regimen was "2 weeks on/1 week off" in 17 and "4 weeks on/2 week off" in 2 patients. The completion rate was 79%, and no dose-reduction rate was 80%. Four patients were incomplete due to liver metastasis, patients' desire, undernutrition and adverse event. Elemental diet was used in all cases, and 84% were concurrently used with S-1. Adverse events ( $\geq$  grade2) were leucopenia in 6, appetite loss in 4, oral inflammation in 1, liver dysfunction in 1, eye symptom in 1. There was no patient with Grade 4. The 1-year overall survival was 94%, and it in patients who completed S-1 was 100%.

**Conclusion:** Perioperative nutritional management appears to contribute to early induction and increase of completion rate of adjuvant chemotherapy. Combining nutritional management with adjuvant chemotherapy may enable to improve the treatment outcome in pancreatic cancer.

PP03-121

### INVESTIGATION OF NEOADJUVANT THERAPY FOR BORDERLINE RESECTABLE PANCREATIC CANCER

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**Aim:** Although there are a few reports on the efficacy of neoadjuvant therapy (NAT) as a treatment for borderline resectable pancreatic carcinoma (BRPC), the topic remains controversial. Therefore, we conducted a retrospective study to analyze the long-term outcome.

**Method:** Fifty-one patients who underwent neoadjuvant chemotherapy (NAC) or neoadjuvant chemoradiotherapy (NACRT) for BRPC at our hospital, between April 2003 and September 2019 were recruited in this study.

**Result:** Altogether, 51 patients were diagnosed with BRPC based on the General Rules for the Study of Pancreatic Cancer (7th edition), of which, 15 had NAC, and 36 underwent NACRT. In total, 33 patients underwent resection of the pancreas (10 from NAC group (66.7%) and 23 from NACRT group (63.9%)), and 32 had radical surgery (9 from NAC group (60.0%) and 23 from NACRT group (63.9%)). R0 resection rate was 50% (16/32), and there was no significant difference between the NAC and NACRT groups (44.4% vs. 52.2%,  $P = 0.16$ ). OS (21.0 months vs. 36.1 months,  $P = 0.974$ ) and RFS (20.0 months vs. 24.0 months,  $P = 0.266$ ) showed no significant differences between the NAC and NACRT groups. As revealed by the pathological findings, the percentage of patients with positive dissected peripancreatic tissue margin was significantly lower for the NACRT group than that of the NAC group (66.7% vs. 26.1%,  $P = 0.033$ ).

**Conclusion:** Although no significant difference was observed regarding long-term prognosis between the NAC and the NACRT groups, the results indicate the effectiveness of radiotherapy in local tumor control of BRPC.

PP03-122

### INITIAL EXPERIENCE OF LAP ASSISTED WHIPPLE'S PROCEDURE FROM A TERTIARY CARE INSTITUTE

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**Introduction:** Pancreatico-duodenectomy is one of the most complex and challenging abdominal surgical procedures performed till date. Since Gagner performed first laparoscopic Whipple's procedure in 1994, only few series have been published for the same mostly because of challenging resection as well as complex reconstruction

involved in the procedure. We hereby present our initial experience with laparoscopic assisted Whipple's procedure in peri-ampullary tumours.

**Materials:** This was a retrospective analysis of prospectively collected database of all laparoscopic assisted pancreatico-duodenectomy done in a single surgical unit at a tertiary care centre from January 2017 - October 2019. All the procedures were performed for malignancy.

**Result:** Eight patients were operated for periampullary tumour. All were male except one, and the mean age was 53.1 years. Mean operating time was  $298 \pm 37$  minutes. Mean hospital stay was  $6.1 \pm 2.7$  days. SSI and delayed gastric emptying was noted in 2 patients each. One patient had grade A pancreatic fistula. There was no mortality. All patients had R0 resection.

**Conclusion:** Laparoscopic assisted pancreatico-duodenectomy is a safe and feasible treatment option for periampullary carcinoma with out any increase in mortality and morbidity with equivalent oncological outcome

PP03-123

### SOLID PSEUDO PAPILLARY TUMOR OF PANCREAS: DIAGNOSIS AND MANAGEMENT APPROACHES OF 39 PATIENTS

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**Introduction:** Solid Pseudopapillary tumour of pancreas (Frantz tumour), a rare tumour. Affecting mostly young females, benign with low malignant potential. Represent 1-2% of pancreatic neoplasms.

**Methods:** A retrospective study of treatment results in 39 patients with Solid pseudopapillary neoplasms (SPN) was performed in the institute from Nov 2009 to Dec 2019. The mainstay of assessment was clinical, its mode of onset & physical findings. Abdominal ultrasound, contrast-enhanced computed tomography (CECT) and Magnetic Resonance Imaging (MRI). Asymptomatic, septated or multilocular cysts with a solid component, thick walls, mucoid material or hemorrhagic cyst fluid are predictors of malignancy. An elevated tumour marker (CA 19-9), a contributory factor for malignancy.

**Result:** Patients were female 37 & male 2, between 3<sup>rd</sup> to 4<sup>th</sup> decade (average 35 yr.). 15 (38.46%) were pancreatic head tumour, 10 (25.64%) body tumour and 14 (35.9%) in the tail of the pancreas. Distal Pancreatectomy with splenectomy done in 12 (30.77%), Spleen preserving distal Pancreatectomy 7 (17.95%), Whipple's procedure 14 (35.9%) and middle pancreatectomy in 6 (15.38%). Post-operative pancreatic leakage noted in 4 (10.25%), Pseudocyst in 2 (5.12%) & pancreatic fistula in 1 (2.56%). Followed-up 8 to 106 months, recurrence after 6 yr. in 1 (2.56%), without any postoperative deaths.

**Conclusion:** SPN is a relatively indolent tumour. initial diagnosis is suggested by radiologic imaging, which should be considered in the context of clinical and histopathologic characteristics. SPN is often misdiagnosed as Pseudocysts of Pancreas and leads to therapeutic indecisiveness. We advocate for complete surgical resection once it is diagnosed.

PP03-124

**PEDIATRIC PANCREATIC CANCER IN THE UNITED STATES: A 45 YEAR EXPERIENCE**

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**Introduction:** Primary pancreatic cancer is rare in children, with an incidence rate of 0.018 cases per 100,000. There are no large patient series of pancreatic cancer in the pediatric population.

**Method:** Clinical data on 103 pediatric pancreatic cancer patients (age≤19) from the Surveillance Epidemiology and End Result (SEER) database (1973 - 2017) was analyzed.

**Results:** 103 cases were identified. There were 8 ductal adenocarcinomas (7.8%), 5 acinar cell carcinomas (4.8%), 18 pancreatoblastomas (17.5%), 32 solid-cystic tumors (31.1%), 31 endocrine tumors (30.1%), 3 sarcomas (2.9%), and 6 undetermined (5.8%). 50.5% patients were Caucasian and 61.2% female with mean age 13. Most cancers were well differentiated (46.7%), size >4 cm (75.4%) and in the head of the pancreas (41.7%). 44.4% cancers had metastasis, except for solid-cystic tumors (52.2% localized disease). Longest survival seen among endocrine tumors (18.9 years) and shortest in acinar cell carcinoma (5.1 years). Highest mortality was seen in ductal cell carcinoma (75.0%) and lowest amongst solid-cystic (6.3%). Surgical resection with chemotherapy conferred the longest survival (33.7 years), compared to no treatment (8.8 years), or combination surgery and radiation (5.1 years), p< 0.005. Multivariate analysis identified a survival advantage for females (OR 0.18) and resection (OR 0.06), p< 0.001.

**Conclusions:** Pediatric pancreatic cancer is rare, and presents more often in female Caucasian children age >10 as well-differentiated tumors >4 cm in size at the head of the pancreas. Surgery is the most common and effective treatment. Enrollment into clinical trial registries will allow for more defined multimodality management.

Variables	Overall	Ductal	Acinar	Pancreato-blastoma	Solid-Cystic	Endocrine	Sarcoma	Unknown	p-value
N (%)	103	8 (7.8%)	5 (4.8%)	18 (17.5%)	32 (31.1%)	31 (30.1%)	3 (2.9%)	6 (5.8%)	-
Mean Age (Mean ± SD)	13 ± 5	13 ± 5	10 ± 3	7 ± 3	15 ± 4	16 ± 3	12 ± 3	14 ± 6	<0.001
Mean Overall Survival (years)	1.869	3.255	1.578	2.478	1.072	18.937 ± 5.513	2.976	4.653	<0.005
Age, N (%)									
0-4 years	10 (9.7%)	0 (0.0%)	1 (20.0%)	7 (38.9%)	1 (3.1%)	0 (0.0%)	0 (0.0%)	1 (16.7%)	0.03
5-9 years	14 (13.6%)	2 (25.0%)	1 (20.0%)	6 (33.3%)	3 (9.4%)	2 (6.5%)	0 (0.0%)	0 (0.0%)	0.04
10-14 years	23 (22.3%)	1 (12.5%)	2 (40.0%)	3 (16.7%)	9 (28.1%)	5 (16.3%)	2 (6.6%)	1 (16.7%)	0.01
15-19 years	56 (54.4%)	5 (62.5%)	1 (20.0%)	2 (11.1%)	19 (59.4%)	24 (77.4%)	1 (33.3%)	4 (66.7%)	<0.005
Gender, N (%)									
Male	40 (38.8%)	5 (62.5%)	3 (60.0%)	9 (50.0%)	5 (15.6%)	16 (51.6%)	1 (33.3%)	1 (16.7%)	0.01
Female	63 (61.2%)	3 (37.5%)	2 (40.0%)	9 (50.0%)	27 (84.4%)	15 (48.4%)	2 (66.7%)	5 (83.3%)	0.01
Race, N (%)									
Caucasian	52 (50.5%)	4 (50.0%)	5 (100.0%)	7 (38.9%)	14 (43.8%)	17 (54.8%)	2 (66.7%)	3 (50.0%)	<0.001
African American	12 (11.7%)	0 (0.0%)	0 (0.0%)	2 (11.1%)	3 (9.4%)	6 (19.4%)	1 (33.3%)	0 (0.0%)	<0.001
Hispanic	25 (24.3%)	1 (12.5%)	0 (0.0%)	6 (33.3%)	10 (31.3%)	6 (19.4%)	0 (0.0%)	2 (33.3%)	<0.001
Asian/Pacific Islander	14 (13.6%)	3 (37.5%)	0 (0.0%)	3 (16.7%)	5 (15.6%)	2 (6.5%)	0 (0.0%)	1 (16.7%)	<0.001
Treatment, N (%)									
No treatment	37 (37.0%)	4 (50.0%)	1 (20.0%)	6 (33.3%)	9 (28.1%)	16 (51.6%)	1 (33.3%)	0 (0.0%)	<0.005
Radiation only	6 (6.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (6.3%)	1 (3.4%)	2 (66.7%)	1 (16.7%)	<0.001
Surgery only	52 (52.0%)	2 (25.0%)	4 (80.0%)	10 (58.8%)	20 (62.5%)	11 (37.9%)	0 (0.0%)	5 (83.3%)	<0.005
Surgery and radiation	5 (5.0%)	2 (25.0%)	0 (0.0%)	1 (5.9%)	1 (3.1%)	1 (3.4%)	0 (0.0%)	0 (0.0%)	<0.001
Treatment-specific Survival (Years ± SD)*									
No treatment						8.831 ± 1.338			<0.005
Radiation only						2.278 ± 3.945			<0.001
Surgery only						33.729 ± 1.768			<0.005
Surgery and radiation						3.050 ± 1.820			<0.001
Cancer Specific Mortality, N (%)									
Alive	73 (70.9%)	2 (25.0%)	3 (60.0%)	14 (77.8%)	30 (93.8%)	17 (54.8%)	2 (66.7%)	5 (83.3%)	<0.001
Cancer Death	26 (25.2%)	6 (75.0%)	2 (40.0%)	4 (22.2%)	2 (6.3%)	11 (35.2%)	1 (33.3%)	1 (16.7%)	<0.001
Non-cancer Death	4 (3.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (9.7%)	0 (0.0%)	1 (16.7%)	<0.001

Demographic and Clinical Data on 103 Pediatric Pancreatic Cancer Patients (1973-2017).

PP03-125

**A PREOPERATIVE PROGNOSTIC SCORE BASED ON A NOMOGRAM TO PREDICT SURVIVAL IN PATIENTS WITH LOCALLY ADVANCED PANCREATIC DUCTAL ADENOCARCINOMA UNDERGOING PANCREATECTOMY WITH ARTERIAL RESECTION**

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**Introduction.** Our aim was to define a pre-operative score able to predict survival in patients with locally advanced pancreatic ductal adenocarcinoma (LA-PDAC) in order to improve the selection process for pancreatectomy with arterial resection (P-Ar).

**Methods.** A retrospective study was conducted on P-Ar performed for LA-PDAC between 2000 and 2017. Cancer specific survival (CSS) was calculated using Kaplan-Meier curves. Univariate and multivariate proportional hazards model were used to identify the preoperative prognostic factors. A nomogram was developed and a score reflecting the individual probability of survival was calculated for each patient in order to classify them into different categories of risk. Performance was assessed by Harrell's C-index.

**Results.** In a cohort of sixty patients the CSS was 20.9 (14-39) months. The prognostic model was composed by male gender (OR=1.81, p< 0.01), insulin-dependent diabetes (OR=0.49, p< 0.01), Ca15.3 (OR=1.04, p< 0.01), Ca125 (OR=1.02, p< 0.01) and tumor size (OR=1.02, p< 0.01). The median value of the prognostic score was 54 (43.5-68.5). Twenty-five percent of the patients were at high-risk, 50% at intermediate-risk, and 25% at low-risk. Corresponding median CSS was 12.7 (10.4-21.9), 24.3 (15.7-33.4), and 44.9 (18.5-NA) months (p=0.0062). Harrell's C-Index was 0.75. The probability of cancer recurrence at 3 years in the three risk groups was 100%, 84.2%, and 50.5%, respectively.

**Conclusions.** Based on this model the risk of recurrence following P-Ar for LA-PDAC can be predicted. The score could be used to select patients for P-Ar. An online calculator is available at [www.survivalcalculator-lapdac-arterialresection.org](http://www.survivalcalculator-lapdac-arterialresection.org)

PP03-126

**NEUROENDOCRINE CYSTIC CARCINOMA IN THE PANCREAS TAIL. ASYMPTOMATIC**

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**Introduction:** Pancreatic neuroendocrine neoplasms are second most common neoplasm. Incidence are fewer than 1 per 100 000 individuals per year. 2017 World Health Organisation (WHO) classification: As well-differentiated pancreatic neuroendocrine tumours (PanNETs), poorly differentiated pancreatic neuroendocrine carcinomas (PanNECs) and mixed neuroendocrine-non-neuroendocrine neoplasms (MiNENs) of the pancreas. PanNETs are much more common than PanNECs and present typically in adults between the fifth and sixth decades and may be asymptomatic or symptomatic due to inappropriate hormone secretion.

**Methods:** INCIDENTAL FINDING DURING MAGNETIC RESONANCE

A 60-year-old male patient presented with spondylolysis and underwent thoracoabdominal magnetic resonance, incidentally finding lumps in the pancreas tail measuring 10X12 centimeters. Laboratory tests and tumor markers were performed in normal range, he was sent to our service.

**Results:** Was performed tail resection of pancreas of 10X12 centimeters, in the postoperative period it presented an acid base imbalance so it is handled in Intensive Care, it evolves favorably and it is discharged from the hospital 4 weeks after the surgery.

**Pathology report:** Tumor in pancreas tail, cystic, well differentiated neuroendocrine, with focal invasion to the capsule and free edges of lesion of low malignant potential.

Conclusion:

1. Pancreatic neuroendocrine tumors are usually asymptomatic and are diagnosed by incidental findings.
2. The success in the postoperative evolution is that they are treated by surgeons who are experts in liver, pancreas and biliary tract surgery.

PP03-127

### HIGH CIRCULATING TUMOUR DNA IS A STRONG NEGATIVE PROGNOSTIC FACTOR IN OPERABLE PANCREATIC CANCER

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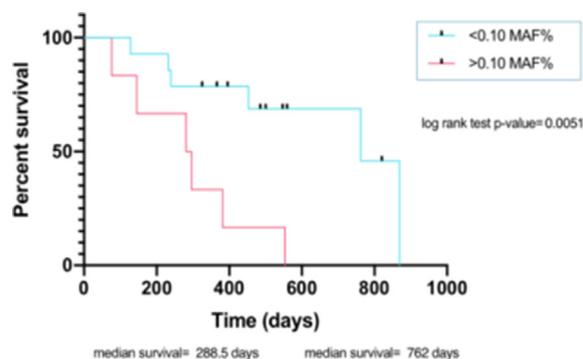
**Introduction:** Pancreatic cancer has a poor five-year survival rate of 9%. In order to improve this overall survival, we need better investigations that can enable early diagnosis, better prognostication and monitoring of disseminated and residual disease. Further, these tests would have to be accurate, minimally invasive and cost-effective to decrease the burden of cancer. This study aims to establish the utility of circulating tumour DNA as a test to help in the diagnosis and prognostication of patients with pancreatic cancer.

**Methods:** Patients who underwent an EUS-FNA for the investigation of solid pancreatic masses or underwent resections for pancreatic cancer at Monash Health between January 2015 and January 2019 had their plasma stored in the Victorian Pancreatic Cancer Biobank (VPCB). These plasma samples were then removed from the biobank and

the cell-free DNA component was extracted. The cell-free DNA was then analysed using droplet digital PCR looking for KRAS G12/13 mutations commonly found in pancreatic cancer. In the validation cohort 25 plasma samples from patients with pancreatic cancer were analysed. In the final cohort 59 patients with pancreatic cancer and 14 patients with benign pancreatic disease were analysed. These results were then compared against the patient's diagnosis, stage of disease, tumour size, tumour location, CA19-9, Tissue KRAS results and survival.

**Results:** Circulating tumour DNA (ctDNA) G12/13 plasma mutations were detected in 66% of patients and 76% of patients with G12/13 mutations in their tissue. Specificity was 100%. Concordance with tissue was 100%. Circulating tumour DNA corresponded with stage and tumour size. High ctDNA was associated with a significantly worse prognosis. Patients with a high ctDNA, MAF>0.10%, had a median overall survival of 155 days compared to 560 days for patients with a MAF< 0.10% (p< 0.001). Patients with operable disease and a high ctDNA, MAF >0.10%, had a median survival of 193.5 days compared to 762 days for patients with a MAF< 0.10% (p=0.015).

**Conclusion:** Circulating tumour DNA is a useful test to aid in the diagnosis and prognostication of patients with pancreatic cancer. Through continuing to investigate the utility of circulating tumour DNA there is the potential to apply it in clinical practice to optimize the care and survival outcomes of patients with pancreatic cancer.



**Figure 1:** Kaplan-Meier curve of ctDNA as a prognostic marker of overall survival in patients who have

### PP04 - Pancreas: Surgical Outcomes

PP04-001

#### NUTRITIONAL ASSESSMENT AND SURGICAL OUTCOMES IN PATIENTS AGED 80 YEARS AND OLDER UNDERGOING PANCREATICODUODENECTOMY

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**Background:** Conflicting data exist regarding the safety of Pancreaticoduodenectomy (PD) in elderly patients. This study aimed to evaluate and compare nutritional factors and clinical outcomes of PD between elderly and non-elderly patients.

**Methods:** A retrospective study was conducted among 116 consecutive patients who underwent PD from April 2008 to August 2019. We compared pre- and post-operative nutritional factors (prognostic nutritional index [PNI], controlling nutritional status [CONUT] score), complication rates, and survival rates between the elderly (age  $\geq 80$  years) and non-elderly (age  $< 80$  years) patient groups.

**Results:** Nineteen elderly patients (18.4%) and 97 non-elderly patients (83.6%) underwent PD. Among preoperative factors, elderly patients had significantly lower PNI and higher CONUT scores than non-elderly patients. The duration of operation and amount of blood loss were similar between the two groups. Three-months post-operation, elderly patients had lower albumin levels and PNI than non-elderly patients. The post-operative complication rates and the incidence rate of pancreatic fistula were similar between the two groups. Median length of hospital stay was significantly longer in elderly patients (41 days) than in non-elderly patients (27 days). The rate of death due to other diseases was relatively higher in elderly patients than in non-elderly patients. Elderly patients had significantly lower overall survival rates than non-elderly patients (1-/3-/5-year overall survival; 83.4/49.7/14.2% vs. 87.1/54.1/47.3%; log-rank test,  $P=0.008$ ).

**Conclusion:** Elderly patients had lower nutritional status and lower survival rates than non-elderly patients. Careful patient selection and optimal peri-operative care are necessary for determining whether PD is indicated in elderly patients.

#### PP04-002

### PALLIATIVE PANCREATICODUODENECTOMY

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**Background:** This study was to evaluate the surgical, oncological and survival outcomes after pancreaticoduodenectomy (DP) with superior mesenteric vein (SMV)/ portal vein (PV) resection for borderline resectable periampullary malignancy by either robotic PD (RPD) or open PD (OPD).

**Methods:** Data for periampullary lesions undergoing PD were retrieved from a prospectively-collected computer database. Surgical risks, oncological and survival outcomes were compared between groups with and without SMV/PV resection.

**Results:** A total of 391 patients undergoing pancreaticoduodenectomy were included for analysis, including 43 (11.0%) with and 384 (89.0%) without vein resection. Eleven (25.6%) of PDs with vein resection were performed by robotic approach. Operation time in vein resection group was significantly longer (median of 8 vs. 7 hours). Blood loss, curative resection (R0) rate, and harvested lymph node number were similar between these two groups. Surgical outcomes including postoperative pancreatic fistula (POPF), delayed gastric emptying (DGE), post-pancreatectomy hemorrhage (PPH), chyle leakage, wound infection and hospital stay were of no significant difference between these two groups. There was no survival difference between these groups, with 1-year and 3-year survival rates of 92.6% and 26.5% respectively for the patients with vein resection, vs. 70.3% and 37.2% without vein resection.

**Conclusions:** PD with vein resection is technically feasible not only by open approach but also by robotic approach in selected patients. Additional SMV/PV would not increase the surgical risks of PD, and moreover, could achieve similar survival outcomes for pancreatic head adenocarcinoma when compared to PD without vein resection.

#### PP04-003

### THE VULNERABLE POINT OF MODIFIED BLUMGART PANCREATICOJEJUNOSTOMY REGARDING PANCREATIC FISTULA LEARNED FROM 80 CONSECUTIVE PANCREATICODUODENECTOMY

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**Background:** Blumgart Anastomosis (BA) during pancreaticoduodenectomy (PD) had reduced postoperative pancreatic fistula (POPF) after PD in literatures. The aim of this study is to report surgical results of consecutive series of modified BA method.

**Methods:** Data of consecutive 80 patients who underwent PD using modified BA between September 2011 and August 2019 were prospectively collected and retrospectively analyzed, regarding POPF and other morbidity and mortality.

**Results:** Overall incidence of POPF was 8.8%, the rate of Grade B POPF was 7.5% (6/80) and Grade C was 1.3% (1/80). Among 80 patients, five post pancreatectomy hemorrhages (6.3%) including two POPF related bleeding, and four abscesses including two POPF related with it were occurred. Fistula Risk Grades were 2 Negligible, 10 Low, 53 Intermediate, and 15 High. They were well improved the clinical courses after radiologic intervention under drainage and angiography except one. The mortality occurred because of POPF followed by the jejunal detachment from the remnant pancreas stump. In case of mortality, jejunum was too slender, comparing the pancreatic thickness.

**Conclusions:** This retrospective single-center result demonstrated that the modified BA had acceptable rate of POPF. Modified BA may be risky and potentially provoke fatal POPF, conjoining slender jejunum and thick pancreas.

#### PP04-004

### TRANSITION FROM OPEN AND LAPAROSCOPIC TO ROBOTIC PANCREATICODUODENECTOMY IN A UK TERTIARY REFERRAL HEPATOBILIARY AND PANCREATIC CENTRE - EARLY EXPERIENCE OF ROBOTIC PANCREATICODUODENECTOMY

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**Introduction:** Pancreaticoduodenectomy is performed using an open technique (OPD) as the gold standard. An increase in those performed laparoscopically (LPD) and

robotically (RPD) are now reported. We compared the short-term outcomes of RPD cases with LPD and OPD.

**Methods:** A retrospective review of a prospectively collected database was undertaken of our first consecutive RPD, our first LPD and consecutive OPD cases. Those requiring venous and/or arterial resection were excluded.

**Results:** RPD (n=25) had longer operating times (451.9 +/- 92.2 mins) than LPD (n=41) (338.2 +/- 55.6 mins) and OPD (n=37) (309.6 +/- 81.0 mins,  $p < 0.0001$ ). On subgroup analysis, after 20 cases, RPD operating time was comparable to OPD ( $p=0.414$ ). Estimated blood loss and transfusion requirement was less after RPD and LPD compared to OPD ( $p=0.012$  and  $p < 0.0001$  respectively). No RPD cases required conversion to open operation compared to 24.4% of LPD. Morbidity was comparable. 90-day mortality was seen in 0.97% of the total cohort. Length of hospital stay (LOS) was shorter for RPD compared to both LPD ( $p=0.030$ ) and OPD ( $p=0.002$ ).

**Conclusion:** RPD is safe to perform with comparable outcomes to LPD and OPD. Further evidence is provided that a randomised controlled trial for PD techniques is required.

PP04-006

### SURGICAL, SURVIVAL AND ONCOLOGICAL OUTCOMES AFTER VASCULAR RESECTION IN ROBOTIC AND OPEN PANCREATODUODENECTOMY

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**Background:** To evaluate the surgical, oncological, and survival outcomes after pancreaticoduodenectomy (PD) with superior mesenteric vein (SMV)/portal vein (PV) resection by either robotic PD (RPD) or open PD (OPD).

**Methods:** Data of patients with periampullary lesions undergoing PD were retrieved from a prospectively collected computer database. Surgical risks as well as oncological and survival outcomes were compared between patients with (vein resection group) and without SMV/PV resection (without vein resection group).

**Results:** A total of 391 patients undergoing pancreaticoduodenectomy were enrolled, including 43 (11.0%) and 384 (89.0%) patients with and without vein resection, respectively. Eleven (25.6%) of PDs with vein resection were performed using the robotic approach. Operation time in the vein resection group was significantly longer (median of 8 vs. 7 hours). Blood loss, curative resection (RO) rate, and harvested lymph node number were similar between these two groups. Surgical outcomes including postoperative pancreatic fistula (POPF), delayed gastric emptying (DGE), post-pancreatectomy hemorrhage (PPH), chyle leakage, wound infection, and hospital stay were not significantly different between the two groups. There was no survival difference between these groups, with 1-year and 3-year survival rates of 92.6% and 26.5%, respectively, for vein resection group, vs. 70.3% and 37.2%, respectively, for the without vein resection group.

**Conclusions:** PD with vein resection is technically feasible by OPD and RPD in selected patients. Additional SMV/PV would not increase the surgical risks of PD and could

achieve similar survival outcomes for pancreatic head adenocarcinoma when compared to PD without vein resection.

PP04-007

### SURGICAL OUTCOMES OF COMBINED MODIFIED BLUMGART PANCREATICOJEJUNOSTOMY AND LONG INTERNAL PANCREATIC STENT FOR PANCREATODUODENECTOMY: A PRELIMINARY REPORT

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**Introduction:** The modified Blumgart pancreaticojejunostomy is a wellknown technique during the reconstructive phase of pancreaticoduodenectomy. A short stent is often placed across the anastomosis to prevent pancreatic fistula. On the other hand, the long internal stent is rarely used and the outcome is controversial.

**Method:** We retrospectively analysed the early postoperative results, especially the pancreatic fistula, of 10 patients who underwent pancreaticoduodenectomy during June, 2017 to December, 2019 in single center. All pancreaticojejunostomies were reconstructed with combined the modified Blumgart technique and long internal pancreatic stent.

**Results:** According to the International Study Group on Pancreatic Fistula criteria, the pancreatic fistula occurred in 4 patients (40%). Two patients (20%) had biochemical leakage (Grade A). Another one required percutaneous drainage (Grade B). Only one patient died after the reoperation (Grade C). The 30-day mortality rate was 10 (1/10) percents. The median postoperative hospital stay was 15 days (range, 12-36).

**Conclusion:** Combined the modified Blumgart pancreaticojejunostomy and long internal pancreatic stent is a favorable technique to prevent the pancreatic fistula. Simplified management, acceptable mortality rate and shorten postoperative hospital stay are important advantages. Due to the limited sample size, further studies are needed to support our results and clarify the issue.

#### Postoperative outcomes

Postoperative complications	No(%)
Pancreatic fistula ; Grade A, Grade B, Grade C	4/10(40) ; 2/10(20), 1/10(10), 1/10(10)
Bile leakage ; Grade A, Grade B, Grade C	1/10(10) ; 0/10(0), 0/10(0), 1/10(10)
Intraabdominal bleeding	1/10(10)
Intraabdominal abscess	2/10(20)
Reoperation	2/10(20)
Morbidity	4/10(40)
Mortality(30-day)	1/10(10)
Postoperative hospital stay, day(s)	15(12-36)



Modified Blumgart's pancreaticojejunostomy

#### PP04-009

### EFFECT OF POLYGLYCOLIC ACID MESH FOR PREVENTION OF PANCREATIC FISTULA FOLLOWING SEGMENTAL PANCREATECTOMY: A SYSTEMATIC REVIEW

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**Background:** Postoperative pancreatic fistula (POPF) is the most common and intractable complication after segmental pancreatectomy, with an incidence of 13-64%. Polyglycolic acid (PGA) mesh is a new technique that is designed to prevent POPF, but its effect has been evaluated only in a small number of patients and in retrospective studies. In this study, we systematically and comprehensively analyzed the efficacy of PGA based on reported research.

**Methods:** We searched Medline, Embase, and Cochrane Library databases in English between January 2010 and October 2019. Analysis was performed by using Review Manger5.3 software.

**Results:** Three randomized controlled trials and 8 non-randomized studies were eligible with a total of 1598 patients including 884 PGA patients and 714 control patients. For pancreatoduodenectomy (PD), distal pancreatectomy (DP) and segmental pancreatectomy, we found significant statistical differences in overall POPF ( $RR_{All} = 0.76$ , 95%  $CI = 0.64-0.89$ ,  $P = 0.0009$ ;  $RR_{PD} = 0.75$ , 95%  $CI = 0.61-0.91$ ,  $P = 0.004$ ;  $RR_{DP} = 0.74$ , 95%  $CI = 0.57-0.96$ ,  $P = 0.02$ ,

respectively), grade B/C pancreatic fistula ( $RR_{All} = 0.41$ , 95%  $CI = 0.32-0.52$ ,  $P < 0.00001$ ;  $RR_{PD} = 0.5$ , 95%  $CI = 0.37-0.68$ ,  $P < 0.00001$ ;  $RR_{DP} = 0.31$ , 95%  $CI = 0.21-0.46$ ,  $P < 0.00001$ , respectively), and overall complications

( $RR = 0.77$ , 95%  $CI: 0.67-0.88$ ,  $P = 0.0002$ ) in favor of RGA. We did not find significant differences regarding operative time ( $WMD = -8.86$ ; 95%  $CI: -27.59-9.87$ ,  $P = 0.35$ ) and hospital stay

( $WMD = -2.73$ ; 95%  $CI: -7.53-2.06$ ,  $P = 0.26$ ).

**Conclusions:** This meta-analysis shows the benefits of the PGA technique regarding POPF and postoperative complications. Currently, the quality of evidence on the benefits of PGA is low due to the lack of randomized controlled trials and needs to be taken into consideration when evaluating PGA. This will require conducting large randomized control trials.

#### PP04-010

### PRIOR RENAL TRANSPLANT PATIENTS DEMONSTRATE SIMILAR OUTCOMES FOLLOWING PANCREATECTOMY

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**Introduction:** The purpose of our study was to evaluate clinical outcomes of previous kidney transplant recipients (KTxRs) undergoing pancreatectomy.

**Methods:** We queried the National Inpatient Sample (NIS) database from 2005 to 2014 to identify KTxRs with pancreatic lesions (case group) who underwent partial or total pancreatectomy. Propensity matching was used to create a comparative control group of non-KTxRs. Chi-square analyses were utilized to compare the clinical variables between groups, while regression analyses were utilized to compare clinical outcomes as well as hospital charges.

**Results:** Twenty-five pancreatectomy patients had also undergone prior kidney transplant. KTxRs were more likely to have a benign tumor type (32.0% vs. 14.4%,  $p = 0.020$ ). The KTxR population utilized a greater percentage of government-based health insurance (72.0% vs. 50.0%,  $p = 0.028$ ). On univariate analysis, KTxRs demonstrated a higher rate of blood transfusion during pancreatectomy (40.0% vs 22.2%,  $p = 0.032$ ), and the average total hospital charge for these patients was significantly greater (\$108,218 vs \$85,858,  $p = 0.047$ ). However, prior receipt of a kidney transplant was not associated with increased mortality, morbidity, length of stay, or total hospital charges on multivariate analysis (all  $p > 0.05$ ). While KTxRs underwent pancreatectomy mostly at transplant centers (84.0% vs 58.9%,  $p = 0.011$ ), receipt of perioperative pancreatectomy care at transplant centers did not negatively affect any outcome.

**Conclusion:** KTxR demonstrate similar clinical outcomes with non-KTxR when undergoing pancreatectomy. Prior kidney transplant should not be considered a contraindication to undergoing pancreatic resection.

PP04-011

### EARLY EXPERIENCE OF SYSTEMATIC MESOPANCREAS DISSECTION (SMD) FOR PANCREATIC AND PERIAMPULLARY CARCINOMA

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**Introduction:** The incidence of R1 resection is high in pancreatic cancer despite of a good quality surgery. Amongst various techniques of mesopancreas excision, SMD is applicable to pancreatic and other periampullary carcinoma. This study has been conducted to compare the perioperative outcomes, the lymph node yield and the margin status in patients who underwent standard pancreaticoduodenectomy and SMD pancreaticoduodenectomy for pancreatic and periampullary carcinoma.

**Methods:** A retrospective comparative study was conducted in a single unit of Gastrointestinal and Hepatopancreatobiliary surgery at Tribhuvan University Teaching Hospital, Nepal. The demographics, indication of surgery, duration of surgery, intraoperative blood loss, incidence of procedure-specific complications according to ISGPS, length of hospital stay, perioperative mortality, lymph node yield and margin status were compared.

**Results:** Total of 17 patients underwent SMD pancreaticoduodenectomy. The demographic data was comparable with the historical data of 45 patients who underwent standard pancreaticoduodenectomy. The duration of surgery was longer in SMD pancreaticoduodenectomy (354.7±51.1 mins vs 276.2 ± 43.1 mins), however, the blood loss was less (502.9 ± 178.1 ml vs 701.1 ± 354.6 ml). The incidence of POPF and perioperative mortality were less as compared to the patients who underwent standard pancreaticoduodenectomy (11.5% vs 14.6% and 5.9% vs 8.5% respectively). The rate of margin negative resection was comparable (88.2% vs 90%). The median lymph node yield was significantly high in patients who underwent SMD pancreaticoduodenectomy (15 vs 6,  $p < 0.05$ ).

**Conclusion:** SMD pancreaticoduodenectomy is feasible and should be performed not only for pancreatic carcinoma but also for other periampullary carcinoma.

PP04-012

### PANCREATIC RESECTION FOR METASTATIC TUMORS TO THE PANCREAS

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**Introduction:** The incidence of metastases to the pancreas is rare. Therefore the benefit of their surgery is unclear. Here we assessed the outcome of patients undergoing pancreatic resection for metastatic tumor to the pancreas.

**Methods:** From January 2010 to September 2019, seven patients underwent pancreatic resection for metastatic tumor to the pancreas in our department. The primary sites were kidney (n=5), Duodenum (n=1), uterus (n=1). One synchronous and six metachronous metastases. Median

interval between primary treatment and resection of pancreatic metastasis was 49 months (0 - 224 months).

**Results:** Treatments included distal pancreatectomy in five patients, pancreaticoduodenectomy in one patient and remnant total pancreatectomy after pancreaticoduodenectomy in one patient. Associated treatment of extra-pancreatic metastases was performed in one patient performing Radiofrequency ablation for lung metastases. There was no postoperative mortality, but five postoperative morbidities, including two grade 3 pancreatic fistula, one grade 1 pancreatic fistula, one grade 1 pancreatic pseudocyst, and one grade 1 chylorrhea. Median overall survival was 17 months (4.7-100.3 months). Two patients died of recurrent disease at 17 and 100.3 months after pancreatectomy and five patients survived without recurrence.

**Conclusions:** Pancreatic resection for metastatic tumor to the pancreas should be considered in selected patients, especially metastases limited to the pancreas. Long-term survival or good palliation may be achieved.

PP04-013

### A 14-YEAR RECORD OF PANCREATICODUODENECTOMY: A SINGLE INSTITUTIONAL OBSERVATIONAL STUDY WITH CONSECUTIVE 2,668 CASES

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**Introduction:** To evaluate clinicopathological features and chronologic changes of postoperative outcomes in patients undergoing pancreaticoduodenectomy (PD).

**Methods:** We retrospectively reviewed 2,668 cases of PD performed at Samsung Medical Center in Seoul, Korea for 14 years from January 2005 to December 2018. To identify clinicopathologic features, periampullary diseases were classified into 4 locations of pancreas, bile duct, ampulla and duodenum. The chronologic changes in postoperative outcomes were compared between subdivided periods of 1st period (between 2005 and 2011) and 2nd period (between 2012 and 2018). In order to obtain at least 2 years of follow-up data for survival analysis, 2nd period was set between 2012 and 2016.

**Results:** 1,098 and 1,570 cases were performed in 1st and 2nd periods, respectively. Most of PD were performed on diseases of pancreas, followed by bile duct, ampulla, and duodenum. Benign cases accounted for about 15% of entire cases. When analyzing chronologic changes of postoperative outcomes in entire cases, we identified complication rate was significantly lower, and hospital stay was significantly shorter in 2nd period. The postoperative pancreatic fistula did not significantly differ between two period groups. In survival analysis of cancers of each location, survival rates were significantly higher in 2nd period than in 1st period.

**Conclusions:** PD has been increasingly being performed to more patients. It was confirmed the incidence of postoperative complications was reduced and survival was improved in our study. Although we cannot conclude PD is

sole factor in improving survival, development of PD will lead to therapeutic improvement in periampullary diseases.

**PP04-014  
PRE AND INTRAOPERATIVE  
PREDICTORS OF POST-  
PANCREATICOUDENECTOMY  
HEMORRHAGE: A COHORT STUDY**

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**Introduction:** Post-Pancreaticoduodenectomy Hemorrhage is an important cause of morbidity and mortality. We examined the effects of pre and intraoperative factors in the development of this complication.

**Methods:** This is a retrospective study in a cohort of patients who underwent PD in a tertiary care center (January 2010 - December 2019). Patients with R2 resections and other types of anastomoses than Telescopic and Blumgart were excluded. Morbidity and mortality were logged during a 90-day postoperative follow-up. Severe Morbidity was defined as Clavien-Dindo ≥ III. Post-Pancreatectomy Hemorrhage (PPH) and Post-operative Pancreatic Fistula (POPF) were defined according to the ISGPS definition and grading.

**Results:** A total of 182 patients were included. Clinically significant pancreatic fistulas were 29% (n=53). Protective prognostic factors for PPH were serum albumin levels (OR 0.92 CI95% 0.86 - 0.98 p=0.008) and performing a Blumgart anastomosis (OR 0.34 CI95% 0.13 - 0.89 p=0.028) (Table 1). The group of Telescopic anastomosis was 117 and 65 for Blumgart. PPH was present in Telescopic PJ in 22% and 12% in Blumgart PJ. None of the patients in the Blumgart group developed a PPH Type C. No differences in POPF (p=0.981), severe morbidity (p=0.676), hospital stay (p=0.673) and mortality (p=0.878) were found.

**Conclusions:** Blumgart pancreaticojejunostomy is related to lower PPH rates and severity after Whipple Procedure. Higher serum albumin levels may have a modest effect in decreasing this complication.

**Table 1.** Univariate and Multivariate Analysis for Post-Pancreatectomy Hemorrhage (n=182).

	Univariate		Multivariate	
	p-value	OR	CI 95%	p-value
Age	0.100			
Sex	0.717			
BMI in kg/m <sup>2</sup>	0.447			
ASA	0.610			
Hemoglobin in g/dL	0.017			0.968
Platelet count in 10 <sup>9</sup> /L	0.034			0.268
Prothrombine time	0.532			
International Normalized Ratio	0.275			
Serum glucose levels in mmol/L	0.877			
Serum creatininin in μmol/L	0.350			
Albumin in g/dL	0.066	<b>0.916</b>	<b>0.859 - 0.978</b>	<b>0.008</b>
Serum total bilirubin in μmol/L	0.373			
Estimated blood loss (cc)	0.112			
Type of Anastomosis (Blumgart)	0.100	<b>0.337</b>	<b>0.128 - 0.890</b>	<b>0.028</b>
Operative time (min)	0.102			0.129

<sup>†</sup>p<0.2 was entered to the model and is marked in *italics*  
Significant OR are marked in **bold**

**PP04-016  
DEFINING HIGH VOLUME CENTER  
FOR MINIMALLY INVASIVE DISTAL  
PANCREATECTOMY**

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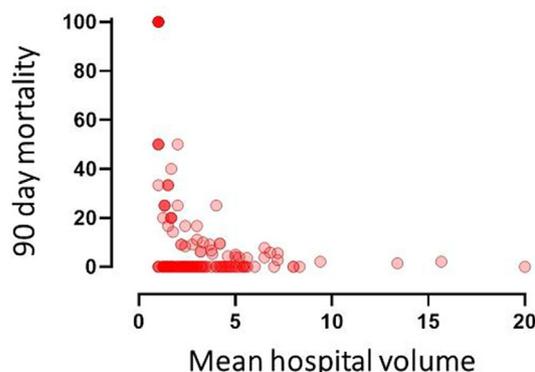
**Introduction:** Minimally Invasive Distal Pancreatectomy (MIDP) is associated with reduced intra-operative blood loss, transfusion requirement, and shorter length of stay compared to open distal pancreatectomy (ODP). Several studies have outlined the relationship between hospital volume and postoperative mortality for patients undergoing pancreatic surgery, but the exact effect of centralization of care for MIDP still needs to be determined. The purpose of this study is to evaluate the association between hospital-procedure-volume and mortality for patients undergoing MIDP to determine an evidence-based threshold of hospital volume associated with improvement in mortality.

**Methods:** Patients who underwent MIDP were identified using the National Cancer Database (2010-2015). Logistic regression analysis and restricted cubic spline regression analysis were performed to determine the linear and non-linear association between mean hospital volume and mean 90-day mortality.

**Results:** 2837 patients underwent distal pancreatectomy at 487 different hospitals. 30 and 90-day mortality of the study population was 1.27% (n=36) and 2.54% (n=72), respectively. Baseline characteristics and mean annual mortality of individual hospitals were determined (fig1). A logistic regression and cubic spline analysis was performed, which demonstrated that institutional volume is significantly associated with decreased overall 90-day mortality. The maximum improvement in 90-day mortality is seen if the annual hospital volume was greater than 7 (p< 0.0001).

**Conclusion:** Our data suggest that the centralization of MIDP results in decreased postoperative mortality. Based on these results, we recommend defining high volume center as hospitals performing eight or more MIDP cases/year. The true impact of this finding on overall survival should be assessed in future studies using large databases with long-term follow-up information.

90 day mortality after MIDP decreases with increase in hospital volume



Hospital volume and mortality

PP04-018

### OPERATIVE RESULTS AND PATIENT SATISFACTION AFTER ROBOTIC PANCREATODUODENECTOMY

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**Background:** There are no reports available on patient satisfaction and quality-of-life after robotic pancreaticoduodenectomy (RPD). This study aimed to evaluate not only surgical outcomes but patient satisfaction after RPD.

**Methods:** Prospectively collected data for RPD were analyzed for surgical outcomes. Questionnaires were sent to patients to assess patient satisfaction regarding RPD.

**Results:** The study included 105 patients who underwent RPD, with 44 (41.9%) patients presenting with associated surgical complications. There were no significant differences between the without and with complication groups in median console time (390 min. Vs. 373 min.), blood loss (100 mL vs. 100 mL), and harvested lymph node number (14 vs. 15). There was no surgical mortality in this study. Major complications  $\geq$  Clavien-Dindo III occurred in 7.6% of the 105 patients. The most common complication was chyle leakage (18.1%), followed by postoperative pancreatic fistula (5.7%), intra-abdominal abscess (4.8%), delayed gastric emptying (3.8%), and post pancreatectomy hemorrhage (3.8%). Almost all the patients responded to this RPD-related survey with “fair” to “excellent” grades for all items, except 1 (< 1%) poor grade for operation service and 2 (1.9%) “not good” grades for diet tolerance.

**Conclusions:** RPD is a feasible procedure with acceptable surgical outcomes. This patient survey with high patient satisfaction rates indicates that RPD provides acceptable satisfaction results, and the robotic approach for a major operation such as RPD has probably a higher priority than cost concerns. RPD could be recommended not only to surgeons but also to patients in terms of surgical outcomes and patient satisfaction.

PP04-019

### POSTOPERATIVE DAY FIVE NEUTROPHIL-LYMPHOCYTE RATIO BEHAVES AS AN INDEPENDENT PROGNOSTIC FACTOR IN PATIENTS WITH PANCREATIC CANCER

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**Introduction:** We have designed this work to relate the postoperative day 5 neutrophil-lymphocyte ratio (POD 5 NLR) to overall survival (OS) and disease-free survival (DFS) in pancreatic cancer surgery.

**Methods:** We have selected pancreatic cancers operated at our Institution between January 2015 and December 2017. Receiver operating characteristics curve was used to

establish the cut-off value of POD 5 NLR. Survival curves were constructed using the Kaplan-Meier method.

**Results:** Finally, 42 patients were eligible for statistical analysis. POD 5 NLR cut-off value was set at 7.5. The 6-, 12-, 24-month OS were 85.7%, 85.7%, 76.2% for POD 5 NLR < 7.5, and 90.5%, 71.4%, 50.0% for POD 5 NLR  $\geq$  7.5 (p-value = 0.045). The 6-, 12-, 24-month DFS were 90.0%, 85.0%, 80.0% for POD 5 NLR < 7.5, and 75.4%, 64.6%, 43.1% for POD 5 NLR  $\geq$  7.5 (p-value = 0.010).

**Conclusions:** Our work shows that POD 5 NLR behaves as an independent prognostic factor for patients with pancreatic cancer.

PP04-020

### POSTOPERATIVE DAY FIVE C-REACTIVE PROTEIN PREDICTS ONCOLOGIC OUTCOMES IN PANCREATIC CANCER SURGERY

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**Introduction:** The aim of this work was to relate the postoperative day 5 (POD 5) C-reactive protein to overall survival (OS) and disease-free survival (DFS) in pancreatic cancer.

**Methods:** We have selected pancreatic cancers operated at our Institution between January 2015 and December 2017. Receiver operating characteristics curve was used to establish the cut-off value of C-reactive protein at POD 5. Survival curves were constructed using the Kaplan-Meier method.

**Results:** Finally, 41 patients were eligible for statistical analysis. POD 5 C-reactive protein cut-off value was set at 160. The 6-, 12- and 24-month year OS were 88.5%, 84.6% and 76.9% for POD 5 C-reactive protein < 160, and 86.7%, 66.7% and 40.0% for POD 5 C-reactive protein  $\geq$  160 (p-value = 0.027). The 6-, 12- and 24-month DFS were 87.8%, 79.5% and 70.6% for POD 5 C-reactive protein < 160, and 73.3%, 66.0% and 44.0% for POD 5 C-reactive protein  $\geq$  160 (p-value = 0.038).

**Conclusions:** Our work shows that POD 5 C-reactive protein represents a relevant prognostic factor for patients with pancreatic cancer.

PP04-021

### PREOPERATIVE PANCREATIC RESECTION (PREPARE) SCORE PREDICTS ONCOLOGIC OUTCOMES IN PATIENTS WITH PANCREATIC CANCER

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**Introduction:** We have designed this work to relate the 'preoperative pancreatic resection' (PREPARE) score to overall survival (OS) and disease-free survival (DFS) in pancreatic cancer.

**Methods:** We have selected pancreatic cancers operated at our Institution between January 2015 and December 2017. PREPARE score classifies patients according to surgical risk in low risk (0-5 points), intermediate risk (6-9 points) and high risk (10-17 points). We have created two groups: low PREPARE (< 10 points) and high PREPARE ( $\geq$  10 points). Survival curves were constructed using the Kaplan-Meier method

**Results:** Finally, 43 patients were eligible for statistical analysis. 8 patients had a high PREPARE. The 6-, 12- and 24-month OS were 91.4%, 82.9% and 67.9% for low PREPARE, and 75.0%, 62.5% and 50.0% for high PREPARE (p-value = 0.033). The 6-, 12- and 24-month DFS were 88.0%, 81.8% and 65.7% for low PREPARE and 62.3%, 50.0% and 37.5% for high PREPARE (p-value = 0.029).

**Conclusions:** PREPARE score appears as an outstanding prognostic factor among patients who undergo pancreatic cancer surgery.

PP04-022

### MINIMAL INVASIVE PANCREATODUODENECTOMY PROVIDE SHORTER POSTOPERATIVE HOSPITAL STAY AND EARLY DRAIN REMOVAL FOR ELDERLY PATIENTS: A PROPENSITY SCORE MATCHING STUDY

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**Introduction:** Pancreatoduodenectomy (PD) is the most complex pancreatic operation and entails a challenging reconstruction where major morbidity and mortality may result from anastomotic failure or hemorrhage. This study aim to evaluate the risk and benefit of minimal invasive pancreatoduodenectomy (MIS PD) in elderly patients.

**Methods:** From 2017 to 2019, we retrospective enroll 121 patient with PD. 22 patients receive MIS PD and other 99 patients receive open PD (OPD). Postoperative mortality and morbidity, short-term outcome. Propensity score matching was apply for further old age (>70-year-old) patient analysis.

**Results:** Older patient with underwent PD had significantly higher surgical mortality, major complication, longer postoperative hospital stay (POHS), longer ICU stay, longer TPN dependence, later ambulation and drain removal comparing to young age patients. Elderly patient underwent MIS PD had significantly shorter POHS (22 days vs 27 days, p=0.043) and early drain removal (18 days vs 25 days, p=0.011) comparing to OPD. After 1:3 Propensity score matching, elderly patient receive MIS PD still had significantly shorter POHS (21 days vs 28 days, p=0.023) and early drain removal (19 days vs 25 days, p=0.018). Besides, there was no surgical mortality comparing to open group (0% vs 13.6%, P=0.53).

**Conclusions:** Elderly patients underwent PD have higher overall surgical risk and slower postoperative recovery course. MIS PD for elderly patients provides shorter POHS and early drain removal. Without increasing mortality and major complication, MIS PD might also provide potential advantage for elder patient in short-term outcome and postoperative recovery over OPD.

PP04-023

### THE CLOSURE TECHNIQUE FOR REDUCING POSTOPERATIVE PANCREATIC FISTULA AFTER DISTAL PANCREATECTOMY

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**Introduction:** The number of patients who performed pancreas division using stapler in distal pancreatectomy has been widely increasing. But, postoperative pancreatic fistula(POPF) still remains important problem. In this study, we analyzed our results retrospectively, and evaluate our new strategy to reduce POPF.

**Methods:** 180 patients who underwent distal pancreatectomy were retrospectively analyzed. Grade B or C of the grading system of International Study Group of Pancreatic Fistula were considered to be POPF. Because we changed pancreatic division method from January 2005, we separate two periods in this study. The pancreatic stump was closed by hand-sewn suture or using stapler. The thickness of pancreas was measured in preoperative CT.

**Results:** In first period, there was no significant difference in the incidence of POPF between hand-sewn group(17.0%) and stapler group(17.4%). In stapler group, the average pancreatic thickness in patients with POPF was 18.0mm and in patients without POPF was 13.5mm, respectively. There was significant difference. A 16mm cut-off for pancreatic thickness was established based on the receiver operating characteristic (ROC) curve. Therefore, we used stapler in case with under 16mm of pancreatic thickness and chose hand-sewn closure with over 16mm in second period. The incidence of POPF were 17.2% in first period and 10.9% in second period. The rate of POPF tended to decrease. The incidence of POPF with stapler were 17.4% in first period and 5.4% in second period. There was significant difference.

**Conclusions:** To limit using stapler with a pancreatic thickness under 16mm, we could reduce the incidence of POPF.

PP04-024

### PLATELET/LYMPHOCYTE RATIO ON DAY-1 AFTER PANCREATECTOMY WAS PREDICTIVE FACTOR FOR PANCREATIC FISTULA

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**Introduction:** The safety of pancreatectomy (Pt) regarding the surgical technique and perioperative care management has increased recently, but postoperative pancreatic fistula (POPF) is a lethal complication. We aimed to evaluate the risk factors of operative and postoperative findings for PF after Pt.

**Methods:** Between Nov 2014 and Dec 2018, 103 patients who underwent Pt at our center were prospectively examined and classified into Group A, those with no fistula/biochemical leak (n=97), or B, those with grade B/C POPF (n=6). Operative (operative time, bleeding volume, blood transfusion, abdominal cavity washing volume), and 1- and 3-day postoperative (white blood cells; Neutrophils, lymphocytes; hemoglobin (Hb); Plate; Creatine; Albumin; Total Bilirubin; amylase; C-reactive protein(CRP); neutrophil/lymphocyte ratio; prognostic nutritional index, platelet/lymphocyte ratio (PLR), CRP/Alb ratio (CAR); drain amylase; drainage cell counts, volume, bacteria) factors were collected and analyzed at postoperative day1, and day3. Post-Pt POPF predictors were evaluated using univariate and multivariate analyses.

**Results:** The mean patient age was 68.7 y ( 67 men, 36 women). The diseases were pancreatic cancer (n=46), intraductal papillary mucinous neoplasms (n=13), bile duct cancer (n=10), papilla Vater cancer (n=8), chronic pancreatitis (n=7), neuroendocrine neoplasms (n=7), and others (n=12). Surgical procedures included PD (n=74) and DP (n=29). PF grade B/C was noted in 6 patients (5.8%), without grade C. Univariate analysis showed that POPF predictors were Hb-day1(p=(p=0.016),PLR-day1 (p=0.011), CAR-day1 (p=0.012), CRP-day1 (p=0.011). Multivariate analysis showed that PLR-day1 was independent risk factor for POPF(p=0.034).

**Conclusions:** PLR-day1 ( $33.5 \leq$ ) was early risk predictor for POPF after Pt.

PP04-026

### ALTERNATIVE FISTULA RISK SCORE IS A BETTER PREDICTOR OF IDEAL OUTCOME IN PATIENTS UNDERGOING MINIMALLY INVASIVE PANCREATODUODENECTOMY

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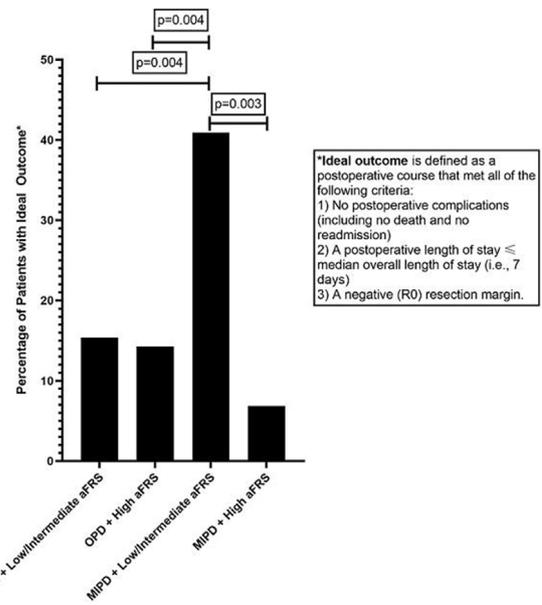
**Background:** The benefit of minimally-invasive (MIPD) versus open pancreaticoduodenectomy (OPD) to patients is controversial. The major driver of morbidity and mortality after pancreaticoduodenectomy is postoperative pancreatic-fistula (POPF). The alternative-fistula risk score (aFRS) is a validated prognostic tool that predicts patients' risk of POPF using three variables (pancreatic duct size, gland texture, and patient BMI). We hypothesized that patients who are not at high risk for POPF benefit most from MIPD.

**Methods:** Patients undergoing pancreaticoduodenectomy were prospectively followed for 40 months. Perioperative and pathologic covariates and outcomes were compared. Patients were categorized as either aFRS-high risk (POPF-risk >20%) or aFRS-low/intermediate-risk (POPF-risk ≤20%). The ideal-outcome (IO) was defined as shown in Figure-1. Multivariable logistic regression was used to test for independent-associations with IO.

**Results:** Out of 312 patients, 212 (83.7%) underwent OPD and 51 (16.4%) underwent MIPD. MIPD patients had significantly longer overall operative time (462.8 min vs. 378.5 min,  $p < 0.001$ ), reduced intraoperative blood loss (280.5 ml vs. 436.0 ml,  $p = 0.001$ ), and a decreased rate of 90-day readmission (15.7% vs. 30.7%,  $p = 0.030$ ). MIPD patients were significantly more likely to be aFRS-high risk (56.9% vs. 40.2%,  $p = 0.028$ ). IO was significantly more frequent in aFRS-low/intermediate-risk patients undergoing MIPD compared to aFRS-low/intermediate-risk patients undergoing OPD, aFRS-high risk patients undergoing either MIPD or OPD (40.9% vs. 15.4% vs. 6.9% vs. 14.3%,  $p = 0.007$ ). In multivariate analysis, MIPD in aFRS-low/intermediate-risk patients was independently-associated with an increased likelihood of IO (OR= 4.09,  $p = 0.012$ ).

**Conclusions:** Patients who are not at high-risk for POPF are most likely to benefit from MIPD. The aFRS could be a useful tool to aid the surgeon experience and expertise in selecting patients for MIPD.

Figure 1



Ideal Outcome in aFRS high vs. low/intermediate risk patients undergoing MIPD/OPD

PP04-027

### LAPAROSCOPIC PANCREATIC SURGERY: SINGLE CENTER EXPERIENCE

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**Introduction:** Laparoscopic pancreatic resections are widely performed. We analyzed short-term operative outcomes of laparoscopic pancreatic surgery, compared to open surgery.

**Method:** We retrospectively reviewed data of 150 patients who underwent distal pancreatectomy (DP) at Chonnam

National University Hospital from 2009 to 2019 and 93 patients who underwent pancreaticoduodenectomy (PD) from 2014 to 2019. We reviewed each patient's age, sex, pathologic diagnosis, hospital stay, operative time, estimated blood loss, morbidity, 30-day mortality, incidence of postoperative pancreatic fistula (POPF), and post-pancreatectomy hemorrhage (PPH).

**Results:** 81 patients underwent open distal pancreatectomy (ODP) and 69 patients underwent laparoscopic distal pancreatectomy (LDP). Intraoperative estimated blood loss was significantly lower in the LDP group than ODP group (200 vs. 400ml  $p < 0.01$ ). There was no significant difference in incidence of POPF ( $p=0.235$ ), morbidity (18 vs. 30  $p=0.152$ ), PPH, wound infection, hospital stay and readmission. Delayed gastric emptying in LDP group occurred less than in the ODP group. 50 open PD (OPD) and 30 laparoscopic PD (LPD) were performed by single surgeon. Median operation time was 422 minutes (range, 210-695) in OPD and 527 minutes (range, 425-910) in LPD. Blood loss of OPD and LPD was 500ml (range, 200-2300) and 300ml (range, 100-3000), respectively. Median hospital stay was shorter in LPD group (15.5 vs 19 days).

**Conclusions:** LDP showed more shorten hospital stay and less blood loss than open surgery. Operation time is longer in LPD group than OPD group. However, Hospital stay was shorter in LPD group. In conclusion, Laparoscopic pancreatic surgery is feasible and safe.

PP04-029

### THE INFLUENCE OF DIAGNOSIS ON COMPLICATIONS AFTER PANCREATODUODENECTOMY: RESULTS FROM A NATIONWIDE AUDIT

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**Introduction:** Comparison of hospital outcomes after pancreaticoduodenectomy requires adjustment for prognostic factors. The objective of this study was to investigate the relation between diagnosis and complications after pancreaticoduodenectomy.

**Methods:** The study was based on the Dutch Pancreatic Cancer Audit that collects data from all 18 hospitals in the Netherlands that perform pancreaticoduodenectomy. Complication rates and mortality were compared between pancreatic ductal adenocarcinoma (PDAC), ampullary adenocarcinoma (AAC), distal cholangiocarcinoma (DCC), duodenal carcinoma (DAC), non-invasive intraductal papillary mucinous neoplasm (IPMN), pancreatic neuroendocrine tumors (pNET), chronic pancreatitis (CP) and other diagnoses.

**Results:** Between 2014 and 2017, 2725 consecutive patients underwent pancreaticoduodenectomy and were included. The most common diagnoses were PDAC in

1215 patients (45%), DCC in 356 patients (13%), AAC in 340 patients (13%), DAC in 165 patients (6%), IPMN in 158 patients (6%), pNET in 107 patients (4%), and CP in 81 patients (3%). Major complication rate (Clavien-Dindo grade  $\geq 3$ ) ranged from 14.8% in CP to 43.9% in pNET ( $p < 0.001$ ). Postoperative pancreatic fistula ranged from 3.7% in CP to 24.3% in pNET ( $p < 0.001$ ). Post-pancreatectomy hemorrhage occurred more often in AAC with an OR of 2.32 (1.37-3.92,  $p=0.003$ ). Mortality was higher in DAC compared to PDAC with an OR of 2.37 (95% CI: 1.21-4.62,  $p=0.019$ ). The proportion of a low-risk diagnosis (i.e. PDAC or CP) varied across hospitals from 24% to 60% ( $P=0.003$ ).

**Conclusions:** Diagnosis should be taken into account when informing patients and designing clinical trials. Audits should adjust for case mix factors such as diagnosis when comparing hospitals.

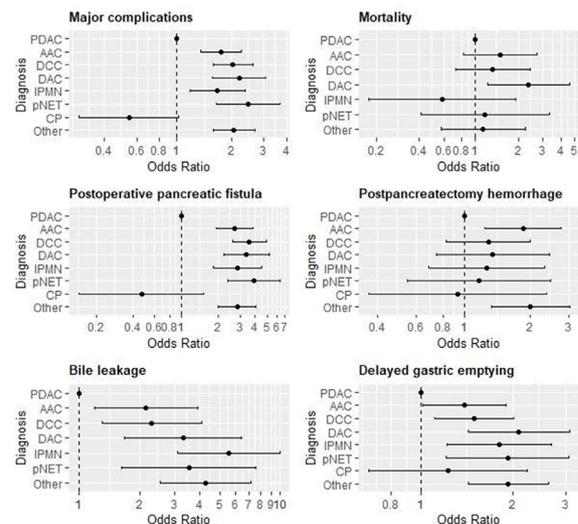


Figure 1: Odds ratios for complications after pancreaticoduodenectomy

PP04-030

### PASIREOTIDE FOR THE PREVENTION OF PANCREATIC FISTULA AFTER PANCREATODUODENECTOMY: COMPARISON WITH A HISTORICAL COHORT

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**Background:** Pasireotide, a somatostatin analogue, aims to reduce the risk of pancreatic fistula after pancreaticoduodenectomy. Based on a reduced fistula rate (9 vs. 21%,  $p=0.006$ ) in a randomized trial, we started the use of postoperative pasireotide twice daily for 7 days after pancreaticoduodenectomy.

**Methods:** All consecutive patients who underwent pancreaticoduodenectomy from 2012 to 2018 were analyzed. Transition to pasireotide was in February 2015. The primary endpoint was the development of an International Study Group on Pancreatic Fistula (ISGPF) grade B or C

fistula. Multivariable analysis was performed for pancreatic fistula with adjustment for BMI, duct size, and pancreatic texture (hard/fibrotic versus soft/normal).

**Results:** During this 6-year period, 387 patients underwent pancreatoduodenectomy; 143 patients (37%) before and 244 patients (63%) after pasireotide introduction. Most patients (83%) underwent an open pancreatoduodenectomy and in most patients (98%) 1 or 2 drains were left. In total, 227 patients (93%) received at least one dosage of pasireotide. The median number of pasireotide dosage was 14 (IQR: 9 - 14). Pasireotide was mostly (67%) discontinued early because of nausea and vomiting. Grade B or C fistula occurred in 28 patients (20%) before versus 51 patients (21%) after pasireotide introduction with an unadjusted Odds Ratio (OR) of 1.09 (95% CI: 0.65 - 1.82) and an adjusted OR of 1.16 (95% CI: 0.64 - 2.09).

**Conclusions:** The rate of clinical relevant pancreatic fistula did not change after introduction of pasireotide prophylaxis following pancreatoduodenectomy.

#### PP04-032

### MEXICAN ONCOLOGICAL REFERENCE HOSPITAL OUTCOMES IN COMPLEX PANCREATIC SURGERY AFTER HPB EUROPEAN FELLOWSHIP. FIRST EXPERIENCE REPORT

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Pancreatic cancer is the fourth malignancy related cancer death in Mexico and U.S. surgical R0 resection is the only potential curative treatment.

After a complete European - Henri Bismuth Institute, France - HPB fellowship, outcomes from 81 patients from 2013 to 2018 with pancreatic cancer and complex pancreatic surgery in a reference Mexican Oncological Hospital are reported.

47% of the procedures were done during the last 2 years, average age was 57y, male gender 56.8%, hospital average stay was 12 days (5-30), surgical time 300 minutes (180-510), bleeding 450 ml (180-2000), pylorus preserving cephalic pancreatoduodenectomy was preferred (54.3%), pancreato-jejunostomy reconstruction was made in 91.4%. venous vascular resection and reconstruction was performed in 15%. Moderately differentiated pancreatic adenocarcinoma was found in 54.3%. most patients reached R1 resection, but R0 resection margins were found in 20%. General morbidity according to Clavien-Dindo score was 49.4%, (13.5% IIIa-IVa), delayed gastric emptying was the most common (23.4%) followed by pancreatic fistula in 19.8%. 30 days mortality (Clavien-Dindo V) was reported in 6 patients (7.4%).

Complex pancreatic surgery in cancer patients is a high risk procedure, with the aim of improving safety and quality outcomes around the world, hospitals with adequate infrastructure and surgeons with a long and formal training in well recognized educational programs in high volume reference centers are mandatory.

#### PP04-034

### ANALYSES FOR CLINICAL OUTCOMES OF GS AND GNP NEOADJUVANT THERAPIES FOLLOWED BY SURGERY FOR BORDERLINE RESECTABLE PANCREATIC CANCER

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To improve the prognosis of pancreatic ductal adenocarcinoma (PDAC) patients, curative resection with multidisciplinary therapy is needed. Consecutive 116 patients with borderline resectable (BR) PDAC who underwent pancreatotomy from Jan 2008 to Dec 2018 were analyzed. We assessed the clinical significance of neoadjuvant therapy (NAT), and compared the clinical impact between gemcitabine plus S-1 (GS) and gemcitabine plus nab-paclitaxel (GnP) for neoadjuvant chemotherapy (NAC) in BR PDAC (n=62). Comparing between surgery first (SF: n=45) and NAT (n=71) group, the Kaplan-Meier analysis showed that median survival time (MST) for overall survival were 22.2 months for SF and 29.2 months for NAT (p=0.057). Focusing on the differences of strategy for NAT, we compared the clinical outcomes of patients between GS (n=36) and GnP (n=26). The mean of NAC duration was 3.2 months for GS and 2.8 months for GnP. Among the clinico-pathological parameters, no differences of backgrounds for patients were observed between these two regimens. The response rates for RECIST criteria were 33.3% for GS and 38.5% for GnP. The decrease rate of CA19-9 during NAC were 51.6% for GS and 67.7% for GnP (p=0.07), whereas the rate of N2 positive in GS was significantly lower than that in GnP (p=0.009). The MST for overall survival were 29.2 months for GS and 24.2 months for GnP in BR, notably, 40.0 months for GS and 27.1 months for GnP in BR-A. Randomized prospective studies for the optimal NAC will be warranted for the strategy of treatment for patients with BR PDAC.

#### PP04-035

### ADVANCED AGE IS A STRONGLY BENEFIT FOR PATIENTS UNDERGOING LAPAROSCOPIC PANCREATODUODENECTOMY, COMPARATIVE STUDY

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**Background:** Past papers have reported that elderly patients undergoing laparoscopic pancreatoduodenectomy (LPD) are at an increased risk compared to non-elderly patients. The aim of this paper is to compare a single centre risk of LPD in elderly and non-elderly patients.

**Methods:** Retrospective review (n = 237) of perisurgical outcomes in patients undergoing LPD during the months of September 2013-December 2017. Outcomes in elderly patients (aged  $\geq 75$  years) were compared with those in non-elderly patients.

**Results:** In elderly patients, transfer to ICU was more frequent (odds ratio [OR] 6.49, P = 0.001) and mean hospital stay was lengthier (21.4 days compared with 16.6 days, P = 0.0033) than for non-elderly patients. There was no statistically significant difference in operation time (P=0.494), estimated blood loss (P=0.0519), blood transfusion (P=0.863), decreased gastric emptying (DGE) (P=0.397), abdominal pain (P=0.454), food intake (P=0.241), time to self ambulation (P=1), reoperation (P=0.543), postoperative pancreatic fistula (POPF) grade A (P=0.454), POPF grade B (P=0.736), POPF grade C (P=0.164), hemorrhage (P=0.319), bile leakage (P=0.428), infection (P=0.259), GI bleeding (P=0.286), morbidity (P=0.272) or mortality (P=0.449) between the two groups.

**Conclusions:** Rate of ICU admission and hospital stay were both increased in elderly patients undergoing LPD when compared with non-elderly ones. LPD can be performed on elderly patients with similar mortality, morbidity and outcomes to younger patients; therefore age alone should not be a contraindication.

PP04-036

### COMPARISON BETWEEN LONG AND SHORT-TERM VENOUS PATENCIES AFTER PANCREATODUODENECTOMY WITH PORTAL/SUPERIOR MESENTERIC VEIN RESECTION STRATIFIED BY RECONSTRUCTION TYPE

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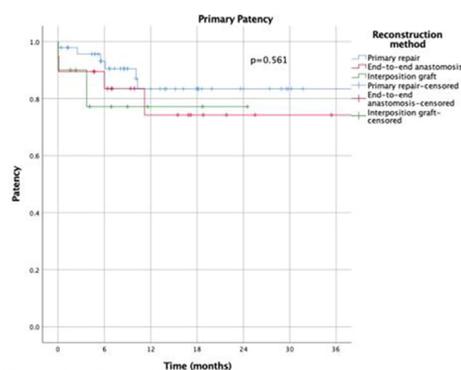
Pancreatic surgery was traditionally contraindicated for tumours adherent to the portal vein (PV) and/or superior mesenteric vein (SMV). Recently, venous resection and/or reconstruction has been demonstrated to be feasible and safe for tumours with invasion into PV and/or SMV. This study aims to compare the patency between various venous reconstructions (VR).

This is retrospective study of 76 consecutive patients who underwent pancreaticoduodenectomy or total pancreatectomy with isolated VR from 2006 to 2018. Demographics, tumour histopathology, morbidity, mortality and patency were studied. Kaplan-Meier estimates were performed for primary venous patency.

Sixty-two patients underwent pancreaticoduodenectomy and 14 underwent total pancreatectomy. Forty-seven, 19 and 10 patients underwent primary repair (PR), end-to-end anastomosis and interposition graft (IG) respectively.

Overall morbidity, major morbidity (Clavien-Dindo  $>$  grade 2) and 30-day mortality were 41/76(53.9%), 14/76(18.4%) and 1/76(1.3%), respectively. Twelve patients (15.8%) had venous occlusion including 4(5.3%) acute occlusions within 30 days. Overall 6-month, 1-year and 2-year primary patency was 89.1%, 92.5% and 92.3% respectively. 1-year primary patency of PR was superior to end-to-end anastomosis and IG (PR 100%, end-to-end anastomosis 81.8%, IG 66.7%, p=0.045). Pairwise comparison also demonstrated superior 1-year patency of PR (adjusted p=0.037). Kaplan-Meier estimates demonstrated 80% cumulative overall 2-year venous patency. There was no significant difference between the cumulative venous patency for each VR method (Figure 1): 84  $\pm$  6% for PR, 75  $\pm$  11% for end-to-end anastomosis, 76  $\pm$  15% for IG (p=0.561).

Comparison between venous patency by reconstruction type demonstrated superior 1-year primary patency of PR compared to end-to-end anastomosis and IG.



No. at risk (months)	0	6	12	18	24	30	36
Primary repair	43	31	20	14	9	5	2
End-to-end anastomosis	18	13	7	4	3	2	1
Interposition graft	9	4	2	2	1	NA	NA

Figure 1: Comparison of primary patency rates among primary repair, primary end-to-end anastomosis and interposition graft

PP04-037

### IMPLEMENTATION OF AN ERAS PROTOCOL FOR PANCREATODUODENECTOMY IN A LOW VOLUME CENTER FOR PANCREATIC SURGERY

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**Introduction:** Enhanced Recovery After Surgery (ERAS) pathways were implemented in the perioperative care after pancreaticoduodenectomy (PD) in high volume centers. Evidence is lacking about the safety of an ERAS pathway for PD in low volume centers.

**Aim:** To study if the implementation of an ERAS pathway for PD in a low volume center was safe.

**Methods:** Patients undergoing elective pancreaticoduodenectomy within an ERAS protocol between 1 October 2013 and 30 September 2019 were considered for the study and outcome was compared between the first and second period of the study. Primary endpoint was the achievement of

postoperative key targets of the ERAS protocol. Secondary endpoints were complications and mortality within 90 days postoperatively, readmissions and postoperative hospital stay.

**Results:** Forty-five patients could be analysed. The two groups were balanced for demographic, clinical and histological variables. In the second periode more patients achieved ERAS key targets: nasogastric tube removal, oral fluids, drain removal and hospital discharge at postoperative day (PoD) 9. The rates of postoperative complications, mortality, reoperations and readmissions were not significantly different between both groups and comparable to data reported for high volume centres.

**Conclusion:** In the present study an ERAS pathway for pancreaticoduodenectomy was implemented safely in a low volume center for pancreatic surgery.

PP04-038

### **DRAINAGE TUBE MANAGEMENT AFTER PANCREATODUODENECTOMY USING FISTULOGRAPHY FINDINGS**

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**Introduction:** The management of pancreatic fistula (PF) in pancreaticoduodenectomy (PD) is directly related to postoperative outcomes. The purpose of this study is to report drainage management for PF in our department.

**Methods:** PD with using the modified Blumgart method was performed in 222 patients at our department from 2013 to 2018. The definition of PF was defined as ISGPS classification in 2016. Two drains were placed beside the pancreaticojejunostomy. D-AMY was measured on postoperative day (POD) 1, 3, and 4. When the D-AMY on POD3 exceeded 1000 U/L, the drain was replaced. Moreover, when the only fistula (defined as fistulous type: FT) was shown in contrast examination (C-Ex), it was removed without exchanging.

**Results:** As for PF, 69 (31.1%) were biochemical leakage (BL), 38 (17.2%) were CR-POPF. There were 155 patients with D-AMY of 1000 U/L or less on POD 3 and 4. CR-POPF was recognized in 10 patients of them. Of the 55 patients with performing C-Ex, 33 showed CR-POPF as a result. When FT findings was shown in first C-Ex, 14(63.6%) developed BL or no leakage and 6(18.2%) developed CR-POPF ( $p < 0.01$ ). FT findings are thought to be the sign of early recovery from PF. The sensitivity and specificity of CR-POPF using D-AMY (cut-off 1000 U/L on POD3 and 4) and drain removal with C-Ex findings are 73.7% and 81.0%.

**Conclusion:** High sensitivity and specificity were achieved by the management strategy for drain removal based on contrast findings.

PP04-039

### **IMPROVED OUTCOMES WITH MINIMALLY INVASIVE PANCREATODUODENECTOMY IN PATIENTS WITH DILATED PANCREATIC DUCTS: A PROSPECTIVE STUDY**

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**Background:** We hypothesized that patients with dilated pancreatic ducts have improved postoperative outcomes with MIPD compared to OPD.

**Methods:** All patients undergoing pancreaticoduodenectomy between April 2016 and July 2019 were prospectively followed, and perioperative and pathologic variables were compared. Patients with dilated pancreatic ducts ( $\geq 3$ mm) who underwent MIPD (Robotic/ Laparoscopic) were propensity score matched to patients with dilated ducts who underwent OPD and outcomes compared. Likewise, patients with non-dilated pancreatic ducts ( $< 3$ mm) were similarly compared. The primary outcome was a composite measure termed the ideal outcome (IO) which required patients to achieve negative margins; experience no complications or readmission and be discharged within seven days.

**Results:** 312 patients underwent PD- 51 (16.4%) MIPD and 212 (83.7%) OPD. Patients who underwent MIPD had significantly longer operative times, less intraoperative blood loss, and a lower rate of 90-day readmission. Patients with dilated pancreatic ducts who underwent MIPD ( $n=30$ ) had significantly increased intraoperative times, less intraoperative blood loss, less postoperative bleeding/anemia complications, lower overall complication rate, and were discharged from the hospital 3.5 days faster compared to matched OPD patients ( $n=90$ ) with dilated ducts. MIPD in patients with dilated pancreatic ducts was independently associated with increased IO (OR= 3.04,  $p=0.021$ ) (Table 3).

**Conclusion:** Patients with pancreatic ducts  $\geq 3$ mm appear to derive the most benefit from MIPD in terms of less complications and shorter hospital stay.

PP04-040

### **OUR EXPERIENCES WITH PANCREATODUODENECTOMY: RISK FACTORS AND OUTCOMES ANALYSIS**

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Pancreatoduodenectomy (PD) is the main surgical option for pancreatic neoplasms, duodenal neoplasms and other

lesions located in the pancreatic head and periampullary region. Despite the prompt progress in surgical technologies and the persistent innovation of postoperative treatments over the last decades, post-pancreaticoduodenectomy complications (PPCs) remains high, which may lead to several potential poor outcomes, including prolonged hospital stays, increased medical costs and mortality. The purposes of this study were to analyze all type of PPCs and to identify associated factors related.

Cross-sectional design was used. Patients, who underwent PD in Fatmawati General Hospital Jakarta between January 2017 and December 2018 were retrospectively analyzed.

We classify PPCs for 45 patients who had undergone PD, ten variables were considered significant predictors of serious complications. The predictors included age, sex, obesity, smoking status, the presence of a comorbidity, nutritional status, combined vascular resection, intra-operative blood transfusion, serum albumin and bilirubin laboratory. Clinically, the most relevant postoperative complication of PD is a pancreatic fistula (PF), which is often associated with the development of life-threatening intra-abdominal complications.

Pancreaticoduodenectomy remains the only curative option for patients with a malignant neoplasm. Good pre-operative assessment and preparation support reduced the morbidity and mortality rate associated with PD

#### PP04-041

### REAPPRAISAL OF CLINICAL INDICATION REGARDING TOTAL PANCREATECTOMY: CAN WE DO IT FOR RISKY GLAND?

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**Background:** Although Total pancreatectomy (TP) is performed at an increasing rate at major pancreatic centers, there is still debate regarding its indications and outcomes. This study aimed to analyze the indications and outcomes of TP.

**Methods:** We conducted a retrospective study of 64 patients who underwent TP between January 2011 and December 2019 at two academic hospitals using data collected from an institutional database. The preoperative data, including demographic data and clinical picture, operative details, and postoperative data were collected and analyzed.

**Results:** During study periods, 70 TP were performed for benign and malignant pancreatic diseases. After excluding six TP undergone due to trauma or complication, 64 consecutive elective TP underwent. Indication of TP were for intraductal papillary mucinous neoplasms (IPMN) (n=14, 21.9%), pancreatic adenocarcinoma (n=40, 62.5%), other neoplasm (n=9, 14.1%), and chronic pancreatitis (n=1, 1.6%). We compared clinical data between conventional indication (n=47, 73.4%) and risky glands (n=17,

26.6%). Risky glands were fatty pancreas (n=5), atrophic remnant (n=5), severe inflammation on remnant (n=4), and small p-duct (n=3). There was no significant difference of clinical data between two groups. Thirty-day major morbidity and mortality was 9.4% and 0%, respectively. With a median follow-up length of 21.5 months, 47 (73.4%) patients were alive at last follow-up. Median HbA1c values at 12 months after surgery were 7.8.

**Conclusions:** Total pancreatectomy appears to be an appropriate option for selected patients with conventional indication and be a viable option for risky glands in terms of surgical safety.

#### PP04-042

### SURVIVAL ANALYSIS AFTER WHIPPLE'S PANCREATICODUODENECTOMY FOR ADENOCARCINOMA IN A TERTIARY REFERRAL CENTRE IN INDIA

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**Introduction:** Prognosis for Pancreatic Cancer remains poor despite advances in multimodality treatment. This study aims to determine the survival of patients undergoing pancreaticoduodenectomy (PD) for adenocarcinoma and also to compare the survival outcomes between standard PD versus with the addition of total mesopancreatic excision(TMpE).

**Methods:** Retrospective analysis of prospectively compiled data of patients who underwent PD for adenocarcinoma between 2003 - 2017.

**Results:** The median disease-free survival (DFS) and overall survival (OS) was 30(20 - 39months) and 39 months(30 - 47 months) respectively(N=239). With the addition of TMpE, median DFS was 45months(26 - 49 months) (p- 0.045) and OS was 48 months(28 - 67 months) (0.109). The difference in DFS was statistically significant while there was a trend towards increased OS, however it was not statistically significant. LN yield also increased significantly after addition of TMpE (p - 0.009). On univariate analysis, margin positivity, higher stage of the disease, presence of positive LN, lymphovascular and perineural invasion decreased OS/DFS significantly. Adjuvant chemotherapy increased DFS/OS. Only 1 patient (N=277) had margin positivity since TMpE. On multivariate analysis adjuvant chemotherapy, LN positivity, perineural invasion and higher stage were significantly associated. Patients with tumours arising from pancreas had worst prognosis (p - 0.006) and with tumours from ampulla had best prognosis. Postoperative mortality was 1.08%(N=3), less than all published series from India.

**Conclusion:** Our study shows better OS and DFS compared to published literature. Survival improved with the addition of TMpE. Radical surgery remains a cornerstone in the multimodality treatment of pancreatic cancer.

PP04-043

### IMPACT OF ARTERY-FIRST PANCREATODUODENECTOMY INCLUDING WHOLE LYMPHADENECTOMY AROUND SUPERIOR MESENTERIC ARTERY BUT PRESERVING WHOLE NERVE PLEXUS FOR RESECTABLE T3 DUCTAL ADENOCARCINOMA OF THE PANCREATIC HEAD

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**Introduction:** Artery-first pancreatoduodenectomy (AF-PD) has a positive impact on short- and long-term outcome as compared to the conventional PD (C-PD). However, appropriate AF-PD may be still unclear when focusing on extent of lymphadenectomy, or that of nerve plexus dissection around the superior mesenteric artery (SMA).

**Methods:** We investigated recurrence and survival in 88 patients with pancreatic ductal adenocarcinoma of the head (PDAC-H) who underwent PD. Forty-five patients underwent AF-PD with the lymphadenectomy around the SMA but without nerve plexus dissection around SMA (AF-PD group), and forty-three patients underwent PD without artery-first approach, i.e., without left side lymphadenectomy at the SMA (C-PD group).

**Results:** The median amounts of blood loss were significantly lower in the AF-PD group than in the C-PD group ( $P=0.0210$ ). The numbers of totally dissected lymph nodes were significantly greater in the AF-PD group than in the C-PD group ( $P=0.0165$ ). The incidence of recurrence rate of the lymph node (LN) around SMA (No. 14 LN) was significantly lower in the AF-PD group (20%) than in the C-PD group (39.5%,  $p=0.045$ ). The median survival after PD was significantly higher in the AF-PD group (40.3 months) than in the C-PD group (22.6 months,  $p=0.014$ ).

**Conclusions:** The present data showed that PD based on artery-first approach and lymphadenectomy whole around SMA but preserving whole nerve plexus in patients with T3 PDAC-H may prevent LN recurrence around the SMA and may result in longer survival.

PP04-044

### PANCREAS-PRESERVING TOTAL DUODENECTOMY: A SYSTEMATIC REVIEW

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**Introduction:** The management of the pancreas in patients with duodenal trauma or duodenal tumors remains a controversial issue. Pancreas-preserving total duodenectomy is a procedure that requires a meticulous surgical technique as well as a thorough and detailed knowledge of

peripancreatic anatomy. The most common indication is familial duodenal adenomatous polyposis.

The aims of this study are to carry out a systematic review of the literature on the indications for pancreas-preserving total duodenectomy, to highlight the risks and benefits, and to demonstrate the significant reduction in mortality compared with other aggressive surgical techniques.

**Methods:** Regulated systematic literature review following PRISMA recommendations of all studies published in PubMed, Embase, and Cochrane library with no limits on year of initial publication until 31 May 2019. A total of 30 articles describing 211 patients that met the inclusion criteria were chosen.

**Results:** The mean age was 48 years. Seventy-five per cent of patients presented an initial surgical indication of familial adenomatous polyposis (98% Spigelman stages III-IV). The mean operating time was 329 minutes, and mean intraoperative bleeding 412 ml. Postoperative morbidity rate was 49.7% (76% with Clavien-Dindo < IIIa) and mortality rate 1.4%. The mean hospital stay was 22 days. Overall survival at 1-3-5 years was > 97.8%.

**Conclusions:** Pancreas-preserving total duodenectomy is indicated for patients with benign and premalignant duodenal lesions without involvement of the pancreatic head. It is a safe and feasible procedure that reduces risks and increases peri-operative benefits compared to other aggressive surgical techniques. Mortality is below 1.5%.

PP04-045

### DECREASED NATIONAL PANCREATIC FISTULA RATES WITH MINIMALLY INVASIVE PANCREATODUODENECTOMY: AN EVOLVING BENEFIT OVER THE OPEN APPROACH?

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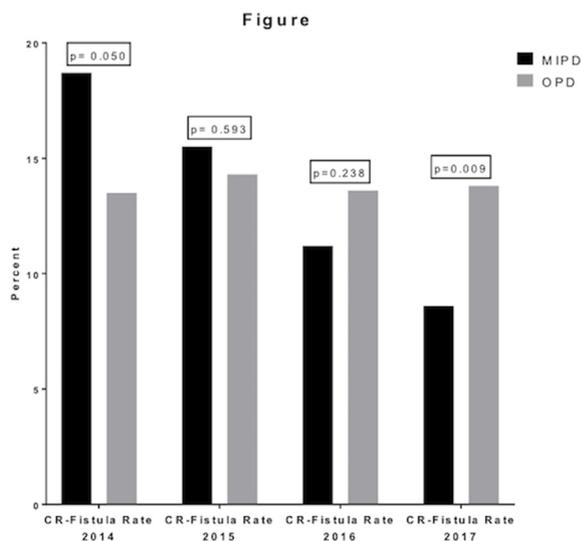
**Introduction:** We hypothesized that national minimally invasive pancreaticoduodenectomy (MIPD) outcomes would improve over time to show a benefit over open pancreaticoduodenectomy (OPD), and that the rates of clinically relevant postoperative pancreatic fistula (CR-PF) would decrease.

**Methods:** All patients in the NSQIP database undergoing MIPD or OPD between 2014 and 2017 were included in the study. Patient variables, outcomes, and rates of CR-PF were compared between each year. Patients were stratified into two eras (2014-2015 and 2016-2017), MIPD patients were propensity score matched to OPD patients (1:3) and their outcomes compared within each era.

**Results:** 13,373 patients underwent pancreaticoduodenectomy between 2014-2017: 12,303 (92.0%) OPD and 1,070 MIPD (8.0%). When comparing CR-PF rates in each year, CR-PF rates went from being significantly higher after MIPD in 2014 (18.7% vs 13.5%,  $p=0.050$ ) to being significantly lower in 2017 (8.6% vs 13.8%,  $p=0.009$ ) (**Figure**). After 1:3 propensity score matching MIPD patients ( $n=440$ ) to OPD patients ( $n=1320$ ) in era 1, MIPD was associated with a significantly increased rate of 30-day

readmission (20.5% vs 14.8%,  $p=0.005$ ). In era 2, MIPD ( $n=630$ ) was associated with significantly decreased rates of CR-PF (9.8% vs 14.8%,  $p=0.002$ ), organ space infection (12.4% vs 16.9%,  $p=0.007$ ), sepsis (5.7% vs 8.9%,  $p=0.011$ ), and myocardial infarction (0.2% vs 1.0%,  $p=0.046$ ) along with a significantly decreased length of stay (9.7 vs 10.7 days,  $p=0.013$ ) compared to OPD ( $n=1890$ ).

**Conclusion:** National MIPD outcomes in the NSQIP database have significantly improved over time, and MIPD has significant perioperative benefits over OPD in recent years.



#### PP04-046

### INVESTIGATION OF PREDICTIVE FACTORS OF EARLY RECURRENCE AFTER PANCREATECTOMY FOR A PANCREAS CANCER

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Postoperative early recurrence is a frequently observed serious problem, even after a macroscopically curative resection in patients with pancreatic adenocarcinoma. The effect of adjuvant chemotherapy may be limited in these patients.

A dismal prognosis after early recurrence indicates the limitation of upfront surgery and adjuvant chemotherapy strategy, and alternative strategy, such as neoadjuvant chemotherapy may be suitable for them.

In this study, we retrospectively investigated predictive factors of early recurrence in 176 patients who underwent pancreatectomy for invasive ductal carcinoma of the pancreas in our institution from 2011-2020. Early recurrence was defined as recurrence within 6 months after the operation.

In the multivariate analysis, BMI < 19 and preoperative CA19-9 level > 100 U/ml and, PV invasion and lymph node metastasis in preoperative CT and tumor size > 35 mm were the independent predictive factors of postoperative early recurrence.

The patients with BMI < 19 and preoperative CA19-9 level > 100 U/ml and, PV invasion and lymph node metastasis in preoperative CT and tumor size > 35 mm may be good candidates for neoadjuvant chemotherapy.

#### PP04-047

### CLINICAL SIGNIFICANCE OF CARCINOMA *IN SITU* AT PANCREATIC CUT MARGIN DURING PANCREATECTOMY FOR PANCREATIC CANCER

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**Introduction:** During pancreatectomy for pancreatic ductal adenocarcinoma (PDAC), additional pancreatic resection is generally performed when pancreatic cut margin (PCM) is cancer positive by intra-operative frozen section analysis. However, the clinical significance of carcinoma in situ (CIS) at a pancreatic cut margin has not been established. **Methods:** We retrospectively reviewed the records of 792 consecutive patients who underwent pancreaticoduodenectomy (PD) or distal pancreatectomy (DP) for PDAC at our hospital from 2000 to 2018. Patients who underwent R2 resection, received preoperative chemotherapy, or died in-hospital were excluded. Based on the final pathologic diagnosis of PCM, patients were divided into the following four groups: Group A, initial PCM negative for cancer; Group B, initial PCM positive for cancer (CIS: Group B-1, invasive cancer: Group B-2), but negative after additional pancreatic resection; Group C, final PCM positive for CIS; and Group D, final PCM positive for invasive cancer. The prognoses of the four groups were compared.

**Results:** Groups A, B-1, B-2, C, and D consisted of 574, 43, 105, 33, and 37 patients, respectively, with median survival times of 22.7, 26.9, 23.2, 23.8, and 11.9 months, respectively. Overall survival rates of Groups B-1, B-2, and C were not significant differences compared with that of Group A. However overall survival rate of Group D was significantly worse than that of Group A ( $P=0.021$ ).

**Conclusion:** Additional pancreatic resection for invasive cancer positive cut margin may improve postoperative survival. However, the presence of CIS at pancreatic cut margin may not always warrant further resection.

#### PP04-048

### RETROSPECTIVE STUDY ABOUT SEVEN CASES OF TOTAL REMNANT PANCREATECTOMY FOR REMNANT PANCREATIC CANCER

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**Introduction:** There are few reports about the cases of remnant pancreatic cancer after surgery for pancreatic malignancy. However, in recent years, opportunities for total remnant pancreatectomy have increased with the progress of surgery, perioperative management and

chemotherapy. We investigated the cases of remnant pancreatectomy in our institute.

**Methods:** 292 patients underwent pancreatectomy for pancreatic malignancy from May 2007 to December 2019 in our institute. There were seven patients who underwent remnant pancreatectomy for remnant pancreatic cancer. These seven cases were retrospectively analyzed.

**Results:** The depth of invasion was T1 in 1 case, T3 in 6 cases. Lymph node metastasis was observed in 3 cases. The stage was IA in 1 case, IIA in 3 cases and IIB in 3 cases. Total remnant pancreatectomy was performed after distal pancreatectomy in 2 cases, and after pancreaticoduodenectomy in 5 cases. Three cases were histologically proven as recurrent pancreatic cancer. On the other hand, four cases had different histological findings. Therefore, these four cases were considered as metachronous pancreatic cancer. The mean disease free survival of recurrent group and metachronous group were 31 months and 62.5 months, respectively. Mean survival time after the first operation of recurrent group and metachronous group were 57 months and 84 months. No significant difference was observed, but it was longer in metachronous cases. Both recurrent and metachronous groups had one case who survived over 3 years each.

**Conclusion:** Cases of metachronous pancreatic cancer had a longer time to recurrence. Some cases may obtain long term survival by total remnant pancreatectomy.

PP04-049

### PREOPERATIVE BILIARY STENTING VERSUS UNSTENTED PANCREATICODUODENECTOMY (WHIPPLE'S PROCEDURE) - A COMPARATIVE STUDY OF EARLY OUTCOMES

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**Introduction:** Routine preoperative biliary drainage prior to a Whipple's procedure is still common in the UK. Recent NICE guidelines (2018) recommend proceeding to unstented surgery in suitable patients. There is level 1 evidence that demonstrates preoperative biliary stenting increases post-operative complications as opposed to early surgery. The study was done to review a single centre experience of early outcomes following stented versus unstented Whipple's procedure.

**Methods:** This is a retrospective review of a prospectively maintained database. 104 patients who underwent a Whipple procedure in 3 years were included. 46 patients underwent preoperative stenting and 58 had Whipple's without stenting. The primary outcomes were rates of pancreatic fistula, bleeding, intra-abdominal collection and wound infections within 90 days post-surgery. The analysis was done using descriptive statistics and non-parametric tests. A two sided significance of p value < 0.05 was considered, with 95% confidence intervals.

**Results:** In Whipple's with preoperative biliary stenting - postoperative pancreatic fistula was seen in 19.56% of

patients, bleeding in 10.86%, intra-abdominal collections in 19.56% while wound infection was noted in 26.08%. In the unstented group 27.58% had pancreatic fistula, 24.13% had collections and 5.175% had wound infection. In our study, patients with unstented Whipple's had similar outcomes (albeit not statistically significant) to stented Whipple's, except the rate of wound infection, which was more in stented (p value -0.004).

**Conclusion:** Unstented Whipple's has the potential of shortening the patient pathway and time to definitive treatment. Hence, we advocate increasing adoption of the surgery first approach in suitable patients.

#### Analysis of outcomes - primary and secondary.

Outcomes	Unstented (n =58)	Stented (n =46)	p Value
POPF	16 (27.58%)	9 (19.56%)	0.342
Bleeding	3 (5.1755%)	5 (10.86%)	0.461
Intra-abdominal collection	14 (24.13%)	9 (19.56%)	0.545
Wound infection	3 (5.175%)	12 (26.08%)	0.004
Delayed gastric emptying	8 (13.8%)	6 (13.04%)	0.911
Re-exploration	3 (5.175%)	5 (10.8%)	0.461
Readmissions	1 (1.7%)	2 (4.34%)	0.582
Death within 90 days	5 (8.6%)	3 (6.52%)	0.611
Death within 30 days	2 (3.4%)	2 (4.34%)	0.612

PP04-050

### SURGICAL THERAPY FOR PATIENTS WITH CHRONIC AND RECURRENT ACUTE PANCREATITIS: PARENCHYMAL PRESERVING OR TOTAL PANCREATECTOMY WITH AUTOLOGOUS ISLET CELL TRANSPLANT

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**Introduction:** Surgeons are often biased for choosing either the parenchymal preserving surgery (PPS) or the total pancreatectomy with autologous islet cell transplant (TPAIT) for chronic or recurrent pancreatitis (CP), depending on their personal beliefs and the availability of the islet isolation facilities. Aim is to evaluate the outcomes of both PPS and TPAIT at a single center having capacity to offer both surgeries.

**Methods:** 152 patients with CP were evaluated between September 2017 to 2019; 32 were offered surgery based on the algorithm in Figure 1. Each surgery was performed by a single surgeon, alleviating potential bias due to surgeon preference or technical expertise. Quality of life (QOL), glycemic control, and reduction in narcotic use was evaluated in each patient. Outcomes were compared using Pearson's  $\chi^2$  test, student's t-test, and Kruskal-Wallis rank test.

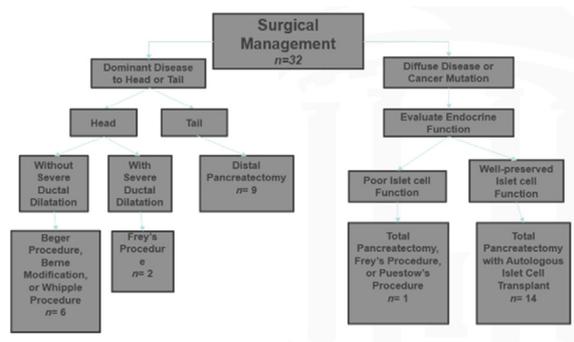
**Results:** Post-operatively 100% of TPAIT patients and 93.3% of PPS patients reported great improvement in QOL by 3 months (p=0.3). At 2 months only 7 (63.6%) of TPAIT and 6 (60.0%) of PPS patients required narcotics. All PPS

patients weaned off narcotics by 3 months; however, 1 TPAIT patient continued to require narcotics at 1 year. Endocrine variables are shown in Table 1. 4 (28.6%) of TPAIT patients completely insulin independent. No hypoglycemic morbidity-mortality occurred.

**Conclusion:** While TPAIT patients may have insulin requirement post-operatively, overall outcomes are comparable. In patients with non-localized disease, advantages of TPAIT in terms of preventing pain, pancreatic cancer and avoiding hypoglycemic complication cannot be overlooked when compared with PPS surgery.

**Table 1.** Endocrine outcomes following TPAIT vs. PPS

	TPAIT	PPS	p-value
All patients Insulin dependent, n (%)			
At 3 months	9 (75.0)	2 (33.3)	0.09
At 1 year	4 (100)	2 (66.7)	0.2
Pre-operatively diabetic/pre-diabetic insulin dependent, n (%)			
At 3 months	6 (100)	2 (66.7)	0.1
At 1 year	2 (100)	2 (66.7)	0.8
Pre-operatively non-diabetic insulin dependent, n (%)			
At 3 months	3 (50.0)	0 (0)	0.1
At 1 year	2 (100)	NR	NA



Algorithm for selection of surgical therapy for patients with chronic pancreatitis.

#### PP04-051

### ROBOTIC PANCREATECTOMY IS SAFE AND FEASIBLE: AN INITIAL AUSTRALIAN EXPERIENCE

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**Introduction:** Pancreatic resections remain highly morbid despite advances in techniques and systemic changes such as centralisation. The technical advantages of robotic resection over laparoscopic and open approaches include stable 3D vision, wide range angulation of instruments, elimination of tremor and proficient intra-corporeal knot tying. Robotics also carries inherent risk as a new

technology and as such the safety and efficacy of robotic pancreatectomy is still being investigated.

**Methods:** All patients undergoing robotic pancreatectomy at The Wesley Hospital and Royal Brisbane Hospital (Queensland, Australia) between May 2014 - December 2019 were analysed. Ethics board approval was obtained for the study.

**Results:** Fifty-one patients underwent robotic pancreatectomy during the study period. There were 25 pancreaticoduodenectomy, 13 distal pancreatectomy with splenectomy, 10 spleen-preserving distal pancreatectomy and 3 enucleations performed. Three unplanned conversions to open occurred (6%) whilst 5 patients had hybrid procedures for vein resections all during pancreaticoduodenectomy. Twenty-three cases were undertaken for malignant pathology with 29% of these cases having R1 (< 1mm) resection margins. Major morbidity (Clavien-Dindo grade 3b or greater) was observed in 10 patients (20%) with 7 cases (14%) of post-operative pancreatic fistula grade B/C. There were two in-hospital mortalities secondary to pulmonary embolus and fulminant hepatic failure, respectively.

**Conclusion:** Based on this initial Australian experience robotic pancreatectomy is safe and feasible with comparable complication rates to that described in the literature for open and laparoscopic procedures.

#### PP04-052

### GLYCEMIC OUTCOMES OF PARENCHYMAL PRESERVING SURGERY COMPARED TO TOTAL PANCREATECTOMY WITH AUTOLOGOUS ISLET CELL TRANSPLANT WHEN STRATIFIED BY PRE-OPERATIVE TYPE 3 DIABETIC STATUS

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**Introduction:** Surgery for chronic pancreatitis (CP) can result in type 3c diabetes with severe hypoglycemic events (SHE) and hypoglycemic unawareness (HU). The aim of this study is to compare glycemic outcomes between total pancreatectomy and autologous islet cell transplant (TPAIT) and parenchymal preserving surgery (PPS).

**Methods:** All patients undergoing CP surgery at a single center from 2017-2019 were included. Glycemic outcomes were compared between 2 groups: (1) TPAIT and (2) PPS and stratified between pre-operatively diabetic/pre-diabetic (DM) and non-diabetic (NDM).

**Results:** 32 patients underwent surgery, 14 (43.8%) TPAIT and 18 (56.2%) PPS. In Group 1, 6 (42.9%) patients had DM pre-operatively. Following TPAIT, 9 (64.3%) patients were insulin dependent at discharge (6 [100%] DM vs. 3 [37.5%] NDM,  $p = 0.02$ ). In Group 2, 12 (66.7%) had DM pre-operatively, 2 (16.7%) insulin dependent. While 4 (33.3%) in Group 2 required insulin at discharge, 2 had weaned off by 3-month follow up. Between TPAIT and PPS, there was a significant difference in number of patients requiring insulin in the immediate post-operative period (64.3% vs. 22.2%,  $p = 0.02$ ). However, by 3 months

there was no significant difference when stratified by pre-operative DM status. No patient in either group experienced SHE or HU.

**Conclusion:** While more patients required insulin following TPAIT than PPS, when stratified by pre-operative diabetic status, there was no statistical difference in glycemic outcomes over time. Therefore, apprehension regarding type 3c diabetes should not be a hindrance to choosing TPAIT in patients with diffuse pancreatic disease.

intolerance at 14 days after operation (OR=2.861, P=0.004), and adjuvant radiotherapy (OR=3.156, P=0.035) were associated risk factors for NAFLD.

**Conclusion:** A high incidence of NAFLD after pancreaticoduodenectomy and many risk factors as the outcomes of this study give consideration to search for the pathogenesis, subsequent morbidity, and interventions to prevent this complication in the future.

**PP04-052** Number of patients requiring insulin when stratified by pre-operative type 3 diabetic status

	Total (n= 32)	Non-diabetic TPAIT (n= 8)	Non-diabetic PPS (n=6)	p Value	DM/Pre-DM TPAIT (n= 6)	DM/Pre-DM PPS (n= 12)	p Value
Pre- operatively, n (%)	3 (9.4%)	0 (0)	0 (0)	NA	1 (16.7%)	2 (16.7%)	1.00
At Discharge, n (%)	13 (40.6%)	3 (37.5%)	0 (0)	0.09	6 (100%)	4 (33.3%)	0.007
At 1 month, n (%)	13 (56.5%)	4 (80.0%)	0 (0)	0.02	6 (100%)	3 (37.5%)	0.02
At 3 months, n (%)	11 (61.1%)	3 (50.0%)	0 (0)	0.1	6 (100)	2 (66.7)	0.1

PP04-054

**A HIGH INCIDENCE OF NONALCOHOLIC FATTY LIVER DISEASE (NAFLD) AFTER PANCREATODUODENECTOMY AND THE ASSOCIATED RISK FACTORS**

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**Introduction:** The purposes of this study were to determine the incidence of NAFLD after pancreaticoduodenectomy and search for the risk factors for this complication.

**Methods:** Two hundred and eighty-four patients who had undergone pancreaticoduodenectomy in Rajavithi Hospital between October 2006 and June 2016 were studied retrospectively. Forty-one patients with preoperative fatty liver, chronic viral hepatitis type B or C, heavy alcohol consumption, loss to follow up during postoperative period, and unavailable postoperative CT scan were excluded. Approximately one year after the operation, an average CT attenuation values in four hepatic segments (segment II, IVa, VIII, and VII) and one splenic area were measured to reach the diagnosis of NAFLD (liver-to-spleen ratio < 0.9). All data of the patients were collected for analysis.

**Results:** A total of 243 patients were studied, including 118 males and 125 females, with a mean age of 57 years. NAFLD occurred in 42% (n=102) of patients. Multivariate analysis showed that female sex (odds ratio [OR] =2.151, P=0.013), resection of portal vein (OR=2.596, P=0.027), postoperative complications defined by Clavien-Dindo Classification (OR=2.162, P=0.022), postoperative pancreatic fistula (OR=2.812, P=0.041), eating

PP04-055

**THE RELATIONSHIP BETWEEN POSTOPERATIVE MUSCLE MASS LOSS RATE AND NUTRITIONAL STATUS AFTER PANCREATECTOMY**

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**Introduction:** To investigated whether perioperative muscle mass loss rates affected postoperative nutritional status after pancreatectomy or not.

**Method:** This study enrolled 164 patients with pancreatectomy between January 2011 and October 2018. Skeletal muscle area was measured at the height of the third lumbar vertebra before and six months after surgery using an axial view of non-enhanced CT. We examined the relationship between perioperative muscle mass loss rate and postoperative nutritional status.

**Result:** The median perioperative muscle mass loss rate was 9.4%. We classified patients into high and low loss rate groups by median value. In the high loss rate group, ALB (3.6g/dL vs 4.0g/dL, p< 0.001), CHE (197U/L vs 248U/L, p< 0.001), prognostic nutritional index (PNI) (41.2 vs 46.1, p=0.002), and CT value of the liver (53.2HU vs 56.4HU, p=0.033) were lower and intramuscular adipose tissue content (IMAC) was higher (0.527 vs 0.432, P< 0.001) at six months after surgery. In the high loss rate group of pancreaticoduodenectomy (PD), ALB (3.5g/dL vs 3.9g/dL, p< 0.001), CHE (198U/L vs 232U/L, p=0.010), PNI (41.2 vs 46.1, p=0.002), and CT value of the liver (53.2HU vs 56.4HU, p=0.033) were lower than the low loss rate group. As to distal pancreatectomy cases, only CHE (204 vs 293, p=0.005) was lower. In regard to total pancreatectomy, there were no significant differences in nutritional status.

**Conclusion:** The nutritional status at six months after pancreatectomy was associated with perioperative muscle

mass loss. However, the influence on nutritional status was different according to the operation methods.

**PP04-057  
MANAGEMENT OF POSTOPERATIVE DRAINAGE AFTER PANCREATODUODENECTOMY: REVIEW FROM THE LOCATION OF PERIANASTOMOTIC FLUID COLLECTION DURING THE EARLY POSTOPERATIVE PERIOD**

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**Introduction:** To assess the association between perianastomotic fluid collection (PFC) during the early postoperative period and postoperative pancreatic fistula (POPF) related complications, and to investigate the optimal drain location.

**Methods:** Medical records of 148 patients who had undergone PD and computed tomography (CT) on postoperative day 4 were retrospectively reviewed. The location—superior, inferior, ventral, dorsal, or splenic hilum—and volume of PFC were determined using CT. Postoperative complications were compared between the PFC and non-PFC groups. Association between volume and postoperative complications was assessed.

**Results:** The PFC group included 102 patients (69%). POPF and organ/space surgical site infection (SSI) were more frequent in the PFC group (p < 0.001 and p=0.020, respectively). According to the location of PFC, superior and ventral PFCs were associated with pseudoaneurysm (p=0.006 and p=0.002, respectively), while inferior and dorsal PFCs were associated with deep incisional SSI (p=0.027 and p=0.034, respectively). In 5 of 9 patients with inferior PFC and deep incisional SSI, the PFC had reached the abdominal wall via the surface of the transverse mesocolon. All of these patients showed a dorsal PFC connected to the inferior PFC on CT performed on POD 4. Therefore, we added drainage tube at the inferior part of PJ for soft pancreas cases after January 2019. We encountered clinically relevant POPF in 3 cases of 10 soft pancreas cases, however we did not experience deep incisional SSI. **Conclusion:** The prevention of PFC during the early postoperative period may prevent more severe POPF related complications.

**PP04-058  
FACTORS IMPACTING SURVIVAL OUTCOMES AFTER CURATIVE RESECTION FOR PRIMARY DUODENAL ADENOCARCINOMA**

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**Introduction:** Primary duodenal adenocarcinoma (PDA) is a rare gastrointestinal tumor and factors predicting survival

outcomes after curative resection have yet to be fully elucidated.

**Method:** Applying the Cox proportional hazard model in univariate and multivariate analyses, we retrospectively evaluated associations between overall/relapse-free survivals (OS/RFS) and 18 clinicopathological factors in 33 patients who had undergone R0 resection for PDA.

**Results:** Univariate analysis revealed worsening RFS to be significantly related to pancreatic invasion, multiple nodal metastases, and the preoperative serum carcinoembryonic antigen level. Pancreatic invasion and multiple nodal metastases were also found to be significantly associated with poorer OS in the univariate analysis. In multivariate analysis, only pancreatic invasion was an independent predictor of OS (hazard ratio [HR] 5.27, 95% confidence interval [CI] 1.15-24.2, P = 0.033). As to RFS, both pancreatic invasion and multiple nodal metastases correlated independently with unfavorable outcomes (HR 42.8, 95% CI 3.59-510, P = 0.003; HR 216, 95% CI 6.86-6.8×10<sup>3</sup>, P = 0.002; respectively). Only one of the 19 patients with PDA limited to the mucosal/submucosal layer developed recurrent disease (local site), while seven patients with pancreatic invasion and/or multiple nodal metastases all experienced metachronous distant recurrence.

**Conclusion:** In PDA within the mucosa/submucosa, the likelihood of progression to systemic disease after meticulous surgical removal is very low. On the other hand, patients with PDA invading the pancreas and/or metastasizing to multiple lymph nodes are at high risk of developing distant relapse and may benefit from additional systemic therapy.

Univariate and multivariate Cox regression analyses for overall and relapse-free survival.

Variables	Overall survival				Relapse-free survival			
	Univariate		Multivariate		Univariate		Multivariate	
	HR (95% CI)	P value	HR (95% CI)	P value	HR (95% CI)	P value	HR (95% CI)	P value
Age at surgery (< 65 years)	1.92 (0.31-7.18)	0.33			1.73 (0.33-8.89)	0.35		
Sex (male)	0.95 (0.28-3.18)	0.94			1.38 (0.44-4.36)	0.58		
Smoking habit (present)	0.69 (0.22-2.14)	0.52			1.03 (0.35-2.89)	0.96		
Diabetes mellitus (present)	2.31 (0.72-7.42)	0.16			2.16 (0.76-6.17)	0.15		
Location (post 2)	0.81 (0.26-2.54)	0.72			0.92 (0.33-2.55)	0.87		
Histological grade (poorly undifferentiated)	1.15 (0.34-3.86)	0.82			1.71 (0.60-4.83)	0.31		
Tumor size (> 30 mm)	2.31 (0.69-7.70)	0.17			2.53 (0.86-7.42)	0.091	1.48 (0.36-6.09)	0.59
Depth of invasion (present)	1.72 (0.56-5.25)	0.004	5.27 (1.15-24.2)	0.003	27.2 (5.50-139)	<0.001	42.8 (3.59-510)	0.003
Nodal metastasis (multiple)	19.8 (1.79-223)	0.005	8.61 (0.70-106)	0.009	58.9 (5.90-589)	<0.001	216 (6.86-6.8×10 <sup>3</sup> )	0.002
Lymphovascular involvement (present)	1.23 (0.39-3.83)	0.73			1.81 (0.64-5.13)	0.27		
Types of surgery (pancreatoduodenectomy)	0.90 (0.27-3.02)	0.87			1.10 (0.39-3.15)	0.85		
Postoperative complication(s) (present)	1.41 (0.42-4.71)	0.58			0.92 (0.33-2.59)	0.87		
Postoperative stay (> 30 days)	2.15 (0.68-6.82)	0.19			1.71 (0.62-4.73)	0.30		
Adjuvant chemotherapy (present)	2.14 (0.44-10.44)	0.36			2.38 (0.66-8.95)	0.18		
Preoperative hemoglobin (< 140 g/L)	1.48 (0.52-5.39)	0.38			1.59 (0.56-4.51)	0.39		
Preoperative albumin (< 40 g/L)	2.14 (0.64-7.11)	0.22			1.46 (0.52-4.10)	0.47		
Preoperative CRP (> 2 mg/L)	0.22 (0.03-1.69)	0.14			0.17 (0.022-1.27)	0.003	0.669 (0.2-2.0) <sup>1</sup>	0.000
Preoperative CEA (> 5 ng/mL)	1.76 (0.22-14.2)	0.60			20.8 (3.38-129)	0.001	1.94 (0.15-24.7)	0.61

HR: hazard ratio; CI: confidence interval; CRP: C-reactive protein; CEA: carcinoembryonic antigen.

<sup>1</sup>Variables with P < 0.1 in the univariate analysis were included in the multivariate analysis.

Univariate and multivariate Cox regression analyses for overall and relapse-free survival.

**PP04-059  
COMPARISON OF LONGTERM EXOCRINE AND ENDOCRINE FUNCTION FOLLOWING DUCT TO MUCOSA VERSUS DUNKING PANCREATICOJEJUNOSTOMY IN PANCREATODUODENECTOMY**

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**Aim:** Though survival following Pancreatoduodenectomy (PD) has improved, long term impairment of exocrine and endocrine function remains problematic. This study aims at evaluating any difference in long term pancreatic

function between those who underwent Duct to Mucosa Vs. Dunking PJ (pancreaticojejunostomy) following PD.

**Methodology:** Patients who underwent PD between the year 2010-18 and were disease free on follow up were evaluated. Patients with chronic pancreatitis were excluded. All survivors beyond 18 months were evaluated for their pancreatic exocrine (Fecal Elastase-1) and endocrine (FBS/PPBS; HbA1c) function as per the Departmental protocol. The risk of developing nutritional impairment was assessed using the Mini Nutritional Assessment (MNA®) tool and by Serum albumin and Hemoglobin.

**Results:** 136 patients satisfied the inclusion criteria. 30 day mortality was 5, 26 had expired and 53 were lost to follow up. Of the remaining 52 who were evaluated, 32 had dunking PJ, 20 had duct to mucosa PJ. Exocrine insufficiency was present in 29/32(90.6%) of dunking PJ and 17/20(85%) of duct to mucosa PJ (P = 0.24). 11(34.4%) & 4 (20%) had endocrine insufficiency in dunking and duct to mucosa groups respectively (P=0.21). Endocrine insufficiency was significantly higher in adjuvant chemoradiotherapy group (P=0.04). The relative risk of developing nutritional impairment in presence of severe pancreatic exocrine insufficiency was 2.68.

**Conclusion:** Exocrine and Endocrine dysfunction post PD can occur irrespective of the type of pancreatic anastomosis and is comparable between the two groups. There appears to be a significant risk of nutritional impairment post PD.

PP04-060

### **PREOPERATIVE BILIARY DRAINAGE: BLESSING OR CURSE FOR PATIENTS UNDERGOING PANCREATICODUODENECTOMY?**

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**Background:** Preoperative biliary drainage by means of endoscopic biliary stenting is thought to improve outcomes by re-establishing enterohepatic circulation prior to pancreaticoduodenectomy. However, recent evidence suggests that it may be associated with increased postoperative infective complications.

**Objective:** The objective of this study was to evaluate the relationship between preoperative biliary stenting and postoperative infectious complications. We also investigated the correlation of intraoperative bile bacteriology to postoperative bacterial culture from wound infection or deeper collection.

**Material and methods:** All patients who underwent Pancreaticoduodenectomy at Shaukat Khanum Memorial Cancer Hospital and Research Centre from January 2014 to December 2018 were included in the study.

**Results:** Out of 161 patients, 119 (74%) patients underwent pre-operative endoscopic biliary stenting before pancreaticoduodenectomy. The overall morbidity rate was 65% and 30-day mortality was 3%. Intra-operative bile cultures were positive in 67% patients of which 37% patients had polymicrobial growth. The most common organism isolated

was e-coli (35%). Bile and wound cultures had similar microbial growth in 21% patients.

On comparison, bile cultures were positive in 78% of stented patients versus 33.33% in the group with no stents (p= 0.000). We found significantly higher rates of both superficial surgical site and deep incisional infections in the stented group (p=0.012, p=0.045). There was no statistical difference in the overall complications and mortality rates amongst the two groups.

**Conclusion:** Preoperative ERCP and stent placement is a risk factor for infective complications following pancreaticoduodenectomy.

PP04-061

### **IS AGE JUST A NUMBER OR A SERIOUS CONSIDERATION FOR OUTCOMES AFTER PANCREATICODUODENECTOMY IN A DEVELOPING COUNTRY?**

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**Background:** The effect of age on outcomes after pancreaticoduodenectomy has been reported inconsistently. The objective of our study was to review the impact of age on perioperative and oncological outcomes in patients following pancreaticoduodenectomy.

**Methods:** All patients who underwent pancreaticoduodenectomy from January 2014 to December 2018 at Shaukat Khanum Memorial Cancer Hospital and Research Center were reviewed. Postoperative morbidity and oncological outcomes were compared between patients with age ≤ 60 years (Group A) and age > 60 years (Group B).

**Results:** A total of 161 patients underwent pancreaticoduodenectomy during the study period including 117 (73%) in group A and 44 (27%) in group B. Mean age was 46±11 years in group A and 67±5 years in group B. Most common pathology was adenocarcinoma (81%), commonest site was periampullary (53%) and most common pancreatic reconstruction technique was pancreaticogastrostomy (68%).

Patients in group B had significantly higher comorbidities including hypertension (p=0.00) and ischemic heart disease (p=0.030). There was no significant difference in morbidity (p=0.856), reoperation (p= 1.000) and 30-day readmission rate (p=0.097) between the two groups. Similarly, there was no difference in disease free survival (p=0.957) and overall survival (p=0.070) in both groups. On multivariate analysis, soft pancreas (p=0.00) and non-dilated pancreatic duct (p=0.00) were associated with postoperative complications while ECOG performance status and ASA score did not show significant association.

**Conclusion:** Pancreaticoduodenectomy can be performed in elderly patients with comparable morbidity and oncological outcomes as younger patients. Comorbid conditions remain higher in elderly patients and preoperative optimization can prevent worse postoperative outcomes.

PP04-063

### IMPACT OF PREOPERATIVE NUTRITIONAL SUPPORT ON PATIENTS WITH SKELETAL MUSCLE LOSS UNDERGOING PANCREATODUODENECTOMY

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**Introduction:** Sarcopenia is closely associated with morbidity after pancreatic surgery. However, little is known about the value of preoperative therapy in the management of sarcopenia. Hence, we investigated the impact of preoperative nutritional support on patients with skeletal muscle (SM) loss undergoing pancreatoduodenectomy.

**Methods:** A retrospective analysis of 101 patients who underwent pancreatoduodenectomy was performed. SM loss was defined using the SM index (cut-off level: 42 cm<sup>2</sup>/m<sup>2</sup> in men and 38 cm<sup>2</sup>/m<sup>2</sup> in women). Preoperative nutritional support, including branched-chain amino acids (BCAAs), was administered in 33 patients. The neutrophil-to-lymphocyte ratio (NLR), Prognostic Nutritional Index (PNI), and modified Glasgow Prognostic Score (mGPS) values were calculated during the first visit and just before surgery.

**Results:** SM loss was present in 65 of 101 patients (64%) and was significantly correlated with female sex, older age, lower body mass index (BMI), and low PNI. Preoperative nutritional support prevented the decrease in the albumin levels and in the PNI values for the patients with SM loss. The NLR significantly improved in the patients with SM loss who received nutritional support. In the patients with SM loss, the lack of nutritional support was an independent risk factor for postoperative pancreatic fistula.

**Conclusion:** Decreased incidence of pancreatic fistula could be achieved through preoperative nutritional support for patients with SM loss undergoing pancreatoduodenectomy. The assessment for SM loss and the administration of nutritional support may improve the surgical outcomes of pancreatoduodenectomy.

PP04-065

### SYNCHRONOUS PORTAL OR SUPERIOR MESENTERIC VEIN RESECTION DURING PANCREATECTOMY FOR PANCREATIC DUCTAL ADENOCARCINOMA: A SINGLE CENTER STUDY

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**Background:** Pancreatic ductal adenocarcinoma (PDAC) has a poor prognosis without surgery. Selected patients with portal or superior mesenteric vein (PV/SMV) infiltration undergo venous resection. The present study aimed to compare the perioperative factors and survival outcomes for pancreatic resection with/without PV/SMV resection in patients with PDAC.

**Methods:** A total of 108 patients requiring pancreatectomy combined with PV/SMV resection for PDAC between 1/2009 and 12/2017 were included in this retrospective analysis. 216 of 798 resected PDAC patients without PV/SMV resection during the same period were matched to control group by TNM stage, preoperative CA19-9, tumor differentiation, adjuvant chemotherapy and year of operation.

**Results:** Patients undergoing PV/SMV resection had an increased risk of intraoperative blood loss (400.0 vs. 275.0 ml;  $P < 0.001$ ), reoperation (1.9% vs. 0%;  $P = 0.045$ ) and 30-day mortality (1.9% vs. 0%;  $P = 0.045$ ) compared with those undergoing standard surgery. A trend toward worse survival in PV/SMV resection was observed from median survival time (13.3 vs 18.3 mo.;  $P = 0.092$ ), although the study was not powered to detect a difference. In PV/SMV resection group, there was a significant difference between tumor axis  $< 3$ cm and  $\geq 3$ cm in terms of median survival time (21.7 vs. 10.8 mo.;  $P = 0.002$ ) while length of PV/SMV resection showed no relation to survival.

**Conclusion:** PV/SMV resection was associated with increased intraoperative risk and postoperative mortality. PDAC patients with PV/SMV resection seemed to have a worse survival compared with those undergoing standard surgery, especially when the tumor axis  $\geq 3$ cm. This may be related to more advanced disease in this group.

PP04-066

### FACTORS PREDICTING POSTOPERATIVE COMPLICATIONS IN WHIPPLE PROCEDURE - SINGLE CENTRE EXPERIENCE FROM A TERTIARY CARE CENTRE

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**Introduction:** Pancreaticoduodenectomy is one of the complex surgical procedures. It's associated with high postoperative morbidity and mortality. Several studies are still being done to determine the factors reducing the morbidity.

**Methods:** This study was retrospective analysis of the database maintained from January 2017 to December 2019. All patients who underwent Whipple procedure included in the study. Various factors related to postoperative pancreatic fistula, delayed gastric emptying, hepaticojejunostomy leak and post pancreatectomy hemorrhage (PPH) were analysed. These complications were defined as per ISGPS classification.

**Results:** In a period of 3 years, 70 patients underwent Whipple procedure. Male to female ratio was 4:3. Mean duration of surgery was 480min(SD 93.72), blood loss 555ml(SD 413). Clinically relevant pancreatic leak occurred in 34.3%, delayed gastric emptying in 11.4%. PPH occurred in 10%. Hepaticojejunostomy leak occurred in 14.2%. Mean duration of stay in hospital was 19days (SD 7). Female sex and addition of jejunostomy reduced the occurrence, while preoperative biliary drainage and use of energy source for pancreatic transection increased the occurrence of pancreatic fistula. Female sex and prolonged duration of surgery increased the occurrence of delayed gastric emptying. Locally advanced lesion, increased intraoperative blood loss and requirement of intraoperative blood products increased the occurrence of

PPH. Preoperative biliary drainage increased risk of hepaticojejunostomy leak.

**Conclusion:** Female sex, Preoperative biliary drainage, locally advanced tumor, use of energy source for pancreatic transection, prolonged duration of surgery and need for intraoperative blood transfusion increased the risk of complications. Addition of jejunojunctionostomy reduced the risk of postoperative pancreatic fistula.

PP04-067

### VALIDATION OF THE SORT SCORE IN GREEK PATIENTS WITH PANCREATIC CANCER UNDERGOING SURGERY AND COMPARISON WITH POSSUM AND P-POSSUM

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**Introduction:** The aim of the present study was to validate the Surgical Outcome Risk Tool (SORT) equation for predicting perioperative mortality in Greek adult patients with pancreatic cancer undergoing surgery, and to compare its performance with the POSSUM and Portsmouth (P)-POSSUM models.

**Methods:** Data was prospectively collected from thirty patients undergoing surgery for pancreatic cancer performed by a single hepato-pancreato-biliary surgical team in a Greek tertiary hospital (January-October 2019). Model discrimination was assessed by calculating the Area Under Receiver Operating Characteristic curve (AUC). The calibration was evaluated by calculating the observed to expected (O:E) ratios and by performing the Hosmer-Lemeshow goodness of fit test.

**Results:** Two patients (6.7%) died and 5 patients (16.7%) had a major complication within 30 days of surgery. All models overpredicted mortality. SORT had fair discrimination and calibration (AUC: 0.759,  $p=0.23$ ; H-L: 3.947,  $p=0.68$ ). POSSUM had the most reliable discrimination (AUC: 0.982,  $p=0.02$ ) and calibration (H-L: 0.3169,  $p>0.99$ ). P-POSSUM had also excellent accuracy (AUC: 0.964,  $p=0.03$ ; H-L: 0.939,  $p=0.99$ ).

**Conclusion:** All models overestimated mortality. SORT presented inferior discrimination and calibration compared to POSSUM and P-POSSUM in the context of predicting mortality in Greek patients with pancreatic cancer undergoing surgery.

PP04-069

### THREE DIMENSIONAL PANCREATIC VOLUMETRY FOR DISTAL PANCREATECTOMY IN EVALUATION OF POSTOPERATIVE GLYCEMIC CONTROL

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**Introduction:** There are few reports on the postoperative glycemic control based on the quantitative measurement of the remnant pancreatic volume (RPV) after distal pancreatectomy (DP). The aim of this study was to evaluate the postoperative glucose tolerance associated with RPV calculated with three-dimensional (3D) simulation software.

**Methods:** 56 patients who underwent DP between 2013 and 2017 were enrolled. Preoperative total pancreatic volume (TPV) and post-operative RPV were calculated by 3D volume analyzer, SYNAPSE VINCENT®. Patients with diabetes mellitus (DM) and/or preoperative HbA1c greater than 6.0% were defined as DM group. We compared the perioperative outcomes between DM and non-DM groups. Primary endpoint was the change of HbA1c for 2 postoperative years.

**Results:** Between DM group (n=19) and non-DM group (n=37), there were no significant differences in the patient's background and operative outcomes, except for hospital stays (15d vs. 12d,  $p=0.047$ ). However, the incidence of newly introducing insulin or oral hypoglycemic agents (step-up DM) were significantly higher in the DM group (55.0% vs. 5.4%,  $p<0.001$ ). In the non-DM group, there was a negative correlation between the RPV/TPV and the HbA1c elevation rate at the first postoperative months ( $r=-0.424$ ,  $p=0.031$ ), however no significant correlation was observed at the 6, 12, and 24 postoperative months. Multivariable analysis confirmed that preoperative DM was strongly associated with step-up DM (odds ratio, 75.4;  $p<0.001$ ), however, RPV/TPV was not an independent predictor for step-up DM.

**Conclusion:** SYNAPSE VINCENT® was useful in the objective evaluation for the transition of the postoperative glycemic control after DP.

PP04-071

### EVALUATION OF THE INTERNATIONAL STUDY GROUP ON PANCREATIC SURGERY DEFINITION AND CLASSIFICATION OF CHYLE LEAK AFTER PANCREATIC SURGERY

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**Objective:** To reappraise the International Study Group on Pancreatic Surgery (ISGPS) definition and classification of chyle leak (CL) after pancreatic surgery.

**Summary background data:** CL is a potentially worrisome complication of pancreatic surgery.

**Methods:** We enrolled patients who underwent pancreatic surgery between January 2017 and January 2019 in our institution. The utility of the ISGPS criteria was evaluated using propensity score-matching (PSM). Outcomes of patients with delay-diagnosed CL (DD-CL) were compared with non-CL and early-diagnosed CL (ED-CL) patients. Risk factors for CL were identified using multivariate regression analysis.

**Results:** Of the 292 patients enrolled, 49 (16.8%) developed CL (grade A CL, 10 [3.4%]; grade B CL, 39 [13.4%]). Hospital stay and medical costs were comparable between patients with grade A and without CL. After PSM, patients with grade B CL had longer hospital stays than patients

with grade A and without CL ( $P = 0.02$ ). In 54 patients, the non-milky drain fluid had a triglyceride concentration  $\geq 1.2$  mmol/L on postoperative day 3. Of them, 22 (40.7%) patients were diagnosed with CL (DD-CL) after a median delay of 5 days. Hospital stay ( $P = 0.036$ ) and medical costs ( $P = 0.035$ ) were greater in the DD-CL group than in the ED-CL group.

**Conclusion:** The validity of the ISGPS classification of CL was confirmed. However, the current definition may delay the diagnosis of CL in a large proportion of patients.

#### PP04-073

### SELECTIVE SUTURE CLOSURE OF MAIN PANCREATIC DUCT IN PANCREATIC REMNANT REDUCES PANCREATIC FISTULA (PF) FOLLOWING OPEN DISTAL PANCREATECTOMY (ODP): A MULTICENTER STUDY

transected by either scalpel or monopolar electrosurgical energy (MEE). The main pancreatic duct (MPD) in remnant was selectively sutured by PDS 4-0/5-0. The pancreatic remnant was reinforced by sutures or left open.

**Results:** Study group comprised of 42 ODP patients (26 males; 16 females; mean age 47.5 years). Of these 6 (14.3%) developed PF and 5 (11.9%) developed CR-POPF).

Selective suture ligation of MPD was performed in 38 (90.4%) patients. Of the technical factors analyzed spleen preservation, method of pancreatic transection (scalpel versus MEE) and remnant reinforcement (none versus sutures) had no significant impact on development of PF.

The demographic data, indications, technical details and outcomes are summarized in Table 1.

**Conclusion:** Selective suture closure of MPD resulted in low PF & CR-POPF rates in our study.

Parenchymal transection technique and suture reinforcement of remnant had no impact on PF rates.

#### PP04-073 Operative details & outcomes of open distal pancreatectomy (n=42)

Diagnosis	Carcinoma / NET / Cystic tumor / Others	07 / 10 / 11 / 14	
Operative details	Spleen preservation: Yes / No	07 / 35	p=1
	Pancreatic transection: Scalpel / MEE / Stapler	18 / 23 / 01	p=0.74 (stapled excluded)
	Main pancreatic duct: Sutured / Duval / Stapled / Not localized	38 / 02 / 01 / 01	
	Remnant reinforcement (suture): - Yes / No	25 / 17	p=0.70
	Median surgery duration (range)	250 (120-360) min	
Outcomes	Pancreatic fistula (ISGPF): A / B / C	01 / 02 / 03	
	Median LOS (range)	7 (5-11) days	
	Mortality	01(2.3%) (Pneumonia)	

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**Introduction:** Pancreatic fistula develops in up to 40% patients following ODP of which 9.7 to 23% of patients have ISGPS grade B or C (CR-POPF). However factors responsible for fistula formation are poorly understood.

We analyzed whether different surgical techniques for pancreatic transection and remnant management have role in PF formation after ODP.

**Methods:** This is a retrospective study of patients who underwent ODP at 3 centers (one each in Central, North and Western India) over 7 - 10 years. CR-POPF was the main outcome measure.

**Operative technique:** Following initial exploration, pancreatic tail and body was mobilized at least 2-3 cm central to designated transection line. Pancreas was then

#### PP04-074

### SURGICAL OUTCOMES OF ROBOTIC SINGLE PORT CHOLECYSTECTOMY WITH EXTENDED INDICATION

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**Introduction:** Minimal invasive cholecystectomy is broadly performed in recently, especially single port cholecystectomy. The aim of this study was to confirm the results of robot single port cholecystectomy and compare robot single port cholecystectomy (RSPC) and laparoscopic single port cholecystectomy (LSPC).

**Methods:** From february 2014 to may 2018, total 79 RSPC was performed with no exclusion criteria. There are two laparoscopic conversion and five port addition group. All patients divided into three groups, difficulty group 1 with simple gallbladder, group 2 with gallbladder mild adhesion to adjacent organ and difficulty group 3 with severe adhesion and severe gallbladder inflammation.

**Results:** RSPC group had longer operative time than LSPC group ( $54.9 \pm 19.4$  min,  $47.5 \pm 15.6$  min,  $P < 0.05$ ) and possibility of port addition is higher too in RSPC group (9%, 1%,  $P < 0.05$ ). In RSPC, high difficult group was more possibility of port addition (4%, 10%, 67%,  $P < 0.05$ ) and group of undergoing emergency operation was higher difficult grade. (Elective operation 85%, 62%, 67%, Emergency operation 15%, 38%, 33%,  $P < 0.05$ ).

**Conclusion:** In case of RSPC, severe cholecystitis was more difficult than laparoscopy and more severe results more possible port addition.

PP04-075

### JOURNEY OF A TERTIARY CARE HOSPITAL AT PUDUCHERRY, INDIA, INTO BECOMING A HIGH-VOLUME CENTRE FOR PANCREATODUODENECTOMY - A DECADE OF EXPERIENCE

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**Background:** This study aims to study the outcomes of the Pancreaticoduodenectomy (PD) procedure- at the department of Surgery, JIPMER, Puducherry, which was in the early process of evolving into a high-volume centre for PDs in the last decade.

**Methods:** Details of 147 patients who underwent PDs from 2010-2019, were collected retrospectively from the Medical Records Department from 2010-2017, and prospectively in the last 2 years. Independent perioperative variables were compared to outcome variables - morbidity and mortality rates, and analysed.

**Results:** 29 patients underwent PDs in the first 5-year period, and 118 in the second, with mortality rates decreasing from 27.6% to 10.2% ( $P=0.029$ ), and to 5.8% in the last year. Overall morbidities remained significantly high, with clinically relevant POPF, DGE and PPH to be 28.2%, 30.1% and 22.6% respectively. Ampullary adenocarcinoma was the commonest malignant tumour (63.3%). Factor significantly associated with perioperative mortality were - the period of surgery (1<sup>st</sup> vs 2<sup>nd</sup> 5 year period), ASA scores, Bilirubin levels, Intraop blood loss, CR-POPF, PPH, pneumonia and Sepsis. But variables which significantly increased the risk of mortality by Multivariate Logistic regression were Sepsis (OR - 108.4,  $p=0.011$ ), and post operative pulmonary complications. Median overall survival was 36 months (19 - 53) months.

**Conclusion:** As we look back in the last decade, there have been significant improvement in the mortality rates of PD, but morbidity still remains high and has to be looked into as the department goes into a new decade as a young high volume centre.

PP04-078

### EMERGING CENTERS CAN PROVIDE TEXTBOOK OUTCOMES (TO) FOR PANCREATODUODENECTOMY (PD): A MULTICENTER STUDY FROM INDIA

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**Introduction:** Textbook Outcome has recently been introduced as novel quality measure for pancreatic surgery. Centralization is one of the strategies proposed in Western Europe and USA for providing quality outcomes following PD.

With large populations and underdeveloped healthcare system, applicability of 'centralization' for low-middle income countries (LMIC) such as India remains debatable.

For LMIC the challenges are:

- Rapid development of well equipped new centers to provide healthcare facilities closer to populations / decrease overwhelming workload of existing centers
- Provide quality care at affordable costs

We investigated whether TO for PD can be achieved at such 'emerging' centers.

**Methods:** Two surgeons trained at same institution from 2000 - 2005 set up independent centers for major digestive tract surgery in North & Western India. The outcomes of PD were retrospectively analyzed.

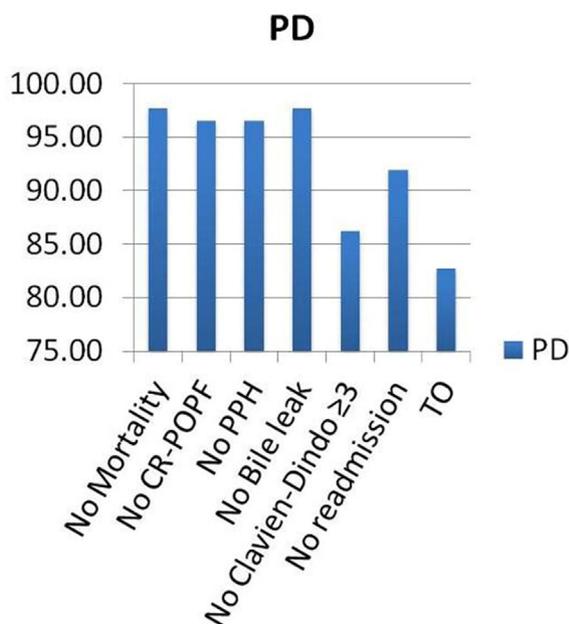
**Results:** Eighty seven patients underwent PD (Team 1 - 39, 10 years; Team 2 - 48, 7 years). TO were achieved in 82.7% patients (Figure1). The median length of stay (post-operative) was 10days. In hospital or 30-day mortality was 2 (2.2%). Three (3.4%) patients had CR-POPF. The cost of treatment ranged from 6000 USD (uncomplicated) to 18,000 -20000 USD (complicated; Clavien-Dindo 4). The demographic, technical details and outcomes for the 2 groups are provided in Table 1.

**Conclusion:** Well trained surgical teams at emerging centers in LMIC can achieve TO following PD.

Development of new well equipped centers manned by adequately trained personnel is reasonable strategy for LMIC for providing quality care at affordable costs.

## PP04-078 Demographic, technical details and outcomes of PD

Parameter	Team 1 (n=39)	Team 2 (n=48)	Total (n=87)
Mean Age (range)	55.8 (19-71)	56.5 (26-78)	
Site: Pancreas / Ampulla / Bile duct / Duodenum	09 / 17 / 07 / 06	14 / 20 / 08 / 06	23 / 37 / 15 / 12
PJ details: Duct-mucosa / Dunking	39 / 0	46 / 02	85 / 02
<b>Outcomes: POPF (B &amp; C) / Mortality</b>	03 / 02	0 / 0	03 / 02
Hemorrhage	02	01	03
Clavien-Dindo Grade: None / 1 / 2 / 3 / 4 / 5	11 / 05 / 15 / 04 / 02 / 02	11 / 20 / 14 / 03 / 0 / 0	22 / 25 / 29 / 07 / 02 / 02
Readmission (30 day)	02	05	07
Bile leak	01	01	02
Textbook Outcomes	29 (74.4%)	43 (89.6%)	72 (82.7%)



**Figure 1.** Textbook Outcomes percentages for each parameter.

## PP04-082

### THE NOVEL INDEX USING C-REACTIVE PROTEIN AND NEUTROPHIL-TO-LYMPHOCYTE RATIO PREDICTS POOR PROGNOSIS IN PATIENTS WITH PANCREATIC CANCER

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**Introduction:** The preoperative systemic inflammation, represented by neutrophil-to-lymphocyte ratio (NLR) and serum C-reactive protein (CRP) -to-albumin ratio (CAR) have been reported to predict tumor recurrence and survival in various cancers, including pancreatic cancer. However, more sensitive biomarkers are required to improve

perioperative management of pancreatic cancer. Therefore, we developed a novel indicator using CRP and NLR (C-NLR), which was defined as CRP x NLR. The aim of this study is to evaluate the prognostic significance of C-NLR in patients with pancreatic cancer after pancreatic resection.

**Methods:** The study comprised 217 patients who had undergone pancreatic resection for pancreatic cancer between January 2001 and December 2016. We retrospectively investigated the relation between C-NLR and disease-free survival (DFS) or overall survival (OS) after pancreatic resection, and compared the prognostic significance of C-NLR with NLR and CAR.

**Results:** The optimal cut-off level of C-NLR by receiver operating characteristics analysis was 0.206. By multivariate analysis, C-NLR [Hazard ratio (HR): 1.373, 95% confidence interval (CI): 1.005-1.874,  $p=0.046$ ], age (HR: 0.695, 95% CI: 0.507-0.954,  $p=0.024$ ), and TNM Stage (HR: 2.197, 95% CI: 1.521-3.174,  $p=0.000$ ) were independent predictors of DFS. As for OS, C-NLR (HR 1.468, 95% CI: 1.042-2.067,  $p=0.028$ ), and TNM Stage (HR 1.644, 95% CI: 1.097-2.463,  $p=0.016$ ) were independent predictors, while NLR and CAR were not.

**Conclusion:** C-NLR may be an independent and significant indicator of poor long-term outcomes in patients with pancreatic cancer after pancreatic resection.

## PP04-083

### OUTCOMES AFTER DISTAL PANCREATECTOMY WITH CELIAC AXIS RESECTION FOR PANCREATIC CANCER: A SINGLE CENTER RETROSPECTIVE STUDY

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**Introduction:** As distal pancreatectomy with celiac axis resection (DP-CAR) is the only possible cure for pancreatic body and tail cancer with celiac axis involvement, we performed this study to show the post-operative outcomes of DP-CAR.

**Method:** 48 patients with pancreatic body and tail cancer with celiac axis involvement who underwent DP-CAR in Asan medical center between January 2008 and December

2018 were included in the study. We retrospectively reviewed the patient's preoperative, operative and post-operative data. Primary outcome was major morbidity and 90-day mortality, and secondary outcome was overall survival.

**Results:** Major morbidity occurred in 9 patients (18.8%). 13 patients (27.1%) had pancreatic fistula grade B or C according to ISGPS guideline. There was 1 case (2.1%) of 90-day mortality after operation. Kaplan-Meier estimated median overall survival was 25.0 months.

**Conclusions:** DP-CAR is a good treatment option for cure in pancreatic body and tail cancer with celiac axis involvement without significant morbidity and mortality.

#### PP04-084

### THE ROLE OF HEPATICOJEJUNOSTOMY LEAKS AFTER PANCREATODUODENECTOMY IN THE INCREASE OF MORBIDITY AND MORTALITY

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**Introduction:** Leakage of Hepaticojejunostomy are less frequent than pancreatic leaks after pancreatoduodenectomy, and the current literature suggests comparable outcomes. The main purpose of our study was to establish the hepaticojejunostomy leak adversely affected patient outcomes.

**Methods:** Consecutive cases of pancreatoduodenectomy (n = 1010) were reviewed at a single high-volume institution in period 2009-2018. BL was defined by the presence of bile in the abdominal drains, radiologically or surgically drained bilioma or biliary peritonitis. BL severity was established according to the Clavien-Dindo classification.

**Results:** Pancreaticojejunostomy leaks were identified in 216 (21,5%) patients and hepaticojejunostomy leaks were identified in 30 patients (3%); combined hepaticojejunostomy/pancreaticojejunostomy leaks were identified in 32 patients (3%). Those with biliary fistula or combined leaks had a significantly increased risk of morbidity when compared to pancreaticojejunostomy leaks or no leak (53 and 57 vs. 31 and 23%, respectively,  $p < 0.05$ ). The median length of stay was significantly greater for hepaticojejunostomy leaks or combined leaks when compared to pancreatocjejunostomy leaks (19 or 15 vs. 10 days,  $p = 0.001$ ) and those with no leak (18 or 13 vs. 8 days,  $p = 0.001$ ). Early (ninthy-days ) mortality for all patients was 2.9%. Hepaticojejunostomy leaks and combined leaks significantly increased 90-day mortality rate (15 and 30%, respectively,  $p < 0.05$ ).

**Conclusions:** Hepaticojejunostomy and combined leaks after pancreatoduodenectomy are rarer than pancreaticojejunostomy leaks; these patients are at a significantly increased risk of major morbidity and mortality. Bile leakage remains a major concern after pancreatic operations (PD).

#### PP04-085

### PROGNOSIS AND APPROPRIATE RESECTION CRITERIA OF CONVERSION SURGERY FOR LOCALLY ADVANCED UNRESECTABLE PANCREATIC CANCER

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**Introduction:** With the improvement of multidisciplinary treatments for locally advanced unresectable (UR-LA) pancreatic cancer, long-term survival has been increasing, especially combined with conversion surgery (CS).

**Methods:** A retrospective study was performed on 13 patients who underwent CS for UR-LA pancreatic cancer between May 2011 and December 2018. In principle, our institutional criteria to go for conversion surgery are as follows: (1) disappearance of abnormal FDG-PET accumulation and (2)  $\geq 80\%$  reduction in CA19-9 level.

**Results:** Of the patients, 8 were male and 5 were female, with a median age of 69 years (range, 38-78 years) and median duration of nonsurgical treatment of 6 months (range, 2-9 months). Eleven patients (84%) had an R0 resection. Histopathologically, 6 cases (46%) were Evans classification grade  $\geq$  IIb (IIb : 3 cases, III : 2 cases, IV : 1 case). The MST from the start of treatment was 21 months. In 9 patients who were CA19-9/FDG-PET positive before the start of treatment, the prognosis was significantly better in those who met both resection criteria (MST, 34.5 months) than in the non-standard cases (MST, 13 months;  $p > 0.05$ ).

**Conclusion:** It is likely that CS should be applied to UR-LA on the basis of the appropriate selection criteria to achieve the better survival.

#### PP04-086

### FÖRSTER RESONANCE ENERGY TRANSFER (FRET) NANOPROBE COULD DIAGNOSE PANCREATIC JUICE ACTIVATION DUE TO POSTOPERATIVE PANCREATIC FISTULA

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**Introduction:** Postoperative pancreatic fistula (POPF) after pancreatoduodenectomy often causes activation of pancreatic juice, resulting in critical complications. In POPF, it is important to diagnose the activity of pancreatic juices in real time, so contributes to the development of postoperative management after pancreatoduodenectomy. This study suggests prosperous results of the clinical application of the FRET nanoprobe that is developed to distinguish between the active and inactive types of pancreatic juice.

**Methods:** The FRET nanoprobe was a 12nm diameter nanoprotein capsule. It exuded a red color when the capsule structure was maintained. Activation of protease in the pancreatic juice on it, the capsules are reduced quantitatively, and FRET is abolished, changing in color from red to green. Pancreatic juice activation can be measured by the FRET signal. A total of 112 drainage fluid samples from 16 post-pancreatoduodenectomy patients were obtained and evaluated.

**Results:** The pancreatic juice activation could be determined using the FRET signal with a boundary value of 1.6. Drainage fluid amylase (AMY) level was unrelated to pancreatic juice activation. This results suggested pancreatic juice was activated when drainage fluid was infected.

**Conclusion:** The FRET nanoprobe enabled detection of the presence or absence of pancreatic fistula activation after pancreatoduodenectomy. It was suggested that infection in drainage fluid was the major cause of pancreatic juice activation regardless of drainage fluid AMY levels.

PP04-088

### AN OUTCOME ANALYSIS OF CENTRAL PANCREATECTOMY: A SINGLE CENTRE EXPERIENCE

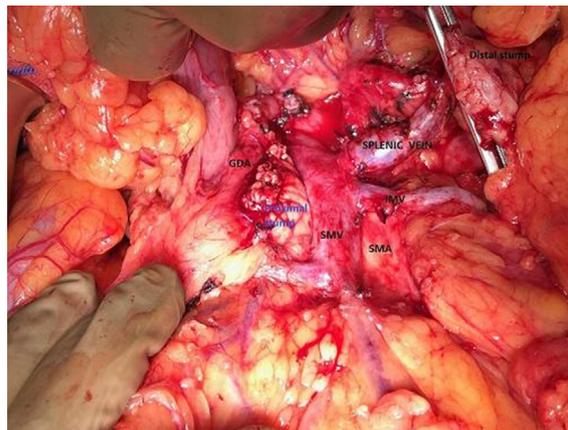
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**Introduction:** Central pancreatectomy is a pancreatic resection procedure for selected pancreatic lesions. Literature reveals a higher pancreatic fistula rate compared to Whipple procedure and distal pancreatectomy. This study highlights our indications, technique and outcomes of this procedure.

**Methods:** This retrospective evaluation of a prospectively maintained data includes 16 consecutive patients who underwent central pancreatectomy from January 2012 to December 2018 at our tertiary centre. Patient demographics, indications, surgical details and outcomes were evaluated.

**Results:** Of 16 patients, 10 were males and 6 females with median age of 56 years. Four were diabetic. Indications were MCN in 4 patients, branch duct IPMN in 6, NEN in 3, SPEN in 2 and RCC metastasis in 1 patient. In all cases (Figure 1), pancreatic transection was performed with knife. The proximal stump was closed with suture and the distal was managed by a modified Blumgart pancreatico-jejunosomy. Mean operative time was 259 minutes and blood loss 178 ml. All had R0 resection. There were 2 ISGPF Grade B pancreatic fistulas, managed conservatively. One patient had postoperative pancreatitis which resolved with conservative management. 3 patients had delayed gastric emptying. 6 patients had surgical site infection. All are alive and well at follow up. The patient with metastatic RCC is on sunitinib.

**Conclusion:** Central pancreatectomy, a pancreatic parenchyma preserving surgery can be safely performed with acceptable pancreatic fistula rates, contrary to previous literature, at high volume tertiary centres by experienced teams.



**Figure 1:** Field after central pancreatectomy and closure of the proximal stump.

PP04-090

### ROLE OF BILIARY DIVERSION IN ADDITION TO HEAD CORING IN CASE OF CCP WITH HEAD MASS AND BILIARY STRICTURE

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**Introduction:** Biliary strictures as a consequence of Chronic pancreatitis(CP) have long been recognized. Clinical presentation of biliary stricture varies from an incidental finding to overt jaundice and cholangitis. Head coring is the recommended treatment in a subset of patients with head mass who develop biliary symptoms.

**Aim:** We want to report on our experience regarding surgical management in CP with head mass and benign biliary stricture.

**Method:** Observational study (Retrospective - prospective study).

**Results:** Over a period of 3 years, we have managed 80 cases of CP at our institution by surgical intervention. Presenting symptoms, laboratory findings with radio-imaging, operative procedures and follow-up parameters of these patients were collected from our prospective database. Total 21 (26%) patients had biliary obstruction in the background of CP, out of which 15 (19%) patients had a mass lesion in head of pancreas. The most commonly performed operation was Frey's procedure with Choledocho-jejunosomy in 6(40%) patients, while other procedure were Choledocho-duodenostomy in 4(27%), Hepatico-jejunosomy in 1(7%), Cholecysto-jejunosomy in 1(7%), Cholecystectomy in 2(13%) and 1(7%) patient with hard head mass with regional lymphadenopathy had undergone Whipple's procedure. Two patients came with recurrent biliary stricture after 3 years of Frey's Procedure with cholecystectomy, underwent Choledocho-jejunosomy.

**Conclusion:** Biliary diversion is still the best option for CP with head mass and benign biliary stricture in addition to Frey's procedure, since head coring alone is not an adequate operation in the management of biliary obstruction in CCP with head mass.

PP04-091

### POSTOPERATIVE C-REACTIVE PROTEIN AS A PREDICTOR OF POSTOPERATIVE PANCREATIC FISTULA AND HOSPITAL READMISSION FOLLOWING PANCREATICODUODENECTOMY

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**Introduction:** Postoperative pancreatic fistula (POPF) is the Achilles heel following Pancreaticoduodenectomy (PD). Early prediction of POPF has direct influence on patient management and outcome. This study aimed at identifying role of C-reactive protein (CRP) on first postoperative day (POD1) as predictor of clinically relevant pancreatic fistula (CR-POPF) and at discharge as a predictor of hospital readmission.

**Methods:** A prospective observational quantitative study was performed on 49 patients over one year who underwent PD. Clinical, biochemical, intraoperative and pathological characteristics were recorded. Quantitative serum CRP was sent on POD1 and at discharge. POPF was graded according to International Study Group in Pancreatic Surgery 2016. Diagnostic accuracy of CRP on POD1 to predict CR-POPF and at discharge to predict 90 day readmission were assessed by Receiver Operating Characteristics (ROC) curve analysis and cut-off value of CRP was calculated.

**Results:** Overall morbidity was 57.1% with mortality of 4.1%. Bile leak occurred in 38.8%. CR-POPF developed in 26.5% and cholangitis was independent risk factor ( $p < 0.05$ ). Readmission rate was 14.3%. ROC curve analysis showed POD1 CRP level  $>100\text{mg/l}$  as a predictor of CR-POPF (AUC: 0.687; 95%CI [0.522-0.852] and CRP  $>50\text{mg/L}$  at discharge as a significant predictor of hospital readmission (AUC: 0.807 (95%CI [0.607-0.100],  $p < 0.05$ ).

**Conclusion:** CRP is a reliable predictor of CR-POPF and hospital readmission, thus should be utilized in patient management.

**Keywords:** C-reactive protein; Pancreaticoduodenectomy, Postoperative pancreatic fistula; Readmission

PP04-094

### TREATMENT AND OUTCOME DIFFERENCES IN PATIENTS WITH DUODENAL ADENOMAS

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**Background:** Duodenal adenomas (DA) can be symptomatic and carry risk of malignant transformation, thus resection is recommended in fit candidates. This study examined the perioperative outcome trends associated with three types of resection in DA patients.

**Methods:** Patients who underwent pancreaticoduodenectomy (PD), local surgical resection (LR), or endoscopic

resection (ER) of pathologically-confirmed DA between April 2005-July 2018 at our center were retrospectively reviewed. Outcomes among resection methods were compared with univariate logistic regression with post hoc analysis to identify differences between groups.

**Results:** During the study period, 77 patients underwent resection for DA; 27 (35.1%) DR, 15 (19.5%) LR, and 35 (45.4%) ER. When compared to the two surgical resection groups, ER had shorter hospital LOS ( $p < 0.001$ ), fewer postoperative complications ( $p = 0.002$ ) and readmission ( $p = 0.002$ ), but reduced ability to achieve an R0 resection ( $p < 0.001$ ) and higher risk of recurrence (21 patients, 60%,  $p < 0.001$ ). Between PD and LR, there was higher blood loss in the PD group ( $259 \pm 164\text{ ml}$  vs.  $72 \pm 52\text{ ml}$ ,  $p < 0.001$ ) in addition to a trend toward more postoperative complications ( $p = 0.065$ ), hospital readmission ( $p = 0.066$ ), and higher success with achieving R0 resection ( $p = 0.052$ ). There were no perioperative deaths in the entire cohort.

**Conclusions:** ER of DA results in fewest complications and shorter hospital LOS, but is more likely to result in eventual recurrence from higher incidence of incomplete resection. The most definitive way to resect DA is likely via PD, but this may carry higher intraoperative and postoperative morbidity when compared to LR.

PP04-095

### EVALUATION OF THE CURRENT TREATMENT STRATEGIES FOR PANCREATIC NEUROENDOCRINE TUMORS: A PROPENSITY SCORE MATCHED ANALYSIS

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**Purpose:** The management of pancreatic neuroendocrine tumors (PNET) varies between observation(O), pancreatic resection(PR) and enucleation(E). Currently, size, grade and location are used to determine which treatment strategy may be employed. We sought to evaluate each strategy and further clarify the role for surgery.

**Methods:** Utilizing the National Cancer Database we identified patients with PNET and stratified based upon size  $< 1\text{cm}$ ,  $1\text{-}2\text{cm}$  and  $>2\text{cm}$ . Propensity score matching was performed by age, Charleeson-Deyo score, and grade. Survival analyses was performed using the Kaplan-Meier method. A  $p < 0.05$  was considered significant.

**Results:** We identified 17,921 patients ( $< 1\text{cm}$ , 1214,  $1\text{-}2\text{cm}$ , 4325, and  $>2\text{cm}$ , 12,382) with a median age of 61.5 (18-90). Tumors  $< 1\text{cm}$  and well differentiated(WD) the median and 5-year survival in the O group was not reached (NR)(77%) vs 142.6 month(87%) in the surgery groups,  $p < 0.04$ ; in the  $1\text{-}2\text{ cm}$  WD group 95.7 months and 60% vs NR and 94%,  $p < 0.001$ . Similarly in the PD tumors  $< 1\text{cm}$  the median and survival was 32.9 months and 24% in the O vs NR and 81%,  $p < 0.001$ ; in the  $1\text{-}2\text{ cm}$  group 14.8 months and 19% vs NR and 73%,  $p < 0.001$ . There were no differences in survival between PR or E,  $p = 0.09$ .

**Conclusions:** While observation is acceptable for the management of  $< 1\text{cm}$  WD PNET, we found an

improvement in survival in the patients undergoing surgery. Enucleation and PR did not differ in overall survival. Surgery for PNET should be considered as the first line treatment of these patients.

PP04-096

### **RISK FACTORS ASSOCIATED WITH POSTOPERATIVE PANCREATIC FISTULA AFTER PANCREATODUODENECTOMY: A RETROSPECTIVE ANALYSIS**

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**Introduction:** Pancreatoduodenectomy is one of the most complex surgeries. It is the main therapy for malignant and some of the benign diseases in the head of pancreas, distal common bile duct and the ampullary region. Postoperative pancreatic fistula (POPF) is the most common complication that occurs post PD and it accounts for other intraabdominal complications such as post pancreatectomy hemorrhage, intraabdominal infection and delayed gastric emptying. The aim of this study is to assess the possible riskfactors associated with POPF.

**Methods:** 85 patients who underwent PD in the department of Surgical Gastroenterology, Bangalore Medical College between 2014 august to 2019 august were analysed retrospectively. Preoperative factors and intraoperative factors which might be related to POPF were analysed by univariate and multivariate analysis. POPF was defined and graded according to ISGPS definition.

**Results:** POPF occurred in 22 patients (25.8%) after PD. 18 patients had Grade B POPF whereas 4 patients had Grade C POPF. Univariate analysis showed significant association between POPF and the following factors: pancreas texture (soft vs hard: 34.5% vs 7%, P-0.007), pancreatic duct diameter (< 3mm vs >3mm: 42% vs 7%, P- 0.01) and preoperative serum albumin (< 3.5 g/dl vs >3.5 g/dl: 47% vs 11%, P-0.0002). Multivariate logistic regression analysis showed significant association between POPF and preoperative serum albumin, pancreas texture, pancreatic duct diameter and preoperative serum bilirubin levels.

**Conclusion:** A soft pancreas, Pancreatic duct diameter of < 3mm and preoperative albumin of < 3.5 g/dl and preoperative bilirubin are independent risk factors for POPF after PD.

PP04-097

### **POSTOPERATIVE DAY 3 DRAIN AMYLASE (POD3DA) VS FISTULA RISK SCORE (FRS): PREDICTING CLINICALLY RELEVANT POSTOPERATIVE PANCREATIC FISTULA (CR-POPF) FOLLOWING PANCREATICO-DUODENECTOMY (PD)**

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**Background:** Clinically relevant Postoperative pancreatic fistula (CR-POPF) remains the most common cause of perioperative morbidity following pancreatico-duodenectomy (PD). Early and accurate prediction of CR-POPF can be helpful in postoperative drain management as well as stratifying patients for ERAS protocol. Both FRS and postoperative drain amylase levels have been analyzed in past. Present study sought to assess the utility of POD-3DA level as a predictor of CR-POPF in comparison with FRS. **Methods:** A retrospective analysis was done on 57 patients who underwent PD at our institute between 2014 to 2018. POPF was defined and graded in accordance with ISGPF definition. Receiver operating characteristic (ROC) analysis predicted a threshold of POD3DA >486 IU/L associated with CR-POPF. Sensitivity, specificity and odds ratios with 95%CI calculated & ROC curves were plotted for POD3DA of  $\geq 500$  IU/L and FRS (negligible/low vs. moderate/high) as predictors of CR-POPF.

**Results:** Incidence of POPF and CR-POPF was 63% & 32% respectively. Sensitivity and specificity of POD3DA  $\geq 500$  & moderate/high FRS for predicting CR-POPF were 83%, 79% & 78%, 51% respectively. Difference between ROC area under the curve (AUC) for POD3DA  $\geq 500$  IU/L (0.868) and FRS (0.692) was significant (p = 0.028). Combining FRS and POD3DA  $\geq 500$  IU/L improved specificity (87%) at the cost of sensitivity (67%). The negative predictive value of POD3DA < 500 IU/L & negligible/low FRS were 91.2% & 83.3% respectively.

**Conclusions:** POD3DA level greater than 5 times of upper normal range is more precise at predicting CR-POPF, hence clinically more reliable for drain & postoperative management.

PP04-098

### **PREOPERATIVE SCORING SYSTEM TO PREDICT EARLY RECURRENCE AFTER SURGERY FOR RESECTABLE PANCREATIC CANCER: A MULTI-CENTER RETROSPECTIVE STUDY**

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**Introduction:** The prognosis of the patients with early recurrence after surgery for pancreatic adenocarcinoma (PDAC) is extremely poor, so these patients have no benefit from surgery.

The aim of this study is to create a scoring system to predict early recurrence after surgery for resectable pancreatic cancer (R-PDAC).

**Method:** This study enrolled 631 patients from 15 institutions of the Okayama Study Group of Hepato-Biliary-Pancreatic Surgery. The treatment outcomes after upfront surgery for R-PDAC from 2013 to 2017 were analyzed retrospectively. Univariate and multivariate analyses were

utilized to identify preoperative indicators for early recurrence (ER) to create risk scoring system.

**Results:** ER occurred in 126 patients (20%) with a median survival time (MST) of 10 months. Logistic regression analysis revealed 3 independent predictors for ER: Tumor size > 30mm (odds ratio[OR] 1.75, P=0.02), Contact to portal vein or superior mesenteric vein (PV/SMV) (OR 1.65, P=0.02), and preoperative cancer antigen19-9 (CA19-9)>150U/mL (OR 2.47, P< 0.0001). OR was used to determine the allocation of points to each patients: Tumor size > 30mm (1point), Contact to portal PV/SMV (1point), CA19-9>150U/mL(2point). The incidence of ER was 37% in high-risk group (score 3-4 point), 19% in the moderate risk group (score 3-4 point) and 10% in the low risk group (score 0 point). There were significant differences in overall survival between the three groups (P< 0.0001).

**Conclusions:** A preoperative prognostic scoring system for ER after surgery in R-PDAC using tumor size, PV/SMV contact, and CA19-9 is useful to select the patients requiring more multidisciplinary treatment strategy.

PP04-099

### PARENTERAL VERSUS ENTERAL NUTRITION FOR PANCREATIC FISTULA: A SYSTEMATIC REVIEW AND META-ANALYSIS

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**Background:** Postoperative pancreatic fistula (POPF) remains a significant source of morbidity following pancreatic surgery. The most effective feeding route for the conservative management of POPF is a topic of debate. We aimed to compare the efficacy of enteral nutrition (intervention) versus parenteral nutrition (control) in the rate of POPF closure.

**Methods:** Medline, EMBASE, CENTRAL, and Web of Science databases were searched for randomized controlled trials comparing enteral to parenteral nutrition in the conservative management of POPF. Risk of bias was assessed using the Cochrane Risk of Bias Tool. Quality of the evidence was assessed using GRADE. Random-effects meta-analysis was used to estimate the time to POPF closure and corresponding confidence intervals (CI).

**Results:** From 2,682 relevant citations, three studies (n=167 patients) were analyzed (85 patients in the enteral group and 82 patients in the parenteral group). Mean time to POPF closure was 3.64 days shorter in the enteral group than the parenteral group, which failed to reach statistical significance (95% CI -3.22 to 10.49, P = 0.30, I<sup>2</sup>). There were no significant differences in postoperative complication rate (OR 1.69, 95% CI 0.52 to 5.47, P = 0.38; very low quality evidence) or length of stay (LOS) between groups (mean difference: 0.76, 95% CI -9.21 to 10.74, P = 0.88; very low quality evidence).

**Conclusions:** The rates of POPF closure, postoperative complications, and LOS are not significantly different between patients receiving enteral feeds and those receiving parenteral feeds. The quality of evidence was very low and larger comparative studies are required.

PP04-100

### PREHABILITATION BEFORE ONCOLOGICAL PANCREATIC RESECTION: A SYSTEMATIC REVIEW OF AVAILABLE EVIDENCE

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**Introduction:** Paucity of data exists regarding benefits of prehabilitation before pancreatic surgery. This review aimed to appraise available evidence regarding the role of prehabilitation in patients undergoing pancreatic surgery.

**Methods:** Systematic literature searches of PUBMED, MEDLINE and EMBASE were conducted to identify articles describing prehabilitation programmes before pancreatic resection for malignancy. Data collected included pre-operative assessments, timing of prehabilitation, type, duration, adherence and outcomes.

**Results:** Six studies, including 193 patients, average age 67 years, average BMI 23.8, were included in the final analysis. Time from diagnosis to surgery ranged from 2- 22 weeks. Two studies reported a professionally supervised exercise programme, four described unsupervised programmes. Exercise programmes varied from 5 days to 6 months in duration. Two studies included nutritional interventions. Adherence to exercise programmes was better in patients not undergoing neoadjuvant therapy (90% reaching weekly activity goal vs 82%). Supervised programmes reported higher adherence than unsupervised (99% reaching weekly activity goal vs 85%). Two studies reported the impact of prehabilitation on peri-operative outcomes (major complications, gastric emptying, pancreatic leakage, mortality, readmission). Prehabilitation did not change the likelihood of major complications, pancreatic leakage, mortality or readmission in either study. Prehabilitation was associated with a shorter length of stay in both studies. All six studies reported changes in anthropometric and biochemical markers of fitness. In multiple studies, patients undergoing prehabilitation had significant improvements in muscle mass or markers of muscle function.

**Discussion:** Current studies report diverse exercise and nutrition programmes, with no current consensus regarding optimal timing or duration.

PP04-101

### DISTAL PANCREATECTOMY WITH MULTIVISCERAL RESECTION: A MULTICENTER STUDY

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**Introduction:** Multivisceral resection is sometimes necessary to achieve disease-free margins in cancer surgery. In 2/3 of the patients it is proven that there is no true neoplastic infiltration, but not performing multivisceral resection increases the recurrence rate, usually with higher morbidity and mortality. In certain patients with pancreatic tumors that invade neighboring organs these must be removed to perform an appropriate oncological surgery.

**Methods:** Retrospective multicenter observational study from prospective databases focused on distal pancreatectomy in seven Hepato-Pancreato-Biliary Units, from 1/01/2009 to 31/12/2018 (ERPANDIS Project). Inclusion criteria: any distal pancreatectomy with multivisceral resection. Exclusion criteria: DP with celiac trunk resection or portal vein resection.

**Results:** 435 distal pancreatectomies were performed. In 81.1% (353 patients) multivisceral resection was not performed and in 18.9% (82 cases) some extra organ was resected. Patients with multivisceral resection had superior ASA score (plus ASA III) ( $p < 0.001$ ) and larger tumors ( $p = 0.001$ ). In the multivisceral resection group, the approach was mostly laparotomic, splenic preservation was not performed, there were more cases of extended distal pancreatectomy and blood losses and the percentage of intraoperative transfusion was higher. The pancreatic fistula rate was the same in both groups. The average stay was double in the multivisceral resection group. The patients who underwent multivisceral resection had larger tumors and the percentage of patients with malignant tumors was higher (43.2% vs 19%).

**Conclusion:** Multivisceral resection increases morbidity and mortality but within acceptable limits and allows the removal of associated pathology or organs invaded by malignant tumors of the body and tail.

#### PP04-102

### DOES LAPAROSCOPIC DISTAL PANCREATECTOMY DECREASE MORBIDITY? A MULTICENTRE STUDY (ERPANDIS PROJECT)

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**Introduction:** Most of HPB surgeons consider that laparoscopic distal pancreatectomy (LDP) is standard treatment for pancreatic diseases. The cost-effectiveness studies performed does not obtain a clear economical and medical benefit comparing open distal pancreatectomy (ODP) and LDP. The aim of this study is to evaluate morbidity and mortality at 90 days measured and pancreatic fistula rate in a large series of distal pancreatectomies comparing results obtained in ODP and LDP.

**Materials and method:** Multicentre retrospective observational study. All scheduled ODP and LDP performed in seven hospitals. Period: 01/01/09 - 31/12/18. Postoperative complications were measured with Clavien-Dindo classification and CCI. Major complications were defined as grade IIIa or severe. Pancreatic complications were measured using definitions of ISGPS. Resection margins were categorized using "Royal College of Pathologists" classification. Morbidity and mortality were measured at 90 days.

**Results:** 419 patients were included. 250 (59.7%) were ODP and 169 (40.3%) were LDP. Both groups were comparable, except Charlson Comorbidity Index, tumor size, type of resection, splenic resection, and vascular resection. Morbidity (Clavien-Dindo), mortality, fistula rate and readmissions are shown in Table 1.

**Conclusions:** LDP is more commonly performed in non-adenocarcinoma cases, closure of stump is usually done with stapler and spleen preservation is almost 25%. ODP is performed in more adenocarcinoma cases and patients with bigger tumors, closure is done with suture and spleen preservation is only 13%. Moreover, morbidity is similar between both groups, but mortality and readmissions are higher in ODP group. Prospective RCT with matched groups is complex but needed.

#### PP04-103

### SURVIVAL ANALYSIS ACCORDING TO THE NEW RESECTABILITY CRITERIA IN PATIENTS WITH PANCREATIC CANCER

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**Background:** The definition of borderline resectable (BR) for pancreatic cancer (PC) has been based on imaging findings as for anatomical relation between the tumor and vessels (Anatomical R/BR). In fine, not only imaging findings but also other clinical parameters such as tumor makers, general status and nutritional condition are important factors in consideration of resectability. Anatomical R-PC with poor prognosis might be treated with neoadjuvant chemotherapy (NAC) same as Anatomical BR.

**Methods:** From 2007 to 2014, we intended upfront curative resection in 431 consecutive patients with PC. Among them, 380 patients underwent pancreatectomy and were enrolled. The relationship between preoperative clinical features and survival outcomes were assessed. We adopted modified Glasgow prognostic score (mGPS) and neutrophil/lymphocyte (N/L) ratio for patient's conditional assessment. Patients were stratified due to risk factor, and we distinguish risky group from others.

**Results:** Patients comprised 291 Anatomical R-PC patients (77%) and 89 BR-PC patients (23%). Multivariable analysis identified mGPS=2, CA19-9>500 U/ml and anatomical BR were independent unfavorable prognostic factors in terms of overall survival. Median survival time of

Anatomical R patients with CA 19-9 > 500 U/ml was as poor as that of anatomical BR patients (17.5 vs. 17.8 months, P = 0.483).

**Conclusions:** It is essential to stratify Anatomical R-PC and distinguish oncologically risky group from the others. Anatomical R with CA 19-9 > 500 U/ml was as unfavourable as Anatomical BR-PC, and we should consider NAC for such “risky R” patients.

#### PP04-104

### SINGLE CENTER EXPERIENCE OF THIRTY FIVE CONSECUTIVE TOTAL DUODENOPANCREATECTOMIES

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**Introduction:** laparoscopic total duodenopancreatectomy (TLDPE) remains one of the complex procedures in minimally invasive abdominal surgery.

**Objective** is to assess the short-term and long-term outcomes of TLDPE.

**Methods:** 35 patients underwent TLDPE during last 10 years. 22 were females, 13 were males. 30 patients were operated on because of malignancies and 5 because of benign diseases. Postoperative complications were assessed in order to evaluate the safety and feasibility of laparoscopic approach.

**Results:** To date this is one of the largest single-center experiences of TLDPE. Mean operative time was 466 min and mean blood loss was 356 ml. The postoperative course of 22,8% of patients was complicated by Clavien-Dindo IIIa-V complication. Among them CD V - 5,7%. Mean ICU stay was 3,42 days, while mean hospital stay was 14 days. Rate of complications demanding repeat surgeries was 14,3%. Concomitant venous resection was performed in 10 cases. Venous resection was associated with higher blood loss and operation time. R0 resection was obtained in 97% of cases with mean number of lymph nodes harvested of 13. Median overall survival of patients with pancreatic cancer was 26 months with 5-years OSR of 29%. Mean maximum glucose level during the day was 9,8 mmol/l, HbAc 7,1 with mean demand in long-actin insulin 13,8 U. Median weight loss was 5 kg. One third of patients were complaining on diarrhea.

**Conclusion:** TLDPE is feasible and effective procedure providing satisfactory short-terms and long-term outcomes.

#### PP04-105

### CENTRAL PANCREATECTOMY: A 20 YEARS SINGLE INSTITUTION EXPERIENCE

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**Background:** Central pancreatectomy is an alternative resection to distal pancreatectomy. This procedure is performed in tumors of the neck or proximal body of the pancreas. The aim of this study is to analyze the clinicopathological features, morbidity and mortality rates of patients who underwent this sparing parenchyma procedure.  
**Methods:** Between 2000 and 2019 twenty-three patients with diagnostic of pancreatic tumor underwent a central pancreatectomy. Clinicopathological data were statistically analyzed and also we study the morbidity and mortality of this surgical treatment.

**Results:** Of the 23 total patients, 20 (87%) were women and 3 (13%) were men. The median age was 43.6 (range, 5-76 years). The median tumor size was 5.6 (range, 1.3-12.5 centimeters). All patients had R0 resection and only one had a multi-visceral resection. Indications included 10 solid pseudopapillary neoplasms, 8 serous cystadenomas, 3 neuroendocrine tumors, one pancreatoblastoma, and one mucinous cystadenoma. The median operative time was 285 minutes (range, 180 - 445 minutes) and the median intraoperative blood loss was 273 (range, 50 - 600ml). Eight patients (34.7%) had postoperative complications including six cases of pancreatic fistula, one case of pancreatitis and one case of post pancreatectomy hemorrhage. Only one patient (4.3%) died after surgery because of post pancreatectomy hemorrhage. The median follow up was 46.2 months.

**Conclusions:** Central pancreatectomy is associated with increased postoperative morbidity, especially pancreatic fistula. Central pancreatectomy should be chosen for special cases and performed by experienced surgeons.

**Key Words:** Central pancreatectomy; Morbidity; Mortality; Pancreatic fistula.

#### PP04-106

### RADICAL ANTEGRADE MODULAR PANCREATOSPLENECTOMY VS STANDARD DISTAL PANCREATECTOMY FOR PANCREATIC ADENOCARCINOMA OF THE BODY AND TAIL - A COHORT STUDY FROM A SINGLE CENTER

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**Background:** The aim of this study is to investigate the impact of Radical antegrade modular pancreatosplenectomy (RAMPS) compared with standard standard distal pancreatosplenectomy (DP) on short-term outcomes and long-term survivals.

**Methods:** 192 patients who underwent RAMPS or SDP from May 2013 to December 2017 were analyzed. The comparisons of short-term and long-term outcomes were performed.

**Results:** Seventy-eight patients underwent RAMPS and 114 patients underwent SDP. 44(56.4%) patients

underwent posterior RAMPS. The average operative time in RAMPS was longer than SDP ( $230\pm 67$ min vs.  $207\pm 78$ min,  $P=0.039$ ), and the median greatest tumor diameter was much larger in RAMPS group (4.5cm vs. 3.5cm,  $P=0.001$ ). RAMPS had much more T4 ( $P<0.001$ ) and stage III ( $P=0.020$ ) by 8<sup>th</sup> AJCC TNM staging system, as well as the median number of resected and positive lymph nodes (8 vs. 6,  $P=0.007$ ; 1 vs. 0,  $P=0.011$ ). The rate of R0 resection was comparable (94.9% vs. 86.8%,  $P=0.086$ ). The overall morbidity rate was similar in two groups (39.7% vs. 31.6%,  $P=0.244$ ). The long-term survival showed that RAMPS had a shorter median survival time (16.7m vs. 20.7m,  $P=0.479$ ). The subgroup analysis demonstrated the median survival was 16.5 months in RAMPS and 12.7 months in SDP for T4 patients ( $P=0.122$ ), respectively. In addition, RAMPS group had longer median survival time for high level CA19-9 ( $\geq 300$ ) patients (16.5m vs. 13.2m,  $P=0.227$ ).

**Conclusions:** RAMPS is a safe and feasible procedure for pancreatic cancer and it may be beneficial to T4 and high level of CA19-9 patients.

#### PP04-109

### MITIGATION OF ROBOTIC PANCREATICODUODENECTOMY LEARNING CURVE THROUGH A COMPREHENSIVE TRAINING PROGRAM

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**Background:** The utilization of robotic surgery for pancreaticoduodenectomy continues to increase. There is an apparent associated lag in the training for this complex operation resulting in a learning curve with the adoption of this technique. We hypothesize that the reported learning curve can be mitigated through a comprehensive graduated training protocol.

**Methods:** Prior to robotic pancreaticoduodenectomy program implementation, all surgeons (n=3) and operating room staff at The Ohio State University underwent dedicated training. All patients who underwent an open (n=156) or robotic (n=41) pancreaticoduodenectomy following program implementation between 2015-2018 were identified. Operative and post-operative outcomes over time were analyzed. Robotic and open patients were matched 1:1 based on all measurable pre-operative patient- and tumor-specific risk factors.

**Results:** The unplanned robotic-to-open conversion rate was 19.5% (n=8). Of the remaining 33 robotic whipple operations, operative time plateaued at 11 cases (figure); however, mean operative time did not change over time ( $P=0.08$ ). Similarly, no difference over time was seen in the rate of grade B/C postoperative pancreatic fistula (POPF) (n=9.1%) or need for blood transfusion (n=4, 12.1%) ( $P=1.00$ ). After matching, no difference was seen between

robotic and open operations in the incidence of grade b/c POPF, delayed gastric emptying, length of stay, readmission, major complications, and death (all  $P>0.05$ ).

**Conclusion:** Through a graduated comprehensive training protocol, there was no apparent learning curve associated with the implementation of robotic pancreaticoduodenectomy as described in previous studies. Furthermore, robotic cases had similar postoperative outcomes compared to matched open cases.

#### PP04-111

### CONTEMPORARY PERIOPERATIVE OUTCOMES FOR PORTAL VEIN RESECTION AND RECONSTRUCTION FOLLOWING PANCREATICODUODENECTOMY FOR MALIGNANCY

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**Background:** Portal vein resection and reconstruction (PVRR) can be technically challenging during pancreatectomy for cancer, but is sometimes necessary with disease involvement of the mesenteric vessels. This study examined if PVRR negatively impacted perioperative outcomes in a modern patient cohort.

**Methods:** All patients who underwent pancreaticoduodenectomy (PD) or total pancreatectomy (TP) from 2010-2014 for invasive malignancy at our center were retrospectively reviewed. Clinicopathologic variables were compared and univariate logistic regression was used to compare outcomes between patients who underwent PVRR and those who did not.

**Results:** During the study period, 309 patients underwent PD or TP for resection of malignancy, with 78 (25.2%) patients requiring PVRR. Primary repair of the defect was the most common method of PVRR (62.8%), followed by end-to-end repair (23.1%), side-to-side repair (5.1%), and autologous vein patch (5.1%). Nonautologous patch repair was used in only 2.6% of cases, with no cases of synthetic graft use. The PVRR group had increased operative time ( $495\pm 153$  vs.  $437\pm 130$  minutes,  $p=0.001$ ), decreased formation of pancreatic fistula (10.3% vs. 21.6%,  $p=0.029$ ), and decreased deep surgical site infection (9.0% vs. 22.1%,  $p=0.011$ ). There is no difference between groups for all other examined complications, including PV thrombosis (2.6% vs. 1.3%,  $p=0.603$ ) in short-term follow-up.

**Conclusions:** Most PVRR can be performed primarily, and synthetic material can be avoided entirely with modern techniques. Despite increased operative time, perioperative complications appear to be either unchanged or reduced in PVRR patients. This may be due to increased utilization of neoadjuvant therapy in this group.

**Comparison of outcomes in patients who underwent PVRR and no PVRR during PD/TP for invasive malignancy.**

	PVRR (N = 78)	No PV Resection (N = 231)	P Value
Operative Time (mins)	495 ± 153	437 ± 130	0.001
Hospital LOS (days)	9.3 ± 3.9	10.4 ± 6.8	0.177
All Complications	36 (46.2%)	129 (55.8%)	0.150
Superficial SSI	9 (11.5%)	22 (9.5%)	0.663
Deep SSI	7 (9.0%)	51 (22.1%)	0.011
Pancreatic Fistula (grade B or C)	8 (10.3%)	50 (21.6%)	0.029
Required Blood Transfusion	13 (16.7%)	29 (12.6%)	0.347
PV Thrombus	2 (2.6%)	3 (1.3%)	0.603
Reoperation	2 (2.6%)	9 (3.9%)	0.736

PP04-112

**POST-OPERATIVE PANCREATITIS AS A PREDICTOR OF POST-OPERATIVE PANCREATIC FISTULA IN PATIENTS FOLLOWING PANCREATICODUODENECTOMY**

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**Introduction:** Post-Operative Pancreatic Fistula (POPF) remains the challenge following Pancreaticoduodenectomy (PD). Recently Post Operative Pancreatitis (POP) has been defined which has been shown to be independent predictor of POPF in retrospective studies.

**Method:** We Performed a prospective study where Serum Amylase of more than 80U/L on POD0 or POD1 was defined as POP following PD. The end point of the study was to see incidence of POP and its relation with POPF.

**Result:** There were total 23 PDs. Most of the Patients had final diagnosis of ampullary carcinoma (52%). The incidence of POP and POPF was 56.5% and 60.9%. 84.6% patient who had POP developed POPF (P= 0.008). There was total seven Post Pancreatectomy Hemorrhage, two delayed gastric emptying, one chyle leak and four Mortality. However no statistical correlation could be made between POP and other pancreas specific complications and mortality.

**Conclusion:** Though the sample size is less but POP seems to predict POPF in Patient following PDs in our study.

**Keywords:** POP- Post Operative Pancreatitis, POPF- Post Operative Pancreatic Fistula, PD- Pancreaticoduodenectomy.

PP04-113

**LOW VASCULAR DENSITY AT THE PANCREATIC RESECTION MARGIN IS ASSOCIATED WITH POST OPERATIVE PANCREATITIS AFTER PANCREATICODUODENECTOMY**

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**Background:** Post operative pancreatitis (POP) may contribute to post operative pancreatic fistula (POPF) High acinar cell score at pancreatic resection margin has been associated with POPF. The aims of this study were:

- i) To study the relation between vascular density and acinar score at pancreatic resection margin with POP and POPF;
- ii) To study the incidence of POP and its correlation with POPF.

**Methods:** Consecutive patients in a single unit, who underwent pancreaticoduodenectomy between February 2018 to October 2019 were studied. Serum amylase (Day 1) and drain fluid amylase (day 3) were measured. Vascular density and acinar score were calculated from the histopathological slides of pancreatic resection margin. POP was defined as serum amylase more than upper limit of normal on POD1. POPF was defined as clinically relevant pancreatic fistula (grade B& C) as per ISGPF 2016 update.

**Results:** Of the 33 patients (mean age: 56 yrs), 20 were men. POP occurred in 54.5% and POPF in 24.2%. Decreased vascular density (< 26.5 microvessels / 20 consecutive high power fields in 20x magnification) was found to be an independent predictor of POP (OR:0.63, p=0.028). Low acinar score was found to be independent predictor of post operative pancreatic fistula (OR:0.92, p=0.04). POP did not correlate with POPF.

**Conclusion:** Patients who developed POP had low vascular density at the resection margin suggesting that ischemia may play a role in pancreatitis and those who developed POPF had a low acinar score.

PP04-114

**STEP-UP MINI INVASIVE SURGICAL TREATMENT OF PATIENTS WITH DIFFERENT MORPHOLOGICAL FORMS OF ACUTE NECROTIZING PANCREATITIS**

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**Introduction:** Despite significant progress in the treatment strategy of acute necrotizing pancreatitis (ANP), mortality in cases of its severe form remains high. There is no single point of view concerning the indications for the use of mini invasive interventions depending on the nature, extension and localization of the pathological foci of ANP.

**Material:** We performed a prospective observational cohort study of efficacy of elaborated algorithmic mini invasive step-up approach of surgical treatment of 317 patients with different morphological forms of ANP. The following parameters were collected for each episode: length of hospital stay, mortality, occurrence of organ failure and local complications.

**Results:** Transcutaneous puncture/drainages were applied as the first step in 37 patients with acute necrotic

collections (ANC). In the presence of walled-off pancreatic necrosis (WOPN) EUS procedures were preferred in case their close localization to the stomach or duodenum in 65 observations. Initial surgical treatment wasn't effective in 18.8% and video-assisted retroperitoneal debridement (VARD) in patients with ANC or necrosectomies under EUS control in cases of WOPN were applied. Necessary for laparotomic necrosectomies occurred in 14.5% of patients and was the final step of proposed algorithmic approach. During postoperative period complications occurred in 28.3% of patients. They included 7 new episodes of organ failure, 4 cases of erosive hemorrhage, and 5 observations of pancreatic and duodenal fistulas. Overall mortality rate was 3.3%, after interventional treatment - 6.5%.

**Conclusion:** Surgical treatment in patients with ANP based on elaborated algorithmic step-up approach is followed by acceptable complication and mortality level.

#### PP04-115

### PREDICTING POST-OPERATIVE PANCREATIC FISTULA: A SYSTEMATIC REVIEW OF SCORING SYSTEMS

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**Background:** Post-operative pancreatic fistula (POPF) cause major morbidity following pancreaticoduodenectomy. There are multiple published scoring systems which predict the probability of fistula, but few have undergone rigorous external validation. This systematic review aimed to identify current scoring systems and combine the results of external validation to assess scores clinical validity.

**Methods:** The area under receiving operator characteristic curve (AUROCs) were extracted from the included studies, and standard error's were derived from 95% confidence intervals, were reported, or estimated from the p-values or numbers of cases otherwise. For risk scores with data available from more than two studies, intercept-only random-effects meta-regression model were then used to produce pooled AUROCs.

**Results:** Systematic review identified 25 risk scores, of which four were included in the meta-analysis. These were the scores proposed by Mungroop (reported in N=5 studies), Yamamoto (N=3), Roberts (N=4) and Callery (N=11). The overall predictive accuracies were found to be similar for all four scores, with pooled AUROCs of 0.68, 0.68, 0.69 and 0.73, respectively. However, considerably heterogeneity was also observed, with  $I^2$  statistics ranging from 83-93%.

**Conclusion:** There are a multitude of predictive scoring systems, most with no external validation.

Of those that have been externally validated, repeatedly they show similar predictive accuracy.

There is a need for a large, multi-centre study to ascertain clinically important risk factors for POPF and validate a scoring system that performs consistently well regardless of geographic location and that is easy to use.

#### PP04-117

### LONG-TERM OUTCOMES OF PANCREATIC ANASTOMOSIS AFTER OPEN AND LAPAROSCOPIC PANCREATODUODENECTOMY

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**Introduction:** Despite favorable short-term outcomes of laparoscopic pancreaticoduodenectomy (LPD), long-term outcomes after LPD in comparison with open pancreaticoduodenectomy (OPD) have been rarely reported. We compared the long-term outcomes of pancreatic anastomosis between LPD and OPD by evaluating anastomosis stricture and parenchymal atrophy.

**Methods:** We retrospectively reviewed 212 patients who received OPD (n=121) and LPD (n=91) from a single surgeon, from December 2014 to October 2018. We analyzed the long-term outcomes of pancreatic anastomosis by reviewing the postoperative 1-year CT for anastomosis stricture and parenchymal atrophy. Anastomosis stricture was defined as a 30% increase or more in pancreatic duct diameter, and pancreatic atrophy was defined as a 30% decrease or more in the remnant pancreas parenchyma.

**Results:** The incidence of clinically relevant postoperative pancreatic fistula (CR-POPF) was 19.8% in LPD and 18.2% in OPD, with no significance. In the OPD group, there were more patients with pancreatic cancer (22 vs 59.5 %,  $P < 0.001$ ). The LPD group was associated with smaller pancreatic duct (2.3 vs 3.3 mm,  $P=0.041$ ) and soft pancreas (78.0 vs 48.8%,  $P < 0.001$ ). There were no differences in anastomosis stricture (16.5 vs 24.0%,  $P=0.184$ ). There were significantly more patients with pancreas atrophy in the open group (17.6 vs 33.1%,  $P=0.011$ ). Multivariate analysis of risk factors for anastomosis stricture and pancreas atrophy showed operative method was not a significant factor.

**Conclusion:** The results of this study revealed that long term outcomes of LPD were not inferior to OPD in terms of patency of the pancreatic duct and pancreatic atrophy.

#### PP04-118

### INTERVENTIONS TO REDUCE POST-OPERATIVE PANCREATIC FISTULA AFTER PANCREATODUODENECTOMY - DO WE NEED A CHANGE OF DIRECTION? A SYSTEMATIC REVIEW AND META-ANALYSIS

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**Introduction:** Various perioperative interventions designed to reduce postoperative pancreatic fistula (POPF) rate after pancreaticoduodenectomy (PD) have been evaluated, but most are unsuccessful. The aim of this study was to provide a contemporary report of the efficacy of different

interventions and identify areas for future investigation in this complex field.

**Method:** A systematic review of the literature for RCTs evaluating perioperative interventions to reduce POPF after PD was performed according to the PRISMA guidelines. Meta-analyses were performed for each intervention.

**Results:** Some 20 interventions (n=6,628 patients, 56 studies) were identified. Four interventions reduced POPF after PD on MA: external pancreatic stent vs. no stent (OR 0.42; 95%CI: 0.25-0.70); p< 0.005); invagination PJ vs. duct to mucosa PJ (OR 0.60; 95%CI: 0.40-0.90; p=0.01); pancreaticogastrostomy (PG) vs. PJ (OR 0.69; 95%CI: 0.49-0.99; p=0.04) and omission of intraabdominal drains in patients with low risk PJ anastomoses (OR 0.52; 95%CI: 0.34-0.81; p< 0.005). Two interventions with data available from only one RCT were shown to reduce POPF: end to side vs. classic pancreaticojejunostomy (PJ) (OR 0.25; 95%CI 0.07-0.96; p=0.041) and closed suction drainage of pancreatic duct (OR 0.44; 95%CI: 0.2-0.99; p=0.045). One intervention, acute normovolaemic haemodilution, increased POPF rate in one RCT (OR 3.29 95%CI:1.11-9.77; p=0.045).

**Conclusions:** Current evidence for perioperative interventions to reduce POPF after PD is heterogenous and frequently from underpowered RCTs. To further clinical knowledge in this complex field future RCTs should be better powered and flexible enough to involve evaluation of the promising novel strategies identified in this review.

PP04-119

### VASCULAR ANOMALIES IN PANCREATIC HEAD RESECTION DO NOT IMPACT SURGICAL OUTCOME IN HIGH VOLUME CENTER

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**Background:** Vascular anomalies(VA)in pancreaticoduodenectomy(PD)may impact both surgical and oncological outcome.Focused preoperative workout aims to detect these anomalies and therefore prevent intraoperative unwanted events.We present our experience of PD in patients with or without VA.

**Patients and methods:** We retrospectively analysed pre, intra and post-operative data of patients from prospective database with VA undergone PD and compared them to noVA. VA were: replaced and accessory right hepatic artery (rRHA,arHA)), hepatomesenteric trunk (HMT) and celiac-axis (CA) stenosis. Operative time, blood loss, morbidity, length of stay, need of reoperation and R-status were specifically considered.

**Statistical analysis:** Continuous variables were analysed using Student's t-test or Mann-Whitney U test. Categorical variables were compared using Chi-Square test or Fisher's exact test when appropriate.A p-value< 0 .05 was considered as statistically significant.

**Results:** 72 patients VA underwent PD and were compared with 72pts noVA observed in the same period. Abdominal complications occurred in 79,2% and 52,5% of noVA and VA respectively(p:0,001). Abdominal fluid collection in 38.9% vs 22,2% p:0.04, need for transfusion in 48,6% vs 20,8% p:0.001 and length of stay 17days vs 11,5 p:0.001 for noVA and VA respectively.At multivariate analysis LoS is significantly shorter in VA.

**Conclusion:** In our series patients with VA have a better postoperative outcome and shorter stay: experienced surgeon used to plan preoperative strategy based on imaging and increased attention in lamina and selective vascular dissection when aware of the anomaly may play a role.- Technical tricks to intraoperatively detect VA are known and need to be routinely applied.

PP04-120

### PANCREATICODUODENECTOMY PERFORMED BY SURGEONS IN TRAINING AND THE RISK OF POST-OPERATIVE FISTULA: A SYSTEMATIC REVIEW AND META-ANALYSIS

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**Introduction:** The complexity of pancreaticoduodenectomy (PD) and fear of morbidity, particularly post-operative pancreatic fistula (POPF), can be a barrier to surgical trainees gaining vital experience. This meta-analysis sought to establish the POPF rate following PD by trainees or established surgeons.

**Methods:** A systematic review of the literature was performed using PRISMA guidelines and meta-analysis compared complication rates using RevMan software.

**Results:** 3 of 53 studies were included for meta-analysis, all defining POPF using ISGPS 2005 criteria. Some 309 PD (16%) were performed by trainees. The rate of POPF after surgery performed by those who had completed training was not different when surgery was performed by trainees (19.6 vs 23.0%; OR: 0.65; 95%CI 0.36-1.18; p=0.07) or mortality (OR: 1.08; 95%CI 0.30-3.97; p=0.60). Neither soft pancreatic texture (OR: 0.62; 95%CI: 0.19-1.99; p=0.042) nor pancreatic duct width significantly differed between the two groups. Gastrointestinal bleeding, blood loss and operative time were greater when operations were performed by trainees but there was no difference in delayed gastric emptying, intra-abdominal collection or mortality.

**Conclusions:** PD, when performed by trainees, is associated with acceptable outcomes. Evidence of heterogeneity in key variables indicates a need for further studies and it is unclear whether outcomes are similar when trainees perform surgery among patients stratified as low or high risk for POPF using established risk scores. The use of risk adjusted CUSUM as reported recently could be a useful tool to assess trainees performance.

PP04-122

### CENTRAL PANCREATECTOMY - OUR EXPERIENCE IN A TERTIARY CARE CENTRE IN SOUTHERN INDIA

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**Background:** Pancreatic benign and low grade malignant tumors located in the body and neck of pancreas pose a challenge to surgeon for extent of pancreatic resection. The study was done to evaluate the role of central pancreatectomy in intermediate located tumors.

**Methodology:** The study is a retrospective analysis of prospective maintained database from 2005 to 2019 at a tertiary care hospital in India. Demographic, clinical, operative and postoperative characteristics were recorded and analysed.

**Results:** Nineteen patients (16 females) underwent central pancreatectomy. The Median Tumor size was 5cm. Proximal stump duct was ligated in all patients. 85% of Distal stump were managed with Pncretaicojejunostomy. Complications seen were Pancreatic fistula (Biochemical leak n=7/19, GradeB n=2/19); Delayed Gastric emptying (GradeA n=6/19; GradeB n=2/19) and Hemorrhage( GradeA n=2/19; GradeB n=1/19) None had in-hospital mortality. Histopathology results showed( serous cystadenoma- 10/19; Solid pseudopapillary tumor (SPEN)- 7/19, Mucinous cystadenoma- 1/19; Focal pancreatitis-1/19).New onset Endocrine insufficiency and endocrine insufficiency was seen in 10% each during median follow up of 72 months.

**Conclusion:** Central pancreatectomy offers lesser pancreatic insufficiency with acceptable morbidity.

**Keywords:** Pancreatic Neck and Body tumors, Central Pancreatectomy.

PP04-123

### THE ONCOLOGIC AND LONG-TERM OUTCOMES OF LAPAROSCOPIC DISTAL PANCREATECTOMY FOR PANCREATIC CANCER

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**Introduction:** The recent advances of surgical techniques and technology allow minimally invasive surgery to be applied in patients with malignant diseases of the pancreas. We report the oncologic outcomes and long-term outcomes of laparoscopic distal pancreatectomy (Lap-DP) for pancreatic cancer compared with open surgery.

**Methods:** Seventy- three patients underwent laparoscopic and open distal pancreatectomy for pancreatic cancer were included in the study. Patients who had been diagnosed with the tumor in body and tail of the pancreas without suspicion for involvement of major vessels and other

organs except left adrenal gland were eligible for Lap-DP. Postoperative, oncologic and long-term outcomes of patients undergoing Lap-DP (n = 47) or Open-DP (n = 26) were compared.

**Results:** Lap-DP was associated with less blood loss (125 vs. 441 mL, p< 0.05). Operative time was significantly longer in Lap-DP group, when compared with Open-DP group (315 vs. 251 min). Pancreatic fistulas (ISGPF B/ C, 10.6 vs. 7.7 %) were similar between Lap-DP and Open-DP, respectively. There was no mortality in the two groups. Resected lymph nodes (19 vs. 21) were similar in the two groups. Lap-DP was associated with a significantly lower rate of lymph nodes metastasis (35vs. 65%, p< 0.05). Rate of negative margins were similar between Lap-DP and Open-DP, respectively (89 vs. 85%). Long-term outcomes of Lap-DP were similar when compared to Open-DP by Kaplan-Meier method.

**Conclusion:** Lap-DP for pancreatic cancer is less invasive, feasible. It seems to achieve similar oncologic and long-term outcomes to open approach.

PP04-126

### COMPARISON OF OBSERVED VS PREDICTED OUTCOMES FROM NSQIP FOR PANCREATICODUODENECTOMY AT A PANCREATIC SURGERY UNIT

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**Introduction:** Although the mortality of pancreaticoduodenectomy has decreased significantly over the last few years, with a current 30 day mortality of 1% in NSW hospitals, the morbidity, length of stay and readmission rates remain high when compared to other complex surgical procedures. Our aim was to ascertain accuracy of the ACS NSQIP risk calculator for pancreaticoduodenectomy. Estimating Perioperative risk accurately can allow future patients to make an informed decision about undergoing Pancreaticoduodenectomy; provide a benchmark for safe, high-quality Pancreatic surgery and help target complication-reduction measures for hospital staff.

**Methods:** A retrospective analysis of patients undergoing Pancreaticoduodenectomy at our hospital from July 2015 to July 2017 was performed. Patients found to be inoperable during the procedure or who had subtotal or distal pancreatectomy were excluded. For 5 main parameters, observed outcomes were measured against predicted outcomes using ACS-NSQIP Surgical Risk Calculator for Pancreaticoduodenectomy.

**Results:** During the 24-month period, 45 patients underwent Pancreaticoduodenectomy for various pathologies, including 16 for pancreatic Adenocarcinoma, 6 for Cholangiocarcinoma, 5 for ampullary adenocarcinoma, 5 NETs, 5 IPMN and 5 others. 30-day mortality was slightly higher than the NSQIP prediction (2 deaths -4.4% vs predicted 1.2% mortality). Return to theatre rate was higher than predicted (8 cases- 17.7% vs 4.3% predicted). There were fewer actual Readmission rates (4.4% vs 11.8% predicted), observed Serious complications (17.7% vs 20.7% predicted) and observed Surgical Site infections (11.1% vs 15.6% predicted).

**Conclusions:** NSQIP Calculator does not accurately predict Observed outcomes for pancreaticoduodenectomy.

PP04-127

### THE EFFECT OF PREOPERATIVE IMMUNONUTRITION ON SURGICAL OUTCOMES IN PATIENTS UNDERGOING RESECTION FOR PANCREATIC MALIGNANCY

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**Introduction:** The impact of perioperative immunonutrition in pancreatic cancer surgery remains controversial. While some studies have demonstrated a positive impact on outcomes in well-nourished patients, others showed no difference in outcomes. In a recent study examining the effects after pancreatic and gastric cancer surgery, benefits were only identified in malnourished patients. Our goal was to assess the effect of perioperative immunonutrition on the surgical outcomes of patients undergoing pancreatic cancer resections in our institution.

**Methods:** A retrospective review of a prospectively collected database of 101 consecutive patients undergoing surgery for suspected pancreatic malignancy in our centre over an eight-year period was conducted. The demographics, nutritional status, and other relevant endpoints such as grade of surgical complications and length of stay were obtained.

**Results:** 8 patients with benign final histology were excluded. Patients with incomplete data on immunonutrition were also excluded from the final analysis. 36 patients received perioperative immunonutrition while 43 patients did not. There was no statistically significant difference in the infective complications between the two groups and the severity of complications including the median lengths of stay were also similar in both groups.

**Conclusion:** The efficacy of immunonutrition in improving the outcomes of pancreatic cancer resections remains to be proven. Our project is an example of early collaboration with allied health team to improve the outcomes of pancreatic cancer. Given the small sample size of our study and other limitations, further investigations are required to answer this pertinent question.

PP04-128

### LONG-TERM NUTRITION STATUS AFTER TOTAL PANCREATECTOMY IN ELDERLY PATIENTS

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**Introduction:** Total pancreatectomy (TP) is increasingly performed even for elderly patients; however, nutrition status after long-term survival is not well evaluated.

**Methods:** A retrospective review of 39 patients who underwent TP at our institution between 2007 and 2016 and survived more than 3 years. Patients were divided into 2 groups: 80 years or older (n=6) and younger than 80 years (n=33) at the time of analysis. Nutrition status was categorized as normal, light, moderate, or severe according to CONUT score, and evaluated at 2 time points: 1 year after surgery and the last follow-up.

**Results:** The median age at analysis was 82 years in the elderly and 67 years in younger patients. Time after surgery was not different between the groups (5.5 vs. 5.0 years). Nutrition status at 1 year after surgery was normal in 4 (67%) patients and light in 2 (33%) in the elderly, and normal in 16 (52%), light in 13 (42%), and moderate in 2 (6%) in younger patients, respectively ( $p=0.7$ ). Nutrition status at the last follow-up was normal in 3 (50%) patients, light in 1 (17%), and moderate in 2 (33%) in the elderly group, and normal in 14 (42%), light in 11 (33%), moderate in 7 (21%), and severe in 1 (3%) in the younger group, respectively ( $p=0.8$ ). Distribution of improved or stable nutrition status compared to 1 year after surgery was similar between the groups (67% vs. 68%).

**Conclusion:** TP can be performed safely for elderly patients from the long-term nutritional viewpoint.

PP04-130

### MINIMALLY INVASIVE SURGERY FOR CYSTIC NEOPLASMS OF PANCREAS - A SINGLE CENTRE EXPERIENCE

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**Introduction:** Cystic neoplasms of pancreas are being detected in increasing frequency in recent times owing to frequent use of cross sectional imaging and the role of minimally invasive surgery in the management of cystic neoplasms of pancreas is on the rise.

**Methods:** A Retrospective analysis of prospectively maintained database was conducted on all patients who underwent minimally invasive surgery for cystic neoplasms of pancreas from Jan 2009 to Dec 2019. Comparative analysis of perioperative outcomes of Laparoscopic vs Robotic surgery for PD and DPS groups was done.

**Results:** A total of 43 case of cystic neoplasms of pancreas underwent minimally invasive surgery (Laparoscopic - 31 and robotic - 12) during the study period. Out of the 43 patients, 16 underwent Distal pancreatectomy with splenectomy, 6 underwent spleen preserving Distal pancreatectomy, 12 underwent Pancreaticoduodenectomy, 6 underwent Central pancreatectomy and 3 underwent enucleation.

The mean operative time, blood loss and postoperative stay were 372 +/- 39 mins, 266 +/- 82 ml and 7 +/- 1.5 days for Lap PD vs 480 +/- 42 mins, 263 +/- 84 ml, 7 +/- 1.5 days for Robotic PD respectively. Clinically relevant POPF rates were 7% and 8% respectively. For the DPS group, the mean blood loss was 162 +/- 45 ml for Lap DPS vs 190 +/- 60 ml for Robotic DPS respectively. There was one mortality in PD group.

**Conclusion:** Minimally invasive surgery for cystic neoplasms of pancreas is safe and feasible. Both laparoscopic and robotic surgery have comparable perioperative outcomes.

PP04-131

### POST OPERATIVE OUTCOMES AFTER PANCREATODUODENECTOMY: A SINGLE CENTRE EXPERIENCE OF 212 CASE IN NORTH INDIA

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**Introduction:** To evaluate outcomes of Pancreaticoduodenectomy (PD) at Surgical Gastroenterology unit at Government Medical College Hospital in North India.

**Method:** Retrospective analysis of prospectively maintained database of pancreaticoduodenectomy patients was done and early postoperative complications and outcomes were evaluated.

**Results:** A total of 212 patients underwent PD from January 2013 to December 2019. 130 were male and 82 were female. 194 patients underwent open PD and 18 underwent laparoscopic/ laparoscopic assisted PD. 162 operations were done for Periampullary Ca., 26 for carcinoma head of pancreas, 7 for neuroendocrine tumor, 2 for GIST, 1 for carcinoma stomach, 2 for Ca. Gallbladder with ampullary Ca. (dual malignancy) and 2 for tubercular CBD stricture and 10 for chronic pancreatitis. Overall mortality was 4.2% (9 patients). Most common morbidity was surgical site infection in 44 patients (21%). Pancreatic fistula rate was 12.7% (27 patients), of which 20 patient has type A leak, 6 patient has type B leak and 1 patient has type c leak. Incidence of postoperative bleed was 2.83% (6 patients).

**Conclusion:** With adequate surgical expertise and evidence based perioperative care and multispecialty approach, pancreaticoduodenectomy can be performed at medical college hospital with low morbidity and mortality.

PP04-132

### RECURRENT BLEEDING FROM RUPTURED PSEUDOANEURYSM DUE TO COIL MIGRATION CAUSED BY TAPERING VASSOPRESSOR AFTER INITIAL HEPATIC ARTERY EMBOLIZATION IN PATIENT WITH PANCREATODUODENECTOMY: A CASE REPORT

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**Background:** Hemorrhage after pancreatic surgery is dangerous and rebleeding after first bleeding management

can be directly related to mortality if it is not managed early.

**Method:** An 79-year-old male was admitted with hematochezia. He underwent pylorus preserving pancreaticoduodenectomy due to distal bile duct cancer 1 month ago. He was diagnosed with pseudoaneurysm rupture at local hospital and took successful common hepatic artery embolization with coil. The patient was admitted to the ICU with continuous infusion of norepinephrine(NE) due to low blood pressure(BP) at the time of admission. The patient's BP was stable and without additional bleeding, reduced NE and stop. Two hours after NE stop, the patient complained of abdominal pain and large amount of hematochezia followed.

**Result:** The patient's progress was observed with transfusion, but hemoglobin(Hb) level was 4.7g/dl after 10 hours and hematochezia also continue. We decided to repeat diagnostic angiography. The angiogram found that the contrast leak was inside the pseudoaneurysm sac. In the previous procedure, the coil was curled up to the splenic artery branch, which made additional coiling difficult. Further embolization was performed using diluted glue. After re-embolization, there was no more bleeding during the hospital stay and the Hb level rose to 9.2g/dl and the patient's condition gradually stabilized.

**Conclusion:** After embolization, the patient's condition improves and the vassopressor can be discontinued, causing the arterial wall to relax and the coil to fall out. Therefore, rapid and aggressive angiography during mass recurrent bleeding after embolization can help to find the cause of bleeding.

PP04-133

### COMPLIANCE AND OUTCOME OF PATIENTS IN PANCREATIC SURGERY UNDER ERAS PROTOCOL - THE MEDICAL CITY EXPERIENCE

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ERAS principle on Pancreatic surgery are said to be safe and achievable with good outcomes. After the release of Pancreatic ERAS protocol and our institution being the Center for ERAS, this study aims to apply those principles on our pancreatic surgical cases and test if compliance will result to good outcomes. Data are encoded in the ERAS audit system then results are interpreted. 40 cases encoded as pre ERAS (2010-2017) 17 cases under ERAS (2018-2019). Our Compliance rate has increased 60% from 41% pre ERAS with declining complication rate of 41.2% from 57.5%. Median LOS is almost similar at 6-7 days. Our weakness in compliance is mostly at post Surgery phase where in critical timing for oral intake can either lead to fast recovery or result to complication such as leaks. Mobilization time of patients according to the recommendation from the protocol are sometimes difficult to document due to short personnel. ERAS seems to be safe but more cases are needed to fully see the outcomes. Prehabilitation, carbo loading and lesser NPO time can help improve post-operative rate. Resumption of oral intake should be not be immediate and GUT status must be evaluated clinically first to avoid early GUT related complications.

PP04-134

## RESECTION OF THE PRIMARY GASTROINTESTINAL NEUROENDOCRINE TUMOR AMONG PATIENTS WITH METASTATIC NEUROENDOCRINE TUMORS IMPROVES OVERALL SURVIVAL

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**Introduction:** Among patients with metastatic gastrointestinal (GI) neuroendocrine tumor (NET), the role of primary tumor resection remains unknown. We sought to analyze if primary tumor resection of NET was associated improved overall survival (OS).

**Methods:** Individuals diagnosed with Stage IV GI NETs were identified in the linked Surveillance, Epidemiology, and End-Results-Medicare database from 2004-2016. OS of patients who did versus did not undergo primary tumor resection was examined using the Kaplan-Meier method.

**Results:** Overall 3,562 patients (median age: 70, IQR: 64-77; male 53.3%) were identified who had metastatic GI NETs at time of diagnosis. The majority of individuals had a NET in the pancreas (n=1,451, 40.7%); the most common site of metastatic disease was the liver (n=1,684, 47.3%). Overall, 1,425 (40.0%) individuals underwent primary tumor resection whereas a smaller subset (n=264, 7.4%) had liver directed surgery only for metastatic disease. Individuals who had primary tumor resection were slightly younger (71yr, IQR 65-78 vs. 68yr, IQR 63-75) and more commonly had small intestine NET (12.6% vs. 49.6%)(both  $p < 0.001$ ). After adjusting for demographic factors, as well as tumor grade and receipt of liver directed therapy, primary NET resection remained associated with improved OS (HR: 0.58, 95%CI 0.52-0.64;  $p < 0.001$ )(Figure).

**Conclusion:** Primary NET resection was associated with a survival benefit among individuals presenting with metastatic GI NET.

PP04-135

## PANCREATIC DUCTAL DISRUPTION SYNDROME - AN AGGRESSIVE APPROACH

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**Introduction:** Pancreatic ductal disruption syndrome is rare complication of pancreatitis causing severe morbidity and mortality.

Pleural effusion as a consequence of acute pancreatitis is transient, usually left sided.

Rarely, it may be right sided causing diagnostic dilemma,difficult to establish as a complication of pancreatitis.

Early diagnosis and intervention reduces morbidity and mortality.

**Method:** We report a case of acute pancreatitis with ductal disruption , ascites , right sided pleural effusion with severe respiratory distress,managed successfully with distal pancreatectomy.

**Case report:** A 32- year old gentelman presented with shortness of breath and since 7 days.

Known alcoholic and gutka chewar since 20 years.

Initially managed elsewhere with chest tube and ERCP( stenting ).

Due to shortness of breath referred to our hospital .

On arriving, immediately an inter costal draining tube was placed which drained 3 liters of fluid.

A ct done which revealed acute pancreatitis with ascites and right pleural effusion started on octreotide infusion and TPN.

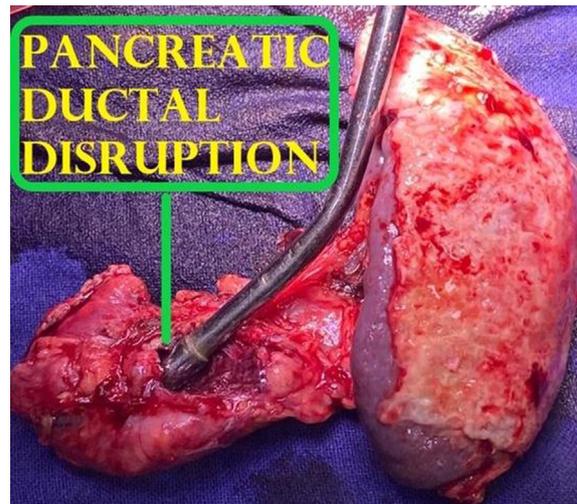
Chest Tube Drain -High Nearly 500ml A Day.

MRCP was done wich revealed distal pancreatic ductal disruption.

So,laparotomy Was Done On 4 th Day Of Admission(- Distal Pancreatectomy)

**Operative Findings:** Free Fluid Of 1 Litre Drained.

Disrupted Distal Pancreatic Duct.



DISTAL PANCREATECTOMY SPECIMEN WITH DUCTAL DISRUPTION.

A Complete recovery was seen in a week,with unremarkable follow up.

**Conclusion:** Early aggressive approach to address the cause of pancreatic ascites that is pancreatic ductal disruption is needed.

In pancreatic ductal disruption with failed ERCP stenting, hemodynamically stable,dispite pleural effusion ,distal pancreatectomy will reduce the hospital stay and morbidity.

PP04-136

## MINIMALLY INVASIVE PANCREATICODUODENECTOMY IN PANCREATIC CANCER PATIENTS AFTER NEOADJUVANT CHEMOTHERAPY - IS IT SAFE?

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**Background:** Neoadjuvant therapy is increasingly being utilized in pancreatic cancer (PDAC) patients. The benefits of minimally invasive pancreaticoduodenectomy (MIPD) over open pancreaticoduodenectomy (OPD) are

controversial, and perioperative outcomes of MIPD after neoadjuvant therapy has not been studied.

**Methods:** The pancreatectomy-targeted American College of Surgeons National Surgery Quality Improvement Program (NSQIP) database was used to examine the outcomes of PDAC patients who underwent MIPD or OPD between 2014–2017. Patients who received neoadjuvant therapy and underwent MIPD were propensity score matched to those who underwent neoadjuvant and OPD based on de-

Pancreatic Surgery. A Novel Tool for Unbiased Outcome Comparisons. (*Ann Surg*, 2019 vol. 270 (2) pp. 211-218.)

**Methods:** We reviewed all our PD performed from January 2015 to January 2020 in our institution and made a comparative table among patients within inclusion criteria and overall sample based on the paper proposal.

**Results:** The overall sample is 38 patients, the patients within the benchmark inclusion criteria were 28, the comparative results are shown in table.

#### PP04-138 Benchmarks in PD in Clinica Santa Maria

Outcome Benchmarks	Within inclusion criteria N=28	Overall Sample N=38	Benchmark
Operative Time (hours)	6.5 (4.4-11)	6.1 (4.4-11)	<7:30
LOS (Days)	15.6 (10-53)	16.1 (10-80)	<15
Overall complication	53.8%	52.4%	<73%
Clavien IV complication	7.8%	7.4%	<5%
Pancreatic Fistula B-C	11%	18%	<19%
In Hospital Mortality	0	0	<1.6%
R1 status	3.7%	5.2%	<39%
Readmission	18%	13%	<21%
1 year DFS	85%	73%	>53%

mographic, oncologic, and operative factors and perioperative outcomes were compared.

**Results:** 2,313 patients received neoadjuvant therapy and underwent pancreaticoduodenectomy during the study period. 197 (8.5%) underwent MIPD. Compared to OPD, MIPD patients had decreased rates of blood transfusions (15.2% vs 26.3%,  $p < 0.01$ ), overall complications (47.2% vs 54.7%,  $p = 0.04$ ), and postoperative length of stay (LOS) (7.9 days vs 9.7 days,  $p < 0.01$ ). MIPD patients had a higher rate of 30-day readmission (20.8% vs 14.7%,  $p = 0.02$ ). There was no difference in 30-day mortality between MIPD and OPD (2.0% vs 1.4%,  $p = 0.49$ ). After 1:3 propensity matching 197 MIPD to 591 OPD patients, MIPD had a decreased rate of blood transfusion (15.2% vs 23.0%,  $p = 0.02$ ) and postoperative LOS (7.9 vs 9.5,  $p < 0.01$ ), but increased rate of 30-day readmission (20.8% vs 13.4%,  $p = 0.01$ ). There was no significant difference in 30-day mortality between groups (2.0% vs 1.7%,  $p = 0.76$ ).

**Conclusion:** Among pancreatic cancer patients who receive neoadjuvant therapy, MIPD is safe with comparable perioperative outcomes to OPD.

#### PP04-138

### APPLYING BENCHMARK OUTCOMES IN PANCREATODUODENECTOMY AT A CENTER IN CHILE

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**Introduction:** Pancreatoduodenectomy (PD) is a high demanding technical procedure, with significant risks of morbidity and mortality. Surgical departments performing this operation around the world should aim for results that are within the best expected outcomes. The aim of this study is to compare our results in PD using the recently published tool for outcome comparisons Benchmarks in

**Conclusions:** The benchmark outcomes established in the mentioned paper are a novel and excellent tool to avoid biases at the moment to analyze results, specially in a low volume center as ours. In the other hand is an inspiring tool to reach and improve the outcomes of our patients.

#### PP04-140

### BILIARY COMPLICATIONS DURING NEOADJUVANT THERAPY FOR PANCREATIC CANCER

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**Introduction:** Neoadjuvant therapy prior to resection of pancreatic head cancer increases time to surgery and thus the possibility of biliary complications. We determined the frequency and impact of biliary complications during neoadjuvant therapy prior to resection.

**Methods:** We completed a retrospective study of patients treated with neoadjuvant therapy for pancreatic head adenocarcinoma from May 2014 through March 2019.

**Results:** Of the 59 patients identified, the average age was 67 and 50.8% were male. Neoadjuvant therapy regimens included gemcitabine and abraxane + chemo-radiation (28 patients, 47.5%), FOLFIRINOX + chemo-radiation (15 patients, 25.4%) and remaining 16 patients received alternative therapeutic combinations based on tolerance. Six (10.1%) patients died prior to completion of neoadjuvant therapy. After completion of all neoadjuvant therapy, 34 (57.6%) patients went on to resection while 19 (32.2%) showed disease progression precluding surgical extirpation. Biliary complications during neoadjuvant therapy affected 16 patients (27%). Biliary interventions included percutaneous cholecystostomy drain (3 patients, 5.1%), ERCP with stent placement or exchange (6 patients, 10.1%), percutaneous transhepatic drain (4 patients, 6.8%) and hospital admission for cholangitis with medical

treatment only (2 patients, 3.3%). Eight of the 16 patients with biliary complications went on to surgical resection (50%) compared to 26 of the 43 (60.4%) patients who did not have biliary complications. ( $\chi^2=0.18$ ,  $p = 0.67$ ).

**Conclusion:** Biliary complications during neoadjuvant therapy for pancreatic head cancer are relatively common, but do not significantly affect proceeding to surgical resection.

PP04-141

### USE OF HEMOPATCH AS A SEALANT AT THE PANCREATICOJEJUNOSTOMY TO PREVENT POSTOPERATIVE PANCREATIC FISTULA. A RANDOMIZED CONTROL TRIAL

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**Introduction:** Postoperative pancreatic fistula (POPF) is a common and most severe complication following pancreaticoduodenectomy (PD) (9.8% to 34.2%). POPF not only prolongs hospital stay and increases healthcare costs, but also plays a central role in the development of life-threatening events such as intra-abdominal abscess and postoperative hemorrhage. We present a new way to decrease POPF after PD using a NHS-PEG patch involving duct-to-mucosa pancreaticojejunostomy (DTM).

**Methods:** Randomized control trial (NCT03419676) including 64 consecutive PD were performed from May 2018 to January 2020, using the same technique, 32 of them sealing with NHS-PEG patch after DTM. Both groups were statistically homogeneous. Demographic data were collected (age, gender, diagnosis, comorbidities), and rates of postoperative complications (pancreatic fistula, biliary fistula, delayed gastric emptying, hemorrhage, readmission, exitus, and mean stay).

**Results:** A detailed analysis of the morbidity rate and mortality at 90 days will be performed. The final results will be presented in the meeting in case of being accepted. (recruitment completed in January 2020).

**Conclusion:** Preliminary results based on an observational series of 26 patients after PD were presented at the E-AHPBA Meeting in Mainz in 2017. This RCT was conducted based on these previous data. If the results confirm it, sealing with NHS-PEG patch can offer a new possibility to decrease POPF, with less fistula rate B and C, less hospital stay and less healthcare costs.

PP04-142

### INTRAOPERATIVE EVALUATION OF THE HEPATIC ARTERY BLOOD FLOW DURING PANCREATODUODENECTOMY (HEPARFLOW STUDY)

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Radiology, and <sup>3</sup>Institute of Medical Biometry and Informatics, University Hospital of Heidelberg, Germany

**Introduction:** During pancreatoduodenectomy division of the gastroduodenal artery can disturb liver blood supply and result in liver ischemia in patients with celiac axis stenosis (CAS). We aimed to assess liver blood supply during pancreatoduodenectomy and the associated risk for ischemia.

**Methods:** This prospective observational study included patients undergoing partial or total pancreatoduodenectomy. Blood flow in the proper hepatic, gastroduodenal, additional arteries and in the portal vein was measured using Doppler flowmetry. Preoperative computed tomography was evaluated with focus on anatomic variations and CAS. Liver perfusion and function failure were recorded based on laboratory parameters. Other complications were also assessed.

**Results:** Between 04/2018 and 01/2019, 100 patients undergoing pancreatoduodenectomy were analyzed. Proper hepatic artery flow was  $190.7 \pm 156.3$  ml/min before,  $187.4 \pm 158.8$  ml/min after division of the GDA ( $P=0.431$ ) and had increased by 60% to  $305.6 \pm 224.6$  ml/min at the end of surgery ( $P < 0.001$ ). In the presence of replaced or accessory hepatic arteries ( $n=23$ ) the total arterial blood flow per cubic centimeter of liver parenchyma was significantly higher compared to standard vascular anatomy ( $n=75$ ) ( $0.29 \pm 0.13$  ml/(min.cm<sup>3</sup>) versus  $0.23 \pm 0.13$  ml/(min.cm<sup>3</sup>);  $P=0.044$ ). The presence of CAS ( $n=35$ ) was associated with lower total flow ( $0.20 \pm 0.11$  ml/(min.cm<sup>3</sup>) versus  $0.27 \pm 0.14$  ml/(min.cm<sup>3</sup>);  $P=0.031$ ) and with a trend towards increased severe complications (25.8% versus 10.9%;  $P=0.07$ ).

**Conclusion:** This is the first study performing systematic intraoperative flow measurement to assess liver blood supply during pancreatoduodenectomy. CAS is a risk factor for reduced hepatic arterial flow and increased morbidity. Additional hepatic arteries increase total arterial flow and may be protective.

PP04-143

### WHIPPLE ERAS: IDENTIFYING AN ACTIONABLE COHORT THAT FAILS TO MEET LENGTH OF STAY (LOS)

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Pancreaticoduodenectomy (PD) is a complex surgical procedure that requires attentive perioperative care. Enhanced Recovery After Surgery (ERAS) protocols have emerged to enhance functional recovery, decrease complications, and reduce hospital length of stay (LOS). We successfully implemented an ERAS pathway for PD to optimize patient care. At our institution, a total of 142 PD procedures utilized the ERAS pathway over two years. We observed a LOS reduction from pre-ERAS vs post-implementation (mean LOS 10.5 vs 8.4 days); but still failed to achieve our target 7-day LOS for 65 patients (46%). The most common reason to fail pathway LOS was either ileus or delayed gastric emptying (36/65, 55%), leading to a longer LOS of 12 days. Within this subgroup, patients who required a nasogastric tube during the admission had longer

LOS (13 vs 9 days,  $p < 0.05$ ). Additional non-gastrointestinal reasons for the remaining “off pathway” patients (29/65, 45%) not meeting target LOS are described in Table 1. Of these 29 patients, 9 underwent computed tomography (on or after POD 7) and only 2 received an inpatient intervention during the extra LOS (1 drain study, 1 percutaneous drain manipulation). In conclusion, we found the most common reasons for PD pathway failure included slow return of gastric or bowel function, which are perhaps inevitable in some patients undergoing PD. The remaining patients not meeting ERAS target were often kept for observation without additional intervention. This group represents an actionable cohort to target for improving LOS through surgeon awareness rather than pathway modification.

#### PP04-144

### EARLY VENOUS INTERVENTION DURING RESECTION OF PANCREATIC NEOPLASMS WITH SMV/PV OCCLUSIONS

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**Introduction:** Pancreatic neoplasms with superior mesenteric and/or portal vein (SMV/PV) occlusions present the significant (substantial) surgical challenge of mesenteric hypertension. We present a series of patients who underwent pancreas resection with complete SMV/PV occlusion.

**Methods:** A retrospective review of patients diagnosed with pancreas tumors with concomitant SMV/PV occlusions, and underwent pancreas resection with vascular intervention in the form of portosystemic shunting, resection and thrombectomy was performed. Demographics, perioperative characteristics and outcomes were reviewed.

**Results:** Eleven patients, with a median age of 56, underwent pancreas resection with vascular intervention for pancreas neoplasms with SMV/PV occlusion. The median follow-up was 26 months. Six patients were treated for pancreatic neuroendocrine tumor, two for pancreatic adenocarcinoma, two for solid pseudopapillary tumor and one for a cystic lesion believed to be a large cystic tumor (final pathology revealed sclerosing pancreatitis). Two underwent pancreaticoduodenectomy, 6 left sub- or near total pancreatectomy, and 3 total pancreatectomy. Six underwent early mesocaval shunting, with SMV/PV reconstruction following pancreas resection. Four underwent in-line SMV/PV reconstruction with conduit prior to the bulk pancreatic dissection/reconstruction, and one underwent early tumor thrombectomy. The internal jugular vein was graft of choice in nine patients. Median hospital length of stay was 11 days. Five patients developed complications with Clavien-Dindo grade  $\geq$ III. Six patients required readmission. There were no 90-day mortalities.

**Conclusion:** Despite the technical challenges that arise from the sequelae of SMV/PV occlusion, early mesenteric decompression via mesocaval shunting or immediate in-line SMV/PV reconstruction with graft allows pancreatectomy in the face of SMV/PV occlusion to be performed safely.

#### PP04-146

### A PROPENSITY SCORE-MATCHED ANALYSIS OF CONTINUOUS VS INTERRUPTED DUCT-TO-MUCOSA PANCREATICOJEJUNOSTOMY IN LAPAROSCOPIC PANCREATICODUODENECTOMY

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**Introduction:** Despite marked improvements in post-operative care and widespread adoption of minimally invasive procedures, postoperative pancreatic fistula (POPF) continues to be a major cause of morbidity. While no single technique of PJ has been proven to be superior, a few reports have indicated that continuous duct-to-mucosa anastomosis can reduce operative time and rates of POPF. But, there is limited data on the feasibility and outcomes of this technique in laparoscopic PD.

**Methods:** Prospectively collected data of laparoscopic PD and their recorded operative videos over the past 5 years were collected. After propensity score matching, 30 cases of patients were chosen in Continuous duct-to-mucosa PJ (C-PJ) group and 30 cases in Interrupted Duct-to-mucosa PJ (I-PJ) group and the data was analysed for PJ anastomosis time, total operative time and POPF rates as primary outcomes and hospital stay as secondary outcome.

**Results:** The analysis revealed a significantly shorter time for PJ anastomosis in the C-PJ group. However, the overall operative time did not reach statistical significance. There was no difference in the rates of CR-POPF and hospital stay between the two groups.

**Conclusion:** Continuous suturing for duct-to-mucosa PJ in Laparoscopic PD is feasible even in undilated ducts. Propensity score matched analysis revealed that C-PJ reduces the time for PJ anastomosis while causing no difference in clinically relevant POPF.

#### PP04-147

### SURGICAL TREATMENT OF IPMN BASED ON THE PREOPERATIVE RADIOLOGICAL FINDINGS

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A growing number of patients are being diagnosed with the intraductal papillary mucinous neoplasm (IPMN) of pancreas. The European guide and revisions of international consensus Fukuoka guidelines for the management of IPMN of the pancreas has been compiled to improve the diagnosis and treatment of these clinical entities. However, the available diagnostic tools lack of sufficient accuracy to be used independently.

The subject of this study will be to evaluate the correlation between preoperative radiological and postoperative pathological findings. Based on this we will assess the role of radiological findings in the choice of appropriate surgical

intervention, the extent of resection and the type of digestive organ reconstruction in patients diagnosed with IPMN.

The study includes 63 patients diagnosed with IPMN (according to the classification provided by the World Health Organization) and treated at the First Surgical Clinic of the Clinical Centre of Serbia. The study monitors clinical symptoms and signs, preoperative radiological diagnostics, intraoperative findings with histopathological diagnostics, and postoperative complications. Furthermore, the type of surgical resection and reconstruction of the organ selected on the basis of the radiological examination are also monitored. The monitored radiological parameters include echo abdomen findings, endoscopic ultrasound, MDCT, MRI with MRCP, ERCP with mucin aspiration and histopathological verification.

This study will contribute to the advancement of diagnosis, surgical treatment and general management of patients with IPMN by examining the significance of radiological findings in assessing the need for surgical intervention, and in selecting the type of surgical organ reconstruction based on preoperative diagnostics.

PP04-148

### DOES THE MODIFIED BLUMGART ANASTOMOSIS IMPROVE THE OUTCOMES OF PANCREATICOJEJUNOSTOMY IN PATIENTS WITH CARCINOMA OF THE PAPILLA OF VATER?

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**Background:** Recently, some studies have shown that the modified Blumgart anastomosis (m-BA) for pancreaticojejunostomy is associated with a low postoperative pancreatic fistula (POPF) rate after pancreatoduodenectomy (PD). Patients with carcinoma of the papilla of Vater are likely to have soft pancreas which is a risk factor of POPF. The aim of this study was to evaluate whether m-BA reduced the occurrence of POPF in patients with carcinoma of the papilla of Vater.

**Methods:** Between 2006 and 2018, 49 patients with carcinoma of the papilla of Vater underwent PD at our institution. The m-BA has been used since 2016. We analyzed the short-term outcomes between the m-BA group (n=15) and the conventional anastomosis group (n=34). Grade B/C POPF was defined according to the 2016 ISGPS update.

**Results:** There were no significant differences in patient characteristics including sex, age, BMI, and UICC stage between the two groups. The rate of POPF did not differ between the groups (53.3% vs 50.0%). However, post-pancreatectomy hemorrhage (PPH) in the m-BA group was significantly lower than the conventional group (0% vs 23.5%, p=0.04). Grade C POPF rate was lower in the m-BA group (0% vs 8.8%) but not statistically significant.

**Conclusions:** Although the rates of POPF were not dissimilar, the m-BA reduced the occurrence of PPH which is associated with more severe complications.

PP04-150

### TREATMENT OF PATIENTS WITH HIGH BENIGN STRICTURES OF THE BILE DUCTS - THE EXPERIENCE OF ONE SPECIALIZED HEPATOPANCREATOBILIARY CENTER

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**Relevance:** Reconstructive surgeries of the bile duct for benign strictures are characterized by unsatisfactory results in 10-30% of patients. Percutaneous and endoscopic interventions are not always effective in cases of stricture recurrence.

**Materials and methods.** From 2012 to 2018 in the National Medical Research Center of Surgery were treated 96 patients with benign bile stricture. The age of the patients was between 23 - 82 years, the mean age - 52.9 ± 12. Women - 71 (74%), men - 25 (26%). 53 (55.6 %) patients had a previously formed hepaticojejunostomy. Levels of stricture according to the classification of Bismuth-Strasberg: type E3 - 45, type E4 - 36, type E5 - 15. 72 (75 %) patients underwent hepaticojejunostomy and re HJ, including liver resections: left lateral sectionectomy - 3, right hepatectomy - 2, left hepatectomy - 2. 24 (25%) patients were performed percutaneous transhepatic biliary drainage (PTBD) with balloon dilation.

**Results:** Long-term results were traced in 85 (89%) patients, follow-up periods 4.8 +/- 1.6 years after reconstructive operations. Excellent and good results (according to Terblanche J.) were achieved in 37 (61%) patients who underwent open reconstructive operations and 18 (78%) in patients after PTBD.

**Conclusion:** The best treatment results were observed in patients with preserved confluence - 92% of successful interventions. An independent risk of stricture recurrence a high level of stricture (type E4 - E5 according to Bismuth-Strasberg). Surgical treatment of treatment of benign strictures is the method of choice, with the ineffectiveness of endoscopic and percutaneous transhepatic biliary drainage.

PP04-151

### THE EFFECT OF PERIOPERATIVE FLUID VOLUME RESTRICTION IN POSTOPERATIVE COMPLICATION OF PANCREATODUODENECTOMY

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**Background:** Complications following pancreaticoduodenectomy are reported to be still high. Pancreatic fistula has been the most common complication after the surgery. Perioperative fluid restriction has been suggested to reduce morbidity and length of stay. However, there are few studies regarding fluid restriction of pancreatobiliary surgery. The purpose of this study was to compare the morbidity following pancreaticoduodenectomy between fluid restriction group and conventional management group.

**Methods:** Between September 2017 and January 2020, 64 patients were enrolled for perioperative fluid restriction of pancreaticoduodenectomy. Of 64 patients, 51 patients were finally analyzed in this study. We compared these patients with fluid restriction and the patients managed conventionally. Conventional management group consisted of 145 patients who underwent pancreaticoduodenectomy from March 2013 to March 2016.

**Results:** The rate of major morbidity which was defined as any complication from grade III to V on the Clavien-Dindo scale in fluid restriction group was not significantly higher than that in conventional management group (21.6% vs. 18.6%;  $p=0.647$ ). Rate of clinically relevant postoperative pancreatic fistula (CR-POPF) in fluid restriction group was not significantly higher, either (17.6% vs. 12.4%;  $p=0.351$ ).

**Conclusion:** Perioperative fluid restriction was not helpful to prevent major morbidity, especially CR-POPF following pancreaticoduodenectomy.

#### PP04-152

### ONCOLOGICAL OUTCOME AFTER MINIMALLY-INVASIVE OR OPEN PANCREATODUODENECTOMY FOR PANCREATIC CANCER: AN INTERNATIONAL PROPENSITY-SCORE MATCHED STUDY

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**Introduction:** Minimally-invasive pancreatoduodenectomy (MIPD) has been suggested as an alternative to open pancreatoduodenectomy (OPD). However, large international multicenter studies comparing oncological outcome after MIPD and OPD for pancreatic cancer are lacking.

**Methods:** A multicenter international propensity-score matched retrospective cohort study including all consecutive patients undergoing MIPD or OPD (January 2010 to July 2019). Patients who had grossly positive resection margins (R2) or metastatic disease were excluded. Patients after MIPD were matched on a 1:1 ratio to OPD controls using propensity scores based on age, sex, BMI, ASA, abdominopelvic surgical history, and tumor size. Propensity score matching is applied to reduce the effect of confounding by indication. Primary outcome was overall survival, secondary outcomes included margin negative resection rate (R0), total number of extracted lymph nodes and chemotherapy rate. Outcomes were addressed by Kaplan-Meier analyses with between group comparisons (log-rank tests) and a multivariable Cox survival model to adjust for remaining confounders unaccounted for by matching (T stage, N stage, tumor grade).

**Results:** A total of 695 MIPD from 20 centers in 8 countries and 900 OPD from 5 centers in 5 countries were collected. Statistical analyses on survival and oncological outcomes will be finished by the end of February 2020.

**Conclusion:** This is the first large international multicenter study comparing outcomes after MIPD and OPD for pancreatic cancer. Results will be available upon acceptance for IHPBA 2020.

#### PP04-154

### SURGICAL AND ONCOLOGICAL OUTCOMES FROM THE EXPERIENCE OF 5,000 PANCREATECTOMIES IN SINGLE INSTITUTION

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**Introduction:** Pancreatectomy has been performed in limited centers due to the surgical complexities and high operative morbidity/mortality. During 50 years, there are many changes in epidemiology and surgical outcomes regarding pancreatectomy.

**Methods:** Since the first pancreatectomy in our hospital at 1961, total 5274 pancreatectomies were performed until 2019. According to the time period, diseases entities and short/long-term outcome were investigated.

**Results:** The overall age and the proportion of pancreatic cancer (PC) has been increased gradually over time. The proportion with PC was most common (30.1%), followed by pancreatic cyst (22.9%), common bile duct (CBD) cancer (16.8%), and ampulla of Vater (AoV) cancer (15.4%). The incidence of postoperative complications tended to be decreased over time (28.6% in 2001-2005, 20.6% in 2016-2019). The 5-year survival rate for malignancies was best in AoV cancer (58.9%), followed by CBD cancer (44.1%), duodenal cancer (38.1%), and PC (23.0%). In comparison of survival outcomes before and after 2000 with each stage of malignancies, PC showed statistically significant improvement (Overall survival; stage I, 32 vs. 84 months,  $p=0.004$ ; stage II, 13 vs. 25 months,  $p<0.001$ ; stage III, 9 vs. 17 months,  $p=0.001$ ). In a field of minimally invasive surgery, the number of laparoscopic and robotic pancreatectomies has been increased every year.

**Discussion:** This study shows the trends of pancreatic resection over time. The proportion of PC and pancreatic cyst is increased and its treatment outcomes including complication and survival are also improved.

#### PP04-155

### PREOPERATIVE SARCOPENIA IS AN INDEPENDENT RISK FACTOR FOR PATIENTS WITH PANCREATIC CANCER WHO UNDERWENT CURATIVE RESECTION

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**Background:** Preoperative nutritional and immunological patient factors have been found to be associated with prognostic outcomes of malignant tumors; however, the clinical significance of these factors in pancreatic ductal adenocarcinoma (PDAC) remains controversial.

**Objective:** The purpose of this study was to evaluate the prognostic value of nutritional and immunological factors including sarcopenia in predicting survival of patients with PDAC.

**Methods:** Retrospective studies of 156 patients who underwent surgical resection for PDAC between 2007 and 2019 were conducted to investigate the prognostic impact of tumor-

related factors and patient-related factors, including Skeletal muscle index (SMI), Visceral adipose tissue accumulation, Glasgow Prognostic Score (GPS), modified GPS, Prognostic Nutritional Index, and neutrophil/lymphocyte ratio.

**Results:** In multivariate analysis, low SMI was an independent factor for OS (HR, 2.82; 95% CI, 1.69-4.71;  $P < 0.001$ ) and DFS (HR, 1.64 95% CI, 1.02-2.63;  $P = 0.04$ ). The low SMI group was significantly associated with no adjuvant chemotherapy ( $P = 0.015$ ), BMI ( $< 22$ ) ( $P < 0.001$ ), tumor size ( $> 2\text{cm}$ ) ( $P = 0.035$ ), Histologic grade (Mod/Poor) ( $P < 0.001$ ) compared with the high SMI group.

**Conclusions:** Perioperative nutrition therapy and rehabilitation might contribute to improve prognosis in patients with PDAC.

PP04-157

### PROGNOSTIC IMPACT OF SIMULTANEOUS VENOUS RESECTIONS DURING SURGERY FOR RESECTABLE PANCREATIC CANCER

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**Background:** The aim of this study was to evaluate the prognostic impact of simultaneous venous resection during pancreaticoduodenectomy (PD) for pancreatic adenocarcinoma (PDAC) that was preoperatively staged resectable according to NCCN guidelines.

**Methods:** A retrospective analysis of 153 patients who underwent PD for PDAC was performed. Patients were divided into standard PD and PD with simultaneous vein resection (PDVR). Groups were compared to each other in terms of postoperative morbidity and mortality, disease free (DFS) and overall survival (OS).

**Results:** 114 patients received PD while 39 patients received PDVR. No differences in terms of postoperative morbidity and mortality between both groups were detected. Patients in the VR group presented with a significantly shorter OS in the median (13 vs. 21 months,  $P = 0.011$ ). In subgroup analysis, resection status did not influence OS in the PDVR group (R0 13 vs. R1 12 months,  $P = 0.471$ ) but in the PD group (R0 23 vs. R1 14 months,  $P = 0.043$ ). PDVR was a risk factor of OS in univariate but not multivariable analysis.

**Conclusion:** PDVR for PDAC preoperatively staged resectable resulted in significantly shorter OS regardless of resection status. Patients who require PDVR should be considered for adjuvant chemotherapy in addition to other oncological indications.

PP04-158

### RESULTS OF DOUBLE-LAYER RUNNING SUTURE HEPATICO-JEJUNOSTOMY IN PANCREATODUODENECTOMY AND TOTAL PANCREATECTOMY

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**Introduction:** The purpose of the study was to present the results of double-layer running suture hepatico-jejunostomy performed during pancreaticoduodenectomy (PD) and total pancreatectomy (TP) with focus on bile leak (BL) and cholangitis related to anastomotic stricture (C-AS).

**Methods:** A prospectively maintained database was searched retrospectively for BL and C-AS occurring in a consecutive series of PDs and TPs, performed between 2007 and 2019. In all patients HJ was performed using a double-layer running suture of 5/0 or 6/0 polydioxanone. Biliary stents were never used. Incidence of BL was the primary study endpoint. Incidence of C-AS ( $\geq 3$  episodes/year) was defined in patients with a minimum follow-up period of 3 years. The study aimed also at identifying factors predictive of BL and C-AS by using univariate and multivariate logistic regression.

**Results:** A total of 603 PDs and 197 TPs were performed. Incidence of BL was 0.9% (7/800) in the entire series, 0.63% in PD (5/603) and 1.02% in TP (2/197). BL were caused by HJ insufficiency in 5 patients (0.62%) and by patency Luschka's ducts in 2 patients (0.25%). Patients with HJ-related BL were reoperated (n= 4) or managed by biliary drainage (n= 1). C-AS occurred in 28/284 patients (0.9%). Recurrent cholangitis was diagnosed in 21 patients (7.4%) and was managed by either repeat HJ (n= 13; 4.6%) or percutaneous biliary interventions (n=4; 1.4%). Factors predictive of BL and C-AS were reported in table 1.

**Conclusion:** Double layer running suture HJ is associated with excellent BL rates and acceptable incidence of C-AS.

Table 1 – Predictive factors of BL and C-AS

	OR	p
BL		
ASA IV	5.85	0.04
C-AS		
Recurrent cholangitis		
Clinically relevant post-operative pancreatic fistula	2.43	0.04
Repeat HJ		
Clinically relevant post-operative pancreatic fistula	11.6	0.002
Small common bile ducts	8.74	0.02

PP04-159

### GORE VIABAHN STENT PLACEMENT FOR HEMOSTASIS OF BLEEDING BY PANCREATIC FISTULA IN FOUR CASES

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**Introduction:** Due to recent advances in surgical techniques, and in perioperative management, the mortality rate after pancreaticoduodenectomy (PD) has significantly decreased. However, the morbidity rate remains significantly high after PD. In perioperative management of pancreatic surgery, postoperative abdominal hemorrhaging from the pseudoaneurysm is often fatal and as yet a treatment method has not been established. In the recent years, transcatheter arterial embolization (TAE) has been used for the treatment of this fatal complication, but it may lead to other organs ischemia. A hemostatic technique

using a covered stent was previously reported for preventing ischemia. In early 2016, the GORE VIABAHN stent was approved for use in Japanese national insurance coverage in treating traumatic and iatrogenic vascular injuries.

**Methods and results:** We reported 4 cases in which the GORE VIABAHN stent was used for hemostasis caused by a pseudoaneurysm. Between January 2016 and December 2019, PD for 74 cases were performed at our hospital. 8 patients suffered from intraabdominal hemorrhages, and we performed a covered stent in 4 patients. In these four patients, the median age was 65.5, one was suffering from pancreatic cancer and the others had cancers of papilla's Vater. One case had a hemorrhage from the Proper hepatic artery, the other from Gastroduodenal artery stump. A liver abscess was caused in one patient due to an obstruction of the stent, but this complication was not fatal.

**Conclusion:** The GORE VIABAHN stent was a useful and safe procedure in stopping the hemorrhaging from pseudoaneurysm, compared with TAE.

## PP05 - Pancreas: Technical Surgery

PP05-01

### CHYLE LEAKAGE AFTER ROBOTIC AND OPEN PANCREATICODUODENECTOMY

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**Background:** Chyle leakage is a well-known but poorly characterized complication after pancreaticoduodenectomy (PD). However, no study examined the incidence of chyle leakage after robotic PD (RPD). This study aimed to evaluate chyle leakage after RPD or open PD (OPD).

**Methods:** Data regarding chyle leakage, including perioperative parameters and daily drainage volumes from the surgical drains, were prospectively collected from patients undergoing RPD or OPD, and these values were analyzed.

**Results:** The study included 283 patients, with 118 RPD and 165 OPD. The incidence of chyle leakage was 12.0% for overall patients, with 13.6% for RPD and 10.9% for OPD. Chyle leakage was eventually resolved in all patients through conservative treatment with dietary measures. The drainage volumes were significantly higher in patients with chyle leakage from postoperative days (PODs) 1 to 7, with a median of 240 mL on POD 1 and POD 7, as compared to 160 mL on POD 1 and 70 mL on POD 7 for those without chyle leakage. The number of lymph nodes involved and resected and the presence of pancreatic head adenocarcinomas affected the risk of developing chyle leakage, whereas the surgical approach used (RPD or OPD) did not.

**Conclusions:** Chyle leakage after PD is not rare, and it can eventually be resolved through conservative treatment. The extent and radicality of the surgery probably have a significant effect on the risk of developing chyle leakage, but the surgical approach used does not. Enteral feeding should

be judiciously delayed for those with a high drainage volume.

PP05-02

### INFERIOR PANCREATICODUODENAL ARTERY PSEUDOANEURYSM RUPTURE CAUSED BY THE PANCREATIC NEUROENDOCRINE TUMOR: A CASE REPORT

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**Introduction:** Inferior pancreaticoduodenal artery (IPDA) pseudoaneurysms rupture caused by the pancreatic neuroendocrine tumor (PNET) are extremely rare.

**Methods:** Here we report an interesting case of emerging IPDA pseudoaneurysm rupture caused by PNET.

**Results:** A 49-year-old man was referred to our hospital for epigastric pain. Dynamic computed tomography showed a heterogeneously enhancing pancreatic head mass measuring 12 cm in diameter with hypervascular lesion. In addition, an irregular aneurysm was found in the branch from the superior mesenteric artery (SMA) to the pancreatic head. Selective angiography of the SMA confirmed an aneurysm of the IPDA, from which a jet blood flow was observed into the pancreatic head mass. The high blood flow resulted in the cavernomatous transformation of the hepatoduodenal ligament. The next day, total pancreatectomy was performed in the hybrid operating room. Laparotomy revealed a large pancreatic head mass, 12 cm in diameter and highly vascular. Left side pancreas demonstrated necrotizing pancreatitis, so the distal pancreatectomy was performed in advance. The intermittent inflow occlusion of IPDA was obtained by a balloon catheter, and pancreaticoduodenectomy was safely achievable. The pseudoaneurysm at the root of IPDA was blocked with vascular clip. The postoperative course was uneventful. Immunohistochemical examination was positive for chromogranin A and synaptophysin. The final pathological diagnosis was PNET G1. In addition, arterial invasion of tumor cells was observed.

**Conclusions:** This case demonstrates that PNET can cause IPDA pseudoaneurysm rupture. The hybrid operation is advisable in pancreatic surgery for patients associating complicated vascular event.

PP05-03

### FREY PROCEDURE FOR CHRONIC PANCREATITIS IN ADOLESCENT WITH RECURRENT BLEEDING: A CASE REPORT

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**Background:** Chronic pancreatitis is rare in children and commonly unresponsive to medical therapy, associated

with a higher complication and mortality rate. Abdominal pain is the major presenting symptom.

**Case presentation:** A 13-year-old female presented with severe abdominal pain and massive hematemesis recurred several times during a period of 3 months, always crescendo-decrescendo followed by hemorrhage - starting once every 3-4 weeks and gradually became more frequent. Upper endoscopy found an active bleeding came out of the papilla Vater, with subacute bleeding intra-pseudocyst, suggestive of chronic arterial injury at the splenic artery (4 cm from the proximal part of coeliac trunk) and no dilatation of Intra- and extra-biliary was showed in MRCP.

**Results:** Surgical exploration revealed a chronic pancreatitis with multiple pancreatic duct stone and pseudocyst. A pseudoaneurysm also found in the pseudocyst. Frey procedure was carried out.

The post-operative course went uneventfully, and patient was discharged on post-operative day 14.

**Conclusions:** Surgical failures in the management of chronic pancreatitis have been attributed to inadequate decompression of the head of the pancreas, The Frey procedure adds anterior resection of the head of the pancreas to the LPJ and was created to improve decompression of the head of the gland, with relatively lower morbidity compared to Beger procedure.

#### PP05-06

### TRIKS OF THE TRADE CATTEL-BRAASCH MANEUVER IN PANCREATIC SURGERY. NEVER TNEEDED A VENOUS GRAFT FOR VASCULAR RESECTION

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**Background:** During pancreaticoduodenectomy vascular resection has become a routine task in referral centers. Nevertheless, in relation to portal or mesenteric vein length resection the need of a vascular graft is often needed and autologous, heterologous or PTFE graft are usually used in common practice.

The use of Cattell-Braasch maneuver -the entire right colon, mesenteric root and duodenopancreatic block mobilization- allows a direct venous anastomosis without graft interposition, no matter the length of resection. This maneuver is performed in the very beginning of the operation. It starts with the right parieto-colic gutter incision with complete mobilization of right colon. Then the primary root of the mesentery is sectioned allowing progressive mobilization of the entire intestine and exposing the retroperitoneal space. The dissection passes behind D2-D3 and behind pancreatic head with the exposure of the left renal vein and the origin of the superior mesenteric artery. Then the pancreaticoduodenectomy continues as usual with progressive resection of the different structures leaving the portal/superior mesenteric vein to be resected as the last attachment of the specimen. Once the venous has been sectioned an end to end direct venous anastomosis is easily performed as the entire mesentery can be pulled up without tension. During this phase temporary superior mesenteric artery clamping is suggested to avoid visceral congestion.

#### PP05-07

### THE ALTERNATIVE ARTERIAL SOURCE DURING PANCREATODUODENECTOMY WHEN PATIENT WITH TOTAL REPLACED HEPATIC ARTERY FROM SUPERIOR MESENTERIC ARTERY

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**Introduction:** During pancreatoduodenectomy(PD), the gastroduodenal artery (GDA) which lied on the groove between duodenum and pancreatic head should be sacrificed. However if the source of the hepatic artery(HA) was replaced from celiac axis(CA) to superior mesenteric artery(SMA), it always followed the GDA direction and need to be segmental resection with end to end anastomosis for clear surgical margin. Unfortunately the tension of the anastomosis site may be large and the location was just behind the P duct anastomosis. Above of them increased the chance of HA anastomosis bleeding. Herein we would share an alternative arterial source to prevent such adversity.

**Method:** A 45-year-old man was admitted due to right upper abdominal pain with jaundice looking for 2 weeks. The hyperbilirubinemia (total bilirubin 11 mg/dl) was found. After full abdominal study, the narrowing distal biliary duct (BD) with diffused biliary tract dilatation was noted and biliary stenting was done for drainage. Then the PD was performed after the intraoperative frozen section of common BD showed adenocarcinoma. However the segmental GDA was dense adhered with tumor and in addition the HA was totally replaced with GDA-SMA. Then segmental resection of the vessel was done. Then we chose the left gastric artery (LGA) as the arterial source due to the less anastomosis tension and not in the dependent site.

**Results:** Then post-operative was smooth and the patient was discharge 1 month after operation.

**Conclusions:** The LGA was a feasible arterial source during PD when patient with total replaced HA from SMA.

#### PP05-08

### SPLenic VESSELS FIRST APPROACH LAPAROSCOPIC SPLEEN-PRESERVING DISTAL PANCREATECTOMY WITH KIMURA TECHNIQUE (WITH SHORT VIDEO CLIP)

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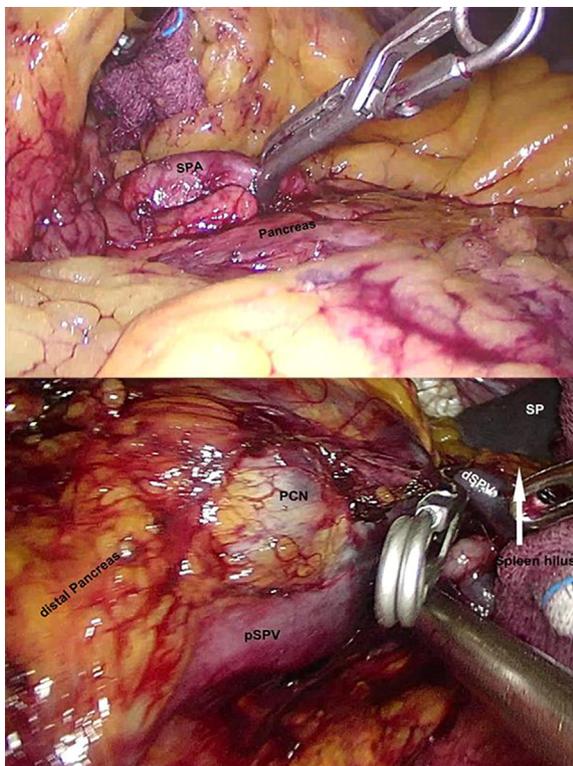
**Aim:** In order to improve the success rate of spleen preservation in laparoscopic distal pancreatectomy with Kimura technique, we use a new splenic vessels control procedure which we call splenic vessels first approach.

**Method:** We begin the operation with dividing the gastrosplenic ligament in order to expose the body and tail of the pancreas. We are now dissecting out the splenic artery first. With opening the capsule of the superior border

of the pancreas, here the splenic artery comes into view. The proximal splenic artery is blocked with a bulldog. The next step will be distal splenic vein mobilization and blockage. We dissect at left side of the inferior border of the pancreas tail near the splenic hilus and block the distal splenic vein with another bulldog. After fully blocking the proximal splenic artery and distal splenic vein, we perform laparoscopic spleen-preserving distal pancreatectomy with standard Kimura technique.

**Result:** With fully controlling the inflow of splenic artery and outflow of distal splenic vein, the distal pancreas is easily dissected with the splenic vessels preservation. We have successfully fulfilled all 10 cases of laparoscopic spleen-preserving distal pancreatectomy with Kimura technique. No postoperative splenic complications such as splenic infarction and abscess have been founded by far.

**Conclusions:** Splenic vessels first approach laparoscopic spleen-preserving distal pancreatectomy is a safe procedure and offers technique advantages of lesser blood loss, operation time spare and higher success rate of spleen preservation over the conventional Kimura technique, while no extra postoperative morbidity founded.



Splenic Vessels First Approach

#### PP05-10 NOVEL STANDARDIZED STAPLING TECHNIQUE FOR SOFT PANCREAS IN LAPAROSCOPIC DISTAL PANCREATECTOMY: A PRELIMINARY STUDY

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**Introduction:** The incidence of postoperative pancreatic fistula (POPF) remains high after laparoscopic distal pancreatectomy (Lap-DP). To find the most appropriate stapling technique for the soft pancreas, we standardized a stapling procedure using a newly developed electric-powered stapler.

**Methods:** From Mar. 2016 to Dec. 2019, 20 consecutive patients (8 male and 12 female) underwent Lap-DP for benign pancreatic tumors using an electric-powered stapler. Seven patients had mucinous cyst neoplasms, 3 serous cyst neoplasms, 3 solid pseudopapillary, 3 intraductal papillary mucinous neoplasms, 3 pancreatic neuroendocrine tumors, and 1 malignant lymphoma. The standardized procedure has four steps including 5 minutes compression (Step 1), 5 minutes adaptation (pre-compression, Step 2), 5 minutes cutting (Step 3), and 5 minutes adaptation (post-compression, Step 4). Dividing the pancreas took a total of 20 minutes. Drain amylase was measured on postoperative days (POD) 1, 3, 5, and 7 to evaluate POPF according to the 2016 update International Study Group in Pancreatic Surgery definition. Postoperative complications are evaluated in accordance with the Clavien-Dindo (CD) classification. Pancreatic thickness was measured at the resection line on preoperative computed tomography scan.

**Results:** POPFs in 20 patients were all biochemical leakage. There were no serious complications greater than CD Classification grade III. Mean pancreatic thickness in stump was 14.0 (2.5-28.7) mm. All patients were discharged by POD 12.

**Conclusions:** In Lap-DP, this novel standardized technique using an electric-powered stapler is safe and reduces the rate of POPF for the soft pancreas with a thickness to 29mm.

#### PP05-12 INNOVATIVE DEVICE TO PREVENT POSTOPERATIVE PANCREATIC FISTULA IN DISTAL PANCREATECTOMY

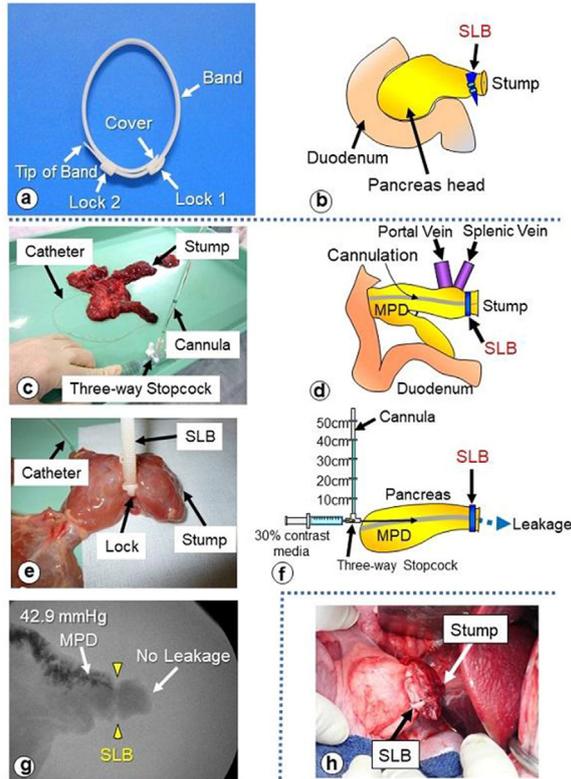
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**Introduction:** New techniques have been introduced to minimize postoperative pancreatic fistula (POPF) after distal pancreatectomy (DP), but the incidence remains still high. We developed the surgical ligature band (SLB) to prevent POPF after DP.

**Methods:** SLB is a surgical device developed for ligating a pancreatic stump atraumatically. **(A)** Twenty pancreases were isolated from pigs. The main pancreatic duct (MPD) was cannulated with a catheter connected to the cannula. After closing the pancreatic stump by either SLB (n=10) or a stapler (n=10), the MPD pressure was elevated by filling the cannula with contrast media. The pressure capacity was estimated by checking leakage at the pancreatic stump by X-ray fluoroscopy. **(B)** We performed DP with two pigs and closed the pancreatic stump by SLB. After one week, we checked the fluid collection around pancreatic stump by CT and performed autopsies.

**Results:** (A) The median pressure capacities with SLB and a stapler were 40.7 mmHg and 34.3 mmHg, respectively. Leakage from the staple line or into pancreatic parenchyma was found in six cases in the stapler group. The rate of cases with a pressure capacity less than 30 mmHg in the stapler group were significantly higher than those of the SLB group ( $p=0.033$ ). (B) No fluid collection or necrosis was found in either cases.

**Conclusions:** SLB successfully ligated the pancreatic stump atraumatically with a high pressure capacity while maintaining the blood flow to the pancreatic stump. We propose SLB as a new device for preventing POPF in DP.



### PP05-13 EVALUATING THE RELATIONSHIPS BETWEEN SPLENIC ARTERY AND PANCREATIC PARENCHYMA USING THREE DIMENSIONAL CT FOR LAPAROSCOPIC DISTAL PANCREATECTOMY

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**Background:** Isolating the root of splenic artery (SPA) is essential for conventional distal pancreatectomy, while remains challenging in laparoscopic procedure due to the complexity in anatomical variation around SPA. This study aimed to investigate the usefulness of preoperative evaluation of the relationships between SPA and pancreatic parenchyma using 3D-CT.

**Methods:** A total of 104 patients who underwent distal pancreatectomy (74 with laparoscopic procedure and 30 with open procedure) were evaluated. The relationship between SPA and pancreatic parenchyma was classified into two types with preoperative 3D-CT, namely "Buried type" and "Non-buried type". Video clips of 50 patients were reviewed to investigate whether this classification would be related with the difficulty of isolating the SPA. In addition, the distribution of dorsal pancreatic artery (DPA) was also evaluated.

**Results:** DPA from SPA was identified in 94 (91.3%) patients and the number was four in one patient, three in 8, two in 29, and one in 56. Fifty-eight (55.8%) patients had DPA within 30mm of the root of the SPA. Of the 50 assessed patients who underwent LDP, there were "Buried-type" in 30 (60.0%) and "Non-buried" type in 20 (40.0%). The median time for isolating SPA in "Buried-type" (25.8 min; range, 4.0 to 101) was significantly longer than that in "Non-buried type" (7.0 min, range, 1.0 to 27.0) ( $P < 0.001$ ).

**Conclusion:** Preoperative 3D anatomical image analysis around pancreas is practical to predict the difficulty of isolating the root of SPA and to provide the safety of the procedure.

### PP05-15 LAPAROSCOPIC DISTAL PANCREATECTOMY

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**Introduction:** Laparoscopic distal pancreatectomy (LDP) is progressively expanding. The aim of this study is to report our experience regarding the benefit of the laparoscopic approach of varied distal pancreatic lesions.

**Methods:** Between 2013 and 2019, a total of 34 LDP including 23 females (67.6%) and 11 males (32.4%) were carried out in our HPB Oncological Centre. Tumoral locations were: 16 in tail (47.1%), 12 in body (35.3%) and 6 (17.6%) in both tail and body. Size average of lesions was 44.1 mm (range: 17-120). LDP was carried out with the standard laparoscopic technique and the section, seal and close of the pancreatic parenchyma was performed with linear staplers.

**Results:** No 90-day postoperative mortality occurred. In 9 out of 17 pancreatic closures with vascular linear staplers a type A pancreatic fistula (52.9%) was observed. But in 2 of 17 cases with visceral linear staplers the type A fistula rate was 11.8% ( $p = 0.026$ ; IC 95% 1.22-92.48; OR: 7.88). Histopathological examination revealed 8 serous cystoadenomas, 6 mucinous cystoadenomas, 2 simple cysts, 3 IPMN type II, 8 ductal adenocarcinomas, 4 benign neuroendocrine tumors, 1 malignant neuroendocrine tumour, 2 metachronous metastasis (1 colorectal and 1 of renal cell carcinoma). In all cancer specimens the surgical margins were tumor free (R0).

**Conclusions:** LDP is recognized worldwide as a feasible, safe and beneficial procedure. The closure of the pancreatic parenchyma with linear visceral staplers would appear to produce less pancreatic fistula than with vascular staplers. All fistulas were type A with easy postoperative management.

PP05-17

### EFFICACY OF OUR STANDARDIZED PROCEDURE WITH MESH-REINFORCED STAPLER TO PREVENT PANCREATIC FISTULA AFTER DISTAL PANCREATECTOMY

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**Background:** The aim of this study was to evaluate whether our standardized procedure with mesh-reinforced stapler (Endo-GIA™ with Tri-Staple™ technology; black reload; 60-m long; Covidien) can reduce the incidence of postoperative pancreatic fistula (POPF) after distal pancreatectomy.

**Methods:** A total of 60 patients underwent mesh-reinforced stapled distal pancreatectomy at our institute from July 2016 to November 2019. Laparoscopic distal pancreatectomy was performed in 43 (71.7%) patients. The incidence of clinically relevant POPF (grade B or C based on the International Study Group on Pancreatic Fistula criteria) was retrospectively analyzed.

**Surgical procedures:** The pancreatic parenchyma was transected by stapler on the transection line with safety margin from the lesion. The closure jaw was carefully clamped over a 1-min period at a fixed speed. The stapler was slowly fired over a 6-min period and then released. Careful, gentle handling of the stapler was required during transection of the pancreatic parenchyma. A closed-suction drain was always placed near the stump of the remnant pancreas.

**Results:** The median operative time was 274min (133-585), and median operative blood loss was 170g (1-2519). The incidence of clinically relevant POPF occurred in 4 patients (6.7%). We have never experienced POPF grade C. The major morbidity rate (Clavien-Dindo classification grade  $\geq$ III) occurred in 7 patients (15%). Complications other than POPF grade B occurred in 3 patients (ileus, n=2; delayed gastric emptying, n=1). No surgical mortality or in-hospital death occurred in this study.

**Conclusions:** Our standardized technique with mesh-reinforced stapler can reduce clinically relevant POPF after distal pancreatectomy.

PP05-18

### EMPIRICAL COIL EMBOLIZATION OF SPLENIC ARTERY AS A SALVAGE LIFE SAVING PROCEDURE IN POST PANCREATECTOMY HEMORRHAGE AND HEMOSUCCUS PANCREATICUS

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**Introduction:** Computerised Tomography Angiogram (CTA) is the diagnostic modality in Post pancreatectomy Haemorrhage (PPH) and Hemosuccus Pancreaticus (HP).

However, occasionally, the offending aneurysm or the source of bleed may not be evident by CTA or conventional angiography. Intraluminal bleeds, especially after Dunking Pancreaticojejunostomy, may be from small pseudoaneurysms in the territory of splenic artery or from cut end of pancreas that are difficult to pick up by CTA. We evaluated the efficacy of empirical segmental Coil embolisation of pancreatic segment of splenic artery in the setting of intraluminal PPH as well as HP following Acute /Chronic pancreatitis.

**Methods:** A cross sectional study was done by analysing the prospectively held pancreatic database from January 2009-december 2018. All consecutive patients with PPH following any type of Pancreatectomy as well as Hemosuccus Pancreaticus (in Acute and chronic pancreatitis) who underwent empirical coil embolization of splenic artery were included. Those who showed blush on CTA or conventional angiography and those who were managed primarily with surgery for PPH were excluded.

The rebleeding and mortality rates were assessed at 72-hour and 30-days respectively.

**Results:** There were 137 Pancreaticoduodenectomies, 68 Distal Pancreatectomies, 11 median pancreatectomies and 134 admissions for Acute pancreatitis/ exacerbation of Chronic pancreatitis during the period.

Overall, 6/7 (85.7%) with negative CTA had successful coil embolization. No re-intervention/ continued bleed/ splenic infarcts/ no requirement of transfusion or abscess were seen in any of these six patients.

**Conclusion:** Empirical coil embolization of splenic artery in pancreatic bleed holds promise as a salvage life-saving procedure.

PP05-19

### UPDATED DP-CAR: MAPPLEBY PROCEDURE WITH RESECTION OF LEFT OR RIGHT HEPATIC ARTERY WITHOUT RECONSTRUCTION. HOW TO USE IT SYSTEMATICALLY

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**Background:** Distal Pancreatectomy with Celiac Artery(-CA) resection (DP-CAR) is a justified option for treatment of Pancreatic Body ductal adenocarcinoma with CA involvement. Theoretically risk of ipsilateral liver lobe ischemia after DP-CAR has to increase in cases of left hepatic artery(LHA) resection and/or replaced LHA(MichelsII,IV,VIIIb), or right hepatic artery(RHA), originating from CA.

**Aim:** To assess safety and oncological results of DP-CARs with resection of one of the main hepatic arteries.

**Methods:** Analysis of intraoperative data, ischemic and other complications after 4 DP-CARs with resection of replaced LHA for Michels type II,IV,VIIIb(2), gastroduodenal(1) and 2 DP CARs with resection of RHA, originating from CA without reconstruction. The main tool for assessment live arterial blood flow adequacy was IOUS, ICG fluorescence and postop CTA.

**Results:** Among 34 DP-CARs in six cases of aberrant arterial anatomy left or right hepatic artery were excised. In all six cases R0 posterior RAMPS were done with portal-superior mesenteric vein resection in one case. There were no mortality and ischemic complications. The main source of blood supply for “devascularized” liver lobe was communicating interlobar artery. Pancreatic Grade B fistula rate was 50%. Mean IO blood loss 230(100-650) ml, operating time 259(195-310)min., LOS 14 (9-26)days. Chemotherapy was neoadjuvant (FOLFIRINOX n5) and neoadjuvant (gem+Abraxane, n1). MS- 24 months. One patient died 26, others disease free 100,28, 14,17,14 months after treatment beginning.

**Conclusion:** DP CAR with resection of RHA or LHA can be safe, controllable and oncologically justified. Ischemic complications can be predicted by IOUS and ICG fluorescence.

PP05-20

### HOW TO MAKE “UNRESECTABLE” RESECTABLE? “LOW” LOCALLY ADVANCED PANCREATIC CANCER WITH THE INVOLVEMENT OF SMV AND ALL ITS TRIBUTARIES

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**Background:** Pancreatic ductal adenocarcinoma(PDAC) involving superior mesenteric vein (SMV) and all its tributaries consider unresectable because of impossibility of venous reconstruction.

**Aim:** To show technical possibility of R0-resection in abovementioned situation

**Patients and methods:** Database retrospective analysis of 202 vein resections during 594 pancreatic surgeries. Five patients were found who underwent R0-resections for locally advanced PDAC involving SMV and all its tributaries. Age: 52-71y.; Neoadjuvant chemotherapy FOLFIRINOX 4-12 courses.

**Results:** Excision of SMV and all its suppliers associated with Whipple procedure without reconstruction in 3 cases and total duodenopancreatectomy with replantation of inferior mesenteric (IMV) in the stump of splenic (SV) vein, once with resection and reconstruction of SMA were performed (2012 -2020). True vein involvement was found in 100% of cases. Temporary (2-14 days) postoperative bowel edema was the constant symptom, lymphorrhea of more than 500 ml longer than 3 days was revealed in 3 cases. All the patients alive, functional and four disease-free 21, 18, 13,12 and 11 months after treatment. The mandatory condition for selection for this surgery is the functioning venous Riolan arch, which can be delineated by CT preoperatively and confirmed at surgery together with adequate portal blood flow, which should not be less than 10 cm/sec.

**Conclusion:** Neoadjuvant therapy, definite controllable anatomical, physiological and technical conditions make systemic performance of R0-resections for locally advanced PDAC involving SMV and all its tributaries feasible, which can reduce number of unresectable cases for PDAC.

PP05-21

### FUNCTIONING ARTERIAL OR VENOUS RIOLAN ARCH IN LOCALIZED PANCREATIC CANCER. HOW IT CAN CHANGE TACTICS?

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**Background:** CT are obligatory before pancreatic surgery. Discovery of functioning arterial or venous Riolan arch (FRA) can have substantial influence on tactics.

**Aim:** To assess importance of FRA discloser for decision making before pancreatic surgery.

**Patients:** Retrospective analysis of 554 patients’ consecutive preoperative CT data revealed arterial(n2) and venous(n5) FRA in 7 cases. Modification of treatment were assessed.

**Results:** Arterial FRA was found in pancreatic body cancer(n2). 1.atherosclerotic occlusion of CA and SMA with symptomatic abdominal ischemia; 2.tumor involved CA on the background of endoluminally unreconstructable SMA occlusion. In the first case CA stenting before distal pancreatectomy eliminated symptoms fully. In the second case after FOLFIRINOXn12 R0 DPCAR without SMA reconstruction was done because of good collateral supply. Uneventful postop period, discharge on days 10 and 13.

Venous FRA in all the cases of PDAC of the head±body were the sign of full block of all SMV tributaries and already formed outflow through the splenic(SV) and/or inferior mesenteric(IMV) vein. In all these cases efficient neoadjuvant therapy and venous FRA were the weighty argument for pancreatic resection. Thrice it was done without venous reconstruction, twice with IMV transposition in SV, once with SMA resection. Uneventful postop period, discharge on days 10-19. One patient died 44 month (distant mets), the second died 19 months disease-free (MI), others alive 21,18,13,12 and 11 months after treatment.

**Conclusion:** Delineation of FRA before pancreatic surgery is the indication for tactics change: endovascular treatment for arterial FRA and more aggressive surgery in case of venous FRA.

PP05-22

### CENTRAL PANCREATECTOMY: A TECHNIQUE FOR THE RESECTION OF SELECTED PANCREATIC NECK AND BODY TUMOURS

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**Introduction:** Pancreatic tumors located in the neck and body region usually require pancreaticoduodenectomy or splenopancreatectomy. For small benign tumors enucleation is not usually feasible due to their size and localization; then pancreatectomy is often needed. Central pancreatectomy consists of a limited resection of the midportion of the pancreas and can be offered in benign and low-grade malignant tumors of the neck of the pancreas.

**Methods:** In this study over a period of 5 years, we performed central pancreatectomy in nine selected patients. Preoperative evaluation and operative frozen section biopsy in indicated cases allowed proper selection for the procedure. Operative details, complications and follow-up were recorded.

**Results:** Nine patients, three with serous cystadenoma, two with mucinous cystadenoma, two with non functional islet cell tumour, one with insulinoma and one with a hydatid cyst, were identified for the procedure. The mean tumor size was 2.7cm, the mean operative time was 216 minutes, and the mean blood loss was 363 ml. No morbidity or mortality in this series. No endocrine or exocrine deficiency was observed during a mean follow-up of 24 months

**Conclusion:** Central pancreatectomy is a procedure that offers excellent results in benign and low-grade malignant tumors preserving functional elements of the pancreas and eliminating the infective and hematological effects of splenectomy. Thus, central pancreatectomy should be included in the armamentarium of pancreatic surgery, and to obtain good results, proper indications and adequate experience are recommended.

PP05-23

### OUTCOMES OF TUBE PANCREATOGASTROSTOMY RECONSTRUCTION AFTER PANCREATODUODENECTOMY - THE MONTENEGRO BINDING TECHNIQUE

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**Introduction:** Pancreatic surgery has come a long way in the past century, with marked improvements in survival albeit lingering complication rates. Postoperative pancreatic fistula (POPF) is a field in need of improvement, with current evidence pointing to a 10 to 20% incidence rate.

**Methods:** The Montenegro's binding technique (MBT) is a type of reconstruction developed in 2005 to decrease POPF, speeding patient recovery and facilitating their treatment resumption. The technique consists of intussuscepting the pancreas into a tube made out of the greater curvature of the stomach, and securing it with a purse string suture placed in the outer edge of the tube. A prospective database was started in 2018 to further evaluate the benefits of the MBT.

**Results:** The first eleven patients accrued are presented here. Patients were  $57.7 \pm 5.8$  years-of-age, predominantly female (7:4), with an ASA score of 2 (1.5-2, median/IRQ). Surgery was performed either partially laparoscopic, or purely open. Operative time was  $362.7 \pm 83.1$ , with EBL of  $181.1 \pm 104.5$  ml. There was no case of ISGPS POPF (BL, B & C), being the highest amylase drain level on POD 5 292mg/dl. There was one case of biliary fistula managed conservatively and two cases of Clavien-Dindo  $\geq 3$ . One of them was a patient that required reoperation due to gastric outlet obstruction secondary to gastric torsion.

**Conclusions:** MBT is a technically undemanding reconstruction, which likely serves both the purpose of facilitating pancreatic reconstruction and mitigating POPFs.

PP05-24

### APPLICATION OF PANCREATICOJEJUNOSTOMY WITH PANCREATIC DUCT-JEJUNUM-MUCOSAL CONTINUOUS SUTURE IN TOTAL LAPAROSCOPIC PANCREATODUODENECTOMY

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**Objective:** To evaluate the clinical effect of pancreatic duct-jejunum -mucosal continuous suture in laparoscopic pancreaticoduodenectomy.

**Methods:** The data of 100 patients who underwent laparoscopic pancreaticoduodenectomy in the department of general surgery, affiliated hospital of xuzhou medical university from February 2017 to October 2019 were retrospectively analyzed. Of these patients, 51 cases received continuous suture pancreaticojejunostomy and 49 cases received "8-character" suture pancreaticojejunostomy for LPD. We compared and analysed the operation time, anastomosis time and incidence of postoperative complications between the patients in the two groups.

**Results:** All the operations were successfully performed, with no transfer to open surgery. The operation time, anastomosis time in the continuous suture group was obviously lower than that of the control group ( $305.8 \pm 60.7$ min vs  $354.3 \pm 69.1$ min;  $28.6 \pm 6.3$ min vs  $39.4 \pm 11.9$ min  $P < 0.001$ ), and the postoperative hospital stay was also shorter ( $12.9 \pm 3.8$ min vs  $15.4 \pm 5.8$ min  $P < 0.05$ ) in the continuous suture group. There was no significant difference in pancreatic duct diameter between the two groups. There was also no significant difference in the incidence of pancreatic fistula between the continuous suture group and the "8-character" suture group.

**Conclusion:** Continuous suture of pancreatic duct and jejunal mucosa in laparoscopic pancreaticoduodenectomy can further shorten the operation time, reduce the length of hospital stay, and is safe and feasible.

PP05-30

### THE EFFICACY OF RADIOFREQUENCY ABLATION (RFA) IN LOCALLY ADVANCED PANCREATIC DUCTAL ADENOCARCINOMA

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**Introduction:** Pancreatic ductal adenocarcinoma (PDAC) presents a challenge for the surgeon due to its aggressiveness and to the stagnation of the management options in cases where complete resection is impossible. Radiofrequency ablation (RFA) in locally advanced pancreatic cancer is described as a promising technique. The aim of this study is to examine and assess the outcome of this local thermal ablative therapy RFA, in locally advanced unresectable PDAC.

**Methods:** Data was collected from all patients who undergone an RFA procedure during laparotomy, followed by palliative Biliary and Gastric bypass procedures. The efficiency and safety of the RFA procedure was evaluated via the post-op complications and the morphological changes of the tumour shown on CT scan at 1 & 6 month post-op as well as patients' survival.

**Results:** The patients had a relatively uneventful post-operative period, with significant improvement in pain relief. The size and morphology of the tumour were remarkably changed on a repeat CT scan. The mean survival with the RFA was 21.8 months (6 - 32 months).

**Conclusions:** This study suggests that RFA for locally advanced and unresectable PDAC in carefully selected patients (excluding multifocal disease) presents a promising, effective and safe weapon in the surgeon's armamentarium. RFA can be safely used as a complementary method of palliative therapy as it improves local tumour growth, prolongs survival and improves the quality of life.

PP05-32

### HYBRID LAPAROSCOPY-ASSISTED PANCREATICODUODENECTOMY: THE BUDDHA'S MIDDLE PATH

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**Introduction:** Laparoscopic pancreaticoduodenectomy (LPD) is not universally accepted due to its steep learning curve and the technical complexity discourages many surgeons from attempting it. We believe that Hybrid laparoscopy-assisted pancreaticoduodenectomy (HLAPD) has all benefits of LPD without its drawbacks and combines the ease of open surgery and the benefits of minimal access surgery. We assessed outcomes of HLAPD compared with open pancreaticoduodenectomy (OPD); the objectives being perioperative, short-term clinical and oncological outcomes.

**Methods:** Retrospective review of prospectively maintained database; study period from 2013 to 2018. Till 2015 we did only OPD. In 2016, we started with LPD but soon switched to HLAPD. Complete resection part was done laparoscopically and reconstruction through a 10 cm mini-laparotomy.

**Results:** We did 33 PD; 19 OPD and 14 laparoscopic (04 LPD and 10 HLAPD). Demographic data of the two groups were comparable. The duration of surgery was significantly longer in the HLAPD group (360 Vs 410 min;  $p=0.01$ ) while the blood loss and hospital stay was longer in the OPD group (520 Vs 340 ml;  $p=0.03$  and 13 Vs 10 days;  $p=0.08$ , respectively). Clinically significant complication rates including delayed gastric emptying and postoperative pancreatic fistula were not different in either group. No patients in HLAPD group had wound-related/pulmonary complications. Lymph node yield was similar in both groups (20 Vs 22) and we had 100% R0 resections.

**Conclusions:** HLAPD was better than OPD in terms of short term outcomes and was not inferior to OPD in terms of complications and oncological outcomes.

PP05-33

### “TRICKS OF THE TRADE” ROBOTIC PANCREATICOJEJUNOSTOMY

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**Background:** Several methods of pancreaticojejunostomy (PJ) have been shown to decrease complications after whipple. With the increased utilization of the robotic platform, it is important to refine the technique. Herein, we discuss variations in technical aspects of robotic PJ.

**Methods:** Multiple methods of PJ that are employed depending on the particular anatomy of the patient, gland texture, and size of the pancreatic duct. One of the most common techniques utilized in both open and robotic PJ is the modified Blumgart technique. Three 3-0 silk mattress sutures (cut to 7cm) are placed through the gland and tied down before the duct to mucosa is performed. This approximates the jejunum to the pancreas and effectively alleviates tension off the inner duct-to-mucosa layer. The middle mattress suture is placed straddling the pancreatic duct (technique 1, figure) or can be eliminated altogether (technique 2). Care must be taken not to cause narrowing of the pancreatic duct when tying this suture. To facilitate exposure for small pancreatic ducts, a 1-millimeter cardiac vascular probe is used to locate, expose, and dilate the pancreatic duct. Typically, all ducts can be dilated to accommodate a four-french pancreatic stent, if desired. Other methods such as running and dunking methods for the outer capsule-to-serosa layer (technique 3) can be used as appropriate. We've found these method to result in equivalent grade B/C fistula rate even with a higher proportion of soft glands ( $n=70$ ).

**Conclusion:** We've found these techniques of PJ to be useful in minimizing fistula rates and optimizing outcomes.

PP05-34

### VIRTUAL REALITY SIMULATION IN LAPAROSCOPIC PANCREATIC SURGERY

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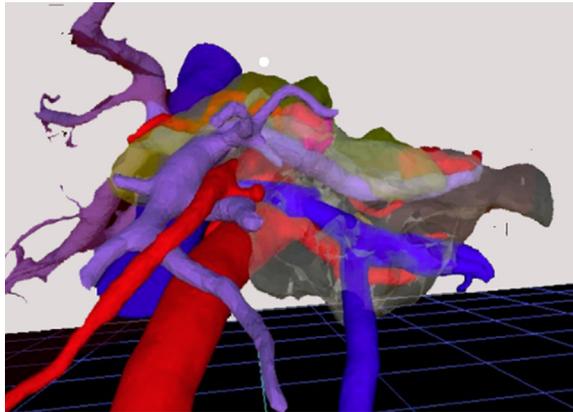
**Introduction:** Laparoscopic distal pancreatectomy (Lap-DP) has become common, and Lap-RAMPS (Radical antegrade modular pancreatosplenectomy) for pancreatic cancer is also established (Ome Y. et. Al. Ann Surg Oncol 26 (13): 4464-4466; 2019). However, since Lap-RAMPS and spleen-preserving DP (SPDP) are not so easy, preoperative simulation is indispensable. In this study, we

introduced the Virtual Reality (VR) technology in the pancreatic resection simulation.

**Methods:** Pancreatic 3D analysis was performed from preoperative contrast-enhanced CT. Using 3D analysis information, a VR simulation with a head-mounted display was performed, and observation was performed with a focus on the vascular anatomy around the pancreas. As a simulation, a head-mounted display (Mirage solo) was used before surgery and a hologram by HoloLens was used during surgery.

**Results:** VR simulation was performed on a total of 12 cases, Lap-RAMPS 5 cases and Lap-DP 3 cases for advanced pancreatic cancer (all after preoperative chemoradiotherapy), Lap-SPDP 4 cases for low-grade tumors. In Lap-RAMPS for pancreatic cancer, we were able to experience an image of retroperitoneal dissection before and during surgery. In Lap-SPDP cases, Kimura method was performed in 2 cases and Warshaw method in 2 cases. In both cases, grasping the anatomy of the splenic artery and vein was useful for the surgical technique. The median amount of bleeding was 105 g (0-200 g), and the median operation time was 356 minutes (288-537 minutes).

**Conclusion:** VR simulation was useful in complicated laparoscopic pancreatic tail resection.



3D images for Lap-RAMPS

PP05-35

### ULTRASOUND GUIDED PERCUTANEOUS IRREVERSIBLE ELECTROPORATION FOR TREATMENT OF LOCALLY RECURRENT PANCREATIC CANCER

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**Introduction:** Irreversible electroporation (IRE) has recently been used as an experimental treatment for cancer including locally advanced pancreatic cancer. There is almost no data on IRE as a treatment on local recurrence of pancreatic cancer after surgical resection. The aim of this study was to evaluate the safety and primary efficacy of IRE on local recurrence after surgical resection.

**Methods:** Ten patients with radiological clear signs of a local recurrence without distant metastases after surgical

resection were included and treated with ultrasound guided IRE under general anesthesia.

**Results:** Two of the ten patients had a severe complication after the treatment. One had an occlusion of the hepatic artery and later the superior mesenteric artery and died from the complications, the other was a pancreatitis with peritonitis that went to laparotomy and later developed a pancreatic fistula. Two patients had minor complications with pain and diarrhoea after the IRE. Overall median survival after the IRE and the resection was 16.5 and 42.7 months respectively. Two patients are alive 42.1 and 23.9 months after the IRE, the others have died.

**Conclusion:** IRE in locally recurrent pancreatic cancer following curative resection is feasible but should be regarded as a high-risk procedure at present. IRE in this situation cannot be recommended outside of clinical trials. More research is needed to select patients that might benefit from this treatment.

PP05-36

### LAPAROSCOPIC PANCREATICOUDENECTOMY: CUSUM ANALYSIS IN A DEVELOPING SINGLE SURGEON

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**Introduction:** Laparoscopic pancreaticoduodenectomy (LPD) was the one of most technically challenging operations of minimally invasive surgery (MIS). This retrospective study aimed to analyze the learning curve of a single surgeon who carried out 63 LPD in a single center. **Methods:** from August 2015 to August 2018, 63 patient underwent laparoscopic pancreaticoduodenectomy in hallym sacred heart hospital by a single surgeon. The patient characteristics, perioperative variables, and immediate postoperative outcomes were retrospectively collected and analysed. The cumulative sum (CUSUM) analysis was used to identify the inflexion points which corresponded to the learning curve.

**Results:** From the CUSUM analysis, two distinct phase of the learning curve were identified (early group: 1-34 cases and late group: 35-63 cases). Among two groups, there was no significant difference in perioperative outcomes. Non-significant reduction were observed in operation time (mean, 448min vs. 425min,  $p=0.239$ ), conversion rate (8.8% vs. 3.4%,  $p=0.618$ ), postoperative complication (Clavien-Dindo grade III or higher, 26.5% vs. 20.7%,  $p=0.768$ ), and intraoperative transfusion rate (35.3% vs. 20.7%,  $p=0.267$ ). Except pancreas adenocarcinoma, two distinct phase of the learning curve were identified (early group: 1-31 cases and late group: 32-45 cases). there was significant difference in operation time (mean, 439min vs. 367min,  $p<0.001$ ) and intraoperative transfusion rate (35.5% vs. 7.1%,  $p=0.07$ ). Non-significant reduction were observed in conversion rate, postoperative stay, and complication.

**Conclusion:** Laparoscopic pancreaticoduodenectomy can be safely and feasibly performed selected cases by experienced hepatobiliary-pancreas surgeons. Conservatively, the learning curve was completed after about 30 LPD in excluding PDAC.

PP05-40

**LAPAROSCOPIC RAMPS**

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Pancreatic adenocarcinoma is very aggressive cancer. Laparoscopic treatment of this kind of cancer is developing and is being improved. Today there are a large number of studies that prove that laparoscopic treatment of left-side pancreatic cancer it's a gold standard. Conventional retrograde distal pancreatectomy and splenectomy for pancreatic adenocarcinoma of the body and tail have been associated with high rates of positive margins, low lymph node retrieval, and poor overall survival. Radical antegrade modular pancreatosplenectomy (RAMPS) was introduced in 2003 to overcome these limitations. A systematic literature search was performed, and articles reviewed to determine that RAMPS or standard distal pancreatectomy and splenectomy offer better survival. This issue remains controversial today. One thing that has been precisely proven as an advantage of RAMPS is the removal of a larger number of regional lymph nodes.

In National Cancer Institute of Ukraine, we started performing laparoscopic RAMPS in 2018 and in this video-presentation want to show our experience and our results.

In National Cancer Institute of Ukraine, we started performing laparoscopic RAMPS in 2018. Today we have experience of 5 cases of RAMPS and one case of conversion. All patients underwent careful selection since we are at the stage of accumulating experience

Laparoscopic RAMPS is feasible in performing minimally invasive, curative resection for well-selected left-sided pancreatic cancer.

PP05-42

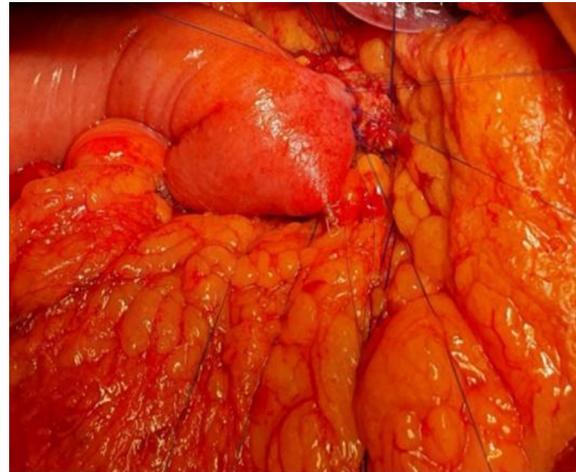
**THE "OMENTAL TUTU" AS A PROTECTIVE BARRIER IN PANCREATIC ENTERIC RECONSTRUCTION AFTER PD**C. Teh<sup>1,2,3</sup>*<sup>1</sup>Surgery, St Luke's Medical Center, <sup>2</sup>Surgery, National Kidney & Transplant Institute, Quezon City, and <sup>3</sup>Surgery, Makati Medical Center, Makati, Philippines*

Pancreaticoduodenectomy (PD) still carries a high risk of POPF in general. POPF often leads to postoperative hemorrhage which carries a high mortality rate. Although mortality after pancreatoduodenectomy has decreased to less than 5% in high volume centers, global data on PD still shows PD as high risk surgery with high morbidity and mortality rate especially in LMIC.

Following an R0 resection, the common hepatic artery, portal vein, superior mesenteric vein, right side of the superior mesenteric artery are all exposed. Although no studies have shown any relation between bleeding from the erosion of exposed vessels weakening its integrity, it is possible that leak of pancreatic juice and bile surrounding these structures may pose a threat to vascular integrity causing hemorrhage.

A protective barrier may help to reduce this harmful effect with the use of omentum to shield the underlying

vascular structures from a hostile environment if leaks are encountered. A part of omentum is selected and a small slit is made just enough to accommodate the pancreas remnant after its mobilization from the splenic vessels Posterior. The pancreas is gently inserted into the slit made and the surrounding omentum overlays the vessels underneath. Reconstruction of PJ or PD is then continued to complete the reconstruction. We have used this technique we call as an "omental tutu" as it serves like a skirt around the remnant pancreas.

**OMENTAL TUTU**

The Omental tutu

PP05-43

**LAPAROSCOPIC SUBTOTAL PANCREATECTOMY AND SPLENECTOMY FOR PANCREATIC BODY TUMOR; CASE PRESENTATION WITH VIDEO**

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**Background:** The development of cross-section imaging increased the number of diagnosed pancreatic cystic tumors (PCNs). Many of these lesions, located frequently in the body or tail of the pancreas, require resection.

**Aim:** My aim is to present a case of female patient underwent laparoscopic subtotal pancreatectomy and splenectomy for PCNs located in the pancreatic body, describing the technique along with the post-operative course.

**Methods and results:** A case of female patient underwent a laparoscopic subtotal pancreatectomy and splenectomy using a five ports technique and surgical staplers for pancreatic transaction and vascular control. Specimen was retrieved through small Fanestiel incision. No morbidity or mortality happened. Specimen came as mucinous cystic tumor.

**Conclusion:** Laparoscopic approach is feasible and safe for subtotal pancreatectomy and splenectomy for pancreatic body tumor resection.

PP05-46

### RESECTION AND RECONSTRUCTION OF THE SUPERIOR MESENTERIC ARTERY RESECTION DURING PANCREATECTOMY: POST-OPERATIVE RESULTS AND SURVIVAL

C. Cacace, N. Napoli, E. F. Kauffmann, F. Menonna, S. Iacopi, A. Tudisco, V. G. Perrone, F. Vistoli and U. Boggi

*Division of General and Transplant Surgery, University of Pisa, Italy*

**Introduction:** We herein report our experience with en-bloc resection and reconstruction of the superior mesenteric artery (SMA) during pancreatectomy (SMA-P).

**Methods:** We performed a retrospective analysis of patients who underwent SMA-P between 1994 and 2019. Kaplan-Meier curve was used to evaluate long-term survival and univariate cox proportional hazard regression to identify prognostic factors.

**Results:** Among a total of 154 patients who received a pancreatectomy with arterial resection during the study period, 60 meet the inclusion criteria. Simultaneous resection of celiac trunk/hepatic artery and portal/superior mesenteric vein was required in 19 (31.7%) and 57 (95%) patients, respectively. SMA was reconstructed by direct anastomosis in 35 patients (58.3%), using a jump graft, either autologous or cadaveric, in 9 patients (15 %) and switching the splenic artery in 16 patients (26.7 %). Median length of hospital stay was 22 days (15.3-31.8). Severe complications occurred in 15 patients (25%) (IIIB: 4 [6.6%]; IVA: 1 [1.7%]; IVB: 1 [1.7%]; V: 9 [15%]). Forty-five patients (75%) had a pancreatic ductal adenocarcinoma (PDAC). R0 resection was achieved in 50 patients (83.3 %). Lymph nodes (LN) metastasis were present in 47 (78.3%) (N1= 28 [46.7%], N2= 19 [31.7%]) patients with a median LN ratio of 3.4 (1.3-7.4) and a mean LODDS of  $-3.2 \pm 1.2$ . Median disease specific survival (DSS) for PDAC was 25.3 (15.7-80.4) months. The median LN ratio (HR= 1.14;  $p=0.02$ ) and the mean LODDS (HR= 2.60;  $p=0.005$ ) both affected the median DSS.

**Conclusion:** SMA-P is a formidable operation rarely associated with long-term results. Further research is needed.

PP05-47

### A FURTHER MODIFICATION OF THE BLUMGART PANCREATOJEJUNOSTOMY: RESULTS OF A PROPENSITY SCORE-MATCHED ANALYSIS VERSUS CATTELL-WARREN PANCREATOJEJUNOSTOMY IN OPEN AND ROBOTIC PANCREATODUODENECTOMY

F. Menonna, N. Napoli, E. F. Kauffmann, C. Cacace, S. Iacopi, A. Tudisco, V. G. Perrone, F. Vistoli and U. Boggi

*Division of General and Transplant Surgery, University of Pisa, Italy*

**Introduction:** Appropriate surgical technique is key to reduce incidence and severity of post-operative pancreatic fistula (POPF).

**Method:** Blumgart pancreatojejunostomy was further modified (m-BPJ), by reducing to 2 the number of trans-parenchymal sutures and by adding two two "half purse-string sutures" at the corners. m-BPJ was compared to Cattell-Warren pancreatojejunostomy (C-WPJ) before and after propensity score matching in both open (OPD) and robotic (RPD) pancreatoduodenectomy. The primary study endpoint was incidence of clinically relevant POPF (CR-POPF).

**Results:** mBPJ was used in 190 patients (124 OPD; 66 RPD). C-WPJ was employed in 225 patients (143 OPD and 82 RPD). The incidence of CR-POPF was 13.7% and 29.8% ( $p < 0.0001$ ; OR=0.37) in mBPJ and C-WPJ, respectively. Equivalent figures in OPD and RPD subgroups were 13.7% and 28.8% ( $p < 0.003$ ; OR= 0.40) and 13.6% and 31.7% ( $p < 0.01$ ; OR= 0.34), respectively. Grade C POPF occurred in 9 patients after C-WPJ (4.0%) and in 1 patient after mBPJ (0.5%) ( $p=0.02$ ). Predictors of CR-POPF are reported in table 1. The matching process identified 107 pairs (78 OPD and 29 RPD). In the global population the adjusted OR decreased to 0.40 ( $p=0.0007$ ). CR-POPF occurred in 12.8% and 28.2% ( $p=0.01$ ) OPDs, and in 6.9% and 41.4% ( $p=0.002$ ) RPDs using mBPJ and C-WPJ, respectively. In propensity score matched analysis OR for CR-POPF of mBPJ decreased to 0.36 ( $p=0.18$ ) and to 0.09 ( $p=0.01$ ) in OPDs and RPDs, respectively.

**Conclusion:** In our analysis mBPJ decreased incidence of CR-POPF as compared to C-WPJ in the general population, in OPD and RPD.

### PP06 - Pancreas: Miscellaneous

PP06-01

### TREATMENT AT A HIGH VOLUME ACADEMIC RESEARCH PROGRAM MITIGATES RACIAL/ETHNIC DISPARITIES IN PANCREATIC ADENOCARCINOMA

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African Americans (AA) have lower overall survival (OS) rates from pancreatic adenocarcinoma compared with Caucasians (C). Socioeconomic status and biology are attributable factors. There is a paucity of data to show which factor(s) will mitigate such disparities. We determined whether treatment at a high-volume center and an academic research program reduces the racial disparity in pancreatic cancer outcomes.

**Methods:** A cohort of 12,950 patients diagnosed with Stage I-III pancreatic adenocarcinoma from 2003-2011 and treated at high-volume ( $\geq 12$  cases/year) academic research programs (ARP) were evaluated from the National Cancer Database. Sociodemographic, clinico-pathological, and treatment variables were compared between AA and C. The 5-year overall survival (OS) was calculated using the Kaplan-Meier method. Cox regression model was used to

assess factors associated with OS. P-value  $\leq 0.05$  was considered significant.

**Results:** In univariable analysis, race was a predictor of OS; AA (N=1,127) had a significantly higher OS than C (N=11,823), despite having significantly lower income, lower education level, more stage III disease, more Medicaid recipients, and higher comorbidity index (P< 0.0001). The 5-yr unadjusted OS for AA and C was 28.6% and 23.9%, respectively and the median survival time (months) was 25.2 and 23.7, respectively (P< 0.015). There was no significant difference in surgical margin status or receipt of chemoradiation between the two cohorts. In multivariable analysis, race was not a significant predictor of OS (P=0.096).

**Conclusion:** Treatment at a high volume, academic research program can mitigate racial/ethnic disparities in pancreatic cancer.

#### PP06-02

### RURAL RESIDENCE DOES NOT PREDICT OUTCOME FOR RESECTED PANCREATIC ADENOCARCINOMA

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Studies are equivocal on the role of rural residence in cancer outcome. Whether rural residence has an influence on outcome following resection for pancreatic cancer is not clear. We hypothesize that rather than being an independent predictor of survival, rural residence serves as a proxy for other socioeconomic determinants.

**Methods:** A cohort of 32,319 patients with Stage I-III pancreatic adenocarcinoma diagnosed from 2003-2011 who underwent resection were evaluated from the National Cancer Database. Sociodemographic, clinico-pathological, and treatment variables were compared between rural and urban residences. The 5-year overall survival (OS) was calculated using the Kaplan-Meier method. Cox regression model was used to assess factors associated with OS. P-value  $\leq 0.05$  was considered significant.

**Results:** In univariable analysis, rural residence was a predictor of OS; rural (N=634) had significantly lower OS than urban (N=31,688). The 5-yr OS for rural and urban was 17.2% and 22.0%, respectively and the median survival time (months) was 18.8 and 21.3, respectively (P< 0.007). In multivariable analysis, residence was not a significant predictor of OS (P=0.63). Independent predictors of worse OS were male (P < 0.0001), old age (P< 0.0001), high comorbidity index (P< 0.0001), low income (P< 0.0001), low education level (P< 0.0001), community cancer program (P< 0.0001), advanced stage (P< 0.0001), high grade (P< 0.0001), great circle distance  $\geq 50$  miles (P=0.003), and lack of receipt of chemotherapy (P< 0.0001).

**Conclusion:** Rural residence was not associated with worse outcome for resected pancreatic adenocarcinoma.

Socioeconomic and tumor factors were independent determinants of pancreatic cancer outcomes.

#### PP06-03

### ARTERIAL BLOOD SUPPLY FROM ACCESSORY MIDDLE COLIC ARTERY TO THE PANCREAS

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**Background:** An accessory middle colic artery (AMCA) is an aberrant artery feeding the splenic flexure of the colon. Little is known about the branching pattern of the AMCA to the pancreas. We aimed to evaluate the branching pattern of the AMCA from the superior mesenteric artery (SMA) with special reference to the pancreatic artery using multidetector-row computed tomography (MDCT).

**Methods:** We investigated 112 patients who underwent contrast-enhancement MDCT before surgical resection of the pancreas between January 2015 and July 2018. The pancreatic branch from the AMCA was divided into the dorsal pancreatic artery (DPA) and the inferior pancreaticoduodenal artery (IPDA). The branching level and angle of the AMCA from the SMA were also evaluated.

**Results:** The AMCA was present in 27.7% of patients (n = 31/112). The AMCA branching pattern was classified into four types: type A, no branch from the AMCA (n = 20); type B, a common trunk with the DPA (n = 6); type C, a common trunk with the IPDA (n = 3); and type D, a common trunk with the DPA and IPDA (n = 2). The AMCA with the IPDA (types C and D) branched more proximally compared to the AMCA without the IPDA (P = 0.04). The AMCA branched vertically from the SMA in most cases (n = 24/31, 77.4%).

**Conclusions:** The AMCA had a pancreatic branch in 8.9% (10/112) of cases. Special attention should be paid to its branching pattern in pancreatic and colon surgery.

#### PP06-04

### IMPACT OF ANTITHROMBOTIC THERAPY ON THE PERIOPERATIVE OUTCOMES WITH FOCUS ON BLEEDING AND THROMBOEMBOLIC COMPLICATIONS IN PATIENTS UNDERGOING PANCRETICODUODENECTOMY

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**Introduction:** We assessed perioperative outcomes of pancreaticoduodenectomy (PD) in patients receiving antithrombotic therapy (ATT).

**Methods:** Seventy-seven patients who underwent PD at our institution between 2013 and 2019 were retrospectively reviewed. Clinical findings and surgical outcomes including hemorrhagic and thromboembolic events were compared in patients with or without ATT. Interruption of

ATT and preoperative heparin bridging were based on our hospital protocol.

**Results:** Among ATT (30) and non-ATT (47) groups, patients receiving ATT had a significantly higher age ( $p=0.019$ ) and history of (H/O) cardio-cerebrovascular diseases ( $p<0.001$ ). Operative time and surgical blood loss were not significantly different between the groups. ATT group was associated with significantly higher rate of postoperative complications, Clavien-Dindo (CD) classification  $\geq$  II (66.7 vs. 40.4%,  $p=0.025$ ) and thromboembolic events (13.3 vs. 0%,  $p=0.020$ ). Operative mortality in ATT and non-ATT groups was 2 (6.7%) and 1 (2.1%), respectively. Multivariate analysis showed that the increased 1) surgical blood loss ( $\geq 1,000$  mL), 2) post-pancreatectomy hemorrhage ( $\geq$  grade B), 3) thromboembolic events, and 4) postoperative major complications (CD  $\geq$  III) were independently associated with 1) diabetes mellitus ( $p=0.001$ ) and H/O percutaneous coronary intervention (PCI) ( $p=0.037$ ), 2) H/O upper abdominal surgery ( $p=0.019$ ) and coronary arterial bypass grafting ( $p=0.033$ ), 3) age  $\geq 80$  years ( $p=0.035$ ) and H/O PCI ( $p=0.011$ ), and 4) American Society of Anesthesiologists Physical Status (ASA-PS) class 3 ( $p=0.010$ ).

**Conclusions:** In patients with ATT under thromboembolic risks, PD is still a feasible procedure. ATT group appears to have higher age with cardio-cerebrovascular diseases and low level of ASA-PS warranting optimization of management to prevent hemorrhagic and thromboembolic complications.

#### PP06-06

### PROGNOSTIC SIGNIFICANCE OF CA 19-9

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**Introduction:** Pancreatic adenocarcinoma (PDAC) remains a lethal disease despite improvements in surgical technique and adjuvant therapies. CA19-9 is a useful tumor marker for monitoring recurrent disease. We sought evaluate the prognostic significance of CA 19-9.

**Methods:** Utilizing the National Cancer Database we identified patients who were diagnosed with PDAC. We then stratified based upon CA 19-9 levels  $< 250$ , 251-500, 501-979, and  $> 980$ . Patient characteristics and survival were compared with Mann-Whitney U, Pearson's Chi-square, and the Kaplan-Meier method.

**Results:** We identified 15,378 ( $< 250$   $n=4829$ , 251-500  $n=1517$ , 501-979  $n=1698$ , and  $> 980$   $n=7334$ ) patients with median age of 67 (18-90) years. Elevated levels of CA 19-9 correlated to more advanced T stage,  $p<0.001$ , and N stage,  $p<0.001$ . Additionally, CA 19-9 correlated to LN+,  $p<0.001$  and lower R0 resections  $> 980$  (73.1%), 501-979 (76.9%), 251-500 (77.8%) and  $< 250$  (79.7%),  $p<0.001$ . Median and overall 5-year survival correlated to CA 19-9 levels:  $< 250$  (28.2mo and 27%), 251-500 (27.7mo and 27%), 251-979 (23mo and 20%), and  $> 980$  (19.5mo and 15%),  $p<0.001$ . We identified CA19-9  $> 500$  as predictor of median and overall 5- year survival:  $< 500$

(28.1mo and 27%) and  $> 500$  (20.1mo and 16%),  $p<0.001$ . CA 19-9 correlated to progression of disease (15.3mo vs 11.3mo).

**Conclusions:** CA 19-9 levels correlates to more advanced disease in patients with PDAC. Patients with levels  $> 500$  will have larger tumors, increased LN+, and lower R0 resections. These patients will have shorter time to progression of disease.

#### PP06-07

### EFFECT OF INTRAMUSCULAR ELECTRICAL STIMULATION ON POSTSURGICAL NOCICEPTIVE PAIN IN PANCREATICOBILIARY CANCER PATIENTS: A RANDOMIZED DOUBLE-BLIND CONTROLLED TRIAL

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**Introduction:** This study aimed to determine the effectiveness of electrical twitch obtaining stimulation (ETOIMS) as a new modality for managing postoperative somatic pain in patients undergoing open pylorus-preserving pancreaticoduodenectomy (PPPD).

**Method:** Among 48 patients who consecutively underwent PPPD, a total of 44 eligible patients were registered and randomly assigned to a control group and ETOIMS group. The ETOIMS group received ETOIMS in the bilateral rectus abdominis muscles at 14 stimulation points under ultrasound guidance immediately after surgery. Pain score (visual analog scale, VAS), peak cough flow (PCF), and gait speed were repetitively measured between a day before surgery and 4 weeks after surgery. Data were analyzed using the linear mixed model and repeated measures analysis of variance.

**Results:** Data of 38 patients (ETOIMS, 18; control, 20) were finally analyzed. The VAS scores at operation day (mean [SD], ETOIMS, 5.50 [1.95]; control, 6.45 [2.19],  $P=.02$ ) and at postoperative day (POD) 3 (ETOIMS, 3.22 [1.48]; control, 4.05 [1.57],  $P=.04$ ) were significantly lower in the ETOIMS group. The improvement of proportional PCF from POD2 to POD7 was greater in the ETOIMS group (mean [SD], ETOIMS, 25.33% [12.19%]; control, 17.13% [9.67%],  $P=.03$ ). Gait speed recovered to the preoperative level at POD14 in the ETOIMS group (mean [SD], 93.30% [13.91%],  $P=.20$ ), while gait speed was still lower in the control group (84.64% [16.03%],  $P<.01$ ).

**Conclusions:** ETOIMS helps in rapid reduction of postoperative somatic pain developed after PPPD and improves PCF and gait speed.

PP06-08

### UPPER DIGESTIVE HEMORRAGE OF UNCERTAIN ORIGIN: HEMOSUCCUS PANCREATICUS

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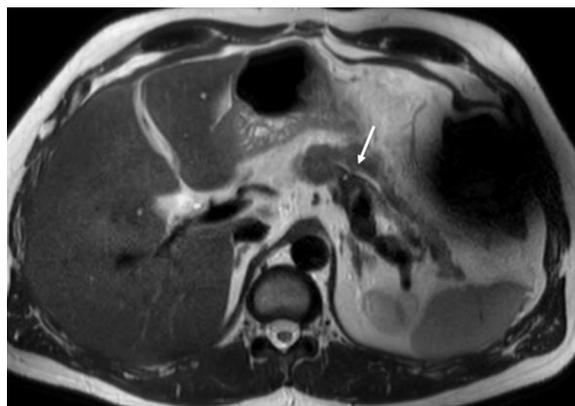
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**Introduction:** Upper gastrointestinal bleeding is a common cause of hospitalization, having multiples possible etiologies, being well known his mains origins, but losing sensibility in front of infrequent entities. Therefore, this article's objective is to introduce a rare, and hence, not considered differential diagnosis that should not be excluded, the Hemossucus Pancreaticus.

**Methods:** A patient's case with upper gastrointestinal bleeding of unknow origin is presented, who has been studied through a six months lapse, in which, during his evolution he develops a hemodynamic instability state.

**Results:** The case of a patient with a rare etiology of gastrointestinal bleeding, in which the diagnosis is reached after multiple procedures, given the ignorance of the underlying pathology, and therefore not expected.

**Conclusion:** This entity is seen, mainly, in patient whit a history of alcoholism, chronic pancreatitis or aneurysm peripancreatic arteries. It's shown as an acute bleeding's case or, most commonly, as intermittent episodes whit the presence of melena. The current literature recommends multiple invasive and non-invasive diagnostic methods, and two therapeutic options: embolization or surgery.



Segmental Arterial Mediolysis. RM sequence T2 in the axial plane. The pancreatic canal is dilated

PP06-09

### DEVIATIONS FROM A CLINICAL PATHWAY POST-PANCREATODUODENECTOMY PREDICT 90-DAY UNPLANNED READMISSION

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**Background:** Post-pancreatoduodenectomy (PD) clinical care pathways result in reduced hospital stay, complications and decreased costs. This study aimed to determine frequency of deviations from a post-PD clinical care pathway to understand how deviations influenced post-operative length of stay and the risk of 90-day unplanned readmissions.

**Methods:** A prospective analysis of a post-PD clinical care pathway at a tertiary referral centre was carried out between May 2016 and March 2018. Patients were divided based on the number of factors deviating from the clinical care pathway (Group I: No Deviation; Group II: deviation in 1-4 factors; Group III: deviation in 5-8 factors). The analysis included profiling of patients on different demographic and clinical as well as medical and surgical outcome parameters (discharge by postoperative day 8 and 90-day unplanned readmission rate).

**Results:** Post-PD clinical care pathways are feasible but deviations from the pathway are frequent (91%). Patients with a higher BMI, low serum albumin and cardiac comorbidities are amongst the cohorts more likely to be associated with deviations. An increase in frequency of deviations from the pathway was significantly associated with increased risk of POPF ( $p < 0.025$ ) and DGE ( $p < 0.0001$ ), delayed discharge ( $p < 0.0001$ ), risk of mortality ( $p < 0.003$ ) and 90-day unplanned readmission rate ( $p < 0.001$ ).

**Conclusions:** Deviations from a post-PD clinical care pathway are common. Poor nutrition and cardiac comorbidities are associated with an increased likelihood of deviation. As the number of deviations increase, so does the risk of significant complications and interventions, delayed discharge and 90-day readmission rate.

PP06-11

### ADULT NON-OBSTRUCTIVE MEGADUODENUM: A CASE REPORT AND REVIEW OF LITERATURES

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**Objective:** To introduce the clinical manifestation, imaging characteristics, diagnosis and treatment of adult non-obstructive megaduodenum.

**Methods:** We reported a case of adult non-obstructive megaduodenum. Meanwhile, related literature was reviewed and the clinical manifestation, imaging characteristics, diagnosis and treatment of the disease were introduced.

**Results:** The patient had duodenal down part obvious dilatation and distal non-stenosis, which had been confirmed by air-barium sulfate double contrast roentgenography, and underwent duodenal shunt procedures and roux-en-Y gastrojejunostomy. The patient was followed-up for five months, without recurrence or complication.

**Conclusions:** Adult non-obstructive megaduodenum is a specific congenital malformation with no obvious clinical symptoms. X-ray examination is very important. Duodenal shunt procedures and roux-en-Y gastrojejunostomy is the optimal approach for treatment of the disease.

PP06-12

### HEPATOPANCREATOBILIARY SURGERY IN LUBAGA HOSPITAL, KAMPALA, UGANDA

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**Introduction:** Hepatopancreatobiliary surgeries were not routinely being done in Uganda thus these patients had to be referred abroad. We, therefore, report the first in country series of patients who underwent these complex surgeries and their outcomes. These pioneer complex surgeries currently are the highest done in a single centre in Uganda.

**Method:** Records of 42 patients who underwent surgery for hepatopancreatobiliary diseases in Lubaga hospital between February 2019 and January 2020 were analyzed. Four (4) patients with incomplete data, 3 with cholelithiasis and 2 with peritoneal carcinomatosis were excluded. Thirty three (33) patients with complete data were included in the study.

**Results:** There were 18(54.5%) females and 15 (45.5%) males. 10 patients had liver surgery (30.3%), 12 underwent roux en y hepaticojejunostomy (36.4%) among which 8 (66.7%) were due to unresectable tumors. 11 patients underwent Whipple's procedure (33.3%). Average Length of hospital stay was 10.5days for liver surgery group, 11.9 days for hepaticojejunostomy group and 15 days for the Whipple's procedure group. There was 1 in-hospital death in the liver surgery group, 2 in the hepaticojejunostomy group and 1 in the Whipple's procedure group.

**Discussion:** Morbidity and mortality that was associated with hepatopancreatobiliary surgeries has reduced due to improvement in techniques and skills. Sixty percent (66.7%) of patients who underwent hepaticojejunostomy in our institution had unresectable tumors hence showing late presentation. Despite the advanced disease, over all in-hospital mortality was 4 (12%) for this heterogeneous group of patients.

**Conclusion:** We are doing hepatopancreatobiliary surgeries in Uganda with comparably good outcomes.

PP06-14

### ALTERATIONS IN PORTAL FLOW DYNAMICS FOLLOWING TOTAL PANCREATECTOMY AND AUTOLOGOUS ISLET CELL TRANSPLANT

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**Introduction:** The aim of this study is to evaluate doppler ultrasonography (DUS) flow dynamics following total pancreatectomy and autologous islet cell transplant (TPAIT).

**Methods:** Retrospective analysis of prospectively collected data was done from February 2018 to September 2019.

DUS measuring portal vein (PV) branch velocity (PVV) was performed on post-operative day (POD) 1, 2, and 5, and as applicable due to abnormal liver function tests (LFT).

**Results:** Fifteen cases of TPAIT were performed. The mean change in PV pressure at infusion was 5.4 cm H<sub>2</sub>O [1.5 -26 (SD 6.3)]. The lowest mean flow was observed on POD 1 in the main and right posterior PV; on POD 2 in the right anterior and left PV. Correlation analysis showed weak correlation between LFTs and PVV, not significant until POD 5 ( $r = 0.55$ ,  $p = 0.04$ ). In the post-discharge period LFTs and PVV correlation was strongly statistically significant ( $r = 1.0$ ,  $p$ -value  $< 0.001$ ). There was a strong negative correlation between islet cell volume infused and right anterior PVV on POD 2 ( $r = -0.88$ ,  $p = 0.02$ ). Islet cell mass and PVV did not significantly correlate until POD 5 ( $r = 0.80$ ,  $p = 0.03$ ). No patients had PVT. Two patients had post-operative bleeding, both of which had extremely low velocities (main PVV 0.181).

**Conclusion:** The correlation between PVV and LFTs is not significant until the post-discharge period when US is performed due to clinical concern rather than protocol. The value of scheduled post-operative velocity measurement may be overstated.

PP06-15

### ASSOCIATION BETWEEN METFORMIN AND CLINICAL OUTCOMES FOLLOWING PANCREATICODUODENECTOMY IN PATIENTS WITH TYPE 2 DIABETES AND PANCREATIC DUCTAL ADENOCARCINOMA: RETROSPECTIVE STUDY WITH SYSTEMATIC REVIEW AND META-ANALYSIS

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**Background:** Retrospective studies on the association between metformin and clinical outcomes may be affected by time-related bias. Recent studies used time-varying analysis to avoid time-related bias, but only considered the start date of metformin and not the stop date. We aimed to determine the clinical benefits of metformin in patients with type 2 diabetes and pancreatic ductal adenocarcinoma following pancreaticoduodenectomy.

**Methods:** Analysis using a Cox model with time-varying covariates was performed while considering both the start and stop dates of metformin use. Also, a systematic review and meta-analysis with previous studies on the effect of metformin in pancreatic cancer patients was performed.

**Results:** A total of 283 patients were included in the retrospective analysis. The overall survival was significantly different according to metformin use, as shown in the adjusted analysis by Cox models with time-varying covariates reflecting both the start and stop dates of post-operative metformin use (HR, 0.747; 95% CI, 0.562-0.993;  $P = 0.045$ ). The results of the meta-analysis differed

according to the analytic method used in each study. Notably, we found that our current study was the first to incorporate both the start and stop dates, and that there are no randomized clinical trials for operable pancreatic cancer as well.

**Conclusions:** Metformin use was associated with a higher overall survival following pancreaticoduodenectomy in patients with type 2 diabetes and PDAC in time-varying analysis incorporating both the start and stop dates. More studies with this analytic method and randomized clinical trials for operable pancreatic cancer are needed.

#### PP06-17

### THE TOP 100. REVIEW OF THE MOST CITED ARTICLES ON PANCREAS AND LAPAROSCOPY

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**Introduction:** The number of citations is considered as an indirect indicator of the merit of a paper, journal or researcher, although it is not an infallible method to determine scientific quality. The bibliography referring to the pancreas and laparoscopy is very scarce. Our goal is to determine the characteristics of the most cited paper about pancreas and laparoscopy.

**Methods:** We performed a search of all articles published in any journal about pancreas and laparoscopy until September 2019 using the *Web of Science* application and selected the 100 most cited papers in all databases. We evaluated number of citations, journal, year, quartile, impact factor, institution, country, authors, type of paper, type of surgery, topic and area.

**Results:** The top-100 citations account 10,970 citations.

The journal with the most articles is *Surgical Endoscopy* and 2007 is the year with the highest number of papers in the top-100 citations. The papers from America and Europe are 39% versus 36% respectively.

Case series is the most frequently type of study; outcomes/morbidity is the most frequently discussed topic, and distal pancreatectomy is the most frequently type of surgery.

**Conclusion:** This bibliometric study on the pancreas and laparoscopy is conditioned by the time factor, since laparoscopy has come later to pancreas surgery and this topic has begun to be studied recently. This fact is related

probably due to the morbidity and mortality associated with pancreatic surgery and the need for high specialization in this field. This means that the information you have is recent and scarce.

#### PP06-18

### EXPLORING THE PSYCHOLOGICAL IMPACT OF LIVING WITH AND AFTER CANCER FOLLOWING MAJOR PANCREATIC SURGERY: A QUALITATIVE STUDY

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**Introduction:** Pancreatic cancer is the 11<sup>th</sup> most common cancer in the UK. Most patients are diagnosed after metastasis but around 10% undergo a pancreaticoduodenectomy. There is limited research focusing on the psychological wellbeing of patients diagnosed with pancreatic cancer, and unmet support needs will impact negatively on quality of life. Our study aimed to explore patients' experiences of surgery and living with pancreatic cancer, as well as identifying opportunities to optimize psychological wellbeing.

**Methods:** Semi-structured interviews were conducted with patients from an NHS Trust in Northwest England who had undergone a pancreaticoduodenectomy for pancreatic or biliary duct cancer. Interviews explored their experience of the diagnostic process and surgery, the impact of cancer on their life, and sources of support. Data were analysed using a thematic approach.

**Results:** Initial analysis has yielded several themes, including: reactions to diagnosis; self-identity and 'redefinition of self' following diagnosis or recurrence; and life being considered a trajectory measured by scans. Participants also described difficulties navigating the healthcare system and being unclear on when and from whom to ask for help. They expressed a desire for a proactive approach from healthcare professionals for both physical and emotional problems. A sense of stoicism was alluded to throughout interviews.

**Conclusion:** An awareness of the impact of treatment on identity, and recognition of psychological sequelae following diagnosis, is vital in order to offer emotional support proactively. Understanding patients' experience of living with cancer and the impact of treatment is crucial in enabling the development of improved support interventions.

**PP06-20  
IMPROVING THE STANDARD OF CARE FOR ALL - A PRACTICAL GUIDE TO DEVELOPING A CENTER OF EXCELLENCE**

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**Introduction:** The incidence of and pancreatic disorders has increased significantly in last decade. With the evolution of minimally invasive pancreas surgery in 1994 and robotic surgery in 2001 surgeons have been able to push the envelope in this field. These operations are technically complex and have historically been accompanied by substantial risk for mortality and morbidity. The number of pancreatic resections performed in the US increased by 75% between 1993 and 2014, which has mandated the need for more specialized surgeons and centers that can maintain low operative risk and good patient outcomes. The strong link between hospital and provider volume and improved patient outcomes has prompted centralization of pancreatic disease management and with that the need for well-designed Centers of Excellence (CoE). This article provides a basic guideline to establishing such a center at a community hospital willing to improve patient outcomes related to pancreatic pathology.

Methods:

1. **Establishing the foundation** with leadership buy-in, structure and purpose; mission statement; determining market share; and budgeting.
2. **Formalizing the program** by providing clinical education and competency training; establishing nurse navigation and multidisciplinary involvement; developing clinical information systems for a value-based healthcare structure and establishing quality and performance improvement initiatives.
3. **Solidifying the CoE status** through certification/accreditation from external institutions such as the Joint Commission and maintain marketing and outreach in the service area.

**Conclusions:** The steps outlined in this article are meant to provide a guide to facilities looking to build a disease or procedure-specific CoE.

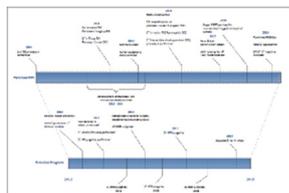


Figure 1: Timeline of CoE Development

Pancreas Dashboard 2017-2018		
	2017	2018
Outcomes Cases	479	700
Operability Cases %	1 monthly	16 monthly
Covered	3.39%	0.00%
Expected	0.10%	0.20%
Operability Expected Ratio	0.00	0.00
Statistically Significant		
Complications of Care %	7 reoperations	16 reoperations
Covered	4.12%	8.00%
Expected	10.00%	0.00%
Operability Expected Ratio	3.38	1.52
Statistically Significant	99%	99%
Readmission Rate - 30 day after 2000 [p]	21 readmissions	7 readmissions
Covered	11.88%	3.00%
Expected	11.00%	12.40%
Operability Expected Ratio	1.07	0.98
Statistically Significant		99%
LOS (in days)		
Covered	4.81	4.74
Expected	4.35	4.52
Operability Expected Ratio	1.10	1.03
Statistically Significant		

Figure 2: Clinical Dashboard Dashboard Example - Pancreas Surgery

**Figure 1:** Timeline of CoE Development; **Figure 2:** Example CoE Dashboard

**PP06-23  
AN EFFECTIVENESS OF PARTIAL SPLENIC EMBOLIZATION FOR HEMORRHAGE FROM ANASTOMOTIC VARICES AFTER CHOLEDOCHOJEJUNOSTMY: A CASE REPORT**

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**Introduction:** Hemorrhage from anastomotic varices after choledochojejunostomy is one of a rare complication after pancreatodudenectomy. We report a case of an effectiveness of partial splenic embolization for hemorrhage from anastomotic varices after choledochojejunostomy.

**Case presentation:** An 85-year-old woman was diagnosed locally advanced pancreatic carcinoma contact with superior mesenteric artery and portal vein. She underwent subtotal stomach-preserving pancreatodudenectomy (SSPPD) with portal vein resection and anastomosis after chemoradiotherapy. Her postoperative course was uneventful, however, she was admitted to our hospital with anemia and melena on postoperative 3 month. Computed tomography showed an obstructed portal vein anastomosis and a formation of collaterals adjacent to the choledochojejunostomy. Double balloon endoscopy showed varices around the choledochojejunostomy site, we diagnosed hemorrhage from the varices. We could not perform endoscopic therapy because it was a difficult procedure. Therefore, we performed partial splenic embolization (PSE) to reduce portal hypertension and control the hemorrhage. After the PSE, she had no anemia and melena.

**Conclusion:** Ectopic varices hemorrhage caused by extrahepatic portal vein obstruction after an intraperitoneal surgery is one of a lethal complication, early detection of the hemorrhage source and its treatment could be difficult. No guideline for varices hemorrhage around choledochojejunostomy site is established. It is worth considering that PSE might be one of a treatment for the varices hemorrhage.

**PP06-26  
PREDUODENAL PORTAL VEIN (PDPV) WITH PREDUODENAL COMMON BILE DUCT (PDCBD) AND WHIPPLE PROCEDURE. A CASE-REPORT**

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**Introduction:** Various anatomic disorders of the Portal Vein (PV) like PDPV have been described, but they are rare. Associated PDCBD is an extremely rare event. We

report a patient with PDPV and PDCBD who underwent a pancreaticoduodenectomy.

**Presentation of the case:** A 69-year-old woman presented with a tumor of the papilla of Vater was scheduled for surgery. Preoperative imaging showed a PDPV anterior to a PDCBD, arising from a pre-pancreatic confluence of the splenic and superior mesenteric vein. During pancreaticoduodenectomy, a choledochoduodenal fistula was encountered and repaired. Complete dissection and isolation of structures was possible, and there was no need for a PV reconstruction, as presented in other case reports. No postoperative complications of importance presented. Pathology confirmed a R0 resection of a non-invasive intra-ampullary papillary-tubular neoplasm (IAPN). At one-month follow-up the patient was clinically asymptomatic.

**Discussion:** Such a discovery is often incidental and of little importance, but it takes on major importance for HPB surgeons because accidental damage of PDPV and PDCBD can lead to serious consequences. These rare disorders do not contradict Whipple procedures but should be performed by experienced surgeons with adequate preoperative imaging. Skills in PV reconstruction and its peri-operative might be beneficial for successful outcomes in some cases.

**Conclusion:** Extended surgical procedures like a pancreaticoduodenectomy are realisable in patients with PV disorders, but require awareness, adequate radiological interpretation and specific surgical experience for secure treatment.

PP06-27

### QUALITY OF LIFE AFTER PANCREATIC RESECTION FOR MALIGNANT AND BENIGN DISEASE - A CROSS-SECTIONAL STUDY

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**Introduction:** To investigate QOL trajectories following pancreatic resection for malignant or benign disease.

**Methods:** Consecutive patients of six upper gastrointestinal surgeons who underwent pancreatic resection at one of six hospitals in Sydney, Australia between Apr-2014 and Apr-2019 were invited to participate. The main outcome was self-reported QOL using the Short Form 36 (SF-36v2) expressed as mental (MCS) and physical component scores (PCS) with values ranging from 0-100 and the Functional Assessment of Cancer Therapy - Hepatobiliary (FACT-Hep) expressed as a total score, with values ranging from 0-180. Higher scores indicate better QOL. QOL outcomes were measured at < 12, 12-23, 24-35, 36-47 and ≥48 months post-surgery. Differences at each timepoint were

compared with ANOVA and multiple pairwise comparisons were made using the Bonferroni correction.

**Results:** Of 224 invited patients, 121 (54%) responded. Mean (SD) age was 68.0 (11.9) years and 52% (n=63) were male. Malignancy was the indication for surgery in 78% (n=94), 63% (n=74) of participants underwent pancreaticoduodenectomy and 57% (n=69) were between 12 and 35 months from surgery.

No difference in the PCS and total FACT-Hep score was observed for the studied period. A significant increase on the MCS was observed from < 12 month to 12-23 months postoperatively (mean difference: 9.4; 95%CI: 1.1to17.1); No difference on MCS was noted on any other time points (Figure 1).

**Conclusions:** MCS improved significantly from < 12 months to 12-23 months. No further significant changes were observed in MCS, PCS and total FACT-Hep scores over time compared to baseline.

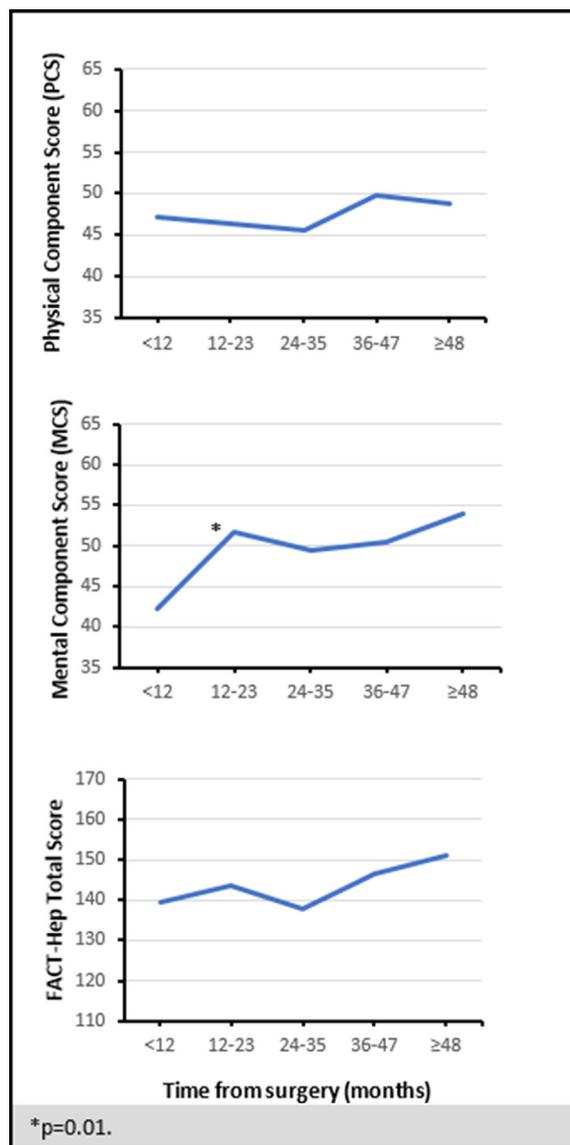


Figure 1. Quality of Life trajectories following pancreatic resection

PP06-28

### POST TRAUMATIC PANCREATIC FISTULA. WHEN ONE SURGERY IS NOT ENOUGH

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In the setting of abdominal blunt trauma, damage to the pancreas is a infrequent complication (0.2 / 3.1%), although when the spleen is damage the lesion to the tail of the pancreas is not as infrequent as the single pancreatic trauma alone. primary closure and repair in an unstable patient can be applied trying to prevent excessive surgical time, but with the risk of developing a pancreatic fistula in the post operative period. in the following case report, we present the case of a young male with splenic and pancreatic trauma, who developed a pancreatic fistula and that required multiple surgeries in order to control this serious complication.

26 yo male who under went emergency laparotomy secondary to blunt abdominal trauma, with splenic and distal pancreatic injury, who after multiple surgeries developed type b pancreatic fistulae with impossibility to perform ercp with stent placement as a treatment, so he was referred to our service for surgical evaluation.

Patient with adequate surgical evolution discharged 4 days after surgery without biochemical leak evidence, currently on 2nd month of followp as out patient with good clinical evolution.

Surgical resection is a feasible as a secondary treatment for non endoscopically fitpatients for treatment pancreatic fistulae with good results in third level high volume centers.

PP06-30

### LIQUID BIOPSIES IN PANCREATIC ADENOCARCINOMA: EVALUATION OF DNA DAMAGE REPAIR PATHWAY ALTERATIONS

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**Introduction:** Pancreatic ductal adenocarcinoma (PDAC) is an aggressive malignancy with few effective standard of care therapeutic options. However, molecular profiling in PDAC patients has identified many potentially actionable gene alterations in these cancers and the FDA recently approved the first BRCA-targeted therapy for patients with PDAC. These drugs are also known to work on patients with somatic alterations in DNA damage response and repair (DDR) genes. Given this new treatment option, patients will require molecular profiling to determine drug eligibility. This study examines the incidence of BRCA and

other DDR gene alterations in our PDAC patient population.

**Methods:** All patients with refractory or metastatic PDAC, referred to a single tertiary cancer center (from 2014-2019) were retrospectively reviewed for molecular profiling results and BRCA/DDR gene alterations.

**Results:** We identified 57 patients with PDAC that underwent molecular profiling. Thirty-nine of the 57 patients (68.4%) underwent tissue-based molecular profiling, while 42 patients (73.6%) underwent blood-based sequencing. Two of the 57 patients had BRCA1 mutations (3.5%) and 10 patients had BRCA2 mutations (17.5%). There were 7 patients (12.3%) with other DDR gene alterations identified, including ATM (7.0%), CHEK2 (1.8%), FANCC (1.8%), and MLH1 (1.8%).

**Conclusion:** This study demonstrates the utility of molecular profiling in PDAC patients and identifies a broad subset of patients that may benefit from new targeted treatment options available for BRCA-mutated tumors.

PP06-32

### EFFECT OF PREOPERATIVE MALNUTRITION USING GLOBAL LEADERSHIP INITIATIVE ON MALNUTRITION (GLIM) CRITERIA ON SHORT- AND LONG-TERM OUTCOMES OF PATIENTS WITH PANCREATIC HEAD CANCER

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**Background:** Although malnutrition is a global concern, there has been a lack of consensus on diagnostic criteria for application in clinical settings. Therefore, the Global Leadership Initiative in Malnutrition (GLIM) criteria has recently developed for assessing the malnutrition. The aim of study is to assess the effect of preoperative malnutrition, by means of GLIM criteria for predicting short- and long-term outcomes in patients who underwent curative pancreatoduodenectomy (PD).

**Methods:** From 2004 to 2018, 228 consecutive patients who underwent curative PD in our center for pancreatic ductal adenocarcinoma. The definition of malnutrition is based on both phenotypic criteria (weight loss, low body mass index [BMI] and reduced muscle mass), and etiologic criteria (reduced intake or assimilation and inflammation) in GLIM criteria.

**Results:** 75 (32.9%) of 228 patients were classified as with malnutrition. Preoperative malnutrition associated with an increased risk of estimated blood loss (816.7±875.2 vs. 593.1±489.9, P=0.015) and total hospital stay (27.3±15.7 vs. 22.9±17.7, P=0.045). The median follow-up period was 9.5months. The malnourished patients had inferior median 1-/3-/5-year overall survival, when compared to well-nourished patients (66.3%, 18.0% and 12.0% vs. 81.3%, 51.8% and 39.3%, P < 0.001). On multivariate

analysis, malnutrition (Hazard Ratio 1.81,  $P=0.002$ ) correlated independently with poor survival.

**Conclusion:** The GLIM criteria is a simple and useful tool for predicting the short- and long-term outcomes of pancreatic head cancer patients who underwent PD.

PP06-33

### POSTOPERATIVE MANAGEMENT OF CLINICALLY RELEVANT PANCREATIC FISTULA IN OUR INSTITUTE

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**Introduction:** Drain amylase levels are determined and drain bacterial culture results are obtained on days 1 and 3 postoperatively. In cases that drain fluid is aseptic, all drains are basically removed early regardless of fluid volume and amylase level. In contrast, in cases with drain fluid infection, the target drain is replaced with an 18-22Fr silicone drain once a stable fistula formation is confirmed. When intraabdominal abscess is detected after the drain removal, a 10-12Fr polyethylene percutaneous pigtail catheter is introduced under CT guidance. Enhanced CT is performed routinely on day 7 and as needed in patients with pancreatic fistula (PF) to evaluate fluid collection with or without pseudoaneurysm.

**Method:** Among 122 patients who underwent pancreatectomy (99 pancreatoduodenectomy (PD) and 23 distal pancreatectomy (DP)) between April 2015 and March 2018, 40 patients (30 PD and 10 DP) complicated with ISGPS PF were reviewed from the hospital records.

**Result:** Grade B and grade C PF developed in 37 and 3 patients, respectively. In patients with grade B PF, 27 were successfully managed only with repeated drain replacement; the first replacement was performed on day 11 (6-25), the median length of drainage was 35 days (17-88), and the median length of postoperative stay was 42 days (25-146). Two patients who underwent reoperation for insufficient drainage and 1 who died of rupture pseudoaneurysm were categorized into grade C.

**Conclusions:** Our postoperative managements of intraoperatively placed drains and PF resulted in relatively favorable outcomes except for considerably long hospital stay.

PP06-34

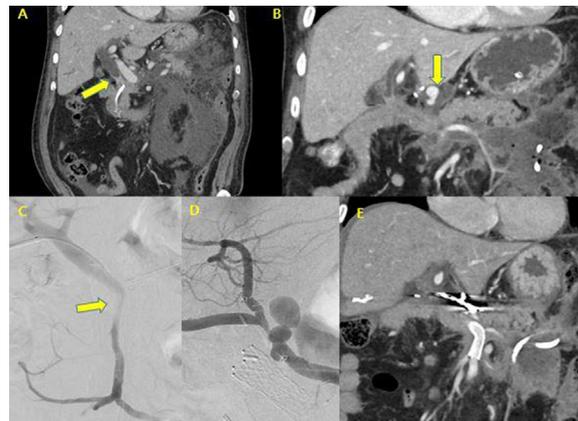
### COIL EMBOLIZATION OF COMMON HEPATIC ARTERY PSEUDOANEURYSM AFTER PYLOROUS PRESERVING PANCREATODUODENECTOMY: A CASE REPORT

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**Introduction:** Pseudoaneurysm from pancreatic leakage after pancreatoduodenectomy can result in fatal intra-abdominal bleeding. Here, we present a case of coil embolization of common hepatic artery pseudoaneurysm after pylorus preserving pancreatoduodenectomy (PPPD).

**Case report:** A 70 year-old male underwent PPPD for common bile duct cancer (T2N0). Prior to the operation, endoscopic retrograde biliary drainage was inserted and resulted in acute interstitial pancreatitis. The operation was uneventful and patient was discharged on postoperative day #14. On postoperative day #25, patient came to the emergency room with abdominal pain and fever. Computed tomography showed aggravated acute interstitial pancreatitis, common hepatic artery pseudoaneurysm with adjacent small hematoma and segmental narrowing of portal vein resulting from localized fluid collection. Emergency abdominal angiography was performed to insert a stent into stenotic part of the portal vein for better portal flow to the liver. Coil embolization from proximal right and left hepatic artery to the common hepatic artery was done. During angiography, arterial flow to the liver from inferior phrenic artery was observed. Additional percutaneous drain was also placed for intra-abdominal fluid collection. Following the embolization, AST/ALT elevated to 456/263IU/L then decreased to 48/57IU/L after four days. Total bilirubin level was also elevated to 5.3mg/dL then decreased to normal range after 20 days. Patient was discharged on 30 days after the embolization without further complications.

**Conclusion:** Coil embolization for pseudoaneurysm of common hepatic artery may be safely considered when portal flow is intact and collateral arterial flow to the liver from inferior phrenic artery is present.



Figures: A)preop CT, B)POD#25, C)Narrowing of SMV,PV, D) CHA pseudoaneurysm, E)POD#60

PP06-35

### LACK OF ASSOCIATION BETWEEN POSTOPERATIVE ACUTE PANCREATITIS AND POSTOPERATIVE COMPLICATIONS FOLLOWING PANCREATODUODENECTOMY: A SECONDARY ANALYSIS FROM A RANDOMIZED TRIAL

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**Objective:** To evaluate the association between postoperative acute pancreatitis (POAP) and postoperative

complications including postoperative pancreatic fistula (POPF) in patients undergoing PD.

**Summary background data:** Prediction of post-PD morbidity is difficult especially in the early postoperative period when CT scans are not available. Elevated serum amylase and lipase in postoperative day 0 or 1 may be used to define POAP, but existing literature do not agree on whether POAP is significantly associated with POPF.

**Methods:** We analyzed the data obtained from a previously published randomized controlled trial. POAP was defined as elevations in serum amylase above 110 U/L on postoperative day 0 or 1. Clinically relevant POAP (CR-POAP) was defined as elevations in CRP on postoperative day 2 in those with POAP. Postoperative complications including severe complications (Clavien-Dindo  $\geq$  IIIa), POPF, and clinically relevant POPF (CR-POPF; grades B or C) were analyzed. For a robust selection of variables for multivariable analysis, 500 bootstrap samples were drawn from the original data and backward elimination was performed while forcing POAP to be included.

**Results:** In 246 patients, POAP did not show significant associations with total postoperative complications (odds ratio [OR] 0.697; 95% CI, 0.360-1.313;  $P = 0.271$ ), severe complications (OR 0.647; 95% CI, 0.258-1.747;  $P = 0.367$ ), and CR-POPF (OR 0.998; 95% CI, 0.310-3.886;  $P = 0.998$ ) in multivariable analysis.

**Conclusions:** In patients undergoing PD, POAP was not significantly associated with postoperative complications including POPF. Caution should be taken when using POAP as a predictor of POPF.

#### PP06-36

### IMPROVING ACCESSIBILITY TO PANCREATIC CANCER WITH CIRCULATING TUMOUR CELL TECHNOLOGIES FOR TARGETED MOLECULAR THERAPEUTICS

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Pancreatic adenocarcinoma is one of the most lethal malignancies with majority of patients having already developed metastases at presentation. Diagnosis is typically made by endoscopic ultrasound guided biopsy which remains a procedure where often samples are insufficient for diagnosis.

Particularly in pancreas cancer where tissue access is limited, circulating tumour cells (CTC) is an attractive target for non-invasive therapeutic monitoring as they can reflect the evolving mutational profile of the disease. Unfortunately, the isolation of CTCs is technically challenging and to date only enumeration assays of limited clinical

utility have been described in pancreatic cancer. The ex-vivo expansion of CTCs would greatly increase the amount of data that can be obtained from a single liquid biopsy.

In this proof-of-concept study, we established CTC cultures from the peripheral blood of patients with pancreatic cancer at various stages of disease progression. CTC isolation and culture conditions were optimised, and tumour status was confirmed by identification of KRAS mutation with demonstration of tumourigenicity in mice. CTC lines were characterised with proteomics and compared against profiles of paired biopsy derived organoids and primary tumour samples where available.

Our study has established CTC lines that provide the opportunity to personalize therapy in real-time by taking into account the temporal evolution of disease. Based on this proof-of-concept study, we have expanded the clinical utility of CTC cultures for drug sensitivity screening and therapeutic biomarker discovery.

#### PP06-37

### INTRADUCTAL PAPILLARY MUCINOUS NEOPLASMS (IPMN): LONG TERM MANAGEMENT AND RESULTS AT SINGLE HPB CENTER

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**Introduction:** IPMN origins within the cells of the pancreatic duct. Accepted as lesions that can progress to pancreatic cancer, TC, MRI and EUS should be used to identify risk factors to decide whether the patient should benefit from a surgical approach.

**Methods:** Retrospective analysis of patients diagnosed of IPMN between 2015 and 2019. Variables analyzed include demographics, symptoms, images, surgical indication, type of lesion, presence of malignant disease and survival. The statistical studies performed will be described in each of the results reports and were performed using SPSS version 17.

**Results:** 58 patients were diagnosed with IPMN: 48 were found pre-operatively (Group 1) while 10 post-resection (Group 2, 9.7%). G1: 73% were fem., 71% asymptomatic, 23 (48%) multifocal, 13 (27%) located the head of the pancreas, 8 (17%) in the body and 4 (8%) in the tail. Table 1 summarizes the analyzed. The average time to surgery was 22.4 +/- 29.4 months. In G2: 6 were associated to invasive AdenoCa, 2 to an Ampuloma, 1 to a NET and 1 in a pancreas divisum. Long term survival: 100% for G1 at 10 years, while in G2 is 100% and 86% at 1 and 10 years respectively. Recurrence rate: 22%.

**Conclusions:** Those results highlight the value of following established guidelines in order to be successful with a conservative approach when an IPMN is diagnosed. In patients with IPMN I or III, surgery is recommended. Newly diagnosed IPMN II should be strictly followed due to an increased risk of malignancy.

PP06-38

### DOUDENAL STENOSIS FROM SPONTANEOUS HETEROTOPIC MESENTERIC OSSIFICATION AROUND PANCREAS: A CASE REPORT

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**Background:** Heterotopic mesenteric ossification is a very rare disease. In most of cases, the patients had a history of an abdominal surgery or trauma. However, spontaneous heterotopic mesenteric ossification is extremely rare.

**Case presentation:** A 60-year-old man presented with recurrent nausea and vomiting. On gastroduodenoscopy, luminal stenosis and edematous change at 2<sup>nd</sup> ~ 3<sup>rd</sup> portion of duodenum without complete obstruction was seen. On abdomino-pelvis computerized tomography, slightly less prominent enhancing wall thickening at 2<sup>nd</sup> and 3<sup>rd</sup> portion of duodenum was found. We performed a pylorus-preserving pancreaticoduodenectomy. The pathologic report confirmed heterotopic ossification with extensive fibrosis in peripancreatic soft tissue.

**Conclusions:** Herein, we described a case of duodenal stenosis from spontaneous heterotopic mesenteric ossification around pancreas that has never been reported.

PP06-40

### ZIP CODES INFLUENCES STAGING OF PANCREATIC CANCER AT DIAGNOSIS

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**Introduction:** The purpose of this study was to determine if pancreatic cancer stage at diagnosis is associated with the patient's zip code. Our hypothesis was that low socio economic status (SES) is associated with late diagnosis of pancreatic cancer.

**Methods:** We interrogated a convenience sample from our cancer center registry and obtained 479 subjects diagnosed with pancreatic cancer between 2010-2018. We selected subjects (328) by zip code, representing the plurality of the cases in our catchment area. Outcome variables were overall survival and socio-economic status; predictor variables were recurrence, insurance, type of treatment, gender, cancer stage, age, and gender. We converted zip code to municipality and culled data using Adjusted Gross Income (AGI, FY 2017) We then created groups using a cutoff at filings of >\$100,000 of AGI; Low SES = municipalities where ≤5% of the filings were over \$100,000, Mid SES = municipalities where between 5%-40% of the filings were over \$100,000, High SES = municipalities where ≥40% of returns were over \$100,000. Comparative statistical analysis was performed using Chi-square for nominal and ordinal variables, a two-way ANOVA test was used for continuous variables, p- value was set at 0.05.

**Results:** Although it was not statistically significant different, we found a trend where patients with low SES had a higher stage pancreatic cancer at diagnosis (Tab. 1). **Conclusion:** Our study shows that the subjects who live in a municipality with low SES are at disadvantage when diagnosed with pancreatic cancer.

		STAGE*												Total
		0	1	1A	1B	2	2A	2B	3	4	4A	4B		
social	High	0	2	1	1	0	3	8	2	11	0	1	29	
	Low	2	4	2	7	3	17	33	13	82	5	21	168	
status	Mid	0	1	1	2	2	4	19	9	34	3	7	82	
	Total	2	7	4	10	5	24	60	24	127	8	29	300	

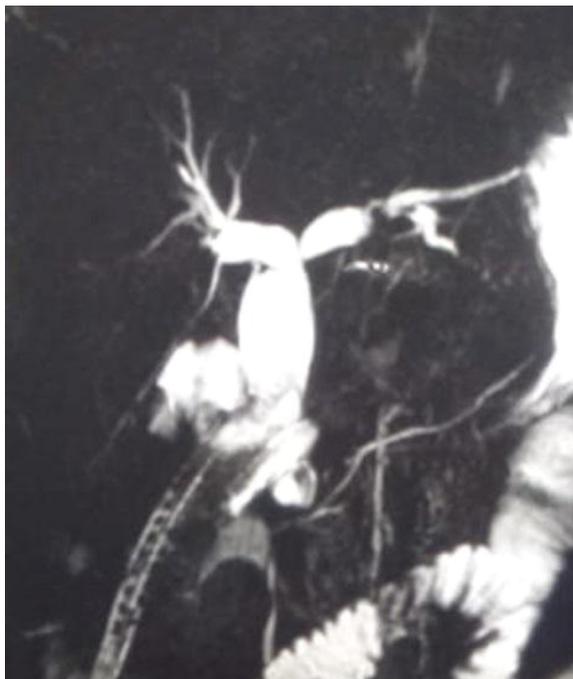
\* p = 0.84

PP06-41

### ROBOTIC ASSISTED ROUX EN Y HEPATICOJEJUNOSTOMY, AFTER FAILED CHOLECYSTOJEJUNOSTOMY FOR THE TREATMENT OF A CHOLEDOCAL CYST. CASE REPORT

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The cysts of the biliary tree are congenital entities, which can occur not only in bile duct, but throughout the biliary tree, often accompanied by an anomalous pancreatobiliary union. With an incidence of 1 case per 100,000 inhabitants, with a preponderance of 4: 1 women-men. They may be asymptomatic in childhood and have symptoms in adulthood, such as abdominal pain or jaundice. We present the case of a 19-year-old female patient, with history of diffuse abdominal pain, accompanied by jaundice, with an ultrasound with diagnosis of choledocholithiasis, with failed ERCP with suspicion of a choledochal cyst, a 2<sup>nd</sup> ercp was performed where stents were placed, and subsequently undergoes an unspecified biliodigestive bypass. At 24 hours with acute abdominal pain, significant distension, re-entering the operating room where a large biliary leak is identified, requiring UCI care for 1 month. With multiple abdominal reinterventions during that period. The patient was discharged with the biliary leak present, arriving at our center with severe dehydration and malnutrition. Improvement of her condition was required, placing a trans hepatic stent and Staging the lesion as a choledochal cyst still IC. Robotic assisted roux en y hepaticojejunostomy was performed, identifying the previous attempt as a cholecystojejunostomy, completing the resection of the remnant cyst and the biliary bypass. Patient continued with favorable post operative follow up, discharged 7 days post op, and is doing well after a year of follow up, avoiding the risk of cholangiocarcinoma in the long term.



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#### PP06-42 ANTICOAGULATION PRACTICES IN TOTAL PANCREATECTOMY WITH AUTOISLET TRANSPLANTATION PATIENTS: AN INTERNATIONAL SURVEY OF CLINICAL PROGRAMS

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**Introduction:** Anticoagulants are used in order to prevent thrombosis and assist with the islet engraftment during TPAIT (Total Pancreatectomy with Autoislet Transplantation) at the risk of bleeding complications. There appears no consensus guideline on anticoagulation protocol used. We aim to describe current practices by centers internationally.

**Methods:** An online survey was sent via email communication to TPAIT programs enrolled in the Collaborative Islet Transplant Registry (45 email domains may be suggestive of equal number of program). Three reminder emails were sent over the course of six weeks. 49 questions assessing demographics, patient related risk factors, and intra- and post-operative anticoagulation and aspirin use were formulated.

**Results:** Fifteen programs across 6 countries, 3 continents responded. 10(66.6%) classified patients into high or low risk. Responses to anticoagulation and antiplatelet practices are in Table 1. Intra-operatively, programs gave one (n=9), two (n=3), or no (n=3) heparin boluses with 10(66.6%) giving based on units/kg(0-50) and 5(33.4%) using a fixed dose. 14(93.3%) used heparin in the islet product. Post-operatively, heparin drips were initially used (n=10) and most commonly were started based on unit/kg/hr (n=8) with aPTT goal monitoring. [40-50 seconds (n=4) or >50 seconds (n=4)]. 8 programs (53.3%) used set duration of heparin, 25-48 hours being most common. 12(80%) used

low molecular weight heparin (LMWH) post-operatively at some point of time. Aspirin was used by 10 programs (66.7%). Rate of thrombosis and bleeding wasn't clarified. **Conclusion:** Very high practice variability among programs providing this specialized treatment warrants further studies and a consensus guideline.

#### PP06-43 A RARE CASE OF MALIGNANT POLYCYSTIC PANCREAS INVOLVING THE WHOLE PANCREAS TREATED SURGICALLY - CASE REPORT

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Polycystic pancreas is a rare disease with an unknown incidence. Very few cases have been reported in the literature. Polycystic pancreas is often found in association with autosomal dominant polycystic kidney disease or Von Hippel Lindau syndrome. The differential diagnosis include congenital cysts, simple cysts, pseudocyst, cystic neoplasms, hydatid cyst. This is a case report of a 54 year old male presenting with obstructive jaundice, loss of appetite, weight loss. Computed tomography scan of the abdomen and magnetic resonance imaging showed multiple cysts of varying sizes involving the entire pancreas. Patient underwent a battery of investigations however there was no conclusive evidence regarding the presence of an underlying malignancy. In view of persistent symptoms the patient was surgically treated. Total pancreatectomy with splenectomy was performed. Histopathology report was suggestive of intraductal papillary mucinous neoplasm, high grade, with associated invasive carcinoma involving pancreatic head, body and tail. The patient required intensive post operative care with management of diabetes mellitus, with repeated intensive care unit stay in view of diabetic ketoacidosis. The patient received 6 cycles of adjuvant chemotherapy. He is doing well so far and is on routine follow up.

#### PP06-44 STUDY OF A RARE BENIGN GANGLIOCYTIC PARAGANGLIOMA WITHIN THE AMPULLA OF VATER

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**Method:** Gangliocytic paraganglioma (GP) is an extremely rare benign tumor with embryological origin commonly from the hindgut.

Retrospective study of this rare presentation in a 64year old male done.

4/ 2016, Our patient had presented with malaena, vomiting and abdominal pain.

Multiple investigations conducted (OGD, ERCP, CT abdomen and pelvis) demonstrated: A 2.4 by 3 cm, non-obstructing, hypodense, polypoidal enhancing tumour arising from the mesenteric aspect of the 3rd segment of the duodenum, with 2-3 areas of ulceration along with a segment VII/VI liver lesion which an MRI liver pointed towards a haemangioma.

Multi-Disciplinary Team Meeting conclusion: Likely Gastrointestinal Stromal Tumor.

9/2016 Serial scans: Stable duodenum mass and liver lesion with no retroperitoneal lymphadenopathy.

09/2016 Trans-duodenal ampulla excision with re-implantation of bile and pancreatic duct completed. Clearance Margin 0.2mm.

Intra- op findings: 2.5-3cm ovoid mass in second part of duodenum prolapsing to 3rd part of duodenum.

The lesion was excised and stalk revealed pancreatic and bile duct opening separately.

Frozen section: negative for malignancy

**Results:** Gangliocytic Paraganglioma is characterized by its triphasic cellular differentiation (epithelioid neuroendocrine cells, spindle cells with Schwann cell differentiation, ganglion cells) along with characteristic immunoprofiling.

Known clinical Features:

- Age 15 - 84 years.
- M > F (1.5:1)
- Approximately only 7% metastasize to lymph nodes.

(Only 23 cases such cases reported by 2014.

**Conclusion:** Here we describe a rare condition managed with a limited resection and reconstruction with no recurrence in 4 years. Meta analyses of the known GP cases to identify differentiating features may be helpful in understanding this disease better.

**PB01 - Biliary: Cholangiocarcinoma**

PB01-02

**OUR SURGICAL EXPERIENCES WITH KLATSKIN TUMOR: TOWARD OPTIMAL CARE FOR ADVANCED CASES**

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**Introduction:** Surgical resection represents the only potentially curative treatment for Klatskin tumor. Because of the aggressive nature and the absence of effective adjuvant therapy treatment remains still a challenge, especially in centers with minimal multimodal resources.

**Methods:** Retrospective analysis of 10 patients diagnosed with Klatskin tumor, underwent surgical management in Fatmawati Central General Hospital from 2017 – 2018.

**Results:** From 10 cases of Klatskin tumor, there were 3 male and 7 female, with median age of 60 (range: 37-73) years old. Imaging diagnosis was done with either CT scan or MRCP due to the limitation from insurance policy. Preoperative staging with Bismuth-Chorlette classification reveal four cases of type II, 3 cases of type III, 2 cases of type IV and 1 cases of type I tumor. Almost all of our cases came late to the hospital, with severe jaundice and comorbidities including severe malnutrition and pneumonia. Surgical resection was attempted in 6 cases, including 4 bile-duct resection, and 2 liver-bile duct resection. Longmire procedure was done for 2 patient, while the other 2 patients receive PTBD and laparoscopic diagnostic, respectively.

**Conclusions:** In our daily practice, sometimes surgery remains the only choice we can offer to patients with Klatskin tumor, which often came late in their disease process. Every efforts, including resection or bypass procedure, are hope to increase patients chance of survival, and most importantly, their hope towards a better life.

**Keywords:** Klatskin tumor, bile duct resection, liver resection, Longmire's procedure

PB01-05

**NEOADJUVANT CHEMORADIOTHERAPY BEFORE RESECTION OF PERI-HILAR CHOLANGIOCARCINOMA (PH-CCA): THE CURRENT WORLD EXPERIENCE**

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**Background:** Treatment with neoadjuvant chemoradiotherapy followed by liver transplantation yields

promising results in peri-hilar cholangiocarcinoma (PH-CCA). It has not been established whether neoadjuvant chemoradiotherapy may similarly influence outcome of resection of PH-CCA.

**Methods:** A systematic review of the literature for reports of patients undergoing resection of PH-CCA after neoadjuvant chemoradiotherapy was performed using Medline and Embase databases for the period between 1990 and 2019. The keywords and MESH headings "hilar cholangiocarcinoma", "Klatskin", "chemoradiotherapy" and "chemotherapy" were used. Data were extracted on demographic profile, disease staging, chemoradiotherapy protocols, complications and outcome. Risk of bias was assessed using Cochrane methodology. Seven reports provide the study population.

**Results:** The median (range) recruitment period was 14 (4 – 31) years. The total number of patients in these studies is 87. Interval from completion of neoadjuvant treatment to surgery varied from 3 days to 6 months. Resection was by hepatectomy with three studies reporting R0 rates of 100%, 24% and 83% respectively. Histopathological evaluation of the resected specimen showed evidence of prior treatment response in the three studies which reported this phenomenon. There were 2 treatment related deaths at 90 days. Median survival was 19 (95% confidence interval 9.9 – 28) months and 5-year survival 18%.

**Conclusions:** The reports comprising these data are from expert centers but are influenced by selection and reporting bias. These data show interesting potential beneficial effects of neoadjuvant chemoradiotherapy on both R0 rate and complete response in resected specimen. Scientific equipoise currently exists in relation to neoadjuvant chemoradiotherapy for PH-CCA.

PB01-06

**STAGING LAPAROSCOPY IS UNNECESSARY IN THE PRE-SURGICAL WORK-UP OF PATIENTS WITH PERI-HILAR CHOLANGIOCARCINOMA (PH-CCA)**

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**Introduction:** The majority of patients with peri-hilar cholangiocarcinoma (PH-CCA) are not candidates for surgery either because of co-morbidity or locally advanced/metastatic cancer. Staging laparoscopy is advocated to reduce non-therapeutic laparotomy. However, modern high-resolution cross-sectional imaging can effectively identify patients with metastatic disease or bi-lobar vascular involvement. This series reports outcome in patients evaluated for surgery without staging laparoscopy.

**Methods:** During the 11 year period January 2009 to January 2020, 424 patients underwent hepatectomy by an

individual HPB surgeon (AKS) in a regional liver surgery service. 22 underwent hepatectomy for type III or type IV PH-CCA and constitute the study population of this report. Patients undergoing surgery for intra-hepatic cholangiocarcinoma are excluded. Pre-operative preparation included percutaneous trans-hepatic drainage of the future liver remnant followed by cardiopulmonary exercise testing and CT of the abdomen and thorax. Vascular involvement was assessed by pre-operative contrast-enhanced magnetic resonance scan. No patients underwent staging laparoscopy.

**Results:** 8 (36%) were IIIa, 7 (32%) were IIIb and 7 were type IV. All underwent major hepatectomy with 4 (18%) requiring arterial reconstruction to the new remnant liver. During the study period 1 further patient (1 of 23) underwent non-therapeutic laparotomy (4%) because of nodal involvement in stations 8 and 9. Histology confirmed an R0 resection margin in 15 (68%).

**Conclusions:** As with other single centre reports this is a highly selected series and care must be exercised when extrapolating from these results. However, the data question the dogma of routine pre-operative staging laparoscopy prior to resection of PH-CCA.

#### PB01-08

### CONTEMPORARY SURGICAL MANAGEMENT OF PERI-HILAR CHOLANGIOCARCINOMA (PH-CCA)

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**Introduction:** Peri-hilar cholangiocarcinoma (PH-CCA) is a rare tumour of the liver hilus. Resection is a major surgical undertaking typically requiring hepatectomy with excision of the extra-hepatic biliary tree. Can this type of surgery be undertaken in regional hepatobiliary centers with worthwhile outcomes?

**Methods:** During the 11 year period January 2009 to January 2020, 424 patients underwent hepatectomy by an individual HPB surgeon (AKS) in a regional liver surgery service. 22 underwent hepatectomy for type III or type IV PH-CCA and constitute the study population. Patients undergoing surgery for intra-hepatic cholangiocarcinoma are excluded. Pre-operative preparation included percutaneous trans-hepatic drainage of the future liver remnant followed by cardiopulmonary exercise testing and CT of the abdomen and thorax. Vascular involvement was assessed by pre-operative contrast-enhanced magnetic resonance scan. There was no policy of neoadjuvant chemo- or radiotherapy. Resection included segment I and reconstruction of biliary drainage was by Roux hepaticojejunostomy. The study was listed as an audit.

**Results:** 8 (36%) were IIIa, 7 (32%) were IIIb and 7 were type IV. All underwent major hepatectomy with 4 (18%) requiring arterial reconstruction to the new remnant liver. In-hospital mortality was zero. Adjuvant chemotherapy

was utilized in 6 (27%). Median (range) survival was 15 (2-74) months.

**Conclusions:** This is a highly selected series and care must be exercised when extrapolating from these results. However, the data show that liver resection in the hands of an experienced team is a feasible option in carefully assessed patients with type III and type IV PH-CCA.

#### PB01-11

### RECURRENCE FACTORS FOLLOWING CURATIVE-INTENT RESECTION FOR INTRAHEPATIC CHOLANGIOCARCINOMA

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**Background:** Recurrence of intrahepatic cholangiocarcinoma (ICC) after curative resection is common and the prognosis of recurrent ICC is dismal.

**Objective:** This study was designed to investigate the risk factors and prognosis after disease recurrence following curative-intent resection for ICC.

**Methods:** Data of patients undergoing curative resection for ICC in a single institution were identified.

**Results:** A total of 147 patients were included. With a median follow-up of 21 months, 101 patients (68.7%) experienced ICC recurrence. On multivariate analysis, rim-enhanced or hypovascular mass on late arterial phase of CT image (hazard ratio [HR] 3.893, 95% confidence interval [CI] 1.700-8.915; p = 0.0013 and HR 6.241, 95% CI 2.670-14.586, p < 0.001, respectively), macrovascular invasion (HR 0.518, 95% CI 0.280-0.960; p = 0.037), microvascular invasion (HR 1.813, 95% CI 1.134-2.900, p = 0.013), advanced T stage (HR 1.801, 95% CI 1.105-2.934, p = 0.018), and Lymph node metastasis (HR 2.067, 95% CI 1.168-3.657, p = 0.013) were associated with recurrence of ICC following curative resection, independently. Median survival after recurrence was better among patients who tried any treatment modality (18.5 months) than patients who did not received treatment (5.0 months) [p < 0.001].

**Conclusions:** Several factors including preoperative vascularity of ICC on CT image are the independent risk factors for recurrence of ICC after curative resection. Proactive treatment for recurrent ICC can be helpful to prolong the survival length of patients with recurrent ICC.

#### PB01-12

### RECURRENCE PATTERNS AND PROGNOSIS FOLLOWING CURATIVE-INTENT RESECTION FOR INTRAHEPATIC CHOLANGIOCARCINOMA

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**Background:** This study was designed to investigate the patterns, timing, and prognosis of disease recurrence after curative-intent resection for ICC.

**Methods:** Patients undergoing curative resection for ICC in a single institution were identified. Data on timing and first sites of recurrence, recurrence management, and long-term outcomes after recurrence were analyzed.

**Results:** A total of 147 patients were included. 101 patients (68.7%) experienced ICC recurrence. In the cohort, 12 patients (11.9%) recurred at the surgical margin, 28 (27.7%) recurred within the liver away from the surgical margin, 41 (40.6%) recurred at extrahepatic sites, and 20 (19.8%) developed both intrahepatic and extrahepatic recurrence. More than 70% (70.3%) of all recurrence occurred within a year after primary surgical resection. Extrahepatic-only recurrence (median 7.8 m) and Both intrahepatic and extrahepatic recurrence (median 5.4 m) tended to occur early, while intrahepatic recurrence at non-margin sites occurred later (median 10.2 m;  $p = 0.027$ , and  $p = 0.003$ , respectively). Median survival after recurrence was better among patients with intrahepatic recurrence (29.2 months) or extrahepatic recurrence (10.6 months) or locoregional recurrence (21.2 months) was better than patients with both intrahepatic and extrahepatic recurrence (4.4 months) [ $p < 0.001$ ,  $p = 0.024$ , and  $p = 0.045$ , respectively].

**Conclusions:** Different recurrence patterns, timing of recurrence, and prognosis suggest biological heterogeneity of ICC.

#### PB01-14

### EXPERIENCE OF TOTAL LAPAROSCOPIC RADICAL RESECTION OF HILAR CHOLANGIOCARCINOMA: REPORT OF 21 CASES

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**Objective:** To investigate the feasibility, safety and clinical effect of total laparoscopic radical resection of hilar cholangiocarcinoma.

**Methods:** Retrospectively summarized the 21 patients with hilar cholangiocarcinoma, who underwent total laparoscopic radical resection of hilar cholangiocarcinoma in our Hospital from Oct 2017 to April 2019. Collected the clinical data of those patients, including 9 cases of Bismuth type I, 10 cases of Bismuth type II, and 2 cases of Bismuth type IIIb.

**Results:** Total laparoscopic radical resection of hilar cholangiocarcinoma were performed successfully. The procedure was finished within a time of  $(211.3 \pm 87.5)$  min and with an intraoperative blood loss of  $(132.3 \pm 59.1)$  ml. There was no death case during the perioperative period. All the patients had the R0 resection and the numbers of dissected lymph nodes were  $13.4 \pm 2.7$ . The postoperative occurred in 2 patients, they were all cured spontaneously in one week, and there was no perioperative death. All patients were followed-up regularly within 3-24 months. One of them recurred within 12 months after the operation. The remaining patients have survived well so far.

**Conclusion:** Under the operation of the experienced surgeon, total laparoscopic radical resection of hilar cholangiocarcinoma is safe, feasible and effective in the short term.

#### PB01-15

### CONSTRUCTION AND VALIDATION OF A CIMP-RELATED PROGNOSTIC SIGNATURE FOR CHOLANGIOCARCINOMA

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**Background:** Cholangiocarcinoma (CCA) presents tremendously high mortality. Its prognosis is unfavorable because of lacking in potential biomarkers for prognostic prediction.

**Methods:** CCA patients in GEO cohort were categorized into two subtypes. Differentially expressed and methylated genes were identified, and the impact of DNA methylation in trans-regulating gene expression were investigated. Finally, a CIMP-related methylation signature for CCA (CMSC) was trained in GEO and validated in Tongji cohort.

**Results:** A subset of patients with CIMP-H were identified, correlated with unfavorable prognosis. Gene enrichment analysis implied the potential mechanism of CIMP as a promoter in carcinogenesis via regulating proliferation. The trans-regulation among differentially methylation CpG sites and genes, with the same changing trends was positively correlated, while the contrary circumstances was predominantly dominated by negative correlation. Notably, CMSC based on four genes could significantly classified CCA patients into low- and high-risk groups in GEO cohort and the robustness of CMSC was validated in Tongji cohort. The result based on receiver operating characteristic analysis further indicated the CMSC presented highly sensitive and specific prediction of prognosis in CCA.

**Conclusion:** our work highlighted the clinical significance of CMSC in predicting the prognosis of CCA.

#### PB01-16

### ARTERIAL ENHANCEMENT PATTERN PREDICTS SURVIVAL IN PATIENTS WITH UNRESECTABLE INTRAHEPATIC CHOLANGIOCARCINOMA AND RESECTED INTRAHEPATIC CHOLANGIOCARCINOMA

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**Background:** Several studies showed an association between vascularity and prognosis in resectable mass-forming intrahepatic cholangiocarcinoma (IHCC). Prognostic utility of arterial enhancement in unresectable IHCC was never reported. Aim of this study was to determine if arterial hypervascularity confers a prognostic benefit in patients with unresectable IHCC and to corroborate previously reported positive prognostic effect in patients resected for IHCC.

**Methods:** All patients treated at single institution for IHCC between 2003 and 2015 with computed tomography (CT)

dynamic enhancement at diagnosis were included. A resected Surgical (n=55) and an unresectable Medical (n=89) cohort were identified. After review by two radiologists, tumor vascularity was classified by total percent arterial enhancement (Hypervascular>50%, Peripherally Enhancing 10-50%, Hypovascular< 10%). Overall survival (OS) was the primary outcome for comparison between tumor vascularity.

**Results:** Unresectable patients were more frequently male (55.2% vs. 32.1%, p=0.01), with higher level of CA 19-9 at diagnosis ( $5470.7 \pm 18826.8$  U/mL vs.  $629.4 \pm 2570.9$  U/mL, p=0.002) and larger radiologic tumor size (mean:  $10.8 \pm 3.8$  cm vs.  $6.3 \pm 2.8$  cm, p< 0.001). In both cohorts, OS was significantly higher in patients with hypervascular when compared to hypovascular tumors (Medical: p=0.030; Surgical p=0.038). There was no significant difference between tumors with hypervascular and peripheral enhancement (Medical: p=0.096; Surgical p=0.157) or peripheral enhancement and hypovascular tumors (Medical: p=0.396; Surgical p=0.297).

**Conclusion:** In resectable and unresectable patients with IHCC, hypervascularity at arterial CT phase represents a surrogate for prognosis. Appropriate preoperative imaging predicts favorable survival in one-third of patients undergoing resection for IHCC.

#### PB01-17

### MORE THAN FOUR LYMPH NODE METASTASES IN HILAR CHOLANGIOCARCINOMA STILL HAD A POOR PROGNOSIS

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**Background:** The hilar cholangiocarcinoma is advanced stage at the time of diagnosis. Although surgical resection is a golden standard of the treatment, however the significance of resection from an oncological point of view for patients with multiple lymph node metastasis is uncertain. In this study, we retrospectively reviewed our experiences of resected cases of hilar cholangiocarcinoma.

**Materials and methods:** Between April 2000 and December 2018, liver resections for 87 cases of hilar cholangiocarcinoma were performed. 59 cases underwent extended right hepatic lobectomy (ERHL), and 28 cases underwent extended left hepatic lobectomy (ELHL).

**Results:** The overall 5-year survival rates (5-SR) was 40.0%. There was no significant difference in the 5-year survival rate between the ERHL and ELHL cases. Pathological examination revealed that there were 7 cases of UICC stage I, 49 cases of stage II, 21 cases of stage IIIc, and 10 cases of stage IVA. Each stage revealed no significant differences in 5-SR. Clinicopathological findings revealed no significant differences in 5-SR between patients with those positive or negative for tumor differentiation, tumor depth, tumor size, tumor infiltration, lymphatic invasion, venous invasion, plexnerve invasion, and lymph node metastasis. However, analysis based on the number of lymph node metastases showed that 76 cases were 3 or less and 11 cases were 4 or more, there was a significant difference in 5-SR ( $p = 0.011$ ).

**Conclusion:** Surgical resection is crucial matter for hilar cholangiocarcinoma. However, more than 4 lymph node metastases in hilar cholangiocarcinoma still had a poor prognosis.

#### PB01-18

### PROGNOSTIC NUTRITIONAL INDEX (PNI) WAS ASSOCIATED WITH POSTOPERATIVE SURVIVAL RATE IN HILAR CHOLANGIOCARCINOMA

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**Background:** Radical resection of hilar cholangiocarcinoma still has high complications and mortality. In this study, we retrospectively reviewed our experiences of resected cases of hilar cholangiocarcinoma, in terms of Prognostic Nutritional Index (PNI) and the outcome.

**Materials and Methods:** Between January 2001 and February 2018, liver resections for 89 cases of hilar cholangiocarcinoma were performed at our department. (1) The preoperative PNI was analyzed, and the median survival time (OS) between the two groups with a Cut Off value of 40 was compared. (2) Statistical differences in the preoperative PNI values, frequency of perioperative complications based on Clavien Dindo classification (CD), and survival rate for the two groups of our clinical path induction cases and non-induction cases investigated.

**Results:** (1) The 5SR in 45 cases less than PNI40 were 26 months, 23%, and in 44 cases more than PNI40, it was 127 months, 53% (p = 0.01). (2)PNI was 40 in patients with clinical path, 37 in non-introduced patients (p = 0.08), and the frequency of CD3 or higher was 24 (48%) in patients with introduction and 12 (63%) (p = 0.52).

**Conclusions:** A correlation between preoperative nutritional status and prognosis was suggested in hilar cholangiocarcinoma, and PNI of 40 or more was associated with better OS.

#### PB01-19

### TUMOR INFILTRATION WAS ASSOCIATED WITH POSTOPERATIVE SURVIVAL RATE IN DISTAL BILE DUCT CARCINOMA

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**Background:** The distal bile duct carcinoma is usually in the advanced stage at the time of diagnosis. Although surgical resection is a golden standard of the treatment, the recurrence rate is still high resulting in a poor prognosis. In this study, we retrospectively reviewed our experiences of resected cases of distal bile duct carcinoma, in terms of clinicopathological features and the outcome.

**Materials and Methods:** Between April 2000 and October 2019, pancreatoduodenectomy (PD) was performed for 109 cases of distal bile duct carcinoma at our department. Of these, 86 cases underwent non-residual tumor surgery (R0).

**Results:** There were 61 males and 25 females with a median age of 69.0 years. The median operation time was 503.5 min and the median operative blood loss was 696.5 ml. The overall 5-year survival rate (5-SR) was 47.4 %. Pathological examination revealed that there were 9 cases of UICC stage I, 53 cases of stage IIA, 22 cases of stage IIB, and 2 cases of stage IIIA. Each stage revealed no significant difference in 5-SR. Clinicopathological findings revealed no significant differences in 5-SR between patients with those positive or negative for tumor size, lymphatic invasion, vein invasion, and lymph node metastasis. However, tumor infiltration positive cases were associated with poor prognosis ( $P=0.028$ ). The results revealed that tumor infiltration was associated with postoperative mortality (odds ratio, 2.024; 95% CI, 1.061-3.859;  $P=0.032$ ).

**Conclusions:** Tumor infiltration was associated with postoperative survival rate in distal bile duct carcinoma.

#### PB01-21

### PANCREATICOUDENECTOMY FOR RECURRENCE OF DISTAL BILE DUCT CANCER AFTER BISTHMUS TYPE IIIA HILAR CHOLANGIOCARCINOMA OPERATION: A CASE REPORT

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**Introduction:** Hilar cholangiocarcinoma is a relatively rare tumor with a poor prognosis and few long-term survivors. Although recent advances in imaging diagnosis, surgical techniques, and perioperative management can result in increased resectability and improved surgical outcomes, patients who had operation still have risk of cancer recurrence. Local recurrence, following a resection for cancer of the bile duct, is usually incurable because second curative surgery being almost impossible.

**Method:** We have experienced a good prognosis case after reoperation for bile duct cancer recurrence and presented in this study. The medical records and clinical outcomes of patients were retrospectively reviewed.

**Results:** The patient, a 63-year-old woman, had undergone curative right hepatectomy, caudate lobectomy, bile duct resection with hepaticojejunostomy for hilar cholangiocarcinoma bismus type IIIa. Histological examination revealed a T1 well-differentiated adenocarcinoma with intraductal papillary neoplasm background and all resection margins were negative. The recurrence at the site of intrapancreatic bile duct was identified 19 months after first operation. We performed a pancreaticoduodenectomy and histological examination revealed a 2cm sized moderately differentiated adenocarcinoma with intraductal papillary neoplasm background. The patient is being followed up for 4 years and 10 months without recurrence after second operation.

**Conclusion:** It is concluded that a secondary surgical resection is possible in selected patients with recurrent bile duct cancer, mostly of the papillary type. A primary operation for bile duct cancer should be performed with a wide surgical margin, and secondary curative surgery could be considered whenever possible in selected cases of recurrence.

#### PB01-22

### ANALYSIS OF RECURRENCE IN PATIENTS WHO UNDERWENT CURATIVE-INTENT RESECTION FOR PERIHILAR CHOLANGIOCARCINOMA

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**Introduction:** This study aimed to investigate the patterns of recurrence and to evaluate factors associated with the time to recurrence in resected perihilar cholangiocarcinoma patients.

**Methods:** A retrospective analysis was conducted on 138 patients undergoing curative-intent resection of perihilar cholangiocarcinoma. The median follow-up time was 115 months.

**Results:** During the follow-up period, 77 patients (56%) relapsed and the 5-year recurrence rate was 61%. Of 77 patients, 71 (92%) relapsed within 5-years after resection. Distant recurrence was detected in 44 patients (57%), whilst locoregional recurrence in 21 patients (27%), and the both in 12 patients (16%). The sites of distant recurrence were the liver (n = 17), peritoneum (n = 16), distant lymph nodes (n = 14), and lung (n = 9). On multivariate analysis, age (hazard ratio [HR] 1.7, P = 0.039), venous invasion (HR 1.9, P = 0.01), primary tumor status (HR 2.2, P = 0.001), and number of positive nodes (1-3: HR 1.8, P = 0.001,  $\geq 4$ : HR 3.7, P = 0.028) were independent factors associated with time to recurrence. The treatment for the 77 relapsed patients were surgery (n = 8), chemotherapy (n = 41), and best supportive care (n = 28). The 3-year overall survival after recurrence was 38%, 4%, and 0%, respectively (P < 0.001).

**Conclusions:** More than half of patients with perihilar cholangiocarcinoma experience recurrence after curative-intent surgery, and these recurrences occur mostly within 5 years. Adjuvant strategies should be considered, especially for patients with venous invasion, extensive primary tumor, and nodal metastasis.

#### PB01-23

### ONCOLOGIC BENEFIT OF FROZEN SECTION OF PROXIMAL BILE DUCT MARGIN IN PERIHILAR CHOLANGIOCARCINOMA

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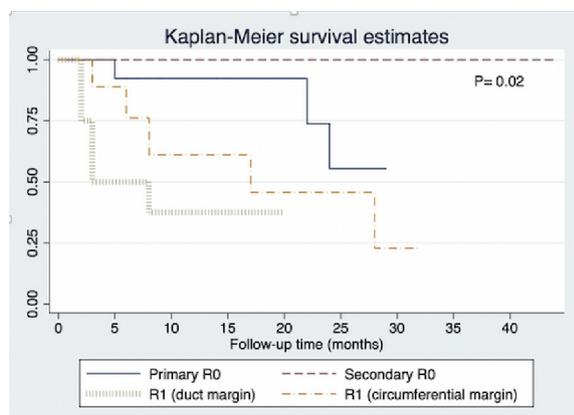
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**Introduction:** R0 resection is the best chance of prolonging the survival of cholangiocarcinoma patients. Frozen section of bile duct margin often be used to determine the histology of the bile duct to achieve R0 resection, but the clinical benefit remains controversial.

**Methods:** All 132 patients underwent hepatectomy for perihilar cholangiocarcinoma between January 2006, and December 2019 were analyzed. Resection status, the accuracy of the frozen section, surgical variables, prognostic factors, survival, and recurrence were evaluated.

**Results:** There were 39 patients in the frozen group and 93 patients in the non-frozen group. R0 status in the frozen section group was higher than the non-frozen section group but not significant (48.72 vs. 35.48 percent) ( $p=0.175$ ). Median survival in both groups was 24 and 17 months that tend to be better in the frozen section group, although there was no statistically significant difference ( $p=0.25$ ). In all populations, the median survival of R0 resection patients was better than R1 resection patients (32 vs. 13 months) ( $p=0.001$ ). All three patients in the secondary R0 group are still alive and have no recurrence. The median follow up time in the frozen section, and the non-frozen section group was 19.12 and 77.67 months.

**Conclusions:** The clinical benefit of the frozen section of the proximal bile duct margin is still inconclusive. The frozen section analysis tends to increase the number of R0 resection and prolong survival. The frozen section should be done if possible for increasing the R0 resection rate.



Overall survival of the cholangiocarcinoma patients underwent frozen section analysis according to r

#### PB01-25

### SURVIVAL ANALYSIS OF HILAR CHOLANGIOCARCINOMA AFTER CURATIVE SURGICAL RESECTION FOCUSED ON ADVANCED STAGE

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**Background/Aims:** Hilar cholangiocarcinoma is known as a tumor showing poor prognosis despite curative surgical resection. Furthermore, many patients are diagnosed at advanced stage of disease, many of them are Bismuth type IV. Most of them are unresectable, and shows poor prognosis in spite of extensive surgical resection.

**Materials/Methods:** We retrospectively reviewed the 107 patients who were undergone surgical resection for hilar cholangiocarcinoma between 2001 and 2017. We did survival analysis according to various clinical factors including type of surgical resection and clinico-pathological factors.

**Results:** A total of 107 patients were classified according to the Bismuth type, there were 3(2.8%) of type I, 10(9.4%) of

type II, 74(70%) of type III and 19(17.9%) of IV. Five-year overall survival was 34.4% and 5-year disease free survival was 28.0% after surgical resection. In multivariate analysis of prognostic factors, CA19-9 elevation, histologic grade, lymphovascular invasion, and portal vein invasion were independent poor prognostic factors for both disease free and overall survival. There were no significant survival difference according to Bismuth type and gross pathologic type. Of note, for the patient who have Bismuth type IV, 5-year overall survival was 38.4% and it was not significantly different between R0 ( $n=4$ , 66.7%) and R1 ( $n=15$ , 33.3%) resection. ( $P=0.740$ ).

**Conclusions:** There are a lot of R1 resection despite strong endeavor to achieve R0 resection for the patients including high proportion of advanced hilar cholangiocarcinoma like Bismuth type IV. However, the overall survival of entire cohort after extensive surgical resection is acceptable.

#### PB01-26

### A CASE OF HILAR CHOLANGIOCARCINOMA UNDERGOING CURATIVE RESECTION AFTER APPROXIMATELY ONE YEAR OF MULTIDISCIPLINARY THERAPY

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A 68 year-old women with obstructive jaundice was referred to our hospital for further examination and treatment.

Computed tomography(CT) scan revealed dilatation of the intrahepatic bile duct, and thickening and enhancement of walls were observed at the liver hilum.

Since bile drainage could not be performed using endoscopic retrograde cholangiopancreatography(ERCP), percutaneous transhepatic biliary drainage(PTCD) was implemented.

We diagnosed hilar cholangiocarcinoma of Bismuth type IV based on imaging from the PTCD tube, requiring a right trisegmentectomy.

Since the remaining liver volume was insufficient for resection, percutaneous transhepatic portal vein embolization(PTPE) was performed.

Although volume of the liver lateral segment increased, the patient was determined inoperable due to low bile production, and chemotherapy (Gem + CDDP) was implemented without surgery starting on March 2, 2017.

During chemotherapy, the patient suffered cholangitis and required hospitalization several times, but no exacerbation of the damage was found in bile duct imaging. When bile and liver volume was measured again in November, the patient was determined operable. In January 2018, a right hepatic trisegmentectomy, caudal lobectomy, and biliary tract reconstruction were performed. S-1 was administered after surgery. Currently, approximately 2 years have passed, and the patient remains recurrence-free.

In this case of an inoperable patient with hilar cholangiocarcinoma, a successful curative resection was performed by implementing PTPE in combination with chemotherapy while waiting for sufficient recovery of liver function. Although it took approximately one year until the operation could be performed, this result was achieved by continuing the treatment without giving up.

#### PB01-27

### THE IMPACT OF PORTAL VEIN RESECTION ON POSTOPERATIVE OUTCOME OF HILAR CHOLANGIOCARCINOMA

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**Introduction:** Concomitant Portal vein resection (PVR) with major hepatic resection could increase the rate of curative resection in hilar cholangiocarcinoma (HCCA). However, the role of PVR is still debatable because it could increase risk of postoperative morbidity. This study aimed to analysis the efficiency of combined PVR for HCCA in terms of postoperative complications and survival rate.

**Methods:** From January 2005 to December 2016, 418 patients had performed surgery for HCCA at Samsung Medical Center. Among them, 235 patients who underwent major hepatic resection with curative intent were finally analyzed retrospectively (patients with PVR, n=35; patients without PVR, n=200).

**Results:** There was no significant difference in post-operative complications between two groups. Patients with PVR were likely to have more advanced HCCA (T3: 40% vs. 12%,  $p < 0.001$ ; nodal metastasis: 60% vs. 28%,  $p < 0.001$ ), but obtained more curative resections (positive resection margin; 5.7% vs. 11.5%,  $p = 0.002$ ). There was no significant difference in 5-year survival rates with or without PVR. After multivariate analysis, EBL > 600ml (HR= 1.688, 95% CI 1.133- 2.514,  $p = 0.010$ ), T3 diseases (HR= 2.403, 95% CI 1.540- 3.747,  $p = 0.001$ ), nodal metastasis (HR= 2.941, 95% CI 1.964- 3.747,  $p = 0.001$ ), and poorly differentiated carcinoma (HR= 1.890, 95% CI 1.260- 2.836,  $p = 0.002$ ) were identified as independent risk factors for survival after resection.

**Conclusions:** PVR does not increase postoperative morbidity, and showed similar oncologic outcomes despite of more advanced disease state in patients with HCCA. After careful patients' section, concomitant PVR could be beneficial for HCCA patients.

#### PB01-28

### IDENTIFICATION OF DYSREGULATION OF IRON METABOLISM AND POST-TRANSLATIONAL MODIFICATIONS VIA BILE IN CHOLANGIOCARCINOMA

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**Background:** Cholangiocarcinoma (CCA) is a highly malignant cancer of the biliary tract with a poor prognosis. Herein, we investigated possible mechanism of extrahepatic CCA (eCCA) by dysregulated iron metabolism and post-translational modifications (PTMs) and evaluated potential biomarkers in the bile fluid for diagnosis of eCCA and differentiation between eCCA and benign biliary disease.

**Methods:** From August 2018 to April 2019, we obtained bile fluids from 46 patients; 28 patients with eCCA (eCCA group) and 18 patients with common bile duct stone (Control group) via percutaneous transhepatic biliary drainage.

**Results:** The remarkable difference of PTMs was that FNTA which means prenylated cysteine as regulator was significantly decreased in eCCA than that of Control. In addition, level of GSH, peroxide, GPx and ferrous iron [Fe<sup>+2</sup>] were significantly depleted in eCCA than Control. These results demonstrate that PTM, dysregulated iron metabolism and GPx-regulated ferroptosis with GSH depletion through cysteine modification in bile are possible mechanisms of eCCA. Liquid Chromatography (LC)-Mass Spectrometry (MS) analysis, several oncogenic pathways including MYC target, apoptosis, fatty acid metabolism, P53 and mTORC1 were enriched in eCCA.

**Conclusions:** In conclusion, redox-dependent modification of cysteine and ferroptosis in bile fluids are possible mechanisms of eCCA. Several protein and oncogenic pathways related to PTM which are seen in eCCA tissues were also enriched in bile fluids. It suggests that bile fluid represents the oncogenic characteristics of eCCA tissues. Therefore, bile fluids have a role of a biomarker for diagnosis in eCCA, especially, differentiation of eCCA from benign biliary stricture.

#### PB01-29

### POSTSEGMENTECTOMY FOR A LOCAL RECURRENCE OF HILAR CHOLANGIOCARCINOMA AFTER CENTRAL BISEGMENTECTOMY AND CAUDAL LOBECTOMY

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**Introduction:** Surgical resection is the only curative treatment for hilar cholangiocarcinoma but the possibility of local recurrence is high. The standard treatment for recurrent hilar cholangiocarcinoma after operation is chemotherapy and repeated resection is rarely performed. We herein report a rare case that re-hepatectomy was done for a local recurrence of hilar cholangiocarcinoma after central bisegmentectomy and caudal lobectomy.

**Methods:** A report of a case.

**Results:** A 75-year-old woman developed hilar cholangiocarcinoma and underwent extrahepatic bile duct resection with concomitant central bisegmentectomy and caudal lobectomy. The histopathological examination confirmed that R-0 resection had been achieved. After 18 months of the operation, computed tomography(CT) showed a local recurrence of the tumor in the posterior segmental branch of the intrahepatic bile duct with the portal vein invasion. The recurrent tumor was localized

only in the region and we decided to operate again. The tumor was resected with the posterior segment, the portal vein and the hepaticojejunostomy. The patient had an uncomplicated postoperative recovery and was discharged home.

**Conclusion:** We successfully performed re-hepatectomy for a local recurrence of hilar cholangiocarcinoma. As far as we know, such a case has not been reported. In the first operation, we chose not extended right hepatectomy nor extended left hepatectomy but central bisegmentectomy and as a result, remnant liver volume was spared. As a result, she could undergo curative major hepatectomy again.

### PB01-31 IMAGING EVALUATION OF THE TUMOR PROGRESSION IN 24 CASES WITH PERI-HILAR CHOLANGIOCARCINOMA AFTER PREOPERATIVE BILIARY DRAINAGE

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**Introduction:** Preoperative biliary drainage is essential for the radical treatment of peri-hilar cholangiocarcinoma. However, the drainage process may take more than one month. The aim of this study was to justify the benefit of improving liver function over tumor progression by biliary drainage.

**Method:** From December 1<sup>st</sup>, 2018 to November 30<sup>th</sup>, 2019, 24 jaundiced patients with peri-hilar cholangiocarcinoma were treated at the department of biliary pancreatic surgery, Sun Yat-sen Memorial Hospital. Preoperative biliary drainage was performed for each case, and each had contrast-enhanced CT before the biliary drainage and the laparotomy, respectively. The tumor progression on imaging was evaluated and marked according to the new staging system from the International Cholangiocarcinoma Group.

**Results:** All 24 patients (11 females and 13 males) underwent biliary drainage, including 12 with ENBD, 7 with PTCD, 5 with ENBD and PTCD. Average serum bilirubin level before and after drainage was 249.0 ±122.2μmol/L and 49.4 ±19.2μmol/L, respectively. The drainage time was 38.7±21.1 days(4 patients over 60 days). Tumor progression occurred at 4 of 24 patients, 2 of whom diagnosed as ICC with hilar involvement. Eight patients had unresectable mass, and 16 patients received large range hepatectomy with 0% mortality. The R0 resection rate was 62.5%(10/16). PV and HA reconstruction rate was 62.5%(10/16) and 25.0%(4/16), respectively. The hypohepatia and abdominal infection was 18.8% and 18.8%, respectively.

**Conclusions:** Most patients with peri-hilar cholangiocarcinoma had no tumor progression during biliary drainage, and this process could result in the increasing radical resection rate and decreasing mortality and morbidity.

### Biliary drainage, surgical resection, and tumor progression on imaging of 24 patients

Table1. Biliary drainage and surgical resection of 24 patients

Case	Gender	Age (years)	Type of drainage	Drainage (days)	Tumor progression	Operation	Vascular reconstruction	Margin (R0/R1/R2)	Morbidity
1	Female	32	PTCD	33	No	extended RHH+CL	-	R0	-
2	Female	53	ENBD	43	No	RHH+CL	-	R0	-
3	Male	54	ENBD	20	No	LHH+CL	RHA	R0	-
4	Female	54	ENBD	27	No	LHH+partial CL	RPV+RHA	R0	-
5	Male	60	ENBD	72	No	RHH+CL	-	R0	abdominal infection, IIIa
6	Female	62	ENBD	13	No	LHH+partial CL	RPV+RHA	R0	-
7	Male	67	ENBD & PTCD	74	No	extended RHH+CL	LPV	R0	hypohepatia, IIIa
8	Male	72	PTCD	40	No	RHH+CL	LPV	R0	hypohepatia, IIIa-d
9	Male	74	ENBD	16	No	RHH+CL	LPV	R0	-
10	Male	75	ENBD & PTCD	40	No	LHH+partial CL	RHA	R0	-
11	Male	60	PTCD	58	No	RHH+partial CL+PD	-	R1	abdominal infection, IIIa
12	Male	78	ENBD & PTCD	92	No	RHH+CL	-	R1	abdominal infection, II
13	Male	63	ENBD & PTCD	43	No	LHH+partial CL	-	R2	-
14	Male	65	ENBD	16	No	LHH+CL	-	R2	-
15	Female	55	ENBD	28	Yes	extended RHH+CL	LPV	R1	-
16	Male	64	ENBD & PTCD	47	Yes	extended RHH+CL	LPV	R1	hypohepatia, II
17	Female	58	PTCD	80	Yes	unresectable	-	-	-
18	Female	61	PTCD	60	Yes	unresectable	-	-	-
19	Female	54	PTCD	26	No	unresectable	-	-	-
20	Male	50	ENBD	30	No	unresectable	-	-	-
21	Male	61	ENBD	26	No	unresectable	-	-	-
22	Female	62	ENBD	29	No	unresectable	-	-	-
23	Female	65	ENBD	16	No	unresectable	-	-	-
24	Female	75	PTCD	41	No	unresectable	-	-	-

right hemi-hepatectomy, RHH; left hemi-hepatectomy, LHH; cascade lobectomy, CL; pancreaticoduodenectomy, PD; mobility level using Clavien-Dindo Classification.

Table2. Tumor progression on imaging in 24 patients with biliary drainage

Case	Tumor progression	First enhanced CT						CT interval						Second enhanced CT								
		B	T	F	PV	HA	N M	time (days)	B	T	F	PV	HA	N M	B	T	F	PV	HA	N M		
1	No	3-R	2	Mass	0	3-R	1	0	28	3-R	2	Mass	0	3-R	1	0						
2	No	3-R	2	Mass	0	0	0	45	3-R	2	Mass	0	0	0	0							
3	No	3-R	2	Mass	0	0	0	21	4	2	Mass	0	0	0	0							
4	No	4	2	Schwering	3-L	4	1	0	20	4	2	Schwering	3-L	4	1	0						
5	No	4	3	Mass	0	3-R	1	0	21	4	3	Mass	0	3-R	1	0						
6	No	4	3	Mass	0	3-R	0	0	12	4	3	Mass	0	3-R	0	0						
7	No	3-R	2	Schwering	0	0	0	65	3-R	2	Schwering	0	0	0	0							
8	No	4	3	Mass	4	3-R	0	0	56	4	3	Mass	4	3-R	0	0						
9	No	2	3	Mass	0	3-R	1	0	16	2	3	Mass	0	3-R	1	0						
10	No	2	2	Schwering	0	0	0	33	2	2	Schwering	0	0	0	0							
11	No	3-R	2	Schwering	0	3-R	1	0	47	3-R	2	Schwering	0	3-R	1	0						
12	No	4	2	Mass	2,3-R	0	1	0	89	4	2	Mass	2,3-R	0	1	0						
13	No	3-R	2	Mass	3-L	3-R	0	0	40	3-R	2	Mass	3-L	3-R	0	0						
14	No	1	2	Mass	1	4	1	0	14	1	2	Mass	1	4	1	0						
15	Yes	3-R	3(30mm)	Mass	3-R	3-R	0	0	28	3-R	3(30mm)	Mass	4	3-R	0	0						
16	Yes	2	2	Mass	0	3-R	0	0	45	2	3	Mass	0	3-R	0	1						
17	Yes	4	3(100mm)	Mass	2,4	2,4	1	0	32	4	3(100mm)	Mass	2,4	2,4	1	0						
18	Yes	4	3	Mass	1,2,3-L	1,2,3-L	2	0	53	4	3	Mass	1,2,3-L	1,2,4	2	0						
19	No	1	3	Schwering	1	3-R	1	0	20	1	3	Schwering	1	3-R	1	0						
20	No	3-R	3	Mass	0	0	1	0	29	3-R	3	Mass	0	0	1	0						
21	No	3-R	3	Mass	0	1,2,4	2	0	19	3-R	3	Mass	0	1,2,4	2	0						
22	No	4	2	Mass	3-L	0	1	0	24	4	2	Mass	3-L	0	1	0						
23	No	4	3	Schwering	3-L	0	1	0	9	4	3	Schwering	3-L	0	1	0						
24	No	3-R	3	Mass	2	3-R	0	0	29	3-R	3	Mass	2	3-R	0	0						

According to the new staging system by the International Cholangiocarcinoma Group, B for bile duct or Bismuth, T for the tumor size, F for macroscopic form, PV and HA for involvement of the portal vein and the hepatic artery, N and M for the lymph nodes status and distant metastasis. Tumor progression was judged if any of these stages changed.

### PB01-32 OPTIMAL SURGERY FOR EARLY AMPULLARY CARCINOMA BASED ON A PATHOLOGICAL EXAMINATION FOLLOWING RESECTION

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**Introduction:** The aim of this study was to investigate whether partial resection (PR) instead of pancreaticoduodenectomy (PD) is acceptable for early (Tis-T1) ampullary carcinoma (AC).

**Methods:** Of 101 patients who underwent resection for AC between January 1985 and December 2018, 40 patients with early AC (Tis: 2; T1a: 18; T1b: 20) and 16 patients treated with PR were assessed. In addition, the lymphatic vessel distribution in the ampulla of Vater was investigated immunohistologically using D2-40.

**Results:** The 5-year survival rate was 100% and 87.4% in the Tis-T1a and T1b patients, respectively. On pathological examination, 10.0% (Tis-T1a: 0%; T1b: 20.0%) were lymph node (LN) metastasis (+), 20.0% (Tis-T1a: 0%; T1b: 40.0%) were lymphovascular invasion (+), 5.0% (Tis-T1a: 0%; T1b: 10.0%) were microvascular invasion (+), and 0% were perineural invasion (+). For the tumor differentiation, papillary or well differentiated tumors were found in all Tis-T1a patients, but moderate in 35.0% of the T1b patients. On immunohistological examination,

abundant capillary lymphatic vessels were present in the mucosa of the ampulla of Vater. In the 16 patients treated with PR, the final pathological diagnosis was T1a in 12, pT1b in 1, and pT2 in 3, and the 4 non-T1a patients all died of recurrence.

**Conclusions:** For T1b AC, PD may be the standard treatment because of the frequencies of LN metastasis and lymphovascular invasion. Abundant lymphatic capillaries in the mucosa of the ampulla of Vater and difficulty with preoperative diagnosis of the invasion depth indicate that PR may not be acceptable for Tis-T1a AC.

### PB01-33

#### THE PREOPERATIVE BILIARY DRAINAGE WITH ENDOSCOPIC NASO-BILIARY APPROACH IS APPROPRIATE FOR THE PATIENTS WITH HILAR CHOLANGIOCARCINOMA

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**Background:** The preoperative biliary drainage (PBD) for hilar cholangiocarcinoma (CCA) in the jaundiced patient is controversial because of its increased postoperative infection, seeding along the percutaneous tract and delayed therapy.

**Aim and Method:** To compare the clinical outcomes between the patients with and without PBD, the morbidity and prognosis of the 312 patients who underwent surgical resection of CCA from 1991 to 2019 were analyzed.

**Result:** Of the total cohort, the endoscopic (E group) and percutaneous (P group) PBD were underwent in 174 and 81 patients, respectively, while no PBD (N group) was needed in 57 patients. Between these groups (E vs P vs N group), the wound infection rate is significantly higher in P group (22.5vs15.4vs39.1%,  $p=0.009$ ) but no differences were detected in other post-operative morbidities. In survival analysis, the P group showed worse prognosis compared to E or N group (median OS: 44.4vs22.6vs49.3m:  $p=0.003$ ). Among 174 patients of E groups, endoscopic naso-biliary drainage (EN) and endoscopic retrograde biliary drainage (ER) were performed in 116 and 20 patients, respectively. In 38 patients, EN was initially performed but converted to EN due to cholangitis (ER/EN). Between these 3 groups (EN vs ER vs ER/EN group), the bile leakage from liver transection surface and pancreatic fistula was more

frequently occurred in ER group (25.0vs26.3vs9.6%,  $p=0.018$  and 25.0vs15.8vs9.6%,  $p=0.048$ , respectively).

**Conclusion:** PBD provides no adverse impacts in morbidity and prognosis for CCA patients. The EN drainage, not percutaneous, is preferable in terms of decreased perioperative morbidities.

### PB01-34

#### EFFECT OF MARGIN STATUS ON SURVIVAL AFTER RESECTION OF HILAR CHOLANGIOCARCINOMA IN THE MODERN ERA OF ADJUVANT THERAPIES

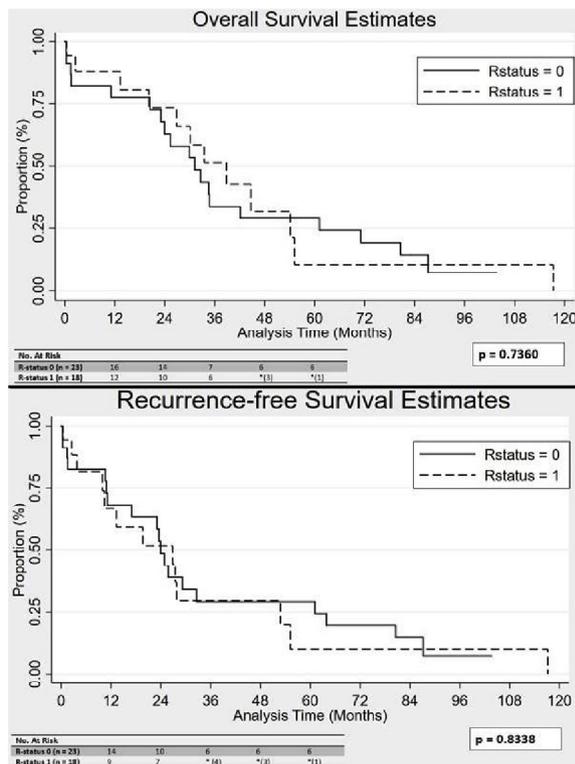
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**Introduction:** Previous studies of patients with perihilar cholangiocarcinoma (PHC) have shown survival disadvantage for R1 resection. New adjuvant treatments improve survival and may offset the deleterious effects of R1 resection.

**Methods:** Patients with PHC between January 2008 and July 2019 were retrospectively reviewed. Demographics, preoperative treatment, perioperative outcomes, post-operative treatment, recurrence, survival, and follow up were collected. Patients with R0 and R1 resection were compared (R2 excluded). Kaplan-Meier (KM) analysis was used to compare overall survival (OS) and recurrence-free survival (RFS).

**Results:** 75 patients went to the operating room for resection and 34 (47.9%) were aborted for metastatic disease (17/34, 50%) or locally advanced disease (17/34, 50%). Of 41 resections, 18 patients (43.9%) had R1 resection. Age, sex, preoperative biliary drainage, tumor size, T stage, and N stage were similar between groups (all  $p>0.05$ ). Rate of adjuvant therapy (R0 56.5% vs 61.1%;  $p=0.7672$ ) was similar between groups. Complication rate and 30-day mortality were similar between groups (both  $p>0.05$ ). Median RFS (R0 23.8 mon vs R1 23.3 mon;  $p=0.4309$ ) and median OS (R0 30.6 mon vs R1 37.2 mon;  $p=0.2439$ ) were similar between groups at similar median follow up time (R0 29.9 vs R1 28.5;  $p=0.5321$ ). KM survival graphs for RFS and OS are displayed in [figure 1](#), without statistically significant difference.

**Conclusions:** At our institution, patients R1 resection of PHC have similar RFS and OS to patients with R0 resection. This indicates that with use of modern adjuvant therapies, obtaining an R0 resection may not be absolutely required.



**Figure 1.** Overall survival and recurrence-free survival for patients with R0 vs R1 resection margins

#### PB01-36

### AN EXPERIENCE OF LAPAROSCOPIC HEPATOPANCREATODUODENECTOMY IN PATIENT WITH PERIHILAR CHOLANGIOCARCINOMA

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**Introduction:** Surgical resection is the only curative treatment for perihilar cholangiocarcinoma (pCCA). Despite this poor survival rate and high morbidity and mortality, hepatopancreatoduodenectomy (HPD) is routinely performed. With recent progress in diagnostic procedures, surgical techniques and perioperative patient care, many studies have shown increased long-term survival rates following this aggressive procedure. However, to our knowledge, there has been no reported case of perihilar cholangiocarcinoma treated with laparoscopic hepatopancreatoduodenectomy (HPD). We recently had a patient who underwent a pure laparoscopic HPD for a type IV pCCA.

**Methods:** A 53-year-old female who was revealed the dilation of intrahepatic hepatic duct and a mass on the perihilar bile duct by abdominal magnetic resonance imaging (MRI). The patient was diagnosed with perihilar cholangiocarcinoma. The decision was to perform a pure laparoscopic extend right hemihepatectomy with caudate

lobectomy and pancreaticoduodenectomy was performed.

**Results:** Operative time was 660 minutes with 500 mL blood loss and 3.5 U red cell. Histological examination revealed a well differentiated mucinous adenocarcinoma without lymph-node metastasis and a negative margin of liver parenchyma and pancreas. She was recovered from a grade B pancreatic fistula by conservative therapy and discharged post-operatively on day 20 in good health.

**Conclusions:** Complete laparoscopic HPD for pCCA is a challenging procedure. However, this procedure is safe and feasible in selected patients and when performed by surgeons with expertise in liver surgery and minimally invasive techniques.

#### PB01-39

### A CASE OF PARANEOPLASTIC NEUROLOGICAL SYNDROME IMPROVED FOLLOWING PANCREATODUODENECTOMY FOR CHOLANGIOCARCINOMA

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**Introduction:** When patients with neoplasm have neurological symptoms, we must consider invasion or metastasizing of the tumors to the neurological system or drug side effects. But it is called paraneoplastic neurological syndrome (PNS) when we deny them. It is said that PNS develops by autoimmune mechanism with anti-tumor antibodies. Immunotherapy is not effective and a removal of the antigen stimulation by treating the tumor becomes the basic treatment. Still it is said that the effect of treatment is poor. Here we report a rare case of PNS with cholangiocarcinoma whose neurological symptoms improved after surgery.

**Methods:** Case report.

**Results:** A 67-year old male visited our outpatient hospital with symptoms of right homonymous hemianopsia, scintillating scotoma, and headache. Magnetic resonance imaging indicated encephalitis. Hepatobiliary enzymes increased by blood data at admission and diabetes was getting worse. Computed tomography showed the mass in the pancreatic head. After being hospitalized, he came to present with disturbance of consciousness, a convulsive seizure. Although immunoglobulin therapy was given, the improvement was poor. PNS due to cholangiocarcinoma of the distal bile duct was considered and he underwent pancreatoduodenectomy on 14 days after hospitalized. After that operation the neurologic symptoms promptly improved and he was discharged on the 19th hospitalized day. The pathological diagnosis was cholangiocarcinoma invading the pancreas and we achieved curative resection.

**Conclusion:** We should consider surgical resection for the patient with PNS when curative resection can be expected.

### PB01-42 DEVELOPING PRIMARY CULTURE FROM HUMAN CHOLANGIOCARCINOMA

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**Background:** Our goal is to isolate and expand tumor cells in culture and identify the spectrum of malignant attributes.

**Methods:** Fresh tumor tissue from Grade 3, Stage IA, intrahepatic CCA was minced and subjected to enzymatic digestion for 75 minutes at 37°C. Digested contents were filtered through a 40 µm filter and the cells in the filtrate after washing were plated in 6 well collagen coated dishes using Williams E. Media supplemented with 2% FBS and several growth factors. One batch of cells was immortalized by *pBABE hTERT* retroviral vector.

**Results:** Within 2-3 days, epithelial cells started propagating and cells grew up to 7 passages (P) over the course of two months both with (CCA-telo) or without (CCA) telomerase immortalization. Using qPCR analysis in P6 CCA/CCA-tel lines, expression profiles of liver cell specific markers like *HP*, *ALB*, *APOA2*, *SERPINA1*, and *AFP* were found to be very low, compared to HCC line HepG2 but expression of these was similar to lung adenocarcinoma A549 cell line. CCA line showed good telomerase expression however lower than CCA-telo line with exogenous telomerase induction.

**Conclusions:** Cells isolated from human CCA show good viability and propagated for up to 7 passages. Though cells exhibited typical epithelial and mesenchymal morphology, the cells did not show liver epithelial markers. CCA line appears to be spontaneously immortalized, independent of exogenous hTERT induction. The gene expression profile of malignant tissue, if retained by primary culture cells, could facilitate the development and testing of novel molecular targets for cholangiocarcinoma.

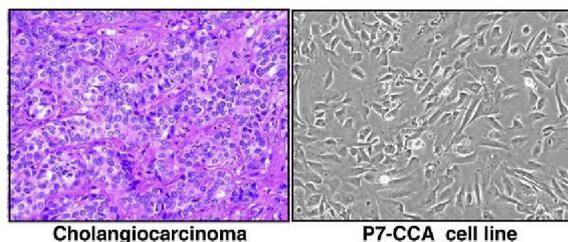


Figure 1

### PB01-43 INVESTIGATION OF THE LYMPHATIC SYSTEM IN THE HUMAN PERIHILAR BILE DUCT REGION

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**Introduction:** Perihilar cholangiocarcinoma has a poor-prognosis due to its frequent lymph node metastasis. The

only cure is surgery, but local recurrence, peritoneal dissemination, and multiple organ recurrence are often observed even after tumor resection with sufficient lymph node dissection. On the other hand, little information is available regarding microanatomy of lymphatic system in the perihilar bile duct region.

**Methods:** We removed the liver and hepato-duodenal ligament from the dissected cadavers. The fine distribution and structure of the lymphatic vessels were investigated in the perihilar region by immunohistochemistry for lymphatic- (D2-40) and blood vascular- (CD31) specific markers and scanning electron microscopy.

**Results:** Lymphatic vessels were abundant throughout the hepatic artery. In the portal vein, lymph vessels were found abundantly in the wall on the ventral side, but lymph ducts in the wall decreased toward the dorsal side. Lymph ducts around the bile duct were present around the peribiliary vascular plexus (PBP), a capillary network around the bile duct. In the liver, immunostaining of CCL21, a chemokine that induces lymphocytes, and CCR7, its receptor, suggested the hepatic lymphatic fluid from the space of disse to the institution of the portal tract.

**Conclusions:** This study could have helped to elucidate the lymphatic network of the hilar part

### PB01-44 BRACHIAL PLEXOPATHY: A RARE PRESENTATION OF METASTATIC CHOLANGIOCARCINOMA

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**Introduction:** Metastatic brachial plexopathy is a rare occurrence, but its presentation may be confused with day to day ailments.

**Methods:** We report a patient who initially presented with worsening right shoulder pain, associated with right hand numbness and weakness, and was subsequently diagnosed with metastatic cholangiocarcinoma.

**Results:** Patient's initial presentation and diagnostic pathway is discussed in this report. As there has not been any cases reported prior, a possible cause of the plexopathy is considered.

**Conclusion:** Although rare, metastatic disease (with cholangiocarcinoma as one of the differential diagnosis) should be considered in patients' with prolonged bone pain.

### PB01-45 ANATOMICAL LIVER RESECTIONS FOR INTRAHEPATIC CHOLANGIOCARCINOMAS: PERIOPERATIVE RESULTS AND SURVIVAL

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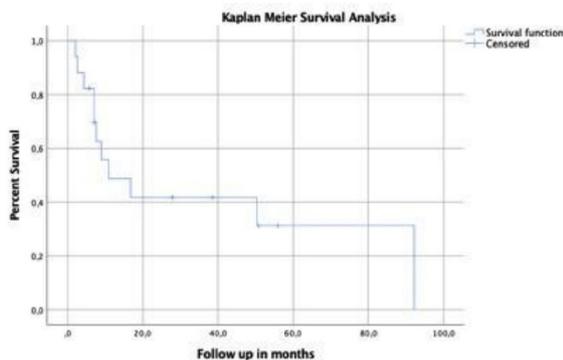
**Introduction:** Intrahepatic cholangiocarcinoma (ICC) is an infrequent neoplasm, whose incidence is increasing with a poor prognosis. The only curative management is

surgery, however, only 1/3 of patients achieve negative margins.

**Method:** Retrospective cohort of 17 resected ICC cases, between 2006 to 2019 from Catholic University Hospital in Chile. The information was obtained from clinical reports. Analysis with descriptive statistics.

**Results:** Out of 17 patients, between 48 and 84 years-old, 2 with risk factors (chronic liver disease, iatrogenic bile duct injury) and 5 patients received neoadjuvant therapy. There were 4 extended right hepatectomies, 3 right hepatectomies, 4 extended left hepatectomies, 3 left hepatectomies, 2 bisegmentectomies (IV, V) and 1 left lateral sectionectomy. Mean operative time was 263 minutes and hospital stay average was 14,2 days. There was no 30-day mortality. The global morbidity was 41,2% (7 patients) and Clavien Dindo>IIIA complications were 17,6% (3 patients). Reoperations were 2 cases, for hemoperitoneum and for bile leak. The oncologic classification was Ia (1), Ib (1), II (4), IIIa (2), IIIb (8) y IV (1). There were positive lymph nodes in 8 cases, 1 with peritoneal metastases, 8 patients resulted R1 (47,1%) and 14 received adjuvant treatment. The global survival was 82,4% at 6 months, 46,7% at 1 year and 40% at 2 years, with a mean follow-up of 24,3 months.

**Conclusion:** The surgical treatment of ICC normally requires large anatomical liver resections, despite which, the incidence of R1 positive margins is high and could result in the poor prognosis of long-term disease.



Survival Analysis with Kaplan Meier curves

PB01-46

### THE VALUE OF MODIFIED MESOHEPATECTOMY IN THE TREATMENT OF HILAR CHOLANGIOCARCINOMA

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**Objective:** To evaluate the feasibility and safety of modified mesohepatectomy for hilar cholangiocarcinoma.

**Background:** Hilar cholangiocarcinoma was often need trisegment hepatectomy when the tumor invasion range beyond P/U point. Mesohepatectomy was limited when the tumor invaded bilateral primary bile duct.

**Method:** From 2015 to 2019, 8 patients underwent mesohepatectomy due to HCCA, the clinical data including

bleeding volume, postoperative complications and other information was analyzed. Modified mesohepatectomy consists of hepatectomy beyond P/U point and bile duct plastic technique.

**Results:**

1) Basic clinical data: Including 6 male and 2 female patients in this study. The average age was 68.38. Bismuth classification: 1 Type IIIA, 3 type IIIB, 4 type IV.

2) Surgical evaluation: 3 cases of IV + V + VIII, 3 cases of IV and 1 case of V + VIII segment resection. The average resection rate of liver parenchyma was 30%, The median end of the bile duct is 4, The median of choledochojejunostomy after bile duct plastic was 2.

3) Postoperative complications: 1 case of Clavien IV (Liver dysfunction, bile leakage), 3 cases of Clavien IIIA and 1 case of Clavien II because of bile leakage.

**Conclusion:** Modified mesohepatectomy showed excellent feasibility and safety in the treatment of III and IV HACC. Improved the cure rate whose FLV isn't enough to endure the aggressive hepatectomy. At the same time, it reduced the difficulty of choledochojejunostomy, ensured the damage control and the functional compensation of the remnant liver volume.

**Funding:** This clinical study was supported by Beijing Natural Science Foundation (7194338).

**Keywords:** Hilar cholangiocarcinoma, mesohepatectomy

### PB02 – Biliary: Gallbladder Cancer

PB02-02

### BRD4 INHIBITOR AND HISTONE DEACETYLASE INHIBITOR SYNERGISTICALLY INHIBIT THE PROLIFERATION OF GALLBLADDER CANCER IN VITRO AND IN VIVO

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**Introduction:** Gallbladder cancer (GBC) is the most common and aggressive malignancy of the biliary tract worldwide. However, the current treatment for GBC is very limited, which makes the development and exploration of novel and effective anticancer agents for GBC treatment becomes vital. Here, we invested the anticancer effects of BRD4 inhibitor JQ1 and histone deacetylase inhibitor suberoylanilide hydroxamic acid (SAHA) on GBC both in vitro and in vivo.

**Method:** In this study, we conducted in vitro assays (CCK-8 assay, colony formation assay, Migration and invasion assay, flow cytometry for apoptosis and cell cycle analysis, qRT-PCR and western blot) and in vivo assays (tumor xenograft modules and immunohistochemistry), which demonstrated BRD4 inhibitor JQ1 and histone deacetylase inhibitor SAHA synergistically inhibited the GBC cells both in vitro and in vivo.

**Results:** Our results showed that cotreatment with JQ1 and SAHA significantly inhibited proliferation, cell viability, metastasis, and induced apoptosis and G2/M arrest in GBC cells, but only minor effects in benign cells. In vivo, tumor volumes and weights of GBC xenograft models were

significantly decreased after treated with JQ1 or SAHA, meanwhile the cotreatment showed the strongest effect. Further study indicated that the above anticancer effects was associated with the downregulation of BRD4 and suppression of PI3K/AKT and MAPK/ERK pathways.

**Conclusions:** These findings highlight JQ1 and SAHA as potential therapeutic agents and their combination as promising therapeutic strategy for GBC.

#### PB02-04

### A NOVEL STAGING SYSTEM TO FORECAST THE CANCER-SPECIFIC SURVIVAL OF GALLBLADDER CANCER PATIENTS

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**Introduction:** Gallbladder cancer (GBC) is one of the most aggressive malignant tumors, and there is no effective and convenient method for predicting cancer-specific survival (CSS). We aim to develop a novel nomogram staging system based on the positive lymph node ratio (pLNR) for GBC patients.

**Methods:** A total of 1,356 patients enrolled in the study. We evaluated the prognostic value of the pLNR and built a prognostic nomogram staging system based on the pLNR in the training cohort. The concordance index and calibration plots were used to evaluate model discrimination. The predictive accuracy and clinical value of the nomograms were measured by decision curve analysis (DCA). The CSS nomogram was further validated in an internal validation cohort.

**Results:** The pLNR was an independent prognostic factor for CSS based on Cox regression analyses. A prognostic nomogram that combined T classification, pLNR, M classification, histologic grade, liver metastasis and tumor size was formulated with a c-index of 0.763 (95% CI, 0.728-0.798), while the c-indexes for the staging system of AJCC 8th, 7th, and 6th for CSS prediction were 0.718, 0.718, and 0.717, respectively. The calibration curves showed perfect agreement. The DCA showed that the nomogram provided substantial clinical value. The nomogram (the AUCs for one, three, and five years were 0.693, 0.716, and 0.726, respectively) showed high prognostic accuracy.

**Conclusion:** We have developed a formulated nomogram staging system based on the pLNR that allows more accurate individualized predictions of CSS for resected GBC patients than the AJCC staging systems.

#### PB02-06

### A RARE CASE OF GALLBLADDER PARANGLIOMA WITH HEMORRHAGE

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**Introduction:** Gallbladder paraganglioma is a very rare tumor and only a few cases have been reported so far. Most of these tumors are asymptomatic and confirmed incidentally after operation. The clinical significance of gallbladder

paraganglioma is differential diagnosis with gallbladder cancer or other gallbladder tumor.

**Methods:** A 48-year-old woman presented with intermittent abdominal pain. The laboratory tests were all within normal range including tumor marker. MRI showed 8 cm sized mass lesion in gallbladder body and fundus with low signal intensity in T2-weighted images considered as hemorrhage. We planned a laparoscopic cholecystectomy under the impression of gallbladder tumor with hemorrhage.

**Results:** We performed laparoscopic cholecystectomy successfully. In the gallbladder lumen, several black stones less than 1 cm in diameter and large hematoma were observed. And about 1 cm sized polypoid lesion was detected in the fundus. In microscopic examination of polypoid lesion shows cuboidal cells including granular cytoplasm surrounded by a fibrous septum containing blood vessels. The chief cell was nested in the inside and the spindle shape sustentacular cells surrounded by the Zellballen cellular arrangement. Synaptophysin, CD56, chromogranin staining were strongly positive for chief cells. In the histopathologic examinations, the diagnosis was gallbladder paraganglioma with hemorrhage.

**Conclusions:** Gallbladder paraganglioma is extremely rare tumor and usually diagnosed incidentally after operation. We need to aware of this disease entity for differentiation of this tumor with other gallbladder tumors.

#### PB02-10

### OUTCOMES AND PROGNOSTIC FACTORS IN PATIENTS WITH GALLBLADDER CARCINOMA WITH MULTIMODALITY TREATMENT

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**Introduction:** India is a high incidence area for Gall Bladder Cancer (GBC). GBC has short median survivals reflecting its aggressive behaviour. Early GBC can be managed by radical surgery which is possible in 10% cases. The tumour is often unresectable at presentation requiring multimodality approach for management.

**Methods:** 173 inpatients of suspected GBC from January 2013 to July 2019 at a tertiary centre in North India were analysed. Patients were grouped as - Potentially resectable, Locally advanced unresectable and metastatic disease. Radical cholecystectomy was performed for resectable GBC. Duration of hospital stay, complications and Survival were analyzed.

**Results:** Out of 173 suspected GBC, 113 patients were resectable. Radical cholecystectomy was performed in 56 patients (72.7%), 9 (11.6%) required bile duct excision, 6 (7.7%) additional organ resection. Major morbidity and mortality rate was 1.7% and 1.7% respectively. The estimated OS of stage I and II was 100% and 91.6%, respectively whereas 66.9% for stage III and 0% for stage IV disease. The median survival of stage I and II was 60.1 months which dropped to 23.9 months in stage IIIB and 6.3 months in stage IVB. Although adjuvant chemotherapy has increased the OS by 8.2 months but not statistically significant.

**Conclusion:** We are still facing challenges in early diagnosis as patients often presents late in our setting. Careful patient selection with combination of surgery and peri-operative chemotherapy has resulted in favourable outcomes in stage II/III disease. Potentially multimodality treatment may add meaningful survival for this disease with inherently aggressive tumor biology.

#### PB02-12

### CLINICOPATHOLOGICAL DIFFERENCES IN T2 GALLBLADDER CANCER ACCORDING TO TUMOR LOCATION

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**Background:** We aimed to identify clinicopathological differences and factors affecting survival outcomes of stage T2a and T2b gallbladder cancer (GBC) and validate the oncological benefits of regional lymphadenectomy and hepatic resection in these patients.

**Materials and methods:** This single-center study enrolled patients who were diagnosed with pathologically confirmed T2 GBC and underwent curative resection between January 1995 and December 2017. Eighty-two patients with T2a and 50 with T2b GBCs were identified, and clinical information was retrospectively collected from medical records and analyzed

**Results:** Three- and 5-year overall survival rates were 96.8% and 96.8% and 80.7% and 80.7% in T2a and T2b groups, respectively ( $p=0.007$ ). Three- and 5-year survival rates among all T2 GBC patients without and with lymph node metastasis were 97.2% and 94.4% and 81.3% and 81.3%, respectively ( $p=0.029$ ). There was no difference in survival rates between the two groups according to whether hepatic resection was performed ( $p=0.320$ ). However, in the T2b group, those who underwent hepatic resection demonstrated a better survival rate than those who did not ( $p=0.029$ ). Multivariate analysis revealed that lymph node metastasis, vascular invasion, tumor location, and adjuvant chemotherapy were significant independent prognostic factors.

**Conclusions:** Hepatic resection was not always necessary in patients with peritoneal-side GBC. Considering the clinicopathological features and recurrence patterns of hepatic-side GBC, a systematic treatment plan, including radical resection and adjuvant chemotherapy, should be established.

#### PB02-14

### CHARACTERISTICS AND MANAGEMENT OF INCIDENTAL GALLBLADDER CANCER: IMPACT AND LIMITATION OF LAPAROSCOPIC WHOLE LAYER CHOLECYSTECTOMY

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**Introduction:** Incidental Gallbladder Cancer (IGBC) is a status of gallbladder cancer (GBC) that has not been diagnosed as cancer preoperatively. Efficacy of laparoscopic whole layer cholecystectomy (LWC) for early stage GBC is reported. However, there is no report about effect of LWC on IGBC. We are reporting the risk factors of recurrence of IGBC and strategy for IGBC from experience of a high-volume center in Japan.

**Methods:** We retrospectively investigated on 3166 patients who were undergone cholecystectomy with preoperative diagnosis of benign disease in our hospital from 2009 to 2018.

**Results:** Fifty-one patients (1.61%) were diagnosed as IGBC. Preoperative diagnoses were acute cholecystitis (16/1106, 1.45%), chronic cholecystitis (4/117, 3.42%), gallbladder polyp (19/151, 10.60%), adenomyomatosis (3/107, 2.80%) and gallbladder stone (9/1580, 0.57%). Post-operative recurrence was observed on 19 cases. Risk factors for recurrence on univariate analysis were bile spillage ( $p=0.001$ ), advanced stage ( $p=0.002$ ), positive surgical margin ( $p=0.005$ ) and non-LWC ( $p=0.047$ ). On multivariate analysis, bile spillage was only significant factor of recurrence ( $p=0.024$ , OR=11.43). No bile spillage was occurred on any of 10 patients performed LWC. Six patients of T1 were undergone LWC and no patients were relapsed. Risk factor of recurrence among advanced stage patients were non-additional resection ( $p=0.010$ ) and bile spillage ( $p=0.036$ ), but LWC was not significant ( $p=0.228$ ).

**Conclusion:** Bile spillage was significant risk factor of recurrence on IGBC. LWC is an efficacious procedure on T1 IGBC, and LWC is recommended on IGBC suspected disease such as gallbladder polyp. For advanced stage, additional resection should be performed.

#### PB02-17

### GLI2/HEDGEHOG SIGNALING CONTRIBUTES TO THE INDUCTION OF MALIGNANT PHENOTYPE OF GALLBLADDER CANCER

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**Background:** We have previously shown that Hedgehog (Hh) signaling is reactivated in GBC. However, which and how three GLI proteins; GLI1, GLI2 and GLI3 contribute to the induction of malignant phenotype of GBC is still unclear. To develop a new therapeutic strategy for refractory GBC, the biological significance of GLI1, GLI2 and GLI3 was investigated.

**Materials:**

1) *In vitro* experiment; GLI proteins were inhibited using siRNA. GLI expressing 3 GBC cell lines (NOZ, TGBC2TKB, and TYGBK-1) were used for invasion assay and proliferation assay.

2) *In vivo* experiment; In xenograft mice model, tumorigenesis of GLI inhibited cells (NOZ) was analyzed.

3) Clinical experiment; 67 patients with GBC who underwent curative surgical resection were enrolled in this study. Correlation between GLI expression and clinicopathological findings was analyzed immunohistochemically.

#### Results:

1) *In vitro* results; GLI2 siRNA but not GLI1/GLI3 siRNA transfection significantly inhibited the invasiveness and proliferation ability of GBC cells.

2) *In vivo* results; Tumor volume from mice injected with GLI2 siRNA transfected cells was significantly lower than that in control tumors.

3) Clinical results; The expression levels of GLI2 in human GBC specimens were higher than those in normal gallbladder tissue. GBC specimens with high GLI2 expression had significantly high level of PD-L1 expression and low number of infiltrated CD3 positive lymphocytes.

**Conclusion:** GLI2 contributes to the induction of malignant phenotype of GBC and could be a potential therapeutic target for GBC.

## PB02-19

### EXTENDED RESECTIONS FOR ADVANCED GALLBLADDER CANCER: RESULTS FROM A NATIONWIDE COHORT STUDY

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**Background:** Extended resections (i.e. major hepatectomy and/or pancreatoduodenectomy) are rarely performed for gallbladder cancer (GBC) as outcomes remain inconclusive. Little data is available from Western centers. In this Dutch, multicenter cohort study outcomes of patients who underwent extended resections for locally advanced GBC are analyzed.

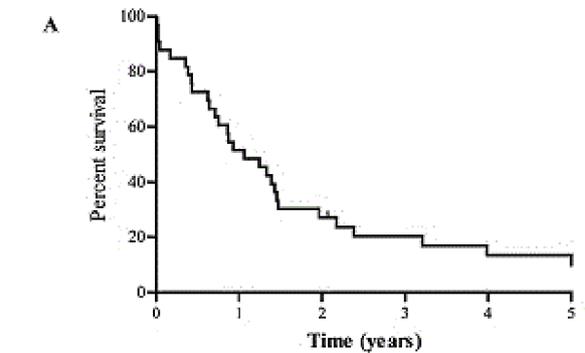
**Design:** Patients with GBC who underwent extended resection with curative intent from 2000 to 2018 were identified from the Netherlands Cancer Registry (NCR). Extended resection was defined as a major hepatectomy (resection of  $\geq 3$  liver segments) and/or a pancreatoduodenectomy. Post-operative morbidity, mortality, survival and characteristics of short- and long-term survivors were assessed.

**Results:** A total of 33 patients was included. R0-resection margins were achieved in 16 patients. Major post-operative complications ( $\geq$ CD3A) occurred in 19 patients and post-operative mortality  $< 90$  days in four. Recurrence occurred in 24 patients. Median overall survival (OS) was 12.8 months (95% CI 6.5 – 19.0). Two-year survival was achieved in 10 patients (30%) and 5-year survival in 5 patients (15%). Jaundice, common bile duct-, liver-, perineural- and perivascular invasion were associated with reduced survival. All (3) recurrence-free patients had R0 resection margins and no liver invasion.

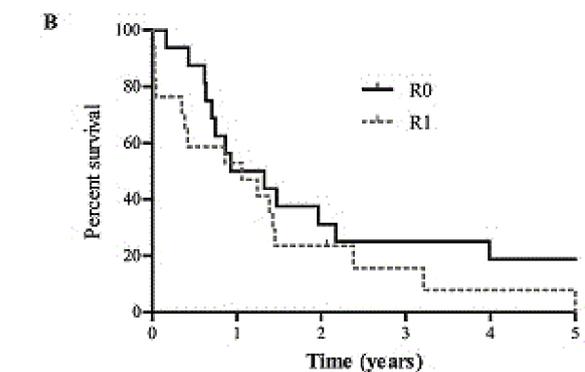
**Conclusion:** Median OS after extended resections for advanced GBC was 12.8 months in this cohort. Although post-operative morbidity and mortality were significant, long term survival ( $\geq 2$  years) was achieved in a subset of patients. Therefore, GBC requiring major surgery does not preclude long-term survival and a subgroup of patients benefit from surgery.

#### Patient and operative characteristics of GBC patients that underwent extended resection

Age (IQR)	64 (57- 69)
Gender (male)	13 (39%)
ASA classification $<3$	19 (76%)
Pre-operative biliary drainage (yes)	20 (61%)
Portal Vein Embolization performed	5 (15%)
Hepatectomy	12 (36%)
Extended hepatectomy	7 (21%)
Hepatectomy + pancreatoduodenectomy	2 (6%)
Pancreatoduodenectomy + liver wedge resection	21 (36%)
Portal vein reconstruction	10 (30%)



No. at risk	OS	1	2	3	4	5
OS	33	17	10	7	5	5



No. at risk	R0	R1	1	2	3	4	5
R0	16	8	5	3	2	2	2
R1	17	9	5	4	3	2	2

A: Survival of patients with GBC and extended resection. B: Survival according to resection margin

PB02-20

### GALLBLADDER CANCER IN AUSTRALIAN CAPITAL TERRITORY: A 20 YEARS ANALYSIS OF INCIDENCE, MANAGEMENT, AND OUTCOMES

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**Introduction:** Gallbladder cancer (GBC) is a rare malignancy in Australia with an incidence of less than 6 per 100000 population. There is marked geographic variation in incidence with the majority of the literature from these endemic regions. The aim of the paper is to assess the incidence, characteristics and outcomes of GBC in a non-endemic region.

**Methods:** A retrospective review of all patients diagnosed with GBC in the Australian Capital territory over a 10-year period was undertaken. This included hospital medical records and a prospectively collected cancer database. Cases were also identified from ACT-wide pathology laboratories where specimens were sent for histological analysis. Adults with GBCs regardless of metastatic state were included. Patient characteristics including presenting features, histology, treatment received and survival were assessed.

**Results:** 58 GBCs (Primary=74.1%) were identified. The incidence of primary GBC was 2.7/100,000 person-years with a mean age of onset at 68.5 years with a female preponderance (~72.5%). The mean survival was 2.3 years with an overall five-year survival of 51%. 88.4% of patients were symptomatic with right upper quadrant pain and/or a mass, jaundice or weight loss. Incidental GBC was found in 11.6% of the patients. Adenocarcinoma was noted in 93% of primary cases with most being at Stage 3A on diagnosis. 60.5% underwent surgery.

**Conclusion:** GBC is rare cancer in the Australian population with majority of the symptomatic patients being diagnosed at a late stage. Incidental cancers are a significant proportion of patients. The overall outcome of this cancer is poor.

PB02-22

### ANALYSIS OF THE CASES WITH CARCINOMA GALLBLADDER (CA GB) IN A TERTIARY LEVEL HOSPITAL OF NEPAL

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**Introduction:** Gallbladder cancer (GC) is a rare disease in some parts of world but is common in countries like Chile, Japan, India and Nepal. Nepal stands as one of the five countries with the highest mortality.

**Methods:** A retrospective analysis of the consecutive operated and non-operated admitted cases of GC in TUTH from 2018 to 2019 was done. Patient demographics, disease characteristics, diagnostic modalities and various curative and palliative treatment variables were analyzed.

**Results:** Of the 59 patients, 33 females (56%) outnumbered the 26 males(44%) with a male is to female ratio of 0.7:1. The median age at diagnosis was 56 years with younger than 60 years comprising 62.7% of the disease. Among all, the most common presenting symptom was abdominal pain followed by jaundice. Onset of first symptoms was within mean duration of 40 days (SD 37.45 days).

USG and CT availability (100%) lead to preoperative diagnosis in majority. Curative resection (extended cholecystectomy) was done in 16 (27%).The most common anatomic location of mass was fundic followed by neck. Of the advanced metastatic Ca GB in 30% of cases, the most common site of metastasis was liver. Most cases were adenocarcinoma with mean survival after diagnosis in advanced cases being 4.5 months.

**Conclusion:** CA GB is more common in Nepal, more among females and younger patients often presenting with pain abdomen and jaundice. Most are advanced at the time of diagnosis. Radical surgery can be offered to few patients where the outcome seems reasonably good.

PB02-23

### A STUDY OF ADVANCED GALLBLADDER CANCER TO EVALUATE SURGICAL PROCEDURE AND POOR PROGNOSTIC FACTORS

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**Background:** It is important to consider the selection of the suitable procedure and identification of poor prognostic factors in the treatment of gallbladder cancer (GBC).

**Objective:** This study was aimed to evaluate each operative procedure for GBC and to identify poor prognostic factors for advanced GBC after surgery.

**Methods:** We reviewed medical records of 53 patients without resection and 87 patients who underwent resection. All patients in the resection had subserosal or deeper invasion (advanced GBC). Overall survival curves and poor prognostic factors of advanced GBC in the radical resection were analyzed.

**Results:** Surgical procedures included partial liver resection with bile duct resection in 37 patients, major hepatectomy with bile duct resection in 30, hepatopancreatoduodenectomy (including minor hepatectomy) in 11, pancreatoduodenectomy in 10, and bile duct resection (including only cholecystectomy) in 19 patients. The R0 rate was 90% (78 patients). In total, 3 patients (3.8%) from the radical resection group died during hospital stay due to worsening of complications. In advanced GBC, the median survival time for radical resection was 26 months. It was significantly longer than the 3 months for the palliative resection and the 10 months for the non-resection ( $p < 0.0001$  in both ). Pathological distant metastasis was the only independent prognostic factor based on univariate analysis (hazard ratio: 8.8, 95% C.I: -1.67 ~ -0.41,  $p=0.0031$ ).

**Conclusion:** Radical resection, according to preoperative imaging for advanced GBC, achieved high R0 resection rate. Developments of preoperative methods are expected to exclude patients with liver metastasis or para-aortic lymph node.

PB02-24

### THE ROLE OF PANCREATODUODENECTOMY IN THE SURGICAL MANAGEMENT OF GALLBLADDER CARCINOMA

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**Introduction:** This study aimed to elucidate indications and limitations of pancreaticoduodenectomy (PD) for gallbladder carcinoma (GBC).

**Methods:** This study retrospectively analyzed the long-term outcomes of 37 patients undergoing PD for GBC. PD was indicated for tumors with evident peripancreatic nodal metastasis and/or massive invasion of the pancreas/duodenum/bile duct. Primary end point was overall survival (OS). The median follow-up time was 264 months.

**Results:** Morbidity ( $\geq$  Clavien-Dindo IIIB) and in-hospital mortality were 19% (n = 7) and 8% (n = 3), respectively. For all 37 patients, OS following resection was 31% at 5 years and 25% at 10 years (median survival time, 20 months). Multivariate analysis identified residual tumor status (P = 0.009) and the extent of disease (P = 0.025) as independent prognostic factors. The 5-year OS in patients with and without residual tumor was 43% and 0%, respectively (P < 0.001). The 5-year OS in patients with peripancreatic nodal disease (n = 12), organ involvement other than the liver (n = 12), and the both (n = 13) was 52%, 37%, and 8%, respectively (P = 0.001). There were 10 5-year survivors; all the patients underwent R0 resection. Of the 10 patients, 6 had peripancreatic nodal disease; 3 had  $\geq$  3 positive nodes.

**Conclusions:** PD provides survival benefit for some patients with advanced GBC only if R0 resection is feasible. Patients with both peripancreatic nodal disease and organ involvement other than the liver are not good candidates for PD. PD may be beneficial in selected patients with peripancreatic nodal disease.

PB02-25

### AN UNUSUAL CASE OF CHOLEDOCHAL CYST COEXISTING WITH GALLBLADDER CANCER

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**Introduction:** Choledochal Cyst is a rare condition. Even rarer is a choledochal cyst in association with a gallbladder carcinoma.

**Aim:** Report an unusual case of choledochal cyst coexisting with gallbladder Cancer.

**Case Details:** A 49 years old male with no comorbidities presented with vague upper abdominal pain for 1 month. Clinical examination was normal. On evaluating with blood investigations including complete hemogram, LFT, USG abdomen with CECT abdomen and MRCP, it was diagnosed as type IC choledochal cyst with cancer gallbladder (fundal region). He underwent staging laparoscopy followed by

open radical cholecystectomy with choledochal cyst excision and Roux en y hepaticojejunostomy. In the post-operative period he had bile leak which settled by itself on POD 8. Histopathology report revealed adenocarcinoma T3N0M0 with 0/17 lymph nodes were involved. Post-operatively he has received gemcitabine chemotherapy.

**Conclusion:** Choledochal cyst with gallbladder cancer is a rare condition, early detection and radical surgery is the only hope for prolonged survival.

PB02-30

### A STUDY FOR THE EXPRESSION OF FAM83H, ZNF16, AND FAM83H-RELATED PROTEINS IN GALLBLADDER CANCER

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**Introduction:** FAM83H is mostly known for its role in amelogenesis, however, recent reports suggest FAM83H might be involved in tumorigenesis. A search of the public database shows a significant association between FAM83H and ZNF16 in various carcinomas including biliary tract cancer. Although the studies of FAM83H in gallbladder cancer are limited, we inferred gallbladder cancer has similar traits with other biliary cancers.

**Methods:** We evaluated the clinicopathological significance of the immunohistochemical expression of FAM83H and ZNF16 in 105 gallbladder cancer patients.

**Results:** The expression of FAM83H and ZNF16 were significantly associated with each other. In univariate analysis, individual, and co-expression pattern of FAM83H and ZNF16 was significantly associated with shorter overall survival (OS) and relapse-free survival (RFS) of gallbladder cancer patients: nuclear expression of FAM83H (OS; P < 0.001), cytoplasmic expression of FAM83H (OS; P < 0.00), nuclear expression of ZNF16 (OS; P < 0.001), cytoplasmic expression of ZNF16 (OS; P = 0.032). In multivariate analysis, nuclear expression of FAM83H (OS; P < 0.001) and the co-expression pattern of nuclear FAM83H and ZNF16 (OS; P < 0.001) were independent indicators of shorter survival of gallbladder patients.

**Conclusion:** These results suggest that FAM83H and ZNF16 might be involved in the progression of GB cancer, and their expression might be used as novel progression indicator for GB cancer patients.

PB02-32

### PREDICTION OF MALIGNANCY USING SKIN AUTOFLUORESCENCE IN PATIENTS WITH GALLBLADDER CARCINOMA

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**Introduction:** Increased accumulation of advanced glycation end products (AGEs) may correlate with progression

of numerous diseases, including some cancers. Skin auto-fluorescence (SAF) measurement in a non-invasive test that quantifies tissue AGEs. The aim of this study was to assess utility of SAF in prediction of malignancy in patients with gallbladder carcinoma (GBC).

**Methods:** This prospective study comprised 29 patients (7 men and 22 women) with suspected or confirmed GBC who underwent surgery in the Department of General, Transplant and Liver Surgery of the Medical University of Warsaw between September 2018 and November 2019. SAF was based on 3 separate preoperative measurements on the anterior side of the forearm and expressed in arbitrary units (AU). Data on patients' weight, height, BMI, and diabetes were collected preoperatively.

**Results:** Gallbladder carcinoma was diagnosed in 22 out of 29 patients (75.86%). Median SAF was 2.2 AU (IQR = 1.925 – 2.675) and 2.2 AU (IQR = 1.8 – 2.5) in GBC patients and individuals without cancer, respectively. There was no difference in SAF between patients with GBC and individuals without cancer ( $p=0.700$ ). The lack of significant difference was unmodified by patient sex, presence of diabetes or BMI>25 ( $p=0.662$ ,  $p=0.643$ , and  $p=0.629$ , respectively).

**Conclusions:** Although SAF may have predictive value in some cancers, this study does not provide evidence for increased accumulation of AGEs in patients with GBC.

#### PB02-33

### INCIDENCE OF INTER AORTOCAVAL LYMPH NODE POSITIVITY IN EARLY GALL BLADDER CARCINOMA

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**Introduction:** Inter aortocaval (IAC) lymph node involvement in Gallbladder cancer (GBC) is considered metastatic (M1) disease. This study aimed to evaluate the incidence of IAC positivity in early GBC (T1/2 lesions), deemed resectable on pre-operative imaging.

**Methods:** A retrospective analysis of patients with suspected GBC, was undertaken, from a prospectively maintained data base, between Jan 2013 to July 2019. All patients deemed resectable on preoperative evaluation underwent staging laparoscopy followed by IAC sampling. During these procedures if no metastasis was evident, resection with R0 intent was attempted. Data was analysed using SPSS version16 and Chi square test for significance applied.

**Results:** Of 245 suspected GBC patients, 105 (42.8%) were deemed operable on preoperative imaging. Nineteen of these were found to have Xanthogranulomatous cholecystitis on final histopathology hence excluded from the analysis. Of the remaining 86 patients, 27 were found to have disseminated disease on staging laparoscopy/laparotomy of which 13 (15.1%) had IAC lymph node positive for malignancy on sampling. Incidence of IAC involvement in GBC cases taken up for surgery was 15.1%. One of the thirteen (7.6%) IAC lymph node positive patients had T2 lesion (T1+T2=33) while twelve (92.3%) were T3+T4(53) tumours. Thus incidence of IAC lymph node metastasis in early GBC was one in thirty three cases that is 3% ( $p<0.014$ ).

**Conclusions:** Gall bladder cancer, even if confined within the gallbladder, has a significantly high incidence of metastasis to interaortocaval lymph nodes which in turn upstages the disease from potentially resectable to metastatic.

#### PB02-34

### TECHNICAL FEASIBILITY AND SURGICAL OUTCOMES OF MODIFIED RIGHT HEPATECTOMY IN PATIENTS WITH GALL BLADDER NECK CANCER WITH JAUNDICE : A STUDY OF 22 PATIENTS

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**Introduction:** Patients with Gall Bladder Neck Cancer with jaundice are difficult to manage and have high mortality. We operated these patients with Right Hepatectomy, Resection of Seg IVb of Liver, resection of extrahepatic biliary tree and regional lymphadenectomy (Modified Right Hepatectomy). We evaluated Perioperative results and surgical outcomes in these patients.

**Method:** Retrospective analysis of Prospective database of patient with Modified Right Hepatectomy for Gall Bladder neck cancer with jaundice in term of perioperative complications and survival outcomes was done

**Results:** Between January 2013 and December 2018, After preoperative imaging and evaluation 49 patients were planned for Modified Right Hepatectomy. All patients underwent Staging Laparoscopy, out of which 12 patients had metastatic disease. 15 patients had locally advance disease (bulky lymph nodes, Tumor extension to left duct), so surgery was deferred. Modified Right Hepatectomy was completed in 22 patients (17 Females, 5 Males). There was no perioperative mortality. Surgical Site Infection was the most common complication (4 patients, 18.2 %). Grade A Post Hepatectomy Liver Failure and Bile leak were other important complication seen in 2 patients (9.1%) each. One year survival in 19 patients was 84.2%(16 patients). 3 years survival in 12 patients was 25% (3 patients)

**Conclusions:** In selected Gall Bladder Neck cancer patients with Jaundice Modified Right Hepatectomy can be performed with minimal morbidity and have reasonable survival benefits.

#### PB02-36

### MESO-HEPATECTOMY IN A LOCALLY ADVANCED CARCINOMA GALLBLADDER IN 21ST CENTURY: IS IT JUSTIFIED?

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**Introduction:** Based on the 2017 systematic review and meta-analysis meso-hepatectomy appears to be safe and comparable in both peri-operative and long term outcomes

while comparing patients undergoing extended hepatectomy. Majority included hepatocellular carcinomas (>95%), cholangiocarcinomas but none have carcinoma (ca) gallbladder (gb). Right extended hepatectomy after biliary drainage and portal vein embolisation is the treatment modality for advanced ca gb. It is common in low socioeconomic strata of India (South Asia). Majority (90%) of them don't achieve R0 resection due to disease progression and procedural complications. Chemotherapy can't be given unless bilirubin < 5. The main difference between cholangiocarcinoma and ca gb is that cholangiocarcinoma spreads along ducts but ca gb infiltrates locally. Hence meso-hepatectomy is not an inferior oncologic surgery in advanced ca gb.

**Methods:** 30 year old male presented with jaundice, weight loss. Scan showed gall bladder mass with hilar block and right hepatic artery (RHA) involvement. Maximum bilirubin was 24. He underwent biliary drainage and bilirubin came down to 14. Ultrasound doppler showed RHA block with good intra-hepatic flow. He underwent meso-hepatectomy with RHA excision and hepaticojejunostomy to right posterior sectoral duct and left duct. Blood loss was 1 litre with a duration of 10 hour. Post operatively neither there was liver failure nor bile leak. Histopathology report was T4N2Mx (ductal margins negative). He completed adjuvant chemotherapy and on follow up of 18 months found to have segment 6 metastasis and still on chemotherapy without jaundice.

**Conclusion:** Meso-hepatectomy is a safer onco-surgical alternative to extended hepatectomy in selected cases of advanced gall bladder cancers.

#### PB02-37

### RARE PRESENTATION OF THE TYPE I CHOLEDOCHAL CYST IN A YOUNG ADULT

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**Introduction:** Incidence of malignancy in choledochal cyst is 7.5%. Most Common malignancy is cholangiocarcinoma (70%), Gall bladder adenocarcinoma (20%), rest others. It is more common in females, and as the age increases the incidence of malignancy increases, the mean age of presentation is 32 years. Although Type I choledochal cysts are more common, the incidence of malignancy is higher in type IV choledochal cysts. Japanese and Koreans have seen High Incidence of Gall bladder cancer in Pancreatico biliary maljunction (PBM).

**Case report:** We present a rare primary presentation of choledochal cyst in 34yrs/male who presented with complaints of vague right upper quadrant Pain for 4 months. On further evaluation with imaging studies he was diagnosed to have Type I Choledochal cyst with Gall bladder malignancy along with pancreatico biliary maljunction. Patient underwent Radical cholecystectomy with cyst excision and hepaticojejunostomy.

**Conclusion:** Adult Choledochal cyst presentation is usually in form of complication - Cystolithiasis, Infection, Pancreatitis, portal HTN, biliary cirrhosis, and malignancy. Mere Primary presentation of GB cancer along with

Choledochal Cyst is quite unusual. We present this case as it is quite rare presentation.

#### PB03 - Biliary: Gallstones

##### PB03-01

### “DIFFICULT GALLBLADDER” INCIDENCE AND MANAGEMENT AT SPECIALITY SURGICAL UNIT

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Laparoscopic cholecystectomy is deemed to common surgical procedure, however 'Difficult Gallbladder' requires modified surgical approach.

#### Aim:

1. To define incidence of "difficult gallbladder"
2. To review bail out procedures for difficult gallbladder

Study period: January 2016 to December 2019.

“Difficult gall bladder” defined as:

1. acute cholecystitis with thick walled/necrotic/gangrenous/empyema of gall bladder.
2. chronic cholecystitis (fused calots triangle with thick contracted gallbladder).
3. Mirizzi syndrome.
4. Known/ suspected GB perforation.

Subtotal cholecystectomy defined as:

1. constituting type: infundibular stump cleared and suture closed.
2. Fenestrating type posterior wall on GB bed left behind and cystic duct closed.

**Results:** Total 745 patients underwent cholecystectomy. Out of 227 cases of acute cholecystitis, there were 119 cases were “difficult gallbladder”. Etiology of difficult gallbladder was as follows, Empyema gall bladder-46, Gangrenous/necrotic gall bladder-20, Chronic cholecystitis with fused calot's triangle-24, Mirizzi syndrome type I/II-8, Gall bladder perforation-21. Out of 119, difficult gallbladder, subtotal cholecystectomy was done in 74 cases-Fenestrating type in 49 cases while constituting type in 25 cases. There was no bile duct injury reported. Bile leak was encountered in 4 cases of constituting type of subtotal cholecystectomy, which was stopped gradually without any intervention.

**Conclusion:** It is advisable to look for cystic duct identification and close the duct whenever is possible. Subtotal cholecystectomy is viable bail out option in difficult gallbladder surgery to prevent bile duct injury.

#### PB03-03

### WHAT IS THE RISK FACTOR FOR CONVERTED FROM TOTAL CHOLECYSTECTOMY TO BAIL-OUT SURGERY?

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Laparoscopic cholecystectomy is regarded as the first choice for patients with Gall bladder diseases, but, biliary injury (BDI) still had serious problem in LC.

Recently, bail-out surgery (BOS) has been proposed to avoid but BDI not also major vessels injury. In this retrospective study, we evaluated that pre- and peri operative risk factor for conversion from total cholecystectomy (TC) to conversion BOS.

**Methods:** This study included 584 patients who underwent elective LC for Gall bladder diseases were between Jan. 2006 and Apt. 2019. We divided into two groups of TC group (including conversion open total cholecystectomy) and BOS group. Univariate and multivariate analyses using pre and perioperative clinicolaboratory characteristics were performed to investigate the most significant risk factors for conversion to BOS.

**Results:** There were 33 cases in BOS group, which had 18 cases of female and 35 male. Procedures of BOS were as follow: open BOS was 19 cases; laparoscopic BOS was 14 cases. On univariate analyses, age, Albumin level, CRP level, WBC, Lymph ratio, Neutro. ratio, platelet count (PLt), NLR, PLR, CAR, with acute cholecystitis (AC), with previous biliary tract drainage(PBTD)were risk factor for conversion BOS. Multivariate analysis using thirteen parameters selected by univariate analyses demonstrated that AC ( $p=0.04$ ), albumin level ( $p=0.01$ ) and age ( $p=0.04$ ) were significant different risk factors.

**Conclusions:** Patients with PBTD or AC are considered to have a high risk of conversion from LTC to BOS and it seems that LC should be cautiously applied.

#### PB03-04

### SUBTOTAL CHOLECYSTECTOMY: IS IT REALLY A SAFE OPTION?

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**Background:** The risks associated with subtotal cholecystectomy (STC) are unclear. The aim of this study is to review our experience with STC, and comparing outcomes to total cholecystectomy (TC).

**Methods:** This is a retrospective study of all patients that underwent STC at a Tertiary HPB unit between November 2011 to February 2019.

**Results:** A total of 4251 patients underwent a cholecystectomy during the study period. 78/4251 (1.8%) underwent STC. The median age of the patients was 70.4 years in the STC group compared to 54 years in the TC group. Overall morbidity (41 vs 1.5%,  $p < 0.00001$ ), bile leak rate (20 vs 1.7%,  $p < 0.00001$ ), and readmission rates (23 vs 8%,  $p=0.00001$ ) were significantly higher in the STC group compared to TC group. Seven (9%) patients in the STC group also required remnant cholecystectomy due to recurrent symptoms.

**Conclusions:** STC is associated with much higher and significant post-operative morbidity and open conversion rate compared to TC. Whilst STC may be an alternative option in difficult cases, it is not risk free and surgeons must consider other options before proceeding to a STC. Further studies are also required to look into possible prediction models for patients who might undergo a STC.

#### PB03-07

### DOES AN EXPERIENCED LAPAROSCOPIC SURGEON NEED A LONG LEARNING CURVE TO START ROBOTIC SINGLE SITE CHOLECYSTECTOMY?

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**Purpose:** It is well known that a laparoscopic single site cholecystectomy has significant limitations associated with proper triangulation and instrument crowding and collisions. Although the da Vinci Single Site robotic system has been proposed to overcome these problems, the Single Site technology is non-wristed and, unlike other conventional robotic instruments, only provides rotation, the ergonomics. Therefore, many surgeons are reluctant to start robotic single site cholecystectomy (RSSC). The purpose of this study is to demonstrate that an experienced laparoscopic surgeon can safely RSSC with less learning curves using the robotic single site platform by showing objective data by single experienced surgeon.

**Methods:** Demographic, perioperative, and postoperative data of thirty nine patients who underwent RSSC between April 2019 and Oct 2019 were collected retrospectively.

**Results:** The mean age and BMI was 45.2 years, 24.69 kg/m<sup>2</sup>. Male/female ratio was 7/23 (27.3/72.7 %). The mean docking time was 10.2±2.85 min. The mean operation time (skin to skin) was 48.2 min (range, 29~65 min). The operation time is slightly longer than conventional laparoscopic cholecystectomy and shorter than the single site laparoscopic cholecystectomy. None of the patients required an additional laparoscopic arm, an additional robotic arm, or conversion to conventional laparoscopic cholecystectomy.

**Conclusions:** Although our cases are small, the results show that RSSC is a safe, feasible and useful operative procedure. In addition, our study results indicate that experienced laparoscopic surgeons can do RSSC with less learning curve because total operation time is almost the same as conventional laparoscopic cholecystectomy except for the docking time.

#### PB03-08

### PREOPERATIVE MRI ASSESSMENT FOR PREDICTING SURGICAL DIFFICULTY DURING LAPAROSCOPIC CHOLECYSTECTOMY FOR ACUTE CHOLECYSTITIS

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**Introduction:** The thickening of the gallbladder wall with low signal intensity on MRI in acute cholecystitis (AC) is associated with severe inflammation with necrosis and fibrosis. However, the associations between MRI findings and operative outcomes are unknown. This study aimed to

assess the utility of MRI to predict surgical difficulty during laparoscopic cholecystectomy (LC) for AC.

**Methods:** We retrospectively identified patients who underwent both preoperative MRI and early LC for AC between 2012 and 2018. Based on the signal intensity of the gallbladder wall on MRI, we classified the patients into High Signal Intensity (HSI) group and Low Signal Intensity (LSI) group. Conversion rates to open cholecystectomy and operative time were compared between the two groups.

**Results:** Of 608 LCs performed for AC, 203 cases were eligible. Conversion rates were 5.3% (8 of 150 cases) and 26.4% (14 of 53 cases), and operative time were 100.5 min and 121 min in the HSI and LSI group, respectively (both  $P < 0.001$ ). On multivariate analysis, the low signal intensity of the gallbladder wall on MRI was an independent predictor of both higher conversion rate (odds ratio 5.87, 95% confidence interval (CI) 1.72-20.00,  $P = 0.0047$ ) and prolonged operative time (regression coefficient 19.99, 95% CI 6.26-33.73,  $P = 0.0046$ ).

**Conclusions:** The low signal intensity of the gallbladder wall on MRI was significantly associated with a higher conversion rate and prolonged operative time of LC for AC. Preoperative MRI could be a novel method for predicting surgical difficulty during LC for AC.

#### PB03-11

### MANAGEMENT OF GALLBLADDER REMNANT AND THE CYSTIC DUCT STUMP CALCULI: A RETROSPECTIVE STUDY

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**Introduction:** Gall bladder remnant and cystic duct stump calculi are reality in the era of Laparoscopic Cholecystectomy (LC). Despite a seemingly uneventful cholecystectomy, nearly 15% patients continue to have biliary symptoms; the post-cholecystectomy syndrome (PCS); which can manifest anytime from few days to several years after surgery. This study aims to assess the safety and feasibility of Laparoscopic exploration of gallbladder remnant calculi leading to PCS.

**Materials and methods:** In this study, surgical explorations were done in 25 patients. The study considered parameters like the operative time, conversion rate, post-operative complications, post-operative hospital stay and mortality in these patients. The duration of study was 2 years and the data was retrospectively reviewed.

**Results:** 25 patients diagnosed as symptomatic gallbladder remnant were identified. The most common symptoms at presentation included right upper quadrant pain (80%), Jaundice(12%) Cholangitis (4%). Symptoms began from 6 months to 25 years after index cholecystectomy. Diagnostic modalities utilized in the evaluation of these patients demonstrated that MRCP were effective with sensitivities of 100%. Of the 25 patients, 22 (88%) had completion LC. 3 patients (12%) were converted to open cholecystectomy because of dense adhesions and non-identification of structures laparoscopically.

**Conclusion:** Diagnosis of residual GB stone is difficult. In expert hands and standard approach, completion LC of the

gallbladder remnant can be performed within a reasonable operating time. There is low conversion rate with minimal post-operative complications and shorter hospital stay and minimal morbidity. Completion cholecystectomy can be challenging but is highly effective.

#### PB03-12

### HYBRID INTERVENTIONS IN THE TREATMENT OF COMMON BILE STONES

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In recent years, the incidence of gallstone disease has increased dramatically. Reports on the possibility of a one-stage minimally invasive treatment in the case of complicated cholecystocholedocholithiasis are increasingly found in the literature.

**Objective:** To improve the immediate results of treatment of patients with "difficult" cholecystocholedocholithiasis.

**Materials and methods:** 108 hybrid surgical interventions were performed between 2014 and 2020. Patients with "difficult" choledocholithiasis included with obstructive jaundice complicated by mild cholangitis and also with large single stones of AJP (with a diameter of more than 15 mm), with duodenal diverticula. All interventions were performed in an X-ray room using laparoscopic and endoscopic approach. The average age of the patients was 59.8 years old. Performed 64 laparoscopic cholecystectomy in combination with laparoscopic choledochotomy and lithoextraction. In these cases, the primary suture of the common bile duct was performed with bile duct drainage. 16 patients with duodenal diverticulum underwent a combination of laparoscopy with drainage, cannulation of bile duct and subsequent ERCP and lithoextraction. In 44 cases, simultaneous surgery included laparoscopy and ERCP.

**Results:** The average duration of surgical intervention was  $94.2 \pm 26.4$  minutes, the hospitalization duration was  $9.6 \pm 4.2$  days. In 4 (3.7%) case, residual choledocholithiasis was observed, requiring repeated endoscopic lithoextraction. There were no other complications and deaths.

So, hybrid surgical interventions can be used for the simultaneous treatment of patients with complicated cholecystocholedocholithiasis, further accumulation of experience and analysis of the results of these interventions are required.

#### PB03-13

### EARLY OPERATION FOR ACUTE CHOLECYSTITIS IN THE TG18 ERA

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Background: Tokyo Guidelines 2018: Updated Tokyo Guidelines for the management of acute cholangitis/acute cholecystitis (TG18) were released in January 2018. Early laparoscopic cholecystectomy (LC) is recommended for

acute cholecystitis within 72 hours when possible or within one week at the latest.

**Aim:** To assess current status of early operation for acute cholecystitis.

**Methods:** From 2018 to 2019, 31 patients who underwent early operation for acute cholecystitis were reviewed retrospectively.

**Results:** During the same period 185 cholecystectomies were performed. Early operations were performed in 17% including 21 males and 10 females, with an average age of 57.9 years. Median time from onset to admission was 1 day. Ultrasonography and CT scans were obtained for all patients and MRCP in 61%. X-ray showed stones in 65% of all patients. Severity score classified into Grade I; 25 patients (81%) and Grade II; 6 patients (19%). Median score of age adjusted Charlson Co-morbidity index was 3 points (0-7). Median time from admission to surgery was 1 day, and 61% underwent LC and 39% open cholecystectomy (OC). In Grade II patients, OC was performed in 83% because of a pericholecystic abscess with severe inflammation. Subtotal cholecystectomy was selected in 50% patients as a bailout procedure. Morbidity rate was 6%. Average postoperative hospital stay was 5.9 days.

**Conclusions:** According to the flowcharts in TG18, early LC is recommended for all patients, but OC was chosen in 39% in this series. OC does not make cholecystectomy easier, but OC must be considered when OC is safer.

#### PB03-17

### ACUTE CHOLANGITIS: VALIDATION OF TG07, TG13 AND TG18

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**Objectives:** Tokyo guidelines have not been widely validated. We aim to validate TG07, TG13 and TG18 for acute cholangitis (AC).

**Methods:** A retrospective audit of AC patients managed from Jan-Dec 2016 is reported. Demographic data, clinical profile, serum and radiological investigations, and type of intervention(s) were recorded. Data was validated for TG07, TG13 and TG18 diagnostic, severity stratification and management guidelines.

**Results:** 272 patients were included. The most common presenting symptom was abdominal pain ( $n=179$ , 65.81%) and 53.31% ( $n=145$ ) of patients met the systemic inflammatory response (SIRS) criteria on admission. The most common abnormal serum biochemistry was 'Raised GGT ( $>72$  IU/L)' with 86.76% ( $n=236$ ) of patients presenting with it. Common bile duct stone(s) were identified in 6.25% ( $n=17$ ) of patients on ultrasonography (US), 12.87% ( $n=35$ ) on computerized tomography (CT) and 22.43% ( $n=61$ ) on magnetic resonance cholangiopancreatography (MRCP). 55.47% ( $n=147$ ) of patients had an Endoscopic retrograde cholangiopancreatography (ERCP), with ductal clearance in 44.90% ( $n=66$ ) while 6.04% ( $n=16$ ) patients had a PTC. 61.59% ( $n=85$ ) of patients had an ERCP done within 96 hours of ward admission. Cholecystectomy was performed in the index admission in 5.66% ( $n=15$ ), and in the elective

outpatient setting in 4.91% ( $n=13$ ) patients. In-hospital mortality rate was 5.66% ( $n=15$ ), while 30-day mortality was 1.13% ( $n=3$ ) and 90-day mortality was 4.04% ( $n=11$ ) of patients.

**Conclusions:** TG13 and TG18 are more sensitive and specific.

#### Validation of TG07, TG13 and TG18 diagnostic criteria and TG13/TG18 severity criteria of Acute Cholangitis (AC)

n=272(%)		TG07	TG13/ TG18
Diagnostic criteria	No AC	73 (26.84)	46 (16.91)
	Suspected AC	102 (37.50)	30 (11.03)
	Definite AC	97 (35.66)	196 (72.06)
Severity criteria	Mild AC	260 (95.59)	98 (36.02)
	Moderate AC	<b>(Mild/Mod severity merged)</b>	95 (34.93)
	Severe AC	12 (4.41)	78 (28.68)

#### PB03-18

### A SNAPSHOT OF THE PRACTICE OF LAPAROSCOPIC COMMON BILE DUCT EXPLORATION IN THE UNITED KINGDOM - (CHOLE S DATA SET)

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**Introduction:** The aim was to describe the utilisation/practice of laparoscopic bile duct exploration(LCBDE) option for the management of common bile duct stones across the UK. The data were obtained from a population-based cohort study of outcomes following cholecystectomy for benign gallbladder diseases (CholeS study).

**Methods:** We used the CholeS Study DataSet to analyse the use of LCBDE in the UK. Descriptive analysis and graphs were used to illustrate the current practice of LCBDE in the UK.

**Results:** Seventy-seven (46%) out of 167 Hospitals that took part in the CholeS study performed LCBDE. Their LCBDE workload was 5.4% out of the total Laparoscopic Cholecystectomies(LC) performed. Almost 90% of LCBDE was performed by hospitals who performed less than five LCBDE in two months. Only 5.2% of hospitals performed more than 10 LCBDEs; this accounts for 19.8% of their LC workload compared to between 2 and 8% for the rest. Out of 8820 LC, a total of 256(2.9%) and 932(10.6%) patients underwent LCBDE and pre-operative endoscopic retrograde cholangio-pancreatography and sphincterotomy(ERCP+ES) respectively for CBDS. Eighty-four per cent of LCBDEs were performed by Upper gastrointestinal surgeons and 16% by other specialities including 10% colorectal surgeons. Interestingly, only just under 5% of the LCBDEs were performed by trainees.

**Conclusions:** In the UK, a significant proportion of patients with CBDS are still treated in two stages: a pre-operative ERCP followed by LC. LCBDE remains an underutilised resource in the UK. Further studies are required to examine the possible reasons for the low utilisation of LCBDE.

### PB03-19

#### IS ROUTINE MRCP NEEDED IN SYMPTOMATIC GALLSTONE DISEASE? - A SINGLE CENTER EXPERIENCE

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**Objectives:** To assess the role of magnetic resonance cholangiopancreatography (MRCP) in the detection of choledocholithiasis in patients with symptomatic gallstone disease and to determine the anatomical variations of extra hepatic biliary tract and their relation to bile duct injury during laparoscopic cholecystectomy.

**Methods:** This is a retrospective observational study of 80 patients from a prospectively maintained database from October 2017 to September 2019. On the basis of findings from Preoperative liver function test and Ultrasound abdomen, patients were divided into 3 groups as per ASGE guidelines for the risk of choledocholithiasis [high risk(n=14), medium risk(n=13), low/no risk(n=53)]. MRCP was performed in all patients routinely.

**Results:** MRCP detected choledocholithiasis in 14 patients. 9 out of 14 patients had dilated CBD on Ultrasound and 7 had elevated ALP. Among 66 patients without CBD stone, ALP was elevated in 4 patients. Patients with MRCP detected stones were subjected to ERCP which was successful in 9 patients. From remaining 5 patients with unsuccessful ERCP, two patients underwent laparoscopic CBD exploration/T tube drainage, one patient underwent bilioenteric anastomosis, two patients with biliary pancreatitis were managed with laparoscopic cholecystectomy alone in view of passed out stone. MRCP diagnosed extrahepatic biliary tract variations in 15% cases(n=12). No patient suffered bile duct injury in this study.

**Conclusion:** In view of high sensitivity to detect choledocholithiasis even in normal LFT and USG abdomen and to delineate extrahepatic biliary anatomy, we suggest routine MRCP in all cases of symptomatic gallstone disease to aid in preoperative management and prevention of bile duct injury.

### PB03-20

#### PROLONGED CHOLECYSTECTOMY WAITING TIME FOR COMPLICATED GALLSTONE DISEASE WAS ASSOCIATED WITH INCREASE RATE OF GRAM-NEGATIVE INFECTION

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**Background:** Early cholecystectomy for complicated gallstone disease is safe and has shorter hospital stay. However, no consensus recommendation about the timing of cholecystectomy for complicated gallstone disease is available in Hong Kong.

**Method:** A retrospective review using administrative data for all cholecystectomy in a public hospital regional network in Hong Kong, consisting of 3 hospitals, from January 2015 to December 2019 was performed. Patients requiring cholecystectomy not due to gallstone were excluded. Relationship between cholecystectomy waiting time and patient outcome were analysed.

**Results:** 1931 patients with cholecystectomy from 2015 Jan to 2019 Dec were retrieved from the hospital electronic patient record system. 723 Emergency Cholecystectomy and 82 patients receiving cholecystectomy unrelated to gallstone diseases were excluded. 1126 patients were recruited in this study. The median operation waiting time were 184 days. 10% of the cohort need to wait for more than 460 days before operation.

The readmission rate and mortality rate were 5.5% and 0.2% respectively. There was no significant difference in readmission rate, mortality rate and post-operative hospital stay according to operation waiting time. Thirty-five patients (3.1%) developed positive gram-negative bacilli in bile or blood while waiting for surgery. Patients with longer operation waiting time (>10 weeks) had a significant higher (p=0.019) positive culture rate.

**Conclusion:** Patients having cholecystectomy waiting time greater than 10 weeks were associated with higher rate of infective episodes requiring admission. To avoid gram-negative infection in patients with complicated gallstone disease, early cholecystectomy within 10 weeks should be arranged.

### PB03-21

#### ACUTE CHOLANGITIS IN OCTOGENARIANS - CLINICAL OUTCOMES FROM A SINGAPOREAN CENTER

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**Objectives:** Octogenarians have increased comorbidity and frailty which impact clinical outcomes. We report outcomes of octogenarians managed for acute cholangitis (AC).

**Methods:** All octogenarians diagnosed with AC between 2010-2016 were included in audit. Demographic data, comorbidities, clinical presentation, serum and imaging investigations, and type of intervention(s) performed were collected.

**Results:** 374 patients with a median age of 84 years (range 80-89) are included. The most common presenting symptom was abdominal pain (n=216, 57.75%) and 45.12% (n=169) of patients met the systemic inflammatory response (SIRS) criteria on admission. 18.72% (n=72) of patients were stratified as having mild, 47.33% (n=177) had moderate and 33.42% (n=125) had severe AC as per TG13. 63 patients (16.9%) were admitted to critical care unit. 147 patients (39.3%) had positive blood cultures and *Klebsiella*

*pneumoniae* was the commonest organism (n=43, 29.2%). Eight patients (2.14%) had qSOFA score of 2 or more. Common bile duct stone(s) were identified in 8.02% (n=30) of patients on ultrasonography (US), 17.91% (n=67) on computerized tomography (CT) and 26.74% (n=100) on magnetic resonance cholangiopancreatography (MRCP). 63.36% (n=237) of patients had an ERCP, with ductal clearance in 42.62% (n=101) and 11.23% (n=42) patients had a PTC. Cholecystectomy was performed in the index admission in 2.67% (n=10), and in the elective outpatient setting in 5.88% (n=22) patients. In-hospital mortality rate was 9.36% (n=35).

**Conclusions:** TG13 diagnostic criteria are more sensitive and specific in octogenarian AC patients. Acceptance for definite cholecystectomy is low. Mortality in octogenarians remains high.

### PB03-22

#### THE APPLICATION OF TOKYO GUIDELINE 2018 (TG18) AND OUTCOME ANALYSIS IN PATIENTS WITH INITIAL DIAGNOSIS OF BOTH ACUTE CHOLECYSTITIS AND ACUTE CHOLANGITIS

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**Purpose:** TG18 established the golden rule for clinicians to manage both acute cholecystitis and acute cholangitis. However, seldom does TG18 mention about the management of combined diagnosis of both acute cholecystitis and acute cholangitis initially. Our aim is to investigate the clinical characteristics and outcome of this disease group.

**Materials and methods:** From January, 2012 to October, 2017, we retrospectively collected 154 patients with the initial diagnosis of both acute cholecystitis and acute cholangitis. We surveyed the disease pattern, subgrouping them based on the severity system in TG18 and compared outcome between management of both diseases following TG18 or not.

**Results:** Of all the 154 patients, 23(14.9%) had grade III acute cholecystitis and acute cholangitis., which was higher than grade III disease in all patient diagnosed as acute cholecystitis (119 of 942, 11.0%) and acute cholangitis (38 of 454, 8.4%), respectively. Recurrent BTI rate showed significant difference between these 154 patients (28.6%) and patients diagnosed as either acute cholecystitis and acute cholangitis (16.3%). All 154 patients were categorized into 4 groups according to the treatment from TG18 for the 2 diseases in different severities. In all groups, the recurrent biliary tract BTI rate had no statistically difference between treatment following TG18 suggestion and not.

**Conclusion:** In this study, we found when patient is impressed with both diagnosis initially, the severity system and treatment management from TG18 may not provide favorable outcome, resulting in new prospect of research for this specific disease group.

### PB03-23

#### LAPAROSCOPIC SUBTOTAL CHOLECYSTECTOMY FOR GANGRENOUS CHOLECYSTITIS IN A LIVER CIRRHOSIS PATIENT: A CASE REPORT

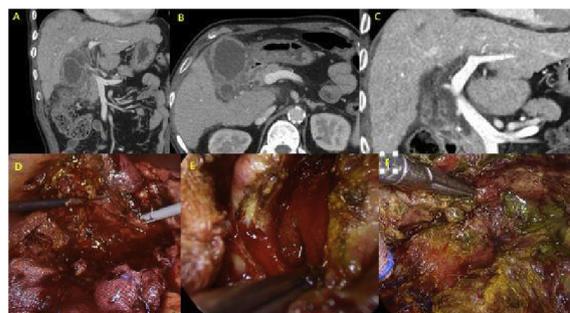
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**Introduction:** Subtotal cholecystectomy should be considered when structures of calot can not be identified or critical view of safety can not be achieved. Here, we present a case of laparoscopic subtotal fenestrating cholecystectomy for gangrenous cholecystitis in a liver cirrhosis patients.

**Case report:** A 64 year-old male came to emergency room after suffering from RUQ pain for 4 days. Underlying medical conditions included hypertension, diabetes, and alcoholic liver cirrhosis with BMI of 22.5. Initial laboratory results were as following: WBC count of 12670/ul, platelet count of 90000/ul, C-reactive protein of 20.35 mg/dL, AST/ALT of 58/52 IU/L, Total bilirubin/Direct bilirubin of 3.88/2.37 mg/dL. Computed tomography showed gangrenous cholecystitis with cystic duct stones and liver cirrhosis with splenomegaly. The patient underwent laparoscopic cholecystectomy using conventional four port approach. Upon entering the peritoneum, severe adhesion around the gallbladder and macronodular cirrhosis were noted. Due to severe adhesion and collateral vessels, calot dissection was not possible. After identifying the cystic duct and retrieving the stones, cystic duct stump was sutured internally with 4-0 vicryl and laparoscopic subtotal cholecystectomy was completed after inserting a drain. Total operation time was 210 minutes with blood loss of 100cc. Patient was discharged on postoperative day #10 after conservative care for ascites.

**Conclusion:** Subtotal cholecystectomy is an important tool for hepatobiliary surgeons facing complex intra operative situations with high risk of postoperative complications.

Figures: A, B) preoperative CT, C) postoperative 1 month CT, D) Dissection of gallbladder, E) Identification of cystic duct, F) Cystic duct stump internally sutured



Figures: A,B)preoperative CT, C)postoperative 1 month CT

PB03-24

### RATE OF CHOLEDOCHOLITHIASIS ON ROUTINE INTRA-OPERATIVE CHOLANGIOGRAM AND THEIR MANAGEMENT IN A REGIONAL AUSTRALIAN HOSPITAL

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**Methods:** A retrospective audit of all elective and emergency cholecystectomies and their IOC's from January 2019 to December 2019 was done. The method of management and their outcomes were evaluated.

**Results:** 113 emergency cholecystectomies were performed with a 93% (105/113) rate of intra-operative cholangiograms. Of these 19% (20/105) found filling defects on IOC. 14 underwent laparoscopic exploration with a choledochoscope of which 10 were successful. 6 were managed with a referral to a tertiary centre for an ERCP. The remaining 4 were either successfully flushed, milked out or left to pass spontaneously. For emergency cholecystectomies, laparoscopic CBD explorations added 48 minutes to operation time (185 vs 137 minutes). Hospital stay for laparoscopic CBD exploration was an average of 4.4 days while patient managed with an inter-hospital transfer and ERCP had a total average hospital stay of 8.0 days. For elective cholecystectomies, 90% (65/70) had an IOC of which 3 found choledocholithiasis. All 3 were successfully managed with a choledochoscope.

**Conclusion:** In a regional Australian hospital with no in-house ERCP facilities, laparoscopic treatment of choledocholithiasis is safe, efficient and reduces the duration of hospital stay and the cost of an inter-hospital transfer.

PB03-27

### RISK FACTORS FOR RECURRENCE OF COMMON BILE DUCT STONES AFTER COMMON BILE DUCT EXPLORATION SURGERY

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**Purpose:** Recurrent common bile duct (CBD) stone is a significant delayed complication after CBD exploration surgery. However, no definite risk factors for recurrence have been established. The aim of this study is to identify the risk factors of recurrent CBD stone following surgical CBD stone removal.

**Methods:** In total, 253 patients who underwent CBD exploration surgery from Jan 2000 to Jan 2018 were identified and included in this study. We retrospectively collected clinical data based on the medical records of the patients and investigated risk factors with logistic regression analysis.

**Results:** A total of 31 patients (12.3%) developed recurrent CBD stones. The median follow-up period was 9.6 months. Univariate analyses showed that the following factors were associated with recurrent CBD stones: delayed diet start after 7 days, longer hospital duration, and preoperative endoscopic sphincterotomy. However, sex, age, gallstone, operation time, transfusion, T-tube insertion, and

postoperative complications were not associated with recurrent CBD stone. In multivariate analysis, longer hospital duration and preoperative endoscopic sphincterotomy were associated with recurrent CBD stone (OR = 1.047; CI 1.001 to 1.095; p = 0.048 and OR = 3.615; CI 1.081 to 12.087; p = 0.037, respectively).

**Conclusion:** Recurrent CBD stones can often occur and require regular follow-up although it is safe to remove by surgical CBD exploration. Further investigation is needed on the risk factors of recurrent CBD stones.

PB03-28

### INCIDENCE OF MICROFLORA FROM CULTURES OF GALL BLADDER BILE OF LAPAROSCOPIC CHOLECYSTECTOMY

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**Background:** Gallstone disease is one of the most common problem affecting the digestive tract. Through experience it has been accepted that bile in normal conditions remains sterile. Bactibilia is a common finding in individuals at high risk or with complicated cholecystolithiasis, however few data prevails about the prevalence of bactibilia in patients operated on for uncomplicated laparoscopic cholecystectomy. There is a common usage of preoperative and post-operative antibiotics in the different patients without the existence of any actual bacteriologic and epidemiologic evidence.

**Material and methods:** 222 patients with diagnosis of cholecystolithiasis postoperated of laparoscopic cholecystectomy had a bile sent to bacteriology. Bile was aspirated from the gall bladder during laparoscopic cholecystectomy.

**Results:** Bactibilia was identified in 50 (23%) of the cultures of mild chronic cholecystitis. A total of 172 negative cultures were obtained (77) and 50 positive (23%). In the present study out of 50 patients, 32 (64%) were females and 18 (36%) were males. We found total of 25 (50%) black pigmented stones, 15 (30%) were brown and 10 (20%) were cholesterol stones. In this study bile culture was showing growth of the following organisms. The commonest organism was Enterococcus (32%) followed by E. coli (26%), Klebsiella (14%).

**Conclusions:** Bactibilia has long been known to be associated with biliary tract diseases and culturable bacteria in bile can represent a state of asymptomatic bactibilia which can disseminate after any intervention causing infective complication. Exploring the microflora of gall bladder bile important role in choosing the appropriate antibiotic to prevent complication.

PB03-29

### LAPAROSCOPIC CHOLECYSTECTOMY IN ACUTE CHOLECYSTITIS - "ANY TIME IS GOOD TIME"

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Acute cholecystitis is a huge burden on the healthcare system. Laparoscopic cholecystectomy is the gold standard in the care for patients with acute cholecystitis

**Aim:** Analyzing clinical aspects and outcomes in patients diagnosed with acute cholecystitis undergoing laparoscopic cholecystectomy. Variables studied 1. Mean operative time 2. Morbidity profile 3. Duration of hospital stay 4. Conversion to open

**Study design:** Prospective hospital based study

**Material and methods:** 103 patients with acute cholecystitis irrespective of duration of symptoms were evaluated, and investigated. After confirming the diagnosis all patients underwent laparoscopic cholecystectomy

**Results:** 103 patients (60 females, 43 males). 102 procedures were completed laparoscopically (one conversion). All cases showed features suggestive of acute cholecystitis (18 - gangrenous cholecystitis) (14 - empyema) and (12 - mucocele). 97.08% of cases were completed in less than 90 minutes duration. Intra peritoneal drains were used depending on surgeon choice and local operative factors, this was done in 44 cases. Mean post-operative stay was observed as  $2.19 \pm 1.22$  days with all but four cases having their drain removed before discharge. These four patients underwent subtotal cholecystectomy and the drains were subsequently removed after two weeks post operatively. There was no incidence of any biliary injury, one patient died due to sepsis and multi organ failure (converted to open).

**Conclusion:** Acute cholecystitis can be dealt with by laparoscopic cholecystectomy irrespective of duration of symptoms with excellent results provided it is performed in a specialized tertiary care referral centre with vast experience in laparoscopy and hepatobiliary surgery.

### PB03-30

#### SAFETY AND EFFECTIVENESS OF PERCUTANEOUS CHOLECYSTOSTOMY (PC) AS A TREATMENT OF ACUTE CHOLECYSTITIS (AC) IN SELECTED PATIENTS. PROSPECTIVE 10 YEARS STUDY OF ADVERSE EVENTS (AE)

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**Introduction:** Definitive treatment for AC is cholecystectomy. However in patients with medical comorbidities or critical illness, PC could be an effective and safe alternative.

**Methods:** We evaluated 1223 patients with AC recovered from 2008 to 2017. Medical treatment was used in 273 patients. In 66 out of 273 a PC was indicated. PC was performed under ultrasonography and local anaesthesia. A minimum follow-up of one year was done. AE were recorded prospectively according to Clavien-Dindo Classification.

**Results:** PC was indicated due to severe comorbidities (55%), critical illness (31%), or long-time AC evolution in weak patients (8%). Median age was 79 years. Eighteen patients were admitted in ICU. Sixty-two patients were ASA III or superior. Twenty patients were treated with delayed cholecystectomy (30%). Two patients needed emergent cholecystectomy due to PC failure, one of them died due to sepsis. Six more patients died with PC (mortality 10%). Effectiveness 48/66 (88%)

Twenty-two AE were observed in 14 patients during hospitalization. Seven grade V and 4 grade III in 4 patients. Thirty patients presented AE during follow-up related to the PC.

Thirty-two out of 59 patients died during follow-up. Five died in the group of patients with delayed cholecystectomy. Twenty patients died in the group of PC without cholecystectomy.

**Conclusions:** PC is safe alternative to cholecystectomy in critically ill or high-risk patients and could be the only treatment. AE are high. The high mortality during follow-up is due to other medical problems. Delayed Cholecystectomy should be done in very selected patients.

### PB03-31

#### RELATIONS BETWEEN HEPATOBILIARY SCINTIGRAPHY FINDINGS AND HISTOPATHOLOGICAL FACTORS IN PATIENTS WITH RECURRENT BILIARY COLIC

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**Background:** The histopathological factors of gallbladder that affect the findings of hepatobiliary scintigraphy is not fully known. The aim of the present study is to investigate the relationship between hepatobiliary scintigraphy findings and histopathological results in patients with recurrent biliary colic.

**Methods:** A total of 107 patients who underwent hepatobiliary scintigraphy for recurrent biliary colic and subsequent cholecystectomy were retrospectively enrolled. According to the hepatobiliary scintigraphy findings, patients were categorized into three groups; patients with non-visualization of gallbladder activity (non-visualized GB group), gallbladder ejection fraction (GBEF) of < 35% (low GBEF group), and GBEF of  $\geq 35\%$  (normal GBEF group).

**Results:** Of all patients, 31 patients were classified as non-visualized GB group, 33 were low GBEF group, and 43 were normal GBEF group. Non-visualized group showed higher rates of patients with severe neutrophil, lymphoplasmic cell, and eosinophil infiltrations and empyema and showed more increased cystic duct wall thickness than other groups ( $p < 0.05$ ). Low GBEF group showed higher muscle-to-total wall thickness ratio and muscle-to-fibrosis thickness ratio than those with normal GBEF group ( $p < 0.05$ ). On multivariate logistic regression analysis, Severe degrees of lymphoplasmic cell infiltration ( $p=0.027$ ) and eosinophil infiltration ( $p < 0.001$ ) were independent predictors for non-visualization gallbladder activity, and muscle-to-fibrosis thickness ratio ( $p=0.030$ ) was an independent predictor for low GBEF.

**Conclusions:** In patients with recurrent biliary colic, non-visualization of gallbladder activity on hepatobiliary scintigraphy was related with the degree of inflammation in the gallbladder, while GBEF was related with muscular hypertrophy of the gallbladder.

PB03-32

### LAPAROSCOPIC CHOLECYSTECTOMY - TWO-DECADE EXPERIENCE OF OVER 3000 CASES FROM A TERTIARY CARE CENTER

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**Introduction:** Laparoscopic Cholecystectomy (LC) remains the gold standard for benign gall bladder diseases. It is associated with higher risk of biliary injury (0.1%-1.5%) resulting in prolonged morbidity, decreased overall survival. This complication counterpoises the benefit of minimal invasive surgery. If we adopt the principle of safe cholecystectomy under supervision, laparoscopic cholecystectomy can be done safely even in difficult situations. **Methods:** Retrospective review of the data of patients who underwent LC in a single surgical unit from January 2003 - December 2018 at a tertiary care center was done. 5 consultants and 12 residents (operating ratio of 70:30) conducted the surgeries. Demographic variables, intra operative findings, conversion rate, morbidity and mortality were evaluated.

**Results:** A total of 3095 patients underwent LC in the mentioned period, 75.05% females and 24.95% males. Difficult calot's triangle anatomy was identified in - 66 (2.132%) patients. 30 (0.969%) were converted to open procedure with one major bile duct injury (CBD transection), one accessory duct injury and one lateral CBD injury. 31 (1.01%) patients developed post operative bile leak. 15 (48.3%) patients were managed by ERCP and 10 (32.2%) underwent re-laparoscopy. 6 (19.35%) patients required pig tail drainage. None of the patients developed bile duct stricture in long term follow up.

**Conclusion:** LC offers shorter hospital stay and low morbidity. Procedure is safe and effective both for uncomplicated and complicated cholelithiasis. The incidence of major Bile Duct Injury can be kept to minimum with proper training and supervision in a tertiary care centre.

PB03-33

### GALL STONE IS "ACTIVE" IN ELDERLY MALES

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**Introduction:** Complicated gall stone disease (GSD) is a common surgical entity worldwide. However, the age

distribution of complicated GSD has not been well described. We studied the age distribution of complicated GSD in both males and females, and compare the metabolic traits between the complicated GSD group and the non-complicated group.

**Methods:** We consecutively assembled a retrospective cohort of patients with GSD at Beijing Tsinghua Changgung Hospital from 1/11/2015 to 1/10/2019.

**Results:** Out of the 1395 patients, 859 (42.6% male) and 536 (35.6% male) patients were with and without complicated GSD. The number of females with complications peaked in the fifth decades, so did that without complications (p=0.217). However, the age distribution in males was significantly different (p=0.005). The number of males with complications peaked in the sixth decades, while the peak of that without complications appeared in the fifth decades. The frequency of complicated GSD was higher among males aged >60 years than that among males aged ≤60 years (72.7% vs. 61.3%, p=0.006). 35.6% and 21.6% female patients aged ≤60 years with and without complicated GSD had dyslipidemia (p=0.000). The percentages in the males aged ≤60 years were 55.5% and 34.8% (p=0.000). In females or males aged >60 years, there was no significant difference in the two groups (32.4% vs. 42.1%, p=0.092 and 41.4% vs. 47.4%, P=0.423). Nor hypertension or diabetes were significantly different between the groups with and without complications.

**Conclusion:** GSD is "active" in elderly males. Patients aged ≤60 years were more likely to develop complications with dyslipidemia.

### PB04 - Biliary: Surgical Outcomes

PB04-04

### EARLY LAPAROSCOPIC CHOLECYSTECTOMY USING THE BAILOUT PROCEDURE FOR ACUTE CHOLECYSTITIS WITH SEVERE LOCAL INFLAMMATION

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**Introduction:** The Tokyo Guidelines 2018 have proposed a bailout procedure that includes the fundus first technique and subtotal cholecystectomy to prevent bile duct injury and vasculo-biliary injury in acute cholecystitis (AC) with severe local inflammation, especially at Calot's triangle. The study aim was to assess the influence of laparoscopic cholecystectomy (LC) using the bailout procedure for AC with severe local inflammation.

**Patients and methods:** A total of 362 patients were enrolled during 15-year study period. The median preoperative length of hospitalization was 1 day (range, 0-30 days). The patient's characteristics, therapeutic strategies, and operative results were compared between the former period (n = 260) and a recent 3-year period (n = 102).

**Results:** In both groups, approximately 20% of the patients with taking antithrombotic agents, and approximately 30% of the patients had severe local inflammation, including gangrenous cholecystitis. Early LC within 4 days after admission was predominantly performed in the recent period (100 cases, 98.0%, p < 0.001). Conversion to open surgery decreased from 6.5% to 1.0%, and postoperative

complication was decreased from 4.2% to 2.0%. The postoperative and total length of hospitalization were significantly shorter in the recent period than in the earlier period (3 days and 5 days, respectively).

**Conclusions:** Active performance of the bailout procedure and technical modification were associated with fewer conversion to open surgery and postoperative complications, leading to significant decreases in the postoperative and total length of hospitalization for AC patients with severe local inflammation.

#### PB04-08

### OUTCOME OF POST CHOLECYSTECTOMY BILE DUCT INJURY MANAGEMENT IN A HIGH VOLUME REFERRAL CENTER IN IRAN

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**Introduction:** However more than a century pass from first cholecystectomy and iatrogenic bile duct injury, still this is a big problem, here we report our experience in a high volume referral center in Iran about handling of this complication.

**Methods:** We collect data of 59 patient who referred us, suspected to post-cholecystectomy bile duct injury for 3 years since may 2016 both retrospectively through review of charts and calling them and prospectively by regular outpatient visit.

**Results:** In this period 59 patients with age range of 20 to 74y/o referred our center, 15 male and 44 female. 21 patients underwent definite repair in 2 weeks from injury, 17 patient after 2 weeks and before 6 weeks and 21 patients after 6 weeks. The most common presenting feature was bilious drain discharge, MRCP and ERCP was falsely negative in 23.07% and 11.53% respectively and the most reliable point was primary surgeon think of "something is wrong during surgery". 17% of patients had failed repair in original hospital and 33.9% had exploration, irrigation and drainage. laboratory abnormality just in 66% of patients detected, most injuries was in Bismuth class II (18%), III (16%) and IV (16%), and Rt hepatic artery injury detected in 27 (45.8%) patients. hepatectomy did in two patients and two patients died. No significant deference found when interval from injury to definite surgery compared between groups.

**Conclusion:** Best decision for patients suspected to bile duct injury is referring to a high volume center at any time before exploration and with any interval from injury, HPB surgeon can go for repair.

#### PB04-09

### SURGERY FOR RECURRENT BILIARY CARCINOMA: RESULTS FOR 5 RECURRENT CASES

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**Introduction:** Typically chemotherapy has been used as standard treatment and surgeries were rarely performed for recurrent extrahepatic biliary carcinoma (RBC). Thus whether surgery for RBC is feasible has remained unclear.

**Methods:** From 2013 to 2019, 5 patients underwent radical resection for RBC at our institution. We retrospectively reviewed the medical data.

**Results:** Recurrence sites were liver metastasis in 3 patients (LM group) and local or bile duct recurrence in 2 patients (BD group). In the LM group, the underlying pathology was distal bile duct carcinoma, gallbladder carcinoma and ampullary carcinoma. Limited resections of the liver were performed for all 3 patients in the LM group. There was no morbidity nor mortality. 1 patient with liver metastasis of gallbladder carcinoma survived 6 years after surgery for RBC. The other 2 patients had recurrence at 9 and 14 months after surgery. In the BD group, the underlying pathology was distal bile duct carcinoma and proximal bile duct carcinoma. 1 patient underwent pancreaticoduodenectomy in the primary surgery and extended right hemihepatectomy for RBC. The other underwent central bisegmentectomy of the liver in the primary surgery and right lateral sectionectomy of the liver for RBC. There was morbidity in 1 patient but no mortality. Both patients could achieve curative resection and survive without recurrence for 9 and 2 months after surgery for RBC.

**Conclusion:** Surgery for RBC is technically demanding procedure but appears feasible and have a possibility of offering longer survival for selected patients but we should be cautious of indication.

#### PB04-10

### INCIDENCE AND IMPACT OF CONCOMITANT VASCULAR INJURIES IN POST-CHOLECYSTECTOMY BILE DUCT STRICTURE: A PROSPECTIVE STUDY WITH MR ANGIOGRAPHY

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**Introduction:** Impact of concomitant vascular biliary injury (VBI) on post-cholecystectomy benign biliary stricture (BBS) repair is still debatable with studies both in favor and against. In our study we look for incidence of VBI and impact on long-term outcomes.

**Methods:** Consecutive patients with BBS during the period December 2010 to May 2012 were included. Magnetic resonance angiography (MRA) with MRCP was done prior to repair. Long-term outcomes were analyzed as per McDonald grading.

**Results:** 36 patients were included in the study. Median age was 36 (15-70) years and 28 (78%) were females. 10 patients (28%) had prior failed repair. 23 (64%) patients had high strictures (Bismuth Type  $\geq 3$ ). VBI was present in 22 (61%) involving right hepatic artery (RHA). Of these, laparoscopic cholecystectomy was performed in 18 patients (82%). Additionally right portal vein injury was present in one patient. In patients with prior failed repair 5 (50%) had RHA injury. 34 patients underwent Roux en Y hepaticojejunostomy (RYHJ). Median blood loss was 300ml (range 50-950). Median duration of surgery was 5 hours (range 2-

9). Complications were present in 13 (36%) patients. At median follow up of 48 months (24 - 60), there were 8 failures (Success= 76%) requiring re-intervention. Two patients required right hepatectomy. Failed previous repair and secondary biliary cirrhosis were significantly associated with failure.

**Conclusion:** Concomitant VBI has significant impact on long-term outcomes of BBS repair. It will be prudent to do MRA with MRCP during workup of BBS patients for better management planning

#### PB04-11

### DOES CONCOMITANT VASCULAR INJURY HAVE AN IMPACT ON THE OUTCOME AFTER SURGICAL REPAIR OF IATROGENIC BILE DUCT INJURIES

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**Introduction:** Effect of concomitant vasculobiliary injury (VBI) and timing for surgical repair remains debatable in case of iatrogenic bile duct injuries (IBDI). Result from previous studies are difficult to compare because difference in definition of patency. This study evaluates outcome of surgical repair for IBDI with or without VBI using standards for reporting outcome proposed by Starberg et al. in 2018.

**Method:** A retrospective study of 78 patients with IBDI treated with surgical repair from 2010-2019 was conducted to compare the patency between VBI and non-VBI patients. We also analyzed patency in VBI patients with immediate, early and late repair.

**Results:** Twenty-four and 54 patients were categorized into VBI and non-VBI groups respectively. The most common vascular injury was right hepatic artery (22/24). Follow-up ranged from 7-120 months (median 36 months). Hepaticojejunostomy is the most common procedure, which was performed in 90% of the patients. Primary repair with T-tube was performed in 10%. There was no difference in the patency grading after the primary treatment between VBI and non-VBI patients (p=1.00). Both methods of repair result in similar patency grading. In VBI group, subgroup analysis of the timing of repair showed no difference in patency rate [Immediate vs. early vs. late repair (p=0.338)]

**Conclusion:** Our study results indicate that VBI and timing of the repair are not associated with poor long-term treatment outcome. Based on our findings, an attempt to repair concomitant vascular injury is not necessary and the primary surgical treatment does not need to be delayed.

#### PB04-12

### SINGLE INCISION LAPAROSCOPIC CHOLECYSTECTOMY: LESSONS LEARNED FROM 1300 CONSECUTIVE PATIENTS IN A SINGLE CENTER

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**Introduction:** Single incision laparoscopic cholecystectomy (SILC) is a considerable option in benign gallbladder surgery. We have developed Konyang Standard Method(KSM) for SILC and gradually innovated KSM. We report the outcomes of our high volume data of SILC.

**Methods:** We retrospectively reviewed the preoperative characteristics and surgical outcomes of 1313 consecutive patients who underwent SILC at a single institution between April 2010 and July 2019. Initially 3-channel SILC with KSM was changed to 4-channel SILC using a modified technique with a snake retractor for exposure of Calot triangle; we called this a modified KSM(mKSM). After that, we have used a commercial 4-channel (Glove) port for simplicity(C-mKSM).

**Results:** The patients included 745 women and 568 men (mean age, 51.4 years). The most common preoperative diagnosis was chronic cholecystitis (n=458, 34.9%). The mean operative time and postoperative hospital stay were 51.83 minutes and 2.55 days, respectively. Overall complication rate was 4.0%. Conversion rate to conventional laparoscopic cholecystectomy and open cholecystectomy were 1.7% and 0.1%, respectively. The proportion of acute cholecystitis was highest in phase 2 (37.0%) and lowest in phase 3 (19.9%). The surgical outcomes were significantly improved in phase 3 period (C-mKSM). On multivariable analysis, acute cholecystitis was risk factor for major complication, conversion, and prolonged operative time.

**Conclusion:** In our experience, SILC can be a safe and feasible treatment for benign gallbladder disease and the use of the mKSM with a commercial 4-channel port was most effective. However, in case of acute cholecystitis, SILC should be selected carefully.

#### PB04-13

### THE SAFETY AND FEASIBILITY OF SINGLE INCISION LAPAROSCOPIC CHOLECYSTECTOMY FOR ACUTE CHOLECYSTITIS: COMPARISON WITH CONVENTIONAL LAPAROSCOPIC CHOLECYSTECTOMY

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**Introduction:** Single incision laparoscopic cholecystectomy (SILC) is a considerable option in benign gallbladder surgery. However, the safety and feasibility of SILC in acute cholecystitis has not been confirmed. We report our surgical outcomes of SILC in acute cholecystitis compared with conventional laparoscopic cholecystectomy (CLC).

**Methods:** 386 patients who underwent SILC and 592 patients who underwent CLC for acute cholecystitis between April 2010 and December 2018 in single institution were retrospectively reviewed the preoperative characteristics and surgical outcomes.

**Results:** The patients in CLC group were older (55.1 vs 65.0 years, p< 0.001), higher ASA score (12.7 vs 35.5% in over III, p< 0.001), and higher incidence of preoperative percutaneous transhepatic gallbladder drainage (PTGBD) than the patients in SILC group. According to Tokyo guideline 18, the patients above grade 2 were more common in the CLC group (15.8 VS 24.3%, p=0.001). There is no statistical significance in operative

time, Blood loss, intra-operative transfusion, adjacent organ injury, open conversion, postoperative complication, incisional hernia, and mortality. The length of postoperative hospital stay was significantly shorter in SILC group. On multivariable analysis, grade II or III acute cholecystitis according to Tokyo guideline 18 (TG18), was risk factor for major complication and prolonged operative time.

**Conclusion:** In our experience, SILC can be a safe and feasible treatment for acute cholecystitis, if appropriate experience and when expertise is available. However, in case of grade II or III acute cholecystitis according to TG18, SILC should be selected carefully.

#### PB04-14

### CHOLECYSTECTOMY OUTCOMES IN PANCREAS-KIDNEY TRANSPLANT RECIPIENTS COMPARED TO KIDNEY OR PANCREAS TRANSPLANT ALONE RECIPIENTS

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**Introduction:** Previous studies have demonstrated that kidney transplant recipients have greater risk for all cause morbidity and mortality when undergoing cholecystectomy. However, cholecystectomy following pancreas transplantation has not been previously studied.

**Methods:** In a total 3738229 cholecystectomies performed in the United States between 2005-2014. There were 600 cholecystectomies performed in pancreas transplant recipients. There were 57.1 White patients and 36.2% male patients. There were 58.5% male pancreas transplant patients and 72.2% White pancreas transplant patients. 75% of pancreas transplant patients received their cholecystectomy at a transplant center.

**Results:** Pancreas transplant alone was associated with a significantly higher odds ratio for developing any complication (3.158,  $p < 0.001$ ). Simultaneous kidney pancreas transplant was not significantly different compared with the general population. ( $P = 0.787$ ). At transplant centers, odds ratio for complications for PTA was significantly higher than at non transplant centers (OR 1.748  $P = 0.025$ ).

**Discussion/Conclusion:** The results of this study differs from previously published materials. While the PTA results are consistent with previously published data showing that transplant recipients are at higher risk for morbidity and mortality when undergoing cholecystectomies, the SPK results showing no difference are unique. This may indicate that factors beyond obligate immunosuppression are causative and require further investigation. Higher rates of complications at transplant centers may be reflective of common practice patterns where patients with greater disease severity and complexity are transferred to specialized quaternary care transplant centers, rather than treated in the community setting.

#### PB04-15

### OUTCOMES OF COMMON HPB CASES IN RURAL AUSTRALIA: IDENTIFYING PREDICTORS OF TERTIARY CARE MANAGEMENT

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**Introduction:** Hepato-Pancreatico-Biliary (HPB) surgery remains an important sub-speciality of General Surgery due to the complexity and the multidisciplinary approach required for the management of these cases. The rural general surgeon is often in a position to either manage or transfer these often-complex cases. Resource availability and remote location pose significant obstacles to the timely and specialised treatment of these conditions. Our primary endpoint was to identify predictors of tertiary referral for common HPB emergencies presenting to a rural general surgery service.

**Methods:** After obtaining relevant ethics approvals, we conducted a review of common HPB cases in two main hospitals in central Victoria over a 2-year period. Both centres have an elective ERCP service.

**Results:** Age was not a predictor for requiring tertiary care whilst cholangitis was; with 60% of transfers due to this. 106 ERCPs were performed with 55% for emergency presentations. Patients requiring ICU care were transferred pre-operatively. Three patients had bile leaks post cholecystectomy. Overall, about 10% of the HPB cases presenting to these centres were transferred to tertiary facilities.

**Conclusion:** Regional centres are an integral part of the management of common HPB emergencies with most cases handled successfully locally; we however advocate the need for a regular on-call roster to manage cholangitis or the establishment of a transfer algorithm to improve the care delivered to this subset of patients.

#### PB04-18

### ON-TABLE HEPATO-PANCREATICO-BILIARY SURGICAL CONSULTS FOR DIFFICULT CHOLECYSTECTOMIES HAVE INFERIOR OUTCOMES

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**Introduction:** Laparoscopic cholecystectomy is a general surgical operation. "Call for help" is an acceptable standard for intra-operative difficulties. Locally, "call for help" is attended by hepato-pancreatico-biliary (HPB) specialists. We audit referral patterns and outcomes for on-table referrals for difficult cholecystectomy.

**Methods:** During the seven-year period from 2011-2017, 87 on-table HPB consults were attended. Patients who required HPB referral for oncologic clearance or multi-visceral resection were excluded. 50 patients with on-table cholecystectomy consults were included. Patient

demographics, reason for referral, perioperative and post-operative outcomes were studied.

**Results:** There is a male predominance (n=33/50, 66.0%) with median age of 62.5 years. No patient had previous HPB pathology. Majority of the surgery were started laparoscopic (n=48/50, 96.0%). Median operating time and blood loss was 165 (IQR 124 - 209) minutes and 100 (IQR 50 - 200) mL respectively. 17 (34.0%) were emergency cholecystectomies. Gallbladder median thickness was 5 (IQR 4 - 7) mm. Majority of the consults were reactive (n=49, 98.0%). The reason for consult was: anatomical difficulties (n=24/49, 49.0%), pathological difficulties (n=22/49, 44.9%) including gangrenous/emphysematous cholecystitis or empyema, and surgical complications (n=14/49, 28.6%) including bile duct injury (n=3, 6.0%), cystic duct injury (n=3, 6.0%) and cystic artery injury (n=1, 2.0%). Open conversion was 31.3% (n=15). Median length of stay was 5 (IQR 3 - 7) days. There was no 30-day or 90-day mortality.

**Conclusion:** Outcomes of cholecystectomy patients who needed on-table consult are inferior to expectations. It remains to be shown if a proactive approach to engage HPB specialists may improve outcomes.

#### PB04-19

### INCOMPLETE SURGICAL RESECTION CAN CAUSE SEVERE COMPLICATIONS AFTER EXTENSIVE HEPATOBILIARY RESECTION FOR HEPATOBILIARY DISEASE

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**Introduction:** The aim of this study was to identify the predictors for fatal complication (FC) and 3 severe complications: biloma (BL); infectious complication (IC); hepatic insufficiency (HI) after extensive hepatobiliary resection for hepatobiliary disease.

**Methods:** One hundred forty patients who underwent major hepatectomy with biliary reconstruction between January 1999 and December 2019 were identified. FC was defined as  $\geq$  Clavien-Dindo classification (C-D) grade IVa. BL was defined as  $\geq$  C-D grade IIIa. IC included all surgical site infections. HI was defined as total bilirubin  $>7.0$  mg/dL postoperatively or within 50-50 criteria (total bilirubin of  $>3.0$  mg/dL and prothrombin time  $< 50\%$  on postoperative day 5).

**Results:** FC, BL, IC, and HI occurred in 8 (5.7%), 23 (21.1%), 47 (43.1%), and 22 (20.2%) patients, respectively. In univariate analysis, the significant predictors for FC were right side hepatectomy (p=0.041) and cancer-positive margin (p=0.034) which was also independently associated with FC (odds ratio (OR)=4.44, p=0.049) in multivariate analysis. Cancer-positive margin was the only risk factor for BL (p=0.005) and IC (p=0.011) in univariate analysis. Regarding HI, male (p=0.034), cancer-positive margin (p=0.027), right side hepatectomy (p=0.007), preoperative portal vein embolization (p=0.044), blood loss  $>2000$  mL (p=0.033), and blood transfusion (p=0.013) were found to be risk factors in univariate analysis, while blood transfusion (OR=4.46,

p=0.035) was the only independent factor and cancer-positive margin was close to significance (OR=2.55, p=0.076) in multivariate analysis.

**Conclusions:** Incomplete surgical resection in addition to excessive surgical stress caused by extensive hepatobiliary resection can trigger hypercytokinemia and worsen post-operative condition.

#### PB04-20

### MANAGEMENT OF IATROGENIC BILE DUCT INJURIES FOLLOWING CHOLECYSTECTOMY IN CIPTO MANGUNKUSUMO GENERAL HOSPITAL INDONESIA

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**Introduction:** Iatrogenic bile duct injuries (IBDI) were most common caused by cholecystectomy during laparoscopy than laparotomy. The aim of this study was to evaluate the management of IBDI following cholecystectomy procedure in Cipto Mangunkusumo General Hospital, Jakarta as a tertiary hospital.

**Methods:** The cross-sectional design was used. We collected patient who undergo IBDI repair since January 2015 until December 2019. We retrospectively analyzed the repair technique, and follow up post-operative.

**Results:** There were 13 patients, who undergo IBDI repair. The median age of the patient was 48 years with composition were 6 male and 7 female. There was 3 patients who proceeded laparoscopy cholecystectomy. The whole patients referred from secondary hospital. We performed hepaticojejunostomy Roux-en-Y to the 11 patients who experiences IBDI and performed drainage in patients due to bile leakage. There were 6 patients which classified as Strasberg E3 type and the rest of it were classified as E1 type. No mortalities were detected post-operatively. Median length of stay of the patient was 27 days and no jaundice recur reported after long-term follow up.

**Conclusion:** Hepaticojejunostomy Roux-en-Y procedure already becomes the first choice in the management of IBDI in our hospital. The prognosis after the procedure tented to be good.

**Key words:** Iatrogenic bile duct injury, Cholecystectomy

#### PB04-21

### CLINICAL SIGNIFICANCE OF INTRAOPERATIVE BILE CULTURE IN SURGERY INCLUDING BILE DUCT RESECTION

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It is widely accepted that intraoperative bacterial infection may potentially result in a worse postoperative outcomes. The purpose of this study is to analyze the microbiology of intraoperative bile smear culture test and the correlation

between the results of culture and postoperative outcomes in bile duct resection operation.

**Methods:** The data was prospectively collected from 235 patients who underwent bile duct resection at Samsung Medical Center for one year from October 2018 to September 2019. The diseases included in the data are periampullary cancer, gallbladder cancer, hilar cholangiocarcinoma, and intrahepatic cholangiocarcinoma. Intraoperative bile smear test was performed in operation, and the included operation was pancreaticoduodenectomy and liver resection surgery with bile duct resection. Specimens were obtained from culture swab of bile drained during bile duct resection.

**Results:** Of the 235 patients, microorganism was isolated in 141 patients (60%). The predominant microorganisms grown from the intraoperative bile cultures were *Enterococcus faecalis* (38 cultures, 27.0%), *Enterococcus faecium* (32 cultures, 22.7%), *Klebsiella pneumoniae* and *Enterobacter cloacae* (28 cultures, 19.9%). In postoperative complication, the positive results of intraoperative bile cultures was related with Clavien-Dindo Classification  $\geq$  III (OR3.117, 95%CI:1.498-6.485,  $p=0.002$ ). Also, it was a risk factors for occurrence of surgical site infection (OR3.266, 95%CI:1.237-8.621,  $p=0.013$ ) and intra-abdominal abscess (OR1.145, 95%CI:1.057-1.240,  $p=0.003$ ). In addition, the incidence of postoperative pancreatic fistula was increased in patients with microorganisms grown in bile (OR1.974, 95%CI:1.098-3.549,  $p=0.022$ ).

**Conclusions:** Smear positivity of intraoperative bile fluid is associated with occurrence of major complication. It was risk factor for surgical site infection and intra-abdominal abscess.

#### PB04-22

### ADVERSE EFFECT OF SARCOPENIC OBESITY ON POSTOPERATIVE COMPLICATIONS AFTER MAJOR HEPATECTOMY IN PATIENTS WITH HILAR CHOLANGIOCARCINOMA

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Recently, it is well known that sarcopenia is one of the risk factors on post-hepatectomy outcomes in patients with hepatocellular carcinoma. However, there were seldom reports for effect of sarcopenia or sarcopenic obesity (SO) on postoperative outcomes in patients with perihilar cholangiocarcinoma (CCC). The purpose of this study is to evaluate the effect of preoperative sarcopenia or SO on postoperative outcomes in patients with hilar CCC following major hepatectomy.

Preoperative sarcopenia and SO was assessed in 328 patients undergoing hepatectomy for hilar CCC at three institution between 2006 and 2016, retrospectively. The sarcopenia was calculated from cross-sectional visceral fat and muscle area on preoperative CT imaging (muscle area/height<sup>2</sup> = skeletal muscle index, SMI). SO was defined by visceral fat area/SMI.

Preoperative sarcopenia and SO was present in 97 (29.6%) and 98 (29.9%) of the patients. Preoperative sarcopenia itself was not associated with postoperative outcomes. However, the rate of major complication in patients with SO was higher than in those without SO (54.1 vs. 37.0%,  $p=0.004$ ). Also, postoperative hospital stay was prolonged in patients with SO (18.5 vs. 16.5 days,  $p=0.038$ ). After multivariable analysis, male sex (OR1.937, 95%CI:1.182-3.174,  $p=0.009$ ) and SO (OR1.866, 95%CI:1.148-3.034,  $p=0.012$ ) were independent risk factors for occurrence of major complication. There was no statistically significant in overall survival with sarcopenia or SO.

SO was an independent risk factor of major complication after hepatectomy in hilar CCC. As a result, careful postoperative management would be needed after major hepatectomy in patients with hilar CCC in case of SO.

#### PB04-23

### SURGICAL MANAGEMENT OF SECTORAL BILE DUCT INJURY AFTER CHOLECYSTECTOMY - A CASE SERIES

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**Introduction:** Injuries to segmental or sectoral bile ducts are encountered less commonly than main bile duct injuries and present a unique diagnostic and therapeutic challenge.

**Methods:** This retrospective study was conducted and data of patients who underwent surgery for sectoral bile duct injury were retrieved from January 2014 to December 2019.

**Results:** Four patients were analyzed. All four were females with mean age of 36.5 years. Two of the four patients had undergone an open cholecystectomy, whereas the remaining two patients had undergone a laparoscopic cholecystectomy. The clinical presentation was external biliary fistula in two and another two patients presented with Pain and fever. Two patients without biliary fistula had late presentation at 2 year and 6 year respectively after index surgery. Two patients had undergone endoscopic retrograde cholangiography (ERCP), the result of ERCP had been interpreted as normal with no leak in one patient, and cystic stump leak in one patient. All patient had undergone magnetic resonance cholangiopancreatography (MRCP). Two of the four patient had right posterior sectoral duct injury and one patient had right anterior sectoral duct injury, one patient had stricture involving right hepatic duct leading to disconnection from common hepatic duct. All patients underwent Roux- en -Y cholangiojejunostomy. At mean follow up of 27 months (range 4 to 68 months) all patients are asymptomatic.

**Conclusion:** Segmental/sectoral bile duct injury should always be suspected and looked for if a biliary leak following cholecystectomy persists. Surgical treatment for

this type of lesions, generally results in a favorable outcome.

#### PB04-24

### OPTIMAL TIME INTERVAL FOR REVISION SURGERY IN INCIDENTAL GALLBLADDER CANCER (IGBC)

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**Introduction:** Management of iGBC involves Revision surgery either upfront or after neoadjuvant treatment. There is no evidence in literature on the impact of time interval between index surgery and revision surgery on survival.

**Material and method:** Retrospective analysis of the prospectively maintained database of all operated patients of iGBC at our centre from 2009 till 2019 was performed. Total number of iGBC operated were 359 of which 275 patients underwent upfront revision surgery and were analysed to study the impact of time interval on the final outcome.

**Results:** 74.9% patients were females with mean age being 50.8yrs. Stages distribution of the initial cholecystectomy specimen included 16.9% T1, 75.2% T2 & 6.9% T3 cancers, which had statistically significant association with the 3yr OS & DFS. Median time to revision surgery was 10.4 weeks. Cox Hazard Regression Model was used to identify the association between OS and the time interval between index and revision surgery, which was not found to be statistically significant with HR 0.99(95%CI,0.96 - 1.04) (p=0.896). Patients with residual disease in the liver wedge &/or the periportal nodes in the post-operative specimen had inferior OS & DFS (p< 0.0001).

**Conclusion:** Time interval to Revision Surgery for iGBC doesn't impact the survival outcomes especially when patients do not have any residual disease in the postoperative specimen, possibly reflection of the good disease biology. It may be prudent to give neoadjuvant treatment to patients of iGBC who have residual disease at presentation.

#### Overall Survival Statistics

Number of iGBC patients	Median Follow up (Months)	3yr OS (%)	3yr DFS (%)
Operated upfront (275)	29.4	69.7	58.2
After Neoadjuvant treatment(84)	24	66.5	47.2

#### PB04-25

### MANAGEMENT OF TYPE E BILE DUCT INJURIES OVER A 10 YEAR PERIOD AT A HPB REFERRAL UNIT

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**Introduction:** Common Bile Duct Transection is an unfortunate rare complication of Laparoscopic Cholecystectomy. We reviewed management of Common Bile Duct transections (Type E injuries) during Laparoscopic

Cholecystectomy over 10 year period at our Hospital, which is a HepatoPancreaticoBiliary referral centre for the area.

**Methods:** Retrospective review of Bankstown Hospital Medical records from 2010 to 2019 was performed to identify any patients who had operative management of bile leak post cholecystectomy.

**Results:** After extensive search, only 5 Type E Common Bile Duct Injuries were found in our database from January 2010 to December 2019. Other bile leaks (Types A,B,C,D), from peripheral ducts or Cystic Duct stump leaks or sub-total cholecystectomy leaks were excluded from the analysis. Of the 5 cases, only 1 primary cholecystectomy was performed at Bankstown Hospital; the other 4 were referred from other hospitals. 4 were recognised intraoperatively as either CBD injuries or difficult anatomy and advice sought. 1 was recognised 24 hrs later due to bile leak. 3 were E2 and 2 were E1 according to Strasberg classification. They were all managed with Roux-en-Y hepatojejunostomy with Jejunal access limb using Infant Feeding catheter for cholangiography/stenting. Strictures ensued in 4 of the 5, requiring ERCP or Percutaneous Drainage and Dilatation including 1 patient requiring Redo-Hepatojejunostomy.

**Conclusions:** Hepatojejunostomy for Type E CBD injuries should be managed in a tertiary referral centre and advice sought early. Stricturing and proximal dilatation are long-term sequelae requiring further intervention.

#### PB04-27

### LONG AND SHORT TERM OUTCOMES OF BILIARY SURGERY FOR PORTAL BILIOPATHY AT A TERTIARY CARE CENTRE IN INDIA

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**Background:** Portal biliopathy (PB) with extrahepatic portal venous obstruction (EHPVO) is usually managed with decompressive shunt surgery and endoscopic drainage. Bilioenteric drainage is rarely indicated (persistent symptoms/shunt not feasible). We report our experience of biliary surgery for PB over 30 years.

**Methods:** Prospectively collected data for PB patients was analysed for clinical, surgical, and long-term followup information. Surgical, postoperative and long-term outcome of patients who underwent bilioenteric drainage was analysed.

**Results:** Thirty-four patients (M:F::1.2:1; mean age 29.2 years) with symptomatic PB who required biliary surgery were included. Jaundice was the initial presentation in 11 patients. 47% of patients had a prior shunt surgery, while 53% underwent direct biliary surgery. The most common bilioenteric procedure done was a side-to-side Roux-en-Y hepaticojejunostomy (25 patients) followed by choledochoduodenostomy (n=3) and CBD exploration and stone clearance (n=1). The planned procedure was executed successfully in 29 (85%) patients. In 5 patients the procedure was abandoned due to intraoperative bleeding and haemodynamic instability. Mean blood loss was 1200 ml (range 100-4000 ml) and the mean number of blood transfusions was 1.25 (range 0-5). Postoperative morbidity was 29% (wound infection, bile leak and

cholangitis). One patient developed severe cholangitis and succumbed to MODS. Mean postoperative stay was 12 days. Over a mean follow-up of 62.2 months, 32 (94%) patients were asymptomatic. 2 patients developed anastomotic strictures and were managed by percutaneous dilatation.

**Conclusion:** Bilioenteric bypass in patients with EHPVO and PB is feasible, with low mortality and good long-term control of cholangitis in most patients.

#### PB04-28

### ANALYSIS OF PREOPERATIVE ULTRASONOGRAPHY TO PREDICT INTRAOPERATIVE FINDINGS DURING LAPAROSCOPIC CHOLECYSTECTOMY OF CHOLECYSTOLITHIASIS

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**Introduction:** Management of cholecystolithiasis and its complications has evolved dramatically and outcomes from surgery is a major challenge and defining surgical findings may help set the benchmark. Abdominal ultrasonography often precedes this operation and can prove diagnosis, as well as helps in showing possible complications during the perioperative period.

**Methods:** Patients aged 18 years and over were included in the study. Data from 2017 until now including demographic, clinical data, comorbidity, laboratory, radiological and findings during intraoperative and surgery technique selection were collected retrospectively and prospectively until now with diagnose cholecystolithiasis.

**Results:** Preoperative USG findings such as gall bladder wall thickness and size, impacted and size of gall stones, presence of pericholecystic fluid collection were significantly associated with difficult laparoscopic cholecystectomy.

**Conclusion:** This study show that analysis of preoperative ultrasonography helping to predict intraoperative laparoscopic cholecystectomy helping to figure out the successful of the operation and outcomes in patients.

#### PB05 - Biliary: Technical Surgery

##### PB05-01

### REDO SURGERY IN RECURRENT BILIARY CYSTADENOCARCINOMA AT COMMON BILE DUCT: A CASE REPORT AND LITERATURE REVIEW

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Biliary cystadenocarcinoma is a very rare cystic tumor that arises in the liver or, less frequently, in the extra hepatic biliary system. It has been shown to arise in congenital liver

cysts, bile ducts, biliary cystadenoma. There are few literature on recurrence of biliary cystadenocarcinoma at common bile duct after a complete resection by major hepatectomy previously. Therefore we report a case of recurrent biliary cystadenocarcinoma in a 65-year-old woman treated by re-surgery after four years since the first operation left hepatectomy followed by six course of chemotherapy.

Previously in 2014, we performed a left hepatectomy by glissonian approach for left portal pedicle. Patient discharged at POD#8 without complication. After the 4th year of follow-up, tumor recurred aggressively CA 19-9 was 347U/ml. Tumor was at whole proximal CBD and dilation of anterior and posterior bile ducts by CT. Distal CBD was free. The MRCP showed a solid mass in the CBD portion with partial obstruction of CBD, and takes only proximal CBD, T.Bil level was 35. We performed a resection of CBD and hepatojejunostomy. The surgery, post-operative course was uneventful. Surgical specimen shows yellow-brownish multilocular cystic lesions with mucinous fluid contents of 6x3cm. Histology shows a cystic neoplasm forming papillary projections, covered by an atypical mucin-producing glandular epithelium. The tumor was determined as well differentiated biliary cystadenocarcinoma.

We report here a rare case of re-surgery on recurrent biliary cystadenocarcinoma in extra hepatic biliary tract. Since the naturally low malignant cystadenocarcinomas are less invasive on surrounding vessels and tissues during re-surgery.

#### PB05-04

### COMPARISON OF CURATIVE EFFECT BETWEEN NASOBILIARY DRAINAGE AND BILIARY STENTING IN MALIGNANT BILIARY OBSTRUCTION: A SYSTEMATIC REVIEW AND META-ANALYSIS

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**Background:** To compare the efficacy of endoscopic nasobiliary drainage (ENBD) and endoscopic biliary stenting (EBS) in preoperative biliary drainage (PBD).

**Methods:** ENBD and EBS related literature of patients with malignant biliary obstruction published before September 2019 were collected from PubMed, EMBASE, and Cochrane Library for comparison analysis. Revman 5.3 statistical software was used for analysis.

**Results:** Nine studies were used for our comparative study. A total of 1435 patients were included, which consisted of 813 in the ENBD group and 622 in the EBS group. Meta-analysis showed that patients with malignant biliary obstruction who received ENBD had reductions in the rates of preoperative cholangitis (RR = 0.44, 95% CI = 0.34-0.58, P < 0.00001), preoperative pancreatitis (RR = 0.69, 95% CI = 0.50-0.95, P = 0.02), stent dysfunction

(RR = 0.58, 95% CI = 0.43-0.80, P = 0.0008), morbidity (RR = 0.77, 95% CI = 0.64-0.93, P = 0.007) and post-operative pancreatic fistula (RR = 0.65, 95% CI = 0.45-0.92, P = 0.02) compared with patients who received EBS. **Conclusions:** The rates of preoperative cholangitis, preoperative pancreatitis, post-operative pancreatic fistula, stent dysfunction, and morbidity of ENBD patients were lower than those of EBS patients. In clinical practice, the physical condition of each patient and their tolerance should be fully considered. ENBD should be given priority. EBS should be replaced if stent dysfunction or intolerance occurs.

#### PB05-05

### **BALLOON-ASSISTED STONE EXTRACTION (BASE): AN INNOVATIVE METHOD FOR LITHOTRIPSY DURING LAPAROSCOPIC CBD EXPLORATION**

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**Background:** Balloon-assisted stone extraction (BASE) can be applied to remove the common bile duct (CBD) stones during laparoscopic CBD exploration (LCBDE).

**Aim:** This study aimed to analyze the efficacy of BASE.

**Methods:** A retrospective analysis of patients with CBD stone who underwent LCBDE using BASE at our center from 2001 to 2017, was conducted. The outcomes of BASE and potential factor for failure of this technique were also evaluated.

**Results:** A total of 163 patients underwent LCBDE using BASE for CBD stone were enrolled. Success rate of BASE was 88.3% (144/163) and 19 (11.7%) patients with failed BASE underwent Basket for lithotripsy additionally. The reason for aborting BASE were stone impaction (n=6), small stone (n=4), migration into IHD (n=3), and others (n=6). The overall success rate of stone clearance was 97.5% (159/163). The mean CBD diameter was 15.8 mm (range 7-34 mm), and the largest stone size was 13.8 mm (range 3-36 mm). 22 patients had undergone gastrectomy prior to LCBDE. The overall complication rate was 4.9% (8/163), including bile leakage in 2 patients (1.2%), bleeding in 2 patients (1.2%) and pancreatitis in 4 patients (2.4%). There was no procedure related complication.

**Conclusions:** BASE for CBD stone is safe and effective techniques for the treatment of CBD stones.

#### PB05-07

### **CHOLEDOCODUODENOSTOMY: TECHNIQUE OF LATERAL SIDE TO SIDE ANASTOMOSIS**

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**Introduction:** Development of new technique in the anastomosis between first part of duodenum and distal end of common bile duct. Efficacy established in the study.

**Materials and method:** A prospective study, period since 2003 till today. About 494 cases operated by this technique.

Done in the cases where obstructive jaundice developed in the distal end of common bile duct by stones, benign strictures, malignant lesion. Stones of common bile duct removed by endoscopic papillotomy and dormia basket. Some cases procedure failed to clear the stones from common bile duct, because of lithogenic bile repeated stones formed causing obstruction, after papillotomy some cases further development of stricture, in old and debilitated patient with malignant lesion at distal CBD where major surgical intervention harmful to life. Different investigation like liver function test, cancer marker, Radiological investigations ultrasonography, CT scan, MRCP performed for the diagnosis.

**Technique of anastomosis:** This ensure intraoperatively a hermetic "bile-proof" anastomosis 2-cm-longitudinal incision made in supraduodenal part of common bile duct mark as lower end B1, upper end B2 and an adjacent vertical incision made in first part of the duodenum mark D1 for upper end and D2 for lower end. First sutures placed between B1 and D1 on right side, second suture on left side of both incision. Used 3-0 vicryl, continuous stitches. Start below to up upto B2 where D2 meet at same point. Right wall and left wall anastomosis completed. The patient recovered uneventfully, had no complaints of abdominal pain fever.

**Conclusions:** Procedure technically simple and safe, results no tension of anastomosis. Not mobilize duodenum.

#### PB05-08

### **QUINCKE'S TRIAD POST-PERCUTANEOUS TRANSHEPATIC BILIARY DRAINAGE INSERTION: A CASE OF DELAYED HAEMOBILIA**

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**Introduction:** Percutaneous transhepatic biliary drainage (PTBD) is a common procedure done in hepatobiliary centre for biliary obstruction or leak. Complications of PTBD range from minor complication such as access port discomfort to a major one which is death<sup>1</sup>. Bleeding post PTBD is not uncommon. This a case of upper gastrointestinal bleeding of a patient with history of PTBD insertion who presented to us more than one month post procedure.

**Case report:** A 58-years-old man presented with UGIT bleed 1 month prior to PTBD insertion, however OGDS and colonoscopy was normal. He had a history of subtotal gastrectomy with roux-en-Y reconstruction in 2010 for pyloric adenocarcinoma. PTBD was inserted because he presented with cholangitis secondary to distal common bile duct stricture during previous admission.

Due to current problem, Computed tomography (CT) angiography was performed, however no evidence of acute arterial haemorrhage either from the biliary tree or from the bowel.

Subsequently hepatic artery angiogram was done as he has another episode of haematemesis. In this study, there was active contrast extravasation into biliary system in keeping with arterio-biliary fistula. The bleeding was successfully controlled after superselective embolization was performed. At the same time, balloon plasty of CBD stricture was performed and Fogarty catheter was used to dislodge blood clots in CBD.

**Conclusion:** Haemobilia is a potentially fatal complication of PTBD and should be considered as one of the cause of gastrointestinal bleeding in patients with unidentified source. Interventional radiology provides effective and save method for the treatment of arteribiliary fistula.

PB05-09

### SAFETY OF BARBED SUTURE MATERIAL FOR WOUND CLOSURE IN SINGLE INCISIONAL CHOLECYSTECTOMY

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Single incisional cholecystectomy is surgical methods that provide comparable results to standard laparoscopic cholecystectomy (LC). However, single incisional cholecystectomy has been accused for post-operative incisional hernia. The incidence of incisional hernia after single incisional cholecystectomy is reported about 2.4% in short-term follow-up studies and up to 10.9% in long-term follow-up. One of incisional hernia's risk factor is surgical technique failure during wound closure.

This study evaluated the incidence of patients developing incisional hernia after single incisional cholecystectomy, and we hope to suggest a solution in overcoming incisional hernia arising out surgical technique failure by using barbed suture material during wound closure.

Total number of 984 patients underwent single incisional cholecystectomy between March 2014 and December 2019. During this period, there were 689 patients who underwent wound closure with non-barbed suture material and 295 patients with barbed suture material. Both Patient groups were comparable in age, gender, BMI and operation time. 2 patients developed incisional hernia in non-barbed suture group and none in the barbed suture group. The incidence of incisional hernia was higher in the non-barbed suture group, but statistically insignificant. (p=1.00)

Our large volume study showed lower incidence of incisional hernia to comparing previous studies. Also, there was no incisional hernia patient in barbed suture group, although statistically insignificant, which means possibility of overcoming the surgical technique failure using barbed suture material. We hope to share our experience on safety and advantage of using barbed suture in wound closure leading to a decrease in the incidence of incisional hernia.

PB05-10

### SINGLE-INCISION LAPAROSCOPIC CHOLECYSTECTOMY: A NEW CLASSIFICATION FOR SHAPE OF THE NAVEL AND MODIFICATION OF THE METHOD FOR INCISIONS IN THE UMBILICAL REGION

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Single-incision laparoscopic cholecystectomy (SIL-C) is a surgical procedure that emphasizes esthetic outcomes. The method used for making the incision in the umbilical region, as the sole wound site, is of the utmost importance, not only because it determines the esthetic outcome, which is a merit of SIL-C, but also because it greatly influences the operability of the forceps. In SIL-C, making a large incision is important to reduce restrictions on procedures resulting from interference between forceps. However, because vertical incisions involve large incisions, the incision line may deviate from the navel and result in poor esthetic outcomes. Therefore, in the pursuit of both favorable esthetic outcomes and safety, we developed a new classification system for the shape of the umbilical region, and have been performing incisions according to these classifications. Specifically, the shape of the navel was classified into the following six types: vertical; horizontal; T-shaped; inverted T-shaped; round with shallow depression; and protruding. In addition, we are performing the following types of incisions according to the shape of the umbilical region, to prevent deviation of the incision line from the umbilical region: vertical; horizontal; T-shaped; inverted T-shaped; and S-shaped. By performing incisions that match the shape of the umbilical region in this manner, a large incision can be made without affecting the esthetic outcomes, thereby promoting the operability of forceps and ensuring both favorable esthetic outcomes and safety.

PB05-11

### COMPARISON OF CRUSH CLAMP METHOD AND ULTRASOUND DISSECTION IN LIVER TRANSECTION OUTCOMES

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**Background:** Preoperative hemorrhage and postoperative bile leakage are important complications of hepatectomy. various methods to reduce intraoperative bleeding during liver transection have been reported. We designed a randomized clinical trial to compare crush clamp method and ultrasound dissection in liver transection.

**Method:** Twenty patient experienced hepatectomy with the crush clamp method.

The ultrasonic dissection group consisted of twenty patient.

The surgical outcomes including:

Operation duration,bleeding ,p.c request,bile leakage,-hospital stay duration and hepatic failure are evaluated and compared.

**Results:** Mean blood loss was 247 cc in crush clamp group and 232 cc in ultrasonic dissection group.

Blood loss in ultrasonic method was lower but the difference did not reach significant level.

Duration of surgery was almost identical ,but duration of transection in crush clamp group was shorter than ultrasonic dissection group.

That mean the crush clamp method is faster.

Acidosis and hepatic failure were rare and difference was not significant.

There were not cases with infection and bile leakage.

**Conclusion:** Post operative complications did not differ in two groups but duration of transection in crush clamp was shorter than ultrasonic dissection method and blood loss was almost identical because ultrasonic dissection is an equipment dependent procedure and more expensive therefore we tend to perform liver transection with crush clamp method.

#### PB05-12

### ROBOTIC SINGLE SITE PLUS ONE PORT: CHOLEDOCHAL CYST EXCISION

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**Introduction:** Choledochal cysts in adults are rare and the treatment requires complete excision of the cyst with bilio-enteric reconstruction. Here, we present three cases of robotic single site plus one port choledochal cyst excision with roux-en-Y hepaticojejunostomy.

**Methods:** Choledochal cyst excision was performed using the Da Vinci single-site surgical platform (DVSSP) with one additional port. Additional robotic 12mm-port was placed on right anterior axillary line, along the level of DVSSP. Choledochal cyst was meticulously separated and dissected from the level of hepatic hilum to intrapancreatic common bile duct and distal part of the cyst was ligated with hemo-loc clips then divided. After transecting proximal part of the cyst at the level of hilum, roux-en-Y hepaticojejunostomy was performed intracorporeally in a retrocolic manner. Drain was inserted at the additional port site and specimen was delivered through umbilicus.

**Results:** The mean age of 3 patients was  $53 \pm 6$  years old. Two patients were female and diagnosed with type I choledochal cyst. One patient was a male diagnosed with type IVa choledochal cyst. Mean cyst size was  $6.2 \times 3.8$ cm. Mean total operation time was  $475 \pm 41$  minutes. Mean postoperative length of stay at the hospital was  $9 \pm 3$  days. One case of pancreatitis and one case of bile leakage occurred. Both cases were resolved with conservative care.

**Conclusion:** Robotic single site plus one port choledochal cyst excision seems feasible and safe with better anatomical visualization and increased dexterity for bilio-enteric reconstruction.

#### PB05-13

### HEPATOPANCREATODUODENECTOMY FOR BILIARY CANCER - ARE THE OUTCOMES ACCEPTABLE?-

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**Background:** Hepatopancreatoduodenectomy (HPD) is usually indicated for advanced biliary cancer. Operative resection is the only way to cure for the advanced biliary cancer patients. However HPD is infrequently performed widely because of high morbidity and mortality. The aim of this retrospective study was to clarify the impact of resected liver volume on outcomes of HPD.

**Methods:** Between January, 1999 to December, 2019, 302 biliary cancer patients underwent bile duct resection with

hepatectomy (HBD; n=108) or pancreatoduodenectomy (PD; n=160), or HPD (n=34). Liver resection was categorized right lobe resection (R; including left trisegmentectomy), left lobe resection (L), and minor liver resection (M; e.g. S4a55).

**Results:** Severe morbidity (Clavien grade 3B or over) and mortality of R-HPD, L-HPD, and M-HPD were 27%, 0%, 6% and 9%, 0%, 0% respectively. Those of R-HBD, L-HBD and M-HBD were 13%, 7%, 9% and 13%, 2%, 0% respectively. Those of PD was 7% and 0.6%. Pancreatic fistula (PF) rate (ISGPF grade B or C) of R-HPD, L-HPD, and M-HPD was 30%, 57%, 40% respectively, and that of PD was 31%.

**Conclusion:** HPD limited to left lobe or minor liver resection is safe and feasible operation. In our series, the mortality of HPD and HBD was similar, and it was mostly occurred after R. In contrast, PF rate seems to be not correlated to resected liver volume. Preserving the liver function is the top priority for R-HPD.

#### PB05-14

### TECHNICAL PITFALLS AND COMPLICATIONS AFTER VASCULAR RESECTION FOR ADVANCED HILAR CHOLANGIOCARCINOMA

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**Background:** Technical pitfalls and complications of vascular resection (VR) for treatment of hilar cholangiocarcinoma (HCh) play an important role in outcome but not completely described in the literature. The aim of this study was the analysis of technical aspects of VR that may cause serious complications in single hpb surgery department.

**Patients and methods:** Within five years (January 2015 to December 2019), 107 consecutive patients with HCh underwent radical surgery with curative intent in Moscow Clinical Scientific Center. Resection and reconstruction of the portal vein and hepatic artery was performed if necessary for a complete removal of the tumour. Different types of portal vein and hepatic artery reconstruction analyzed and complications assessed.

**Results:** We performed 14 arterials and 26 portal vein reconstruction. Cancer-free margins achieved in 80%. The perioperative morbidity and mortality rates of this cohort were 60.2% and 10.7%, respectively. Technical pitfalls includes: hepatoduodenal inflammation due to severe cholangitis, left hepatectomy, significant gap among arteries or veins. Management of cholangitis before liver resection, modifying technique of vascular reconstruction to prevent using inflamed vessels not mobilisation of remnant liver may decrease the risk of vascular complications.

**Conclusions:** Radical liver resection combined with vascular reconstruction provides acceptable morbidity and mortality for treatment of HC. Technical pitfalls of vascular resection should be taken into account as an important factor of surgical outcome.

PB05-15

### OUTCOME OF LAPAROSCOPIC CHOLECYSTECTOMY BY EXPOSING THE INNER LAYER OF THE SUBSEROSAL LAYER

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**Introduction:** Bile duct injury is the serious complication of laparoscopic cholecystectomy (LC). Therefore, the critical view of safety has been accepted as a safe method for gaining a sufficient view of Calot's triangle. However, it usually difficult to achieve a critical view of safety in presence of severe gallbladder inflammation due to a frozen Calot's triangle. Universal safe procedure of laparoscopic cholecystectomy by exposing the inner layer of the subserosal(SS) layer was introduced by G.Honda et al (2016). This approach was used for many cases with cholecystitis with severe inflamed gallbladders in our institution. The purpose of this study was to evaluated outcomes of LC that performed by exposing the inner layer of the serosal layer.

**Methods:** Demographic data and peri-operative data were recorded for both emergent and elective LCretrospectively. The procedure was done by dissecting the gallbladder along the SS-inner layer to achieve cystic duct. The outcome of procedures were recorded.

**Result:** Fifty patients who underwent laparoscopic cholecystectomy in which technique was used. In all cases, the procedure was complete without complications. The mean operating time was 62 minutes (range 30-110 minutes) and the mean of blood loss was 22.6 ml (range 2-100 ml).

**Discussion:** Applying this standardized procedure, we have safely performed LC in all cases without intraoperative cholangiography. But we considered that exposing the ss-inner layer without of gallbladder perforation more easily in case of acute cholecystitis because the ss-inner layer had become frozen by fibrotic change.

PB05-17

### CURATIVE HEPATECTOMY FOR TODANI TYPE IV-A BILIARY DILATATION(BD) IN ADULTS: REMOVAL OF CYSTIC DILATATION AND BILIARY STRICTURE

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**Introduction:** There is no universal surgical strategy for patients with Todani type IV-A BD. Traditionally, excision of the extrahepatic cyst with hepaticojejunostomy is the standard procedure, but long-term outcome is not satisfactory. This study aimed to analyze postoperative and long-term outcomes of a consecutive series of patients undergoing curative hepatectomy for Todani type IV-A BD.

**Patients and method:** All patients who underwent hepatectomy for Todani type IV-A BD in adults during 2007 to

2017 were retrospective analyzed at high-volume centers. Patients were divided into two groups, A: re-operation group who had previous surgery, B: operation group who received initial surgical treatment. Two principles were used in this study. One is radical but conservative hepatectomy and the other type of surgery was based on the anatomical level of diseased bile duct. Segmental BD was removed by anatomical hepatectomy.

**Results:** There were 117 patients enrolled, 66 in group A and 51 in group B. Hepatectomy was performed in 63 and 43 patients in group A and B, respectively. Local BD excision in hepatic hilum was performed in 3 and 8 patients (P = 0.084), while radical resection of cystic dilatation of intrahepatic bile ducts was achieved in 60 and 48 patients, respectively. Postoperative morbidity, but not mortality in group A, was significantly higher.

**Conclusion:** Based on the morphological feature and anatomical level of intrahepatic BD, the strategy of radical but conservative hepatectomy is safe and effective for the treatment of complex Todani type IV-A BD in adults.

PB05-18

### PANCREAS-SPARING PARTIAL DUODENECTOMY WITH ROUX-EN-Y PANCREATOBILIARY RECONSTRUCTION FOR IATROGENIC DUODENAL INJURY

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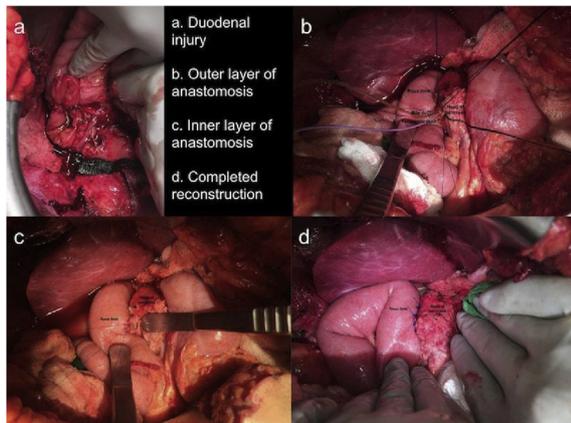
**Introduction:** Injury to the second portion of the duodenum and ampulla of Vater is a highly morbid complication. We report successful management of iatrogenic perforation with a pancreas-sparing partial duodenectomy and duct-to-mucosa pancreatobiliary reconstruction.

**Methods:** A healthy 40 year old woman underwent laparoscopic right nephrectomy for xanthogranulomatous pyelonephritis. The inflammatory mass abutted the duodenum and two large duodenotomies resulted from cautery injury. The anterior and medial walls were extensively disrupted. A cholecystectomy was performed and a wire was advanced through the cystic duct to identify the ampulla. We confirmed that the ampullary mucosa was not salvageable. The antrum was divided and duodenum carefully separated from the pancreas head. The pancreatic and bile ducts were divided sharply. Duodenum was stapled proximal to the mesenteric vessels. A retrocolic Roux limb was delivered. Pancreas head was invaginated with an outer layer of permanent 3-0 suture. The 1 mm ducts were united with suture and 3.5 French feeding tubes secured as stents. Duct-to-mucosa anastomosis was completed with absorbable 6-0 monofilament suture. A gastrojejunostomy was completed distally.

**Results:** The patient had no post-operative complications. Drains were removed on post-operative day 8 after drain amylase studies were normal. She was discharged on post operative day 11.

**Conclusions:** Pancreas-sparing partial duodenectomy with Roux-en-Y reconstruction is a viable option to treat severe proximal duodenal injury or perforation. As an alternative to total duodenectomy, it may preserve the duodenum's

roles in regulation of gastrointestinal hormone release and organization of gastric motor function.



Duodenal injury and reconstruction

**PB05-19  
SAFETY AND ECONOMICS OF  
CONTINUOUS AND INTERRUPTED  
SUTURE HEPATICOJEJUNOSTOMY -  
AN AUDIT OF 556 SURGERIES**

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**Background:** Hepaticojejunostomy (HJ), a standard method of bilioenteric anastomosis, is done with interrupted sutures by most surgeons. This study compares the safety and economics of continuous (CSHJ) and interrupted suture hepaticojejunostomy (ISHJ).

**Methods:** A retrospective analysis of all HJ between January 2014 and December 2018. Patients with type IV or higher biliary injuries, duct diameter < 8 mm and/or associated vascular injury were excluded. Patient demographics, pre-operative parameters including diagnosis, intra operative parameters including type of suture, number of suture, suturing time, and postoperative morbidity (Clavien Dindo) were recorded. Mc Donald's Grade A and B were considered as good outcome. Cost of suture type (PDS-3-0/5-0 mean cost-INR 686/length, vicryl 3-0, 4-0 mean cost- INR 486/ length), suture length, operation theatre time (INR 5000/hour) were considered for comparison of economics of both techniques. Statistical analysis in SPSS 22.0 software.

**Results:** 556 eligible patients were analysed. 468 patients underwent ISHJ and 88 patients underwent CSHJ. Figure 1 shows patient details. Monofilament sutures were preferred in continuous suturing. Demographic profile was comparable. ISHJ required significantly increased number of sutures, time and cost. Bile leak was significantly more in the ISHJ. 54 patients had bile leak (6 CSHJ and 48 ISHJ). One patient in each group had mortality due to septic shock. Four patients (3 ISHJ and 1 CSHJ) required PCD insertion and two patients require single time aspiration. Morbidity was comparable. Follow up Mc Donald's Grade B was significantly higher in ISHJ.

**Conclusion:** CSHJ is safe, economic and worthy of routine practice.

Parameters	CSHJ (n=88)	ISHJ (n=468)	p-value
<b>Pre operative parameters</b>			
Age in years (Mean ±SD)	48.7±16.4	46.2±14.61	0.13
BMI in kg/m2 (Mean ±SD)	21.7±5.05	21.4±3.06	0.34
Sex in % (male/ female)	46.6/53.4	40/60	0.14
<b>Benign Etiology (%)</b>	46(52.3)	254(54.3)	0.4
Cholelithiasis n(%)	20(22.7)	92(19.6)	0.29
Benign biliary stricture n(%)	21(23.8)	134(28.6)	0.22
Cholelithiasis n(%)	1(1.1)	10(2.1)	0.46
Mirizzi syndrome n(%)	2(2.2)	7(1.4)	0.43
Other benign conditions n(%)	1(1.1)	6(1.2)	0.69
<b>Malignant n(%)</b>	42(47.2)	214(45.7)	0.4
Periapillary carcinoma n(%)	26(29.5)	165(35.2)	0.18
Carcinoma head of pancreas n(%)	6(6.6)	12(2.5)	0.05
Carcinoma gall bladder n(%)	3(3.3)	7(1.4)	0.2
Distal cholangio carcinoma n(%)	4(4.4)	22(4.7)	0.6
Other malignant conditions n(%)	3(3.3)	13(2.7)	0.47
<b>Duct diameter (mm) (Median , range)</b>	17(9-90)	15(8-100)	0.46
<b>Intra operative parameters</b>			
Monofilament suture (%)	76	41	<0.05
Number of sutures (mean ±SD)	2.16±0.43	13.04±4.05	<0.001
Stoma size (Mean ±SD)	20.4±9.5	20.2±7.5	0.6
Duration of anastomosis (min.) (mean ±SD)	21.4±11.2	44.6±20.3	<0.001
Cost of anastomosis in INR (mean ±SD)	1291±215.8	7720±1933	<0.001
Duration of drain in days (Median , range)	6(1-28)	5(2-29)	0.001
Hospital stay in days (Median , range)	9(5-60)	10(2-65)	0.47
<b>Post operative parameters</b>			
Follow up in months (Median , range)	36(4-60)	24(4-60)	0.12
Bile leak (n,%)	6(7.3)	48(11.4)	0.04
Morbidity (n,%)	34(38.6)	209(42.7)	0.47
<b>Clavien Dindo Grade</b>			
0 (%)	61.3	62.8	0.07
1 (%)	15.9	18.8	0.2
2 (%)	2.3	2.6	0.62
3a (%)	11.4	6.4	0.17
3b (%)	4.5	4.7	0.07
4a (%)	0	0.2	0.06
5 (%)	3.4	2.6	0.42
<b>Mc Donald's Grading (Outcome)</b>			
A n(%)	79(89.7)	397(84.8)	0.14
B n(%)	1(1.1)	28(5.9)	0.04
C n(%)	0	8(1.7)	0.25
D n(%)	4(4.4)	21(4.5)	0.57

Patient Details

**PB05-20  
SAFE CHOLECYSTECTOMY USING AN  
INDOCYANINE GREEN(ICG)  
FLUORESCENCE CHOLANGIOGRAPHY  
DURING LAPAROSCOPIC  
CHOLECYSTECTOMY**

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**Introduction:** Bile duct injuries are the most dismal complication in cholecystectomy. The Critical View of Safety (CVS) has been shown to be a good way to obtain the secure anatomical identification. We try to get an early detection of imaginary dissection line (fig. 1.) for obtaining the CVS using an ICG fluorescence cholangiography during laparoscopic cholecystectomy

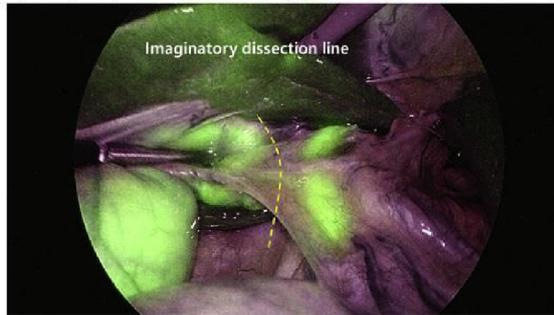
**Method:** Sixty six patients underwent laparoscopic cholecystectomy using ICG cholangiography. Thirty patient were grouped into two groups, with one group underwent needlescopic grasper assisted single incision laparoscopic cholecystectomy (nSLIC) (15 patients) and another group underwent Three port laparoscopic cholecystectomy (TPLC) (61 patients). The surgical outcome that was composed with early detection time and rate of imaginary dissection line, critical view of safety (CVS) time, major procedure time and total operation time, and the post-operative complication was made.

**Results:** Total operation time (skin to skin) of TPLC was shorter than nSLIC group (nSLIC: 67.9 ± 24.1 min, TPLC: 45.0 ± 22.8 min, p = 0.007). We can't get visualization of biliary tree in five patients who was treated with ERCP. Imaginary dissection line obtaining rate

showed fifty six patients (56/61) in two groups. And, confirmatory dissection line obtained all patients in two groups (56/61).

**Conclusions:** ICG fluorescence cholangiography during laparoscopic cholecystectomy may get an early imaginary and confirmatory dissection line during laparoscopic cholecystectomy.

Fig. 1. Imaginary dissection line in ICG cholangiography during laparoscopic cholecystectomy.



PB05-21

### LAPAROSCOPIC CHOLECYSTECTOMY IN PATIENTS WITH LEFT SIDED GALLBLADDER USING AN INDOCYANINE GREEN (ICG) FLUORESCENCE CHOLANGIOGRAPHY

K. -H. Kim

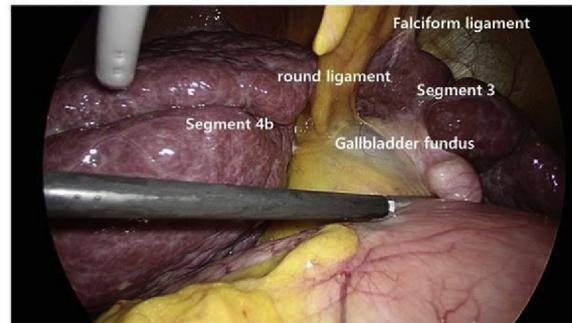
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**Introduction:** Left-sided gallbladder is a relatively rare anatomical variation that is frequently associated with a biliary system anomaly. In patients with LSGB, LC is associated with a higher incidence of bile duct injury (4.4%), necessitating the establishment of a safe surgical approach in these patients. Here, we describe a case of left-sided gallbladder with cirrhotic liver treated by using an ICG fluorescence cholangiography during laparoscopic cholecystectomy.

**Method & Results:** 62-year-old man with gallbladder adenomyoma was admitted to our hospital. Computed tomography demonstrated that the gallbladder was centrally dislocated and left-sided gallbladder with right-sided ligamentum teres. A laparoscopic cholecystectomy was performed. The round ligament was attached to the right side of the gallbladder, and the left-sided gallbladder was diagnosed by intraoperative findings (figure 1.). The patient was discharged 2 days after surgery without postoperative complications.

**Conclusions:** ICG fluorescence cholangiography should be used in cases of left-sided gallbladder during laparoscopic cholecystectomy. An assessment of the extra- and intra-hepatic biliary system is essential to avoid biliary injury in cases of left-sided gallbladder.

Fig. 1. Intraoperative findings. The gallbladder is attached to the liver at the left side of the round ligament



PB05-22

### T-TUBE IN MODERATION: T-TUBE DRAINAGE VERSUS PRIMARY CLOSURE AFTER OPEN COMMON BILE DUCT EXPLORATION FOR COMMON BILE DUCT STONE: A SINGLE INSTITUTION EXPERIENCE

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**Introduction:** To discuss and compare outcomes and complications of routine T-Tube placement versus primary closure in patients who underwent open common bile duct exploration for choledocholithiasis.

**Methods:** This is a randomized prospective analysis of 35 patients categorized as moderate to high risk for CBD stone who underwent open choledochotomy. Thirty (30) patients were included and were randomly divided into 2 groups: T-tube drainage (TD, n=20) and primary closure (PC, n=10). Morbidity was graded using the Clavien-Dindo (CD) classification.

**Results:** Patients in the TD group had less overall complications than patients in the PC group (20% vs 30%, respectively; p=0.083); however, the TD group had more severe (CD Grade III or higher) complications than the PC group (75% vs 0% respectively; p=0.052). Complications included two patients with bile leak for pulled t-tube, post-op biliary stricture and acute kidney injury which required dialysis. Most of the complications in the PC group (3/10, or 30%) were minor complications (CD 1 or 2). There was no mortality in both groups. All 30 patients were followed-up for 3-12 months, with a median follow-up time of 6 months.

**Conclusion:** There was no statistically significant difference between T-tube placement and primary closure in terms of morbidity and long-term outcomes. Primary closure of the choledochotomy after biliary exploration for common bile duct stones is a safe and feasible alternative to routine T-tube drainage in carefully selected cases.

PB05-23

### BALLOON DILATION AND TRIPLE CATHETER PLACEMENT TECHNIQUE FOR TREATMENT OF PROXIMAL BILIARY STENOSIS

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**Introduction:** Post-surgical bile duct lesions occurred in approximately 0.5% of cholecystectomies and are associated with high mortality. These lesions include leaks, stenosis, removal of part of the duct and arterial injury. Percutaneous and endoscopic approaches can definitely treat biliary lesions.

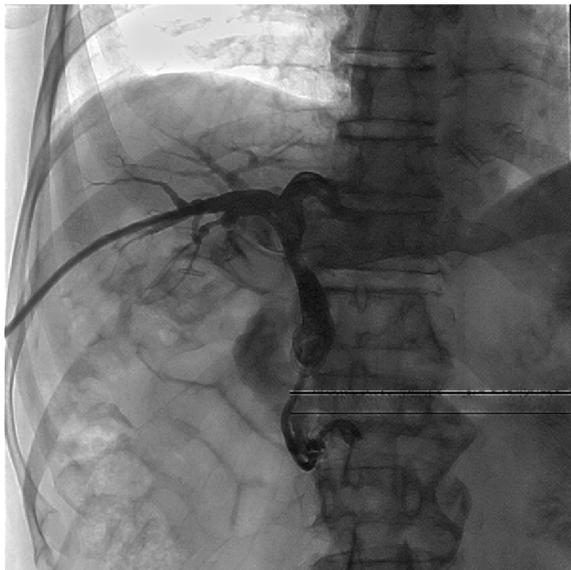
**Objective:** To present the experience of a clinical case where percutaneous interventional treatment of a bile duct stenosis with cholangioplasty and placement of tutors was performed in a single time.

**Methods:** 79-year-old male with a history of high blood pressure, left cerebrovascular accident, open cholecystectomy 20 years ago and bile duct stenosis.

tomography with contrast that showed proximal extrahepatic bile duct stenosis Bismuth II. An endoscopic cholangiopancreatography is performed that identifies the bile duct stenosis and an attempt is made to place a stent while passing a guide, but the catheter device cannot be placed through the diameter of the stenosis. Interventional radiology performs a percutaneous cholangiography identifying the stenosis and performs balloon expansion of the same and inserts a biliary silicone drain along with two 8 fr and 10 fr tutors handcrafted from multipurpose drainage catheters (Cook medical) in parallel at the level of stenosis (maximum diameter 20 Fr)

**Outcome:** patient presented a favorable evolution after the procedure, presented as a minor complication an acute renal injury that resolved with observation

**Conclusion:** Percutaneous treatment with balloon dilation and the use of tutors at the level of stenosis was safe and successful in our patient.



Silicone tutors and biliary drain at the level of bile duct stenosis

PB05-25

### ODDI SPHINCTER REPAIR FOR BILIARY COMPLICATIONS AFTER ENDOSCOPIC PAPILLECTOMY

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**Introduction:** Endoscopic papillectomy (EST) is widely used in the treatment of benign biliary diseases. However, EST can permanently disrupt the function of the Oddi sphincter, resulting in an increased risk of cholangitis, choledocholithiasis, and cholangiocarcinoma.

**Methods:** A novel surgical procedure was designed to repair disrupted sphincter Oddi. During the operation, the duodenum was cut on the anterior wall. 8F catheter was performed through the duodenal nipple from the common bile duct. The injured sphincter was intermittently sutured until the size of the opening was equivalent to the diameter of the catheter. Then the anterior wall of the duodenum was sutured continuously. The drainage tube was placed in the common bile duct, and be removed 4 weeks after the operation.

**Results:** A total of 14 patients received the repair surgery. The primary diseases for EST were cholecystolithiasis combined with choledocholithiasis in 8 cases and hepatolithiasis combined with choledocholithiasis in 6 cases. In these 14 patients, four of them simultaneous underwent cholecystectomy, five of them underwent hepatectomy. Postoperative complications rate was 14.3%, including bile leakage (1 case), incision infection (1 case). The mean follow-up time was 39.5 months. One patient still had intermittent cholangitis due to severe biliary cirrhosis, and the other 13 had a good prognosis (92.8%).

**Conclusion:** As a safe and effective surgical method to reconstruct SO function, Oddi sphincter repair retains the normal physiological structure of the biliary tract, and is expected to be a solution to solve and prevent serious long-term complications after EST.

### PB06 - Biliary: Miscellaneous

PB06-04

### METRONOMIC PHOTODYNAMIC THERAPY USING AN IMPLANTABLE ELECTRONIC DEVICE, A PRECLINICAL EXPERIMENT FOR INTRODUCING PHOTOTHERAPY INTO CANCER TREATMENTS IN INTERNAL ORGANS

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**Introduction:** In a modern aging society, people expect high-quality cancer treatment but don't want to impair their quality of life. These trends made us imagine the needs of a novel cancer treatment system. We intend to develop a less invasive, low-cost cancer treatment system by using an implantable electronic device and introducing photodynamic therapy (PDT) into the treatment of malignancies in internal organs, including HBP area.

**Methods:** We combined wirelessly powered fingernail-size LED chip, and tissue adhesive biomaterials to develop suture-free, tissue-adhesive, wirelessly powered LED devices. As a preclinical experiment, we investigated the anti-tumor effect of low-power and long-term photodynamic therapy, termed metronomic PDT, by using this device for the mouse cancer model. The device was implanted subcutaneously beneath intradermal tumors on the back of mice, and the mice could move freely in the cage placed on the antenna board that enables continuous illumination on the tumor. During the ten days of treatment, a photosensitizer (photofrin) was administered intravenously for two times.

**Results:** The mice receiving mPDT showed significant growth suppression of the tumor when compared to the control mice. There was no adverse reaction in the surrounding normal tissues of the treatment group. Also, this experiment showed the effectiveness of green light, which has yet to be used clinically in PDT for the treatment of solid tumors.

**Conclusions:** Metronomic PDT using implantable optoelectronic devices can be applied safely into the treatment of HBP malignancies as a low cost and less invasive local treatment method.

allow for timely diagnosis and preventive treatment. To substantiate the oncogenic potential of *Salmonella*, this epidemiological study compared the incidence of extrahepatic biliary tract cancer (ehBTC) in patients with diagnosed *Salmonella* or *Campylobacter* infection with the ehBTC incidence in the general population.

**Methods:** National infectious diseases surveillance records for patients aged  $\geq 20$  years when diagnosed with *Salmonella* or *Campylobacter* infection during 1999-2016 in the Netherlands were linked to the Netherlands Cancer Registry. All infections were clinically severe infections confirmed by laboratory testing. Incidence of ehBTC in *Salmonella* and *Campylobacter* patients  $\geq 1$  year post-infection was compared to the incidence of ehBTC in the Dutch general population using Standardized Incidence Ratios (SIRs).

**Results:** 16.252 patients were diagnosed with *Salmonella* and 27.668 with *Campylobacter* infection. Of those, nine developed ehBTC at a median of 46 months (range 13-67) after *Salmonella* infection and seven at median 60 months (range 18-138) after *Campylobacter* infection. Compared to the general population, the SIR of ehBTC in *Salmonella* patients was 1.53 (95%CI 0.70-2.91). In patients aged  $< 60$  years, SIR was 1.74 (95%CI 0.36-5.04). For *Campylobacter* patients, SIR was 0.97 (95%CI 0.39-2.00).

**Conclusion:** Although statistical significance was not reached, there was a tendency towards increased occurrence of ehBTC among salmonellosis patients, but not among campylobacteriosis patients. Further research is necessary to uncover putative oncogenic transformative effects of other enteropathogens.

**PB06-05: Incidence of biliary tract cancer in patients  $\geq 1$  year after confirmed infection with *Salmonella* or *Campylobacter*, stratified by age and gender**

	Observed incidence	Expected incidence	SIR	95% CI	P-value
<b><i>Salmonella</i>, all patients</b>	9	5.88	1.53	0.70-2.91	0.280
20-60	3	1.74	1.72	0.36-5.04	0.507
Male	5	2.665	1.88	0.61-4.38	0.264
Female	4	3.29	1.22	0.33-3.11	0.835
<b><i>Campylo-bacter</i>, all patients</b>	7	7.22	0.97	0.39-2.00	0.868
20-60	2	2.13	0.94	0.11-3.40	0.715
Male	3	4.03	0.75	0.15-2.18	0.857
Female	4	2.23	1.24	0.34-3.17	0.810

**PB06-05  
BACTERIAL GASTROENTERITIS AND  
THE RISK OF BILIARY TRACT  
CANCER: A POPULATION-BASED  
STUDY**

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**Background:** *Salmonella* has shown to have oncogenic transformative effects and thereby increase the risk of certain cancers. For *Campylobacter*, no comparable effects have been demonstrated. Risk factor identification may

**PB06-06  
MANAGEMENT OF CHOLEDOCHAL  
CYST: AN INSTITUTIONAL REVIEW  
FROM A TERTIARY REFERRAL  
CENTER IN NEPAL**

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**Introduction:** Choledochal cysts (CC) are a rare congenital cystic dilation of the biliary tract.

**Method:** This is a retrospective study of 32 consecutive patients of CC who underwent multidisciplinary

management in last 2 and half years at a tertiary referral center from Nepal.

**Result:** A total of 32 patients, 9 males and 23 females were operated. The average age at diagnosis was 25 years (range from 2 to 56 years). The most common presenting symptoms were pain 31(96.88%), jaundice 10(31.25%) and mass 5 (15.63%). Triad of pain, jaundice and mass was present in 4 (12.5%). Transabdominal Ultrasonography (100%) was the initial diagnostic modality of choice followed by MRCP (68.75%), and CECT (31.25%). ERCP was done for stent placement in 3 (9.38%) patients with severe cholangitis. Type IVA (37.5%) was the most common type of CC followed by type IC (31.23%), type IB (15.65%), type IA (12.5%) and type IVB (3.12%). Abnormal pancreaticobiliary duct junction was observed in 3 (9.38%) patients. All patients underwent open cyst excision with Roux-en-Y hepaticojejunostomy (HJ). There were 2 patients who underwent relaparotomy for efferent loop obstruction and Peterson hernia. None of our patient had cholangiocarcinoma on pathological examination.

**Conclusion:** Choledochal cyst is rare cystic dilatation of biliary tract. Surgery (Cyst excision with Roux-en-Y hepaticojejunostomy) is treatment of choice. Although the incidence of cholangiocarcinoma is less, long-term surveillance is essential.

**Keywords:** Choledochal cyst (CC), Cyst excision with Roux-en-Y hepaticojejunostomy.

#### PB06-07

### SYNCHRONOUS GASTROINTESTINAL STROMAL TUMOR AND AMPULLARY NEUROENDOCRINE TUMOR IN ASSOCIATION WITH NEUROFIBROMATOSIS TYPE 1: A REPORT OF THREE CASES

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**Introduction:** Neurofibromatosis type 1 (NF1) is an autosomal dominant hereditary disorder. The pathogenesis of NF1 is suggested to be an alteration of the *NF-1* gene, which normally functions as a tumor suppressor. A mutation of *NF-1* causes the development of viable tumors in various sites. On the other hand, the synchronous manifestation of a gastrointestinal stromal tumor (GIST) and neuroendocrine tumor (NET) in the background of NF1 is extremely rare.

**Methods:** Three patients showed synchronous ampullary NET and GIST in association with NF1 supported by postoperative histopathologic analysis. Surgical treatments, such as pancreatoduodenectomy and local excision were applied.

**Results:** No recurrence occurred during the postoperative follow-up period of 10, 9, and 2.7 years. Synchronous GIST and NET in the background of NF1 is extremely rare, but the possible coexistence of other tumors in NF1 patients is relatively higher than that in the general population. Furthermore, both NETs and GISTs occurring in NF1 patients tend to be smaller in size compared to that in the general population.

**Conclusions:** We reports three cases treated with surgical intervention along with the long-term follow-up results. When NF1 patients present with vague abdominal discomfort, close attention must be paid to identifying the coexistence of other neoplasm.

#### PB06-08

### HEMOBILIA DUE TO RUPTURED PSEUDOANEURYSM OF ACCESSORY RIGHT HEPATIC ARTERY: A RARE CAUSE OF UPPER GASTROINTESTINAL HEMORRHAGE

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**Introduction:** Anatomical variation of hepatic arteries are relatively common, but the occurrence of pseudoaneurysm of hepatic arteries and its branches are rare, representing 0.01%-2% of all aneurysm.

**Method:** We observed a case of 53 year old lady with the presentation of obscure-overt gastrointestinal bleeding associated with obstructive jaundice.

**Results:** This patient had underwent computed tomography scan after repeated endoscopy failed to reveal the cause of bleeding, which has showed an arterially enhancing lesion at liver segment V with its supply from accessory right hepatic artery origin from superior mesenteric artery. This artery supplies segment V and segment VI of the liver. A subsequent digital subtraction angiography demonstrated a large multilobulated pseudoaneurysm of this artery and successful embolization performed using gelfoam. A followup CT scan in 1 month later showed thrombosed pseudoaneurysm.

**Conclusions:** This case has taught us that high suspicion of biliary disorder should be made when gastrointestinal bleeding is associated with jaundice. An early imaging should be considered when repeated endoscopy is unable to determine the cause of bleeding. Non operative management using transcatheter embolisation can be the treatment of choice in pseudoaneurysms to avoid potentially risky and difficult surgery.

#### PB06-09

### MULTIPLE CHOLECYSTOENTERIC FISTULAS AND CHOLEDOCHAL CYST IDENTIFIED DURING LAPAROSCOPIC CHOLECYSTECTOMY: AN INTERESTING CASE

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**Introduction:** Cholecystoenteric fistula is a rare complication of gallbladder disease and cholelithiasis, and are typically discovered incidentally during cholecystectomy. Identification and proper management with division and closure of the fistula is of paramount importance.

Type I choledochal cysts are the most common type of choledochal cysts and carry a risk of malignancy. Here, we report a rare case of a patient with cholelithiasis who during

laparoscopy was found to have both cholecystoduodenal and cholecystocolonic fistulas, as well as a Type I choledochal cyst. We describe an algorithmic approach to definitive management.

**Case description:** A 55-year-old female presented with cholelithiasis. During laparoscopy, a cholecystocolonic fistula, a cholecystoduodenal fistula, and a Type I choledochal cyst were found. Take-down of fistulae and cholecystectomy were performed followed by definitive biliary resection and reconstruction in a staged approach.

To our knowledge, this is the first case of a patient with two incidentally discovered cholecystoenteric fistulae and concurrent choledochal cyst. Furthermore, as avoiding definitive biliary bypass in the presence of a septic focus, we describe a step-wise approach to management.

**Discussion:** In patients with acute cholecystitis or choledocholithiasis, imaging frequently does not show evidence of gallbladder fistulas. Most commonly, these processes are only identified intra-operatively.

We present a rare case of a patient with multiple cholecystoenteric fistulae and a Type I choledochal cyst discovered intra-operatively. This case report highlights an algorithmic approach to the management of not only dual or multiple cholecystoenteric fistulas, but also a concurrent Type I choledochal cyst.

#### PB06-10

### MIRIZZI SYNDROME: DIAGNOSIS AND MANAGEMENT OF A CHALLENGING BILIARY DISEASE

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**Background:** Mirizzi syndrome is difficult to diagnose pre-operatively and treat, represent a particular challenge for hepatobiliary surgeons. Furthermore, it increases the risk of intra-operative biliary injury. The aims of this study were to point out some particular aspect of diagnosis and treatment of this condition that will be helpful for the surgeons.

**Methods:** We retrospectively reviewed all records of the patients, surgically treated for Mirizzi syndrome from January 2013 to January 2018 in Dhaka Medical College Hospital, Shaheed Suhrawardy Medical College Hospital and BIRDEM General Hospital.

**Results:** During the study period, a total of 1320 cholecystectomy were performed, out of which 50 patients were diagnosed with Mirizzi syndrome, Roux-en-Y hepaticojejunostomy was the treatment of choice and subtotal cholecystectomy were done for 7 cases and laparoscopic cholecystectomy for 2 cases. There was no post-operative mortality. Two cases of biliary fistula resolved with conservative management and another case required percutaneous treatment for resolution of an intraperitoneal postoperative collection.

**Conclusion:** Mirizzi syndrome continues to be a disease of difficult diagnosis and treatment. General surgeons without long experience in hepatobiliary surgery should

refer the patient to a specialized hepatobiliary surgical center.

#### PB06-11

### DIFFERENTIAL DIAGNOSIS OF ACUTE CHOLECYSTITIS WITH AN ATYPICAL ULTRASOUND IMAGE

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**Objective:** To improve the ultrasound diagnosis of the gallbladder (GB) pathology by developing a diagnostic algorithm for the atypical ultrasound image of acute cholecystitis.

**Materials and methods:** 5600 patients with acute pathology of GB were examined in CCH No. 68 in 2010-2018. Of these, 360 patients at primary ultrasound revealed changes in the GB that didn't allow them to be attributed to the image of acute cholecystitis. Patients were divided into 2 groups: the 1st group included 120 (33.3%) patients whose changes in the GB included thickening of the wall without increasing the size of the GB, the 2nd - 240 (66.7%) patients with an increase in the size of the GB, but without changes in the wall.

**Results:** In a retrospective analysis in the first group, the following changes were diagnosed: Mirizzi syndrome - in 10 patients, GB tumor - 20, reactive changes in the wall against other diseases and conditions - 62, biliary digestive fistula - 12, perforation of the GB at acute cholecystitis - in 16 patients.

In the second group, only 30 patients were diagnosed with acute cholecystitis, including empyema of GB - in 8 patients, enlargement of GB wall' was regarded as a manifestation of congestive or "hungry" GB, which does not require specific treatment in 210 patients.

**Conclusions:** After comparing the findings of ultrasound examinations of GB and final diagnoses, an analysis of inconsistencies was performed. The diagnostic criteria to help make a differential diagnosis between various pathologies of GB were formulated.

#### PB06-13

### CLINICAL AND SURGICAL RELEVANCE OF CURRENT CLASSIFICATION SYSTEMS OF COMPLEX BILE DUCT INJURIES AFTER CHOLECYSTECTOMY

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**Introduction:** The Classification of bile duct injuries (BDI) after cholecystectomy is a clinical challenge for surgeons because of their heterogeneity in site and clinical presentation and is relevant for decision making and treatment and to allow comparison. Although the outcome of BDI is related to the type, aetiology, time interval between lesion

and diagnosis, and between diagnosis and treatment and to the presence of sepsis, however the current systems are mainly based on anatomical features not considering the wide spectrum of clinical presentation.

**Aim:** This study aims to evaluate the performance of 5 classification systems, namely Strasberg, Stewart-Way, Siewert, Hannover and ATOM, to discriminate complex BDI (cBDI, Strasberg's E) patterns and the relative surgical treatment.

**Methods:** This study includes 24 selected patients with cBDI out of a total 56 admitted with BDI, studied by MRI and ERCP and surgically treated between 2010 and 2019. Data were retrospectively collected and patients were classified according to the 5 systems. X<sup>2</sup>-test was adopted.

**Results:** The Strasberg, Stewart-Way and Siewert systems allowed to classify 19/24 patients, the Hannover's 22/24 and ATOM all patients,  $p < 0.049$ . All patients underwent biliary reconstruction with poliduct-jejunostomy, 3 required vascular repair and 3 major liver resection; one patient died from septic shock.

**Conclusions:** The ATOM classification performed better than other in this small selected cohort of patients with cBDI. Future classifications might include clinical variables to better guide the therapeutic decision.

#### PB06-14

### RELATIONSHIP WITH SIGNIFICANTLY RAISED CA-19.9 WITH BILIARY DUCT STONES: EARLY EXPERIENCE IN DEPT. OF HEPATOBILIARY SURGERY, SHSMCH, BANGLADESH

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**Introduction:** Conventionally it is assumed that raised level of CA 19-9 (*Carbohydrate antigen 19.9*) is related to malignancies of liver, pancreas and biliary tract. During dealing with a patient with bile duct stones, we surprisingly noticed significant rise of CA 19-9 level. Then we decided for a study to explore the relationship of significantly raised CA 19-9 with biliary tree stones.

**Method:** We randomly encountered a total of 138 diagnosed biliary stone cases at department of Hepatobiliary Surgery, Hepatology and Gastroenterology over one year time. All patients were evaluated by routine blood test, USG, MRCP and CA 19-9 levels. CA 19-9 levels were also measured at 5<sup>th</sup> post-operative day and at 4 week follow up day. During ERCP, cytology was taken, and bile duct wall was sent for histopathology in operative cases.

**Result:** Mild and moderate raise in CA 19-9 level (38-1000U/ml) were noted in 15 cases and significantly raised (> 1000 U/ml) in 8 cases. 3 of these cases showed simultaneous presence of hepatic micro-abscess and 6 cases showed angulation, dilatation or tortuosity of CBD in MRCP. All histopathology reports were proved benign. In 4 weeks post ERCP/ operation follow up, CA 19-9 levels became normal in all cases except 3. However, they also showed significant reduction in CA 19-9 level.

**Conclusion:** Significantly raised level of CA 19-9 is associated not only with Hepatobiliary malignancies but also with complicated bile duct stone diseases.

#### PB06-17

### RADICAL CHOLECYSTECTOMY FOR GB TUBERCULOSIS MIMICKING GB NECK CARCINOMA WITH OBSTRUCTIVE JAUNDICE

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**Introduction:** Isolated Hepatic-pancreato-biliary tuberculosis is a very rare condition and gall bladder tuberculosis is still rarer. Majority of patients with GB tuberculosis diagnosed in symptomatic gall stone disease, post cholecystectomy and only a few cases reported with GB neck involvement causing obstructing jaundice. We report a rare case of gall bladder tuberculosis presented as suspected GB neck carcinoma with obstructive jaundice.

**Methods:** 55 year male presented with complaints of painful progressive jaundice since 2 month. H/o loss of appetite and significant loss of weight over last 2month. CECT abdomen and MRCP was s/o circumferential soft tissue thickening with high grade stenosis at gall bladder neck, CHD and superiorly extending upto confluence. EUS showed mass in GB neck extending to CHD around 2.5cm and EUS guided FNAC inconclusive. His total serum bilirubin was 6.9 and CA 19.9 was 271.9.

**Results:** In view of ? carcinoma GB neck with obstructive jaundice he we underwent radical cholecystectomy with CBD excision. Intra operatively there is 3x3 cm mass present at GB neck and CHD reaching upto confluence. Post-operative period was grossly uneventful and patient was discharged on POD 7. Final histopathology was s/o Necrotizing granulomatous inflammation, consistent with tubercular cholecystitis. **Proximal CHD also showing** Necrotizing granulomatous inflammation. ZN stain shows an occasional bacilli. Following biopsy he was started on ATT and now at 6 months follow up he is totally asymptomatic.

**Conclusion:** Gall bladder tuberculosis can present as carcinoma GB with obstructive jaundice and very difficult to diagnose preoperatively.

#### PB06-18

### RECURRENT ACUTE PANCREATITIS IN REMNANT CHOLEDOCHAL CYST AFTER EXCISION

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Choledochal cyst (CDC) treatment requires CDC excision and Roux-en-Y hepaticojejunostomy. These patients with CDC are known to have anomalous pancreatic bile duct junction (APBDJ) leading to complications indicating surgery as a definitive treatment. Some of these patients who have larger remnant of distal bile duct after CDC surgery have recurrence of pancreatitis and malignancy. **Material and methods:** We report three cases of CDC who were operated earlier with CDC excision (1 year to 12 years in past) and presented with recurrent pancreatitis. On evaluation, all three cases had a remnant of distal common bile duct persisting even after the prior CDC

surgery. MRCP revealed a dilated intrapancreatic CDC remnant with hypointense foci (stones or protein plugs). An ERCP was suggestive of a sludge filled dilated CDC remnant with APBDJ.

These patients had undergone a completion distal CBD excision. After the procedure, they have no recurrence of pancreatitis.

**Conclusion:** CDC remnants have persistent reflux of pancreatic juice in remnant CBD due to APBDJ. This result in protein plug/calculi formation in the remnant CBD. This along with a lesser chance of distal CBD getting spontaneously cleared (due to absence of bile flow post CBD excision), predisposes to swelling in the distal CBD, result in recurrent acute pancreatitis.

**Keywords:** Choledochal cyst (CDC), anomalous pancreatic bile duct junction (APBDJ), Recurrent acute pancreatitis

PB06-19

### OBSTRUCTIVE JAUNDICE SECONDARY TO HEPATOBILIARY TUBERCULOSIS: A TERTIARY GOVERNMENT HOSPITAL EXPERIENCE IN THE PHILIPPINES

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**Introduction:** The incidence of extrapulmonary-tuberculosis in the Philippines is 1.9%. Patients of lower socioeconomic status are particularly vulnerable due to community factors, poor health seeking behaviours and less access to specialized health centers. In addition the cost of diagnosing and treating hepatobiliary-tuberculosis is prohibitive. Complicating the management is the lack of protocol in diagnosing and treating this rare disease. This study aims to review cases of obstructive jaundice secondary to hepatobiliary-tuberculosis treated in Jose R. Reyes Memorial Medical Center.

**Methods:** Charts of patients treated for obstructive jaundice secondary to hepatobiliary-tuberculosis from January to December 2019 were reviewed and analyzed.

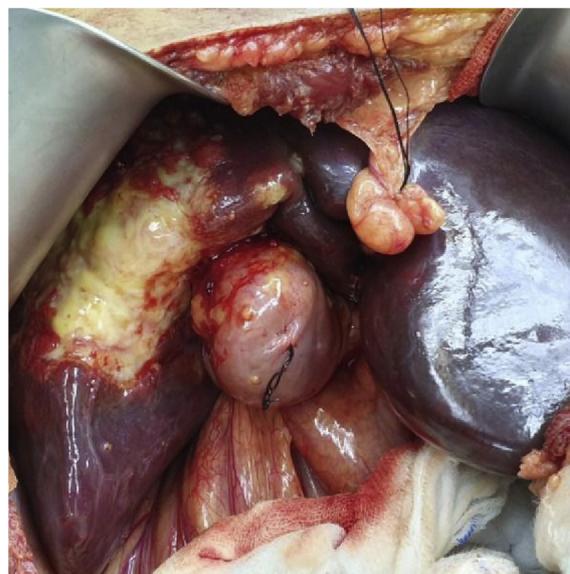
**Results:** There were 142 cases treated for obstructive jaundice from all etiologies. Among these, 10 cases were caused by hepatobiliary-tuberculosis (Table 1). Age ranged from 19 to 56 years old with 1:1 male/female ratio. Most common reason for consultation is abdominal pain progressing to jaundice which may last from several months to a year. Three patients had a history of previous pulmonary-tuberculosis treatment.

Eight patients had histology consistent with tuberculosis (Figure 1). The other two were diagnosed based positive bile TB PCR and imaging respectively. Six patients had extrahepatic ductal obstruction while 4 had hilar/intrahepatic ductal involvement. Seven out of 10 patients were managed with biliary-enteric bypass. There was 1 morbidity, managed conservatively, and no mortality.

**Conclusion:** Treatment of hepatobiliary-tuberculosis depends on the available expertise and equipment. Biliary-enteric bypass is an option for centers lacking ERCP or PTBD; however long-term follow up is needed.

**Table 1:** Patient Summary N(10)

Age	19-53 years old
Sex Ratio	1:1
Symptoms	Abdominal Pain and Jaundice (n6); Jaundice (n3); Fistula (n1)
Symptom Duration	1 week to 4 years
History of Tuberculosis	None (n7); Yes (n3)
Diagnosis	Histopathology (n8); TB PCR (n1); Imaging (n1)
Chest X-ray Findings	Unremarkable (n7); Tuberculosis (n2); Pleural Thickening (n1)
Stricture Location	Extrahepatic (n6); Intrahepatic (n4)
Operation Done	Biliary Enteric Bypass (n7); PTBD (n1); ERCP (n1); Tube Choledochostomy (n1)
Mortality/Morbidity	None (n9); Anastomotic Leak (n1)



**Figure 1:** Extensive TB Granuloma of the Liver

PB06-25

### THREE CASES OF UNUSUAL SOLITARY INTRAHEPATIC BILIARY CYST IN ADULTS

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**Introduction:** Because of its rarity, solitary intrahepatic biliary cyst (SIBC) is often misdiagnosed and under-recognized. The aim of the present study was to focus the attention on this disease and improve its diagnosis and treatment.

**Methods:** 3 cases of SIBC were reported, and the clinical features and lessons were presented.

**Results:** Case 1 was found a solitary cyst involving segments 4,5,8. She was misdiagnosed as simple liver cyst. Before admission, she received laparoscopic liver cyst fenestration followed by two open surgeries including cystojejunostomy and jejunostomy because of biliary fistula. She was cured through mesohepatectomy in our hospital. Case 2 had a cyst involving the confluence of left and right hepatic ducts. He underwent local cyst excision and biliodigestive anastomosis in the local hospital. Recurrent cholangitis occurred after the surgery. Left hepatectomy with Roux-en-Y hepaticojejunostomy was performed for the treatment of biliary stricture in our hospital. Case 3 was found a solitary cyst at hepatic hilum by ultrasonography. MRI and contrast-enhanced CT scans indicated multiple stones in the cyst and local cyst wall thickening. He underwent left hepatectomy with Roux-en-Y hepaticojejunostomy and regional lymphadenectomy. Histologically, SIBC was confirmed in all 3 cases and papillary adenocarcinoma was found in the case 3.

**Conclusion:** To our knowledge, the present series of 3 cases represent the largest series of SIBC reported to date. SIBC should be considered in the differential diagnosis in patients with a solitary cystic mass at the hepatic hilum. Aggressive hepatectomy may be recommended as a curative treatment.

## PB06-26

### STUDY OF A RAPID DETECTION OF CAUSATIVE BACTERIA IN CASES OF ACUTE CHOLANGITIS AND CHOLECYSTITIS USING A MULTICHANNEL GENE AUTOANALYZER

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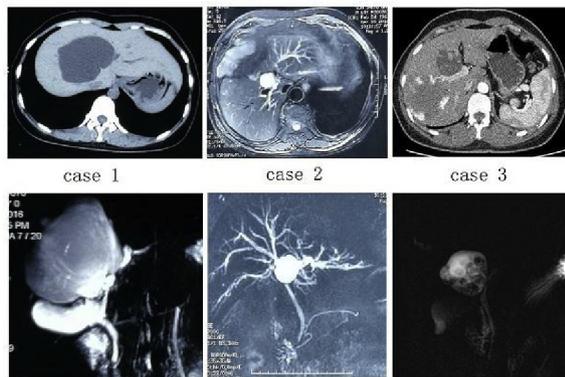
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**Background:** Acute cholangitis and cholecystitis are severe conditions, which are becoming increasingly resistant to antimicrobial treatment owing to inappropriate administration of therapeutics. “Bacterial nucleic acid and antimicrobial resistant gene detection simultaneously” is adopted as a medical fee item for sepsis. In our study, we evaluated the rapid detection of causative bacteria in cases of acute cholangitis and cholecystitis using a multichannel gene autoanalyzer (Verigene® system).

**Table 1:** Clinical data of 3 patients with solitary intrahepatic biliary cyst

Case	Sex	Age	Symptoms	Previous images	Location of biliary cyst	Diameter of biliary cyst (cm)	Previous surgery (times)	Follow-up period (month)	prognosis
1	F	30y	Abdominal pain	US/CT/MRCP	Hepatic hilum	8.5	3	25	Symptom free
2	M	70y	Abdominal pain	US/MRCP	Hepatic hilum	2.8	1	33	Symptom free
3	F	33y	Fever/ jaundice	US/CECT/MRCP	Hepatic hilum	5.0	none	19	Symptom free/ no recurrence

Abbreviations: F=female M=male y=year US=ultrasonography; CT=computed tomography; MRCP= magnetic resonance cholangiopancreatography; CECT=contrast-enhanced CT



**Figure 1:** Radiological findings of 3 cases of solitary intrahepatic biliary cyst

**Methods:** This study included 108 patients who were diagnosed with acute cholangitis or cholecystitis from June 2015 to November 2018. Bile samples were collected and evaluated by bacterial culture test and Verigene® assay.

**Results:** The most commonly isolated bacteria were *Escherichia coli* (*E.coli*) (23.3%), including six extended spectrum beta-lactamase (ESBL) -producing *E. coli*. Of the patients with positive bile cultures, bacteria were detected in 35.7% cases via the Verigene® system. Four (66.7%) of the ESBL-producing *E. coli* were identified as having the CTX-M gene. Detection rates of the Verigene® system significantly increased when the number of bacterial colonies were more than  $10^6$  CFU/mL. These cases with colony of more than  $10^6$  CFU/mL exhibited significantly higher inflammation, suggesting the presence of infection.

**Conclusions:** It was suggested that the multichannel gene autoanalyzer is a new system for the rapid detection of causative bacteria in patients with infectious acute cholangitis and cholecystitis.

PB06-27

### LEMMEL'S SYNDROME LEADING TO ENTEROLITH ILEUS

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**Introduction:** Lemmel's syndrome is obstructive jaundice caused by periampullary duodenal diverticulum in the absence of choledocholithiasis or tumour. We describe a unique presentation of Lemmel's syndrome and enterolith ileus.

**Method:** 67 yo female presented to our emergency department with fever, epigastric pain and vomiting. Patient had a past history of cholecystectomy. Investigations demonstrated raised inflammatory markers and cholestatic LFTs. Biliary tract ultrasound showed a 1.6 cm CBD with dilated intrahepatic ducts and a 5cm complex peripancreatic cystic mass. CT confirmed this mass as a duodenal diverticulum. During ERCP, 5cm periampullary duodenal diverticulum containing a large enterolith causing extrinsic compression on the CBD. Attempts to remove the enterolith during ERCP failed. Sphincterotomy and stent insertion was performed. Patients biliary symptoms resolved and she was discharged for further outpatient investigation and assessment. Five days later, she presented with severe lower abdominal pain and vomiting. CT scan demonstrated distal small bowel obstruction with a 4.2 x 2.8 cm intraluminal filling defect at the transition point. At laparotomy, a large solid intraluminal mass was found at the point of obstruction which was removed using enterostomy.

**Result:** During treatment for Lemmel's syndrome, endoscopic disimpaction of the enterolith and its removal or disintegration is essential to prevent its passage en bloc into small bowel. Enterolith ileus should be considered in patients representing with SBO post Lemmel's treatment.

**Conclusion:** Enterolith dislodgment, if not retrieved, can lead to ileus and should be considered as the likely cause of SBO post treatment of Lemmel's syndrome.

PB06-28

### STUDY ON BACTEREMIA FOLLOWING EXTENDED HEPATECTOMY FOR BILIARY CANCER

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**Introduction:** Infectious complications in hepatectomy for biliary cancer have still frequently occurred. Postoperative bacteremia requires systemic intensive care and it's important to provide an initial treatment by appropriate antibiotics. Results of cultures in patients who suffered bacteremia were investigated in this study.

**Method:** We reviewed 179 patients who underwent hepatectomy for biliary cancer from January 2008 to December 2018. Risk factors of bacteremia, and the relationship between bacteria caused bacteremia and those cultured from bile and abdominal drainage fluid.

**Results:** There were 120 males, and the median age was 69 years old. There were 179/ 33/ 14 cases of bile duct cancer/ intrahepatic cholangiocarcinoma/ gallbladder cancer. Right hepatectomy/ left hepatectomy/ right trisectionectomy/ left trisectionectomy/ central bisectio-nectomy were performed in 81/ 76/ 7/ 14/ 1 patients. Bacteremia was occurred in 41 patients (23.0%). Risk factors of bacteremia were long operative time (p=0.01) and intra-operative blood transfusion (p=0.01). Bacteremias were associated with abdominal abscess (20.2%), cholangitis (14.3%), bile leakage (13.4%). Total incidences of bacteremia were 88 times and 24 kinds of bacteria were detected in blood culture. Postoperative bile/ abdominal drainage cultures were collected in 34/34. The consistency of blood culture with bile/ abdominal drainage cultures were 58.8%/ 52.9%. It was 63.2% when at least one of the drainage cultures was consistent with blood one.

**Conclusion:** Bacteria cultured from postoperative bile and abdominal drainage fluid matches with those from bacteremia in more than half of the patients. The results of these cultures could be considered in selection of antibacterial drug in immediate-use.

PB06-29

### FIVE YEAR EXPERIENCE OF BILE DUCT INJURY IN YANGON SPECIALTY HOSPITAL, MYANMAR

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**Introduction:** HBPS department of YSH is one of the two dedicated HBP units in the Country of 55 million. BDI is usually tackled by HBP surgeons. Our annual incidence of 0.8% seemed a bit higher than most of the published data but it included referred BDI cases.

**Method:** Hospital based, retrospective case series based on hospital data.

**Results:** There were 43 cases of BDI in 5 years of which, 72% (31 cases) is due to benign cases and 33% (12%) cases to malignant cases. Post laparoscopic cholecystectomy accounted for majority (60%) of the BDI due to benign disease while post hepatectomy cases for cholangiocarcinoma accounted for 40% of BDI due to malignant disease. Most of the BDI presented with bile leak but 10% with stricture.

**Discussion:** Various methods (surgery, interventional radiology and endoscopy) performed for BDI in the study period will be discussed with outcome with regard to mortality and morbidity.

**Conclusion:** Early recognition and multidisciplinary approach is the key for management of BDI.

PB06-32

### COMPLICATED DUODENAL ULCER POSTCOLECYSTECTOMY IN A THIRD LEVEL HOSPITAL IN MEXICO

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**Introduction:** The migration of laparoscopic staple with complications such as duodenal ulcer is a rare post-colecystectomy complication. Complication that can occur at any time, but usually 2 years post cholecystectomy. In this report, a case of complicated duodenal ulcer that occurred 1 year after laparoscopic cholecystectomy is reviewed.

**Case Presentation:** 42-year-old male, with bleeding from non-variceal upper gastrointestinal tract and severe epigastric pain. Surgical history of laparoscopic cholecystectomy

CT scan: Plastron complex in vascular bed topography.

The patient is scheduled for emergency surgery, laparotomy is performed with the following **Findings:** lax adhesions of the colon and liver, and omentum to the liver, firm adhesion of the first duodenal portion to the liver bed, with a 3 \* 3 cm hematoma in said area that when opening its capsule, mucous duodenal evidence in said region with laparoscopic clips included in the tissue.

Procedure performed Billroth II

Histopathological report: duodenal ulcer, negative for neoplasia, viable surgical resection edges.

follow-up without complications.

**Discussion:** Cholelithiasis is common and laparoscopic cholecystectomy is the treatment of choice.

Being one of the most performed surgeries since its introduction, surgical hemostatic clips have been widely used and are generally considered safe. Despite the increasing number of annual cholecystectomies performed, postcolecystectomy clip migration (PCCM) remains rare. Apart from migration to the biliary tree, is the cause of other complications such as duodenal ulcer or clip embolism.

**Conclusion:** Complications such as duodenal ulcer of clips should always be present in patients with abdominal pathology and a history of recent cholecystectomy.

PB06-33

### NET OF EXTRAHEPATIC BILIARY TRACT: A CASE REPORT WITH REVIEW OF THE LITERATURE

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Neuroendocrine tumors (NETs) of the extrahepatic bile ducts are extremely rare and represents only 0.1%-0.4% of the cases.

We present the clinical course and radiological findings of a patient with an extrahepatic bile duct NET and a literature review about the management of this rare neoplasm.

We present a case of an 58-year-old man with NET of the common bile duct that was discovered on abdominal ultrasound during a medical examination. He was admitted to our hospital with a diagnosis of hepatic hilar tumor.-EUS+FFNAB confirm the diagnosis Computed tomography and Magnetic resonance cholangiopancreatography revealed a neoplasm of 28 x 24 mm of the common bile

duct without any nodes and distant metastases . The patient underwent to surgery with excision of the biliary ducts and tumor followed by Roux-en-Y anastomosis. Histological results showed NET grade 2.Free margin

We review the literature about the correct management and treatment of these neoplasms. Preoperative diagnosis of NETs is difficult because of their rarity. A definitive diagnosis is usually established intraoperatively or after histopathological evaluation. For these tumors, surgical resection is currently the only treatment modality for achieving a potentially curative effect.

PB06-34

### FETUS IN FETU WITH JAUNDICE - A RARE PRESENTATION OF A RARE DISEASE

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<sup>2</sup>*Birmingham Children's Hospital, United Kingdom*

Fetus in fetu is a rare mysterious medical phenomenon in which an acardiac fetiform mass is commonly located in abdomen of a neonate or infant. We report on a case of a 7 month-old girl with a gradually enlarging right upper abdominal mass and progressive jaundice, whose plain abdominal radiograph, ultrasonography, and CT scan revealed a mass in which the contents favor a fetus in fetu. Obstructive jaundice was caused by biliary obstruction by FIF.

Per-operative findings of deformed fetus presenting well formed lower limbs, one rudimentary upper limb, spina bifida and anencephaly was noted. It was surrounded by a separate gestational sac about 22 wks size. Umbilical cord was communicated with the mesenteric vessels. Cyst contained yellowish fluid. Liver was shrunken & cirrhotic. Umbilical cord transfixated and separated. Deformed fetus was removed and gestational sac excised. Fetus weighed 415 gm. Liver biopsy was taken. Her immediate and early post-operative period was uneventful. Patient was discharged on 11<sup>th</sup> POD, with follow up advices. Unfortunately, patient did not come for follow up.

**Keywords:** Fetus in fetu, Obstructive jaundice in infant, Liver cirrhosis in infant.

PB06-35

### LAPAROSCOPIC HEPATICO- JEJUNOSTOMY FOR BENIGN BILE DUCT STRICTURES - OUR EXPERIENCE

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**Introduction:** The incidence of bile duct injuries (BDI) after cholecystectomy is around 0.6%. Biliary strictures following BDI is a worrisome complication. Laparoscopic hepatico-jejunosotomy for benign biliary strictures has been a rarely attempted operation. The aim of this study is to describe our experience in the laparoscopic approach for biliary stricture repair- currently not attempted by many centres.

**Methods:** A retrospective study of eleven (11) patients with benign biliary strictures secondary to

cholecystectomy, operated between 2012 and 2020, was conducted. Demographics, co-morbidities, presenting symptoms, details of index surgery, type of lesion, pre-operative and post-operative workup and therapeutic interventions were recorded. The biliary strictures were staged according to the Bismuth-Strasberg classification. A side to side anastomoses with Roux-en-Y reconstruction was performed in all cases. Complications, mortality, and long-term follow-up were recorded.

**Results:** Eleven patients with benign biliary strictures were operated. the female to male ratio was 3:2. The mean age of the population under study was 30 years. All eleven cases operated were E3 according to the Strasberg classification. The operative time recorded was ranged between 240 - 480 mins. The median value of bleeding was 200 mL (range 50-1100 mL). Oral intake was started in the first 48 hrs. No bile leak was noted in any of our patients. No patients have underwent re-intervention till date. No mortality was recorded. The maximum follow-up was 48 months (Range 2-48 months).

**Conclusion:** The benefits of minimal access techniques may be utilized successfully in the management of benign biliary strictures with acceptable morbidity.

#### PB06-36 IGG4 CHOLANGIOPATHY MIMICKING CHOLANGIOCARCINOMA: A CASE SERIES

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**Introduction:** IgG4 cholangiopathy is a rare autoimmune condition that is poorly understood. It can mimic several other diseases such as primary or secondary biliary or sclerosing cholangitis, and even cholangiocarcinoma.

**Methods:** We report our case series of 3 patients who first presented with painless obstructive jaundice, and were subsequently discovered to have IgG4 cholangiopathy. We discuss the interesting clinical features and outcomes of each patient.

**Results:** All 3 patients were male, with a mean age of 64 years (range 54-71 years). Initial imaging for all 3 patients showed lesions at the hepatic hilum, suspected to be malignant strictures. Ca19-9 levels were elevated. Our first patient underwent an open extended right hepatectomy. Histology revealed sclerosing cholangitis with increased IgG4 plasma cells. Our second patient had elevated IgG4 serum levels, and was diagnosed to have IgG4 cholangiopathy. He responded well to a trial of steroid therapy, and interval imaging 3 months later demonstrated resolution of the hilar mass. The third patient was offered resection for a suspected cholangiocarcinoma, but opted for traditional medicine. 3 years later, he represented to our clinic, and repeat imaging showed stable disease with no progression of the lesion. None were associated with autoimmune pancreatitis.

**Conclusion:** IgG4 cholangiopathy is an important differential diagnosis to be considered in cases of suspected malignant hilar strictures in middle aged-men. Serum IgG4 levels should be included as part of the pre-operative work up, in order to avoid unnecessary interventions and their associated morbidities.

#### PB06-37 UNUSUAL CAUSE OF EPIGASTRIC PAIN: TORSION OF FALCIFORM LIGAMENT

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A 37-year-old male came with complaints of epigastric pain for 3 days. The pain was continuous in nature and was not radiating to the back. He had no nausea, vomiting, or fever. On examination, there was epigastric tenderness in the epigastric and right hypochondrium region. CT showed localized fat infiltration along the falciform ligament and adjacent hepatic parenchymal hyperemia. Torsion of the falciform ligament is an extremely rare disease that leads to severe acute abdominal pain. This condition is well managed conservatively with anti-inflammatory analgesia. However, we have performed surgical intervention (division of falciform ligament) because he had a severe pain despite supportive care.

#### PB06-39 IS PANCREATIC CANCER MORE PREVALENT IN POOR NEIGHBORHOODS? ZIP CODES ARE THE NEW INFLUENCERS IN DETERMINING CANCER SURVIVAL

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**Introduction:** The purpose of this study was to determine if the prevalence of pancreatic cancer changes based on patients zip codes. Our hypothesis was that low socio economic status (SES) is associated with increased prevalence of pancreatic cancer.

**Methods:** We interrogated a convenience sample from our cancer center registry and obtained 479 subjects diagnosed with pancreatic cancer between 2010-2018. We selected subjects (328) by zip code, representing the plurality of the cases in our catchment area. Outcome variables were overall survival and socio-economic status; predictor variables were recurrence, insurance, type of treatment, gender, cancer stage, age, and gender. We converted zip code to municipality and culled data using Adjusted Gross Income (AGI, FY 2017) We then created groups using a cutoff at filings of >\$100,000 of AGI; Low SES = municipalities where ≤5% of the filings were over \$100,000, Mid SES = municipalities where between 5%-40% of the filings were over \$100,000, High SES = municipalities where ≥40% of returns were over \$100,000. Comparative statistical analysis was performed using Chi-square for nominal and ordinal variables, a two-way ANOVA test was used for continuous variables, p- value was set at 0.05.

**Results:** Although it was not statistically significant different, it appears that pancreatic cancer was diagnosed more often in poor neighborhoods.

**Conclusion:** Access to care, exposure to known risk factors, optimal nutritional status, overall fitness, co-morbidities all play a role in pancreatic cancer. Our study shows

that zip codes should be considered a new risk factor for developing pancreatic cancer.

#### PB06-40

### TRAUMATIC NEUROMA OF BILE DUCT: A CASE REPORT

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**Introduction:** One of the etiologies of obstructive jaundice, is biliary stricture. Biliary stricture can present as either due to a benign or malignant cause. Traumatic neuroma rarely presents as a cause of obstructive jaundice, and is seen in literature usually following cholecystectomy or liver transplant.

**Methods:** We present a case of a 30-year old woman, who presented with acute cholangitis 7 years after an elective laparoscopic cholecystectomy.

**Results:** As this patient presented with cholangitis post surgery, she was stented and eventually underwent biliary reconstruction. The histopathology of the resected duct revealed a traumatic neuroma. In this case report, we review literature of traumatic neuroma presentation and its management.

**Conclusion:** Traumatic neuroma of the bile duct can present with symptoms of biliary stricture. Although it is rare, it should be considered as a cause of benign biliary stricture.

#### PB06-42

### BILIARY PRESSURE MONITORING AND ITS CLINICAL CORRELATION IN PATIENTS WITH OBSTRUCTIVE JAUNDICE

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**Introduction:** Biliary pressure has been postulated to have a direct impact on cholangiovenous reflex and cholangitis in patients with obstructive jaundice. Only limited human studies are available regarding biliary pressure monitoring.

**Methods:** A total of 30 patients with obstructive jaundice either benign or malignant and who didn't undergo any interventional or surgical procedure for relief of the jaundice were included in the study. The clinical and demographic details were noted and Liver function test was taken on the day of biliary decompression. Bile pressure was monitored intraoperatively with a pressure transducer system proximal to the obstruction. In patients who undergo PTBD, bile pressure was noted immediately after inserting the Chiba needle.

**Results:** A total of 30 patients were included in the study (19 males and 11 females). The mean age of the patients included were 55.9 years. The etiology of obstructive jaundice was periampullary carcinoma in 13 patients, carcinoma head of pancreas in 3 patients, carcinoma gallbladder in 3 patients, hilar cholangiocarcinoma in 6 patients, postcholecystectomy biliary stricture in 1 patient, Chronic pancreatitis with distal CBD compression in 2

patients, Post Liver transplant CBD stricture in 1 patient and choledocholithiasis with cholangitis in patient. (19 distal obstruction and 11 proximal obstruction). The mean biliary pressure in patients with distal obstruction was 22.3 and in patients with Proximal obstruction was 18.09. The highest recorded biliary pressure was 52 in periampullary carcinoma.

**Conclusions:** First study of its kind to document the biliary pressure and the bile characteristics in obstructive jaundice of various etiologies.

#### PB06-43

### CONSERVATIVE MANAGEMENT OF BILE LEAK SECONDARY TO AN ACCESSORY DUCT OF LUSCHKA

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**Introduction:** Post cholecystectomy bile leaks are rare, have an incidence of 0.1-1%, and regardless of their nature, most cannot be detected during surgery. In 5-30% they correspond to a Luschka duct, which are small ducts that originate in the right hepatic lobe, extend to the gallbladder bed and may or may not drain to the extrahepatic bile ducts. The objective of this publication is to present the experience obtained in the minimally invasive and conservative management of a post-laparoscopic cholecystectomy bilioma due to leakage of the Luschka duct.

**Case:** Female patient of 59 years, with Diagnosis : Multiple Myeloma + Cholelithiasis, undergoing laparoscopic cholecystectomy. Two days after surgery, a subphrenic collection is identified, which is drained percutaneously, with ultrasound guidance, and bilious fluid is obtained, approximately 800 cc. Subsequently, in the collagior-sonance a bile duct lesion is identified, which is born from the right posterior bile duct and is directed towards the hepatic bed, with indemnity of the main bile duct. The debit decreases progressively during the first week, presenting a negative debit 15 days after placement and the catheter is removed one week later. The evolution 1 month later is favorable, with normal ultrasound controls.

**Conclusion:** The minimally invasive treatment of bile leakage can be considered a safe option in patients with minor injuries, in order to avoid exposure to invasive procedures such as endoscopic retrograde cholangiography and its possible complications.

#### PB06-44

### BACTEROBILIA IN BILIARY SURGERY: RISK FACTORS

M. Chahdi Beltrame, M. L. Del Bueno, J. G. Cervantes, J. P. S. Duran Azurduy, M. Poupard, M. E. Lenz Virreira, E. G. Quiñonez and F. J. Mattera

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**Introduction:** Procedures over the biliary tree are controversial prior biliary surgery and may contribute to bacterobilia which can also lead to higher rate of wound infections. We aim to analyze our population of patients

under biliary surgery and the risk factors leading to bacterobilia.

**Methods:** Retrospective study from 2014 to 2019. Surgeries involving biliary tree were included. Prior biliary procedures and personal risk factors were analyzed. Univariate analysis using Student t test, Fisher and chi2; relative risk was measured and multivariate logistic regression was performed. Statistical significance level set at 0,05.

**Results:** Out of 86 biliary surgeries bacterobilia was documented in 45; 40 had some kind of biliary procedure prior final surgery ( $p=0,001$ ), with a relative risk of 5,66 (CI 95% 1,8-17,3). When type of procedure was analyzed, percutaneous drainage showed no difference but ERCP had higher rate of bacterobilia (RR 3,14, CI95% 1,29-7,58). When previous cholangitis was developed bacterobilia was also higher (RR 2,53, CI 95% 1,04-6,1); but when patients were operated while receiving antibiotic treatment the rate of bacterobilia was lower ( $p=0,05$ ). Age, sex, BMI, alcoholism, smoking, diabetes, immunosuppressive treatment, level of bilirubin, hemoglobin or albumin showed no difference. The presence of bacterobilia was not associated to higher rates of wound infection or other postoperative complications. In multivariate analysis only being operated under antibiotic treatment showed statistical significance ( $p=0,041$ ).

**Conclusion:** Instrumentation of the biliary tree prior surgery should be performed in selective patients. Surgery during antibiotic treatment is feasible and reduces the risk of bacterobilia.

#### PB06-45

### MASS-FORMING XANTHOGRANULOMATOUS CHOLECYSTITIS MASQUERADING AS INVASIVE GALLBLADDER CANCER WITH A FALSE-POSITIVE RESULT ON PET LEADING TO EXTENSIVE SURGICAL RESECTION

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Xanthogranulomatous inflammation of gallbladder wall can extend and infiltrate adjacent organs which can be mistaken for malignancy on preoperative investigations and, intraoperatively, often leads to extensive surgical resections. Only the histopathologic examination of the specimen allows correct diagnosis. We hereby review clinicopathologic findings of a case which underwent extensive surgeries on clinical, radiological and intraoperative suspicion of gallbladder carcinoma which turned out to be xanthogranulomatous cholecystitis. Xanthogranulomatous inflammation extended into liver, duodenum and colon in our case. A 74-year-old woman was admitted to our hospital for right upper quadrant and epigastrium discomfort and diagnosed as gallbladder carcinoma by ultrasonography, computed tomography and fluorine-18 fluorodeoxyglucose positron emission tomography (FDG-PET).

Serum CA19-9 (62.6 U/ml) were elevated. We diagnosed the lesion preoperatively as a gallbladder carcinoma with direct invasion to the liver bed and colon. We performed subsegmentectomy of the liver S4a + S5 and lymph node dissection of the hepatoduodenal ligament with segmental colon resection.

Several reports have demonstrated that FDG-PET is useful in differentiating between benign and malignant lesions in the gallbladder. However, there is a limitation in the ability of FDG-PET to differentiate between inflammatory and malignant lesions. We herein present a case of xanthogranulomatous cholecystitis misdiagnosed as gallbladder carcinoma by ultrasonography and computed tomography. FDG-PET also showed increased activity. In this case, FDG-PET findings resulted in a false-positive for the diagnosis of gallbladder carcinoma.

#### PB06-46

### ARE WE USING THE ADEQUATE ANTIBIOTIC PROPHYLAXIS IN BILIARY SURGERIES?

M. L. Del Bueno, M. Chahdi Beltrame, J. G. Cervantes, J. P. S. Duran Azurduy, M. Poupard, M. E. Lenz Virreira, E. G. Quiñonez and F. J. Mattera  
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**Introduction:** Patients undergoing hepato-pancreato-biliary surgery frequently have preoperative cholestasis and ERCP or preoperative biliary drainage may be necessary. This is a known higher risk for bacterobilia and leads to a higher risk for developing surgical site infections. Standard antibiotic prophylaxis may not be totally effective in this population.

**Methods:** Retrospective analysis including biliary surgeries from 2014 to 2019. Bile culture, antibiotic prophylaxis and postoperative complications were analyzed. Statistical analysis was made using Fisher and chi2. Differences were considered statistically significant at  $P < 0,05$ .

**Results:** 86 patients underwent biliary surgery. Surgical bile duct injuries (34.9%) and post liver transplant biliary strictures (14.0%) were the most frequent diagnosis. Only 24 patients (27.9%) underwent preoperative percutaneous biliary drainage and 47 patients (54.6%) had at least one preoperative ERCP. Hepatojejunostomy was the most frequent surgery (75,6%). Bacterobilia was confirmed in 52%; the most common bacteria were Escherichia spp (55%) and Klebsiella spp (42%). Antibiotic most common prophylaxis was cefazolin (23.3%) or Piperacillin-Tazobactam (23.3%). Prophylaxis was only effective in 21% of Bacterobilia. Postoperative complications were more frequent when prophylaxis was inadequate ( $p=0,015$ ). However, when type of complication was analyzed we found no difference; even though wound infection was higher when prophylaxis was inadequate it was not statistically significant.

**Conclusion:** Bacterobilia can be high specially when previous instrumentation of the biliary tree has been performed. Antibiotic prophylaxis should be escalated

when bacterobilia is suspected to diminish risk of post-operative complications.

#### PB06-47

### ASCARIS LUMBRICOIDES AS A CAUSE OF OBSTRUCTIVE JAUNDICE. WHEN THE NEMATODE OUTDOUES FICTION

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Lumbricoid ascariasis, is the most common helminth in humans. It is a cylindrical worm, humans acquire it by ingesting its eggs, which is found in contaminated areas. It is initially housed in the duodenum and small intestine, from where it can reach other sites. Such as the bile duct, where it can cause bile duct obstruction. Since its frequency is relatively low, we present a case of obstructive jaundice due to ascariasis.

The patient, a Female of 15 years, begins with sudden pain in the right hypochondrium, as well as changes in coloration in teguments until reaching jaundice. Managed medically without improvement, she was sent to our unit. Upon with septic shock, pain in the right hypochondrium, with no evidence of peritoneal irritation. Biliary USG, with intrahepatic dilatation of BD, as well as double rail image in bile duct. CT scan with a bile duct in the intrapancreatic portion, as well as an elongated, hyperdense tubular image. ERCP is performed, finding dilated bile duct with filling defects in distal part compatible with stones and a long filling defect suggestive of ascariasis, a wide sphincterotomy was performed, and several small stones of approx. 5 to 10 mm, two of 12 mm and an adult Ascaris were removed. 72 hours later laparoscopic cholecystectomy is performed without eventualities, and patient was discharged the next day.

Biliary ascariasis is an entity that represents 3.5% of the causes of jaundice, however it should be suspected in entities where the prevalence of the nematode is high.



ascari.

#### PB06-48

### SURGICAL TREATMENT FOR SERIOUS COMPLICATIONS OF PORTAL BILIOPATHY

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**Introduction:** Surgical treatment for complication of portal biliopathy is an exception. It implies a high risk of bleeding given the prominent collaterals present in the hepatoduodenal pedicle secondary to portal cavernomatosis.

**Methods:** Descriptive study of 4 patients who presented serious complications linked to portal biliopathy that required surgical management within the Clinical Hospital of Universidad Católica.

**Results:** Woman 59 years, with necrohemorrhagic pancreatitis (1996), biliodigestive bypass (2001) and portal cavernomatosis (2004) was presenting repeated episodes of hemobilia, one with hypovolemic shock. A Warren's shunt was tried (2005), but it failed. Then, a choledochal devascularization and hepatic-jejunal re-anastomosis intervention was made. Man 57 years, with HIV positive and serious pancreatitis (2007), developed portal thrombosis post inflammatory and cavernomatosis and presented repeated cholangitis. Roux-en-Y reconstruction was made (2012). Woman 47 years, with V Leiden factor deficit and portal cavernomatosis (2012), presented repeated cholangitis. After multiple endoscopic stent treatments, given recurrence of cholangitis and jaundice, a Roux-en-Y biliary reconstruction was performed (2015). Man 47 years, with neonatal thrombosis and cavernomatosis for omphalitis, had portal devascularization surgery made at 7 and 14 years old, he had repeated cholangitis despite multiple endoscopic attempts. Roux-en-Y was performed. All anastomosis was made in biliary conducts with multiple collateral veins that were handled with bipolar coagulation, ligatures and stitches. On the long term, none repeated episodes of hemobilia or cholangitis.

**Conclusion:** The surgery could be a definite solution for portal biliopathy complications. However, it has only been made for selective cases because it implies high complexity and risk.

#### PB06-49

### MANAGEMENT OF BOUVERET'S SYNDROME

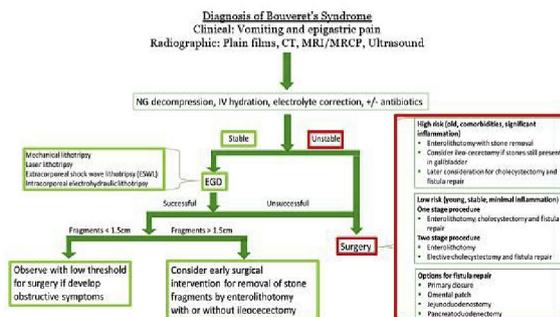
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**Introduction:** Bouveret's Syndrome is defined as gastric outlet obstruction from a large gallstone in the duodenum through a cholecystoduodenal fistula. It is a rare variant of gallstone ileus and accounts for less than 3% of all gallstone ileus cases. We present a case of cholecystoduodenal fistula with 4cm stone causing obstruction in duodenum in the setting of malrotation.

**Case presentation:** 67 year old Caucasian female with history of symptomatic cholelithiasis presented with acute onset nausea/vomiting and oral intolerance for 5 days. She had mild epigastric and right upper quadrant tenderness on examination. CT revealed cholecystoduodenal fistula with one large stone (4 cm) impacted in duodenum causing gastric outlet obstruction with malrotation. Endoscopy was not attempted due to the size of stone and presence of malrotation. Patient was taken to OR for exploratory laparotomy and stone removal. Large cholecystoenteric fistula was clearly identified and duodenotomy was performed distal to obstructing stone in the 3rd portion of duodenum, stone was extracted and duodenum was closed transversely. She was deemed too high risk for cholecystectomy and fistula repair given age and co-morbidities. Post op course unremarkable. Upper GI gastrograffin series demonstrated no leak post operatively.

Doing well on last follow up.

**Discussion:** Patients with Bouveret's syndrome have high mortality rate(12-27% due to delay in diagnosis, advanced age and comorbidities. Endoscopic stone retrieval/fragmentation is often the first step in treatment and surgical treatment is required in upto 91% of patients and considerable debate remains over optimal treatment option.



Management of Bouveret's syndrome

## PB06-50 MALROTATION OF LIVER AND PORTA HEPATIC STRUCTURES ENCOUNTERED DURING LAPAROSCOPIC CHOLECYSTECTOMY- CASE REPORT

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Ever since the start of study of anatomy there have been numerous anatomical variations or aberrations that have been reported for gall bladder, cystic artery, cystic duct, hepatic artery, common bile duct and portal vein. Performing surgeries with laparoscope provides magnified image, thereby allowing a better vision and understanding of the local anatomy of the gall bladder, calot's triangle and porta hepatis. Cholecystectomy requires keen observation and meticulous dissection. Even the most experienced

surgeons have encountered complications during laparoscopic cholecystectomy owing to the anatomical variations. Here is a case report of a 36 year old lady presenting with acute calculous cholecystitis. She was taken up for laparoscopic cholecystectomy. Only the fundus of the gall bladder was seen. Gall bladder was to the left of falciform ligament. During dissection there was sudden gush of blood which could not be controlled, hence converted to open surgery. There was malrotation of the liver causing falciform ligament to be at the right of gall bladder. There was malrotation at the porta with portal vein anterior to common bile duct and hepatic artery and anomalous portal vein being the site of bleeding. Unpredictability of the structures at porta and gall bladder anatomy is a predicament requiring furthermore understanding.

## PB06-51 MANAGEMENT OF ACUTE DISEASE IN THE REMNANT GALLBLADDER: THE EFFECTIVENESS OF REPEAT LAPAROSCOPY

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**Introduction:** Subtotal cholecystectomy has become a widely accepted alternative for patients presented with acute cholecystitis resulting in significant inflammation and anatomic distortion. Recurrent cholecystitis of the remnant gallbladder is an accepted complication of this procedure. International studies have shown completion cholecystectomy to be the definitive management of recurrent cholecystitis. Few investigators in the United States have focused on management of this scenario, and to this point open surgical approach has been recommended.

**Methods:** Cholecystectomies undertaken by one hepatobiliary surgeon over a two-year period from 2017-2019 were reviewed. Cases of patients with previous cholecystectomy who then presented with acute cholecystitis and underwent laparoscopic completion cholecystectomy were compiled and reviewed to determine interval from initial cholecystectomy, operative time, use of intraoperative cholangiography, use of intraoperative indocyanine green (ICG), placement of drain, and total length of hospital stay (LOS).

**Results:** Seven patients met inclusion criteria. The mean interval from initial cholecystectomy was 22 months (range 3-89 months with one patient presenting an unknown length of time from initial operation). Mean operative time was 119 minutes (range 79 minutes to 141 minutes). Five patients had an intraoperative cholangiogram and one case was completed with intraoperative ICG. A drain was left at the completion of three out of seven cases. Average LOS was less than one day (range 0-2) with three patients discharged in good condition post-operative day 0.

**Conclusions:** Laparoscopy is a safe and effective approach to completion cholecystectomy for patients with recurrent cholecystitis that avoids an open surgical procedure.

**PG01 - General HPB: Endoscopy**

PG01-01

**DOUBLE-ENDOSCOPE  
NECROSECTOMY VIA ENLARGED  
TRANSGASTRIC ACCESS SITE, A  
NOVEL MODIFIED NOTES-  
ASSOCIATED TECHNIQUE FOR  
WALLED-OFF NECROSIS IN  
ACUTENECROTIZING PANCREATITIS**

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**Introduction:** Endoscopic modalities, in particularly the natural orifice transluminal endoscopic surgery (NOTES), have minimized the invasiveness for pancreatic necrosis, therefore becoming increasingly important. However, the transmural access to the pancreatic necrosis was limited by the size of the available transendoscopic balloon catheters, with the maximum diameter of 20 mm. We herein reported a novel modified NOTES-associated technique using double-endoscopes to create an enlarged transgastric access site and a more efficient necrosectomy for WON in acute necrotizing pancreatitis.

**Methods:** After confirmation of successful puncture by aspirating the fluid collection content under EUS guidance, a 0.035-inch Jagwire guidewire was then advanced through the puncture needle, and a 6-F-outer plastic sheath was then advanced into the gastric wall to create cystogastrostomy. We then exchanged the EUS needle was exchanged for a balloon catheter, followed by dilatation with an over-the-wire balloon to extent the access diameter to at least 10 mm. The second therapeutic endoscope was then placed to the access site with another balloon catheter to achieve double-balloon dilation to increase the access diameter up to 40 mm. Necrosectomy was therefore performed using the two forward-viewing endoscopes.

**Results:** All 4 cases undergoing the modified endoscopic necrosectomies were performed successfully, making the technical success rate 100%. No severe postoperative complication was observed. Within a 9-month follow-up period, all the pancreatic necrosis was resolved, which indicated a clinical success rate of 100%.

**Conclusions:** A complete necrosectomy has become possible because of maximal enlargement of the transgastric access site with double endoscopes.

PG01-02

**RESECTION OF THE SPLEEN USING  
RADIOFREQUENCY ABLATION**

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**Objective:** to expand the possibilities of performing organ-saving interventions in patients with focal spleen formations.

**Materials and methods:** Since 1976, we have gained experience in treating > 450 patients with local formations of the spleen. In recent years, with benign lesions, we give preference to organ-preserving interventions. We performed 86 laparoscopic and robot-assisted surgeries with spleen preservation.

We have experience in performing > 60 liver resections using RFA. In recent years, we began to perform similar operations on the spleen. Using the Cool-Tipe Radionics® device, 12 patients were operated on. The following morphological forms of focal formations were noted: echinococcal cyst - 3, abscesses - 2, hamartoma - 1, hemangioma - 2, lymphangioma -3, hemlimphangioma -1. Twice such operations were performed by laparoscopic access using 3 trocars.

**Results:** The RFA intervention time has not increased compared to standard operations. In one observation, a small hematoma was noted along the edge of the spleen resection, which did not require repeated intervention. In the remaining patients, the postoperative period was uneventful. According to instrumental research methods, in the long term there was a zone of moderate decrease in blood flow along the edge of the resection with a thickness of up to 5-7 mm. There were no signs of relapse.

**Conclusion:** With benign local formation of the spleen, if technical difficulties arise during organ-saving operations, it is possible to use radiofrequency ablation. The use of this technique allows resection of the spleen with good near and long-term Results to be performed almost bloodlessly.

PG01-03

**ENDOSCOPIC MANAGEMENT OF  
SURGICAL JAUNDICE IN NIGERIA**

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**Introduction:** Endoscopy management of obstructive jaundice has been limited in Nigeria because of unavailability of ERCP, despite growing demand. This study presents our experience establishing an ERCP program at Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC), Ile-Ife, Nigeria.

**Methods:** ERCP was introduced into a well-established advanced endoscopy unit at OAUTHC. We employed an apprenticeship-style model of training with graded responsibility, multidisciplinary group feedback and short-interval repetition. We collate the sociodemographic and clinicopathologic information on consecutive patients who underwent ERCP from March 2018- December 2019.

**Result:** From 155 referrals, 130 patients underwent ERCP, with a median age of 55 (range 8-83). 50.8% (66/130) were male. In total, 143 procedures were performed on this cohort. Sixteen percent of referrals were inappropriate, secondary to misdiagnosis or poor functional status. Ten patients required a repeat procedure due to technical failure, while three patients had a planned second-stage procedure. The most common indications were cancer of the head of pancreas (52/130), choledocholithiasis (33/130), cholangiocarcinoma (18/130) and gallbladder cancer (9/130). Almost all patients (99%) had sphincterotomies and (57/130) had a stent inserted. Twenty-four of these individuals (42%) had self-expanding metallic stents inserted. In total, seven patients had post ERCP pancreatitis and five periprocedural mortalities were recorded.

**Conclusion:** Using an apprenticeship-style educational model - an experienced endoscopist with a well-established endoscopy unit, it is possible to develop an ERCP program in Nigeria without travelling abroad. The multidisciplinary nature of ERCP service delivery places an incentive on training within the home institution environment.

## PG02 - General HPB: Imaging

### PG02-01

#### SURGICAL SIMULATION AND NAVIGATION FOR HPB SURGERY

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**Introduction:** In Japan, preoperative 3D simulation and navigation are becoming popular in hepato-biliary-pancreatic (HPB) surgery. Herein, we report various surgical simulations and navigations in HPB surgery in our department.

#### **Methods:**

- i) We have developed a novel liver surgical navigation system that measures the shape of liver, its position, the cut surface/cut line in real time and gives feedback to the simulation software, using 3D camera.
- ii) ICG fluorescence navigation has been performed in seven cases of laparoscopic cholecystectomy. ICG fluorescence was observed with VISERA ELITE II (Olympus Co., Ltd., Tokyo).
- iii) We perform simulation and navigation using 3DCT image when performing pancreatotomy.

#### **Results:**

- i) A total of six cases have been performed: lateral, posterior segmentectomy and left, right lobectomy. The surgical field of a hepatectomy that progresses during the real operation was measured with two 3D cameras. The group of measurement points was converted to polygon, and the cut line was extracted. The position of the cut surface/cut line was projected on the 3DCG model.
- ii) Although the ICG fluorescence intensity in the bile duct was slightly weak and difficult to confirm in 3 cases with high inflammation, ICG fluorescence navigation was effective in 4 cases in which bile duct was confirmed.
- iii) In pancreatotomy, important blood vessels such as hepatic artery, GDA, SMA, SMV, and pancreatic arcade can be routinely confirmed by 3DCT before and during surgery, so that we were able to perform the operation safely.

**Conclusions:** Surgical simulation and navigation for HPB surgery have become indispensable.

### PG02-02

#### CLINICAL VALUE OF FLUORESCENT CHOLANGIOGRAPHY FOR THE PATIENTS WITH INFRAPOTAL TYPE OF THE RIGHT POSTERIOR BILE DUCT DURING SINGLE-INCISION LAPAROSCOPIC CHOLECYSTECTOMY

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**Introduction:** Reports about clinical value of fluorescent cholangiography using indocyanine green (ICG) during single-incision laparoscopic cholecystectomy (SILC) were increasing. We report clinical value and pitfalls of fluorescent cholangiography during SILC for the patients with the infraportal type of the right posterior bile duct.

**Methods:** Our SILC procedure utilized the SILS-Port with an additional 5-mm forceps through the umbilical incision. Before SILC, 1 mL of ICG (2.5 mg) was administered by intravenous injection. For fluorescent cholangiography, ICG fluorescent laparoscope system was used.

**Results:** We performed fluorescent cholangiography during SILC in 13 patients with the infraportal type of the right posterior bile duct. All procedures were completed successfully. The interval from the injection of ICG to the first obtained fluorescent cholangiography before the dissection of Calot's triangle ranged from 40 to 60 minutes. Detectability of infraportal type of the right posterior bile duct before dissection in Claat's triangle was 23.1% (n = 3) and that during dissection in Calot's triangle was 53.8% (n = 7). The infraportal type of the right posterior bile duct could be identified under fluorescent cholangiography only when it joined into the common hepatic duct.

**Conclusions:** Utilization of fluorescent cholangiography can lead SILC to safe even for the patients with the

infraportal type of the right posterior bile duct. Its benefit is emphasized when the infraportal type of the right posterior bile duct joins into the common hepatic duct.

### PG02-03

#### SPLEEN METASTASES: CRITERIA OF DIAGNOSTICS

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Spleen metastases occupy a special place both from the point of view of the rarity of the lesion, and from the position of the mechanisms of their occurrence that haven't been fully studied.

**Objective:** to define the spleen metastases criteria's of diagnosis on the basis of own experience.

**Materials and methods:** Over 450 patients with spleen's lesions were treated at A.V. Vishnevsky NMRC of Surgery (1985-2019), there were 13 spleen metastases (ovaries cancer - 4, colorectal cancer - 2, in one case of pancreas, duodenum, thyroid cancer, hepatocellular carcinoma, stomach carcinoid and lymphomas, retroperitoneal polymorphocellular sarcoma). All tumors were morphologically/histologically verified.

**Results:** *Spleen metastasis parameters*':

- clinical manifestations are only at considerable sizes of lesion(s)
- multiple nature of lesion (quite often);
- probability of defeat of several bodies (liver/lungs/bone);
- mainly subcapsular localization;
- low-resistant arterial blood-groove in metastasis at duplex scanning;
- low MSCT/MR-density, uniformity of structure of lesions;
- at MSCT: lesions are hypodenses zones without accurate contours (native); insignificant accumulation of contrast agent, thus lesion remains hypodense in relation to a parenchyma in all contrast phases; clearness of contours due to emergence of hypercontrast rim;
- lymphadenopathy of an abdominal cavity is possible;
- the increase in a spleen's sizes can't serve as diagnostic criterion;
- ascites (quite often).

**Conclusion:** In case of any spleen lesion detection it's necessary to carry out differential diagnostics with malignant tumoral process, despite a relative rarity of similar lesions. Oncological vigilance is necessary in case of cystic lesions detection too.

### PG02-07

#### WHIPPLE'S PANCREATODUODENECTOMY REQUIRING TOTAL GASTRECTOMY

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Multiple neoplastic lesions at separate gastrointestinal sites is rare with incidence of 0.7-11%. Majority of Multiple primary neoplasms (MPN's) are double primary lesions while triple/quadruple malignancies is extremely rare with a ratio of 2.7:1. Patients with periampullary lesions having lesion in stomach or gastroesophageal junction are rare. These patients requiring Whipple's pancreaticoduodenectomy (PD) with resection of the adjoining stomach for R0 Resection is rarely reported.

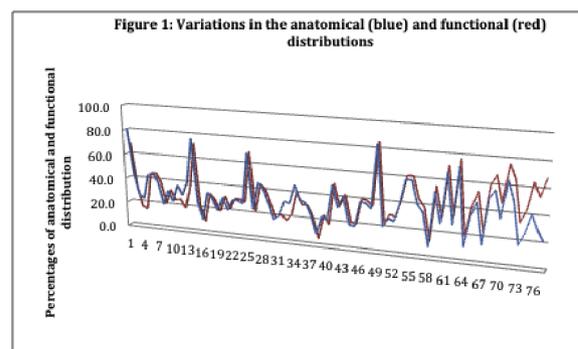
**Material and methods:** We report three cases of periampullary carcinoma with associated lesions in stomach in two patients and lesion at GE junction and pylorus in one. These patients have undergone Whipple's PD with subtotal or total gastrectomy and reconstruction. Usually Whipple's PD shall require resection of antrum and gastrojejunostomy. If pylorus preserving Whipple's is done then duodenojejunostomy is required for reconstruction. In the cases presented here, we did a proximal gastrojejunostomy in two and esophagojejunostomy in one patient. In all these surgeries feeding jejunostomy was done. All patients had a smooth postoperative course. Two patients had GIST in stomach on biopsy. One patient had no evidence of malignancy in spite of a PET positive lesion at gastroesophageal junction and pylorus.

**Conclusion:** Whipple's PD with subtotal or total gastrectomy for en mass resection of lesions is a feasible option for a patient having periampullary carcinoma with multiple lesions (duodenum, stomach and oesophagus).

### PG02-10

#### VARIATIONS IN THE ANATOMICAL LIVER VOLUME AND THE FUNCTION BASED ON <sup>99M</sup>TECHNETIUM-MEBROFINATE SPECT-CT SCAN AND ITS RELATION TO THE PRIMARY INDICATION FOR RESECTION

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[Figure 1]

**Introduction:** <sup>99m</sup>Techetium -Mebrofinatate SPECT-CT scan is a pre-operative investigation useful in assessing the global, lobar and the dynamic liver function. The study is aimed at assessing the discordance in the function (scintigraphy) within the given volume of the liver remnant and

to assess if the variation is related to the primary indication for resection.

**Methods:** All patients who underwent  $^{99m}\text{Tc}$ -Mebrofenin SPECT-CT scan in the unit since 2018 were included. Data were processed on a workstation (MultiModality; Hermes Medical Solutions) to assess the anatomical volumes, global and lobar liver function assessed as scintigraphy as well as the dynamic uptake. Data was collated from a prospectively maintained database.

**Results:** Seventy seven  $^{99m}\text{Tc}$ -Mebrofenin SPECT-CT scans were included. Three patients had the scan prior to the second stage liver resection. Median remnant anatomical volume was 685ml (range: 135-1906ml). Median global dynamic uptake was 13.19/min (range: 4.66-27.4). Percentages of the anatomical volume vs. functional distribution in the remnant liver were shown in Figure 1. There was no variation in 17/77 scans (22%), up to 4.9% variation in 31/77 scans (40%), 5-9.9% variation in 12/77 scans (15.5%), and more than 10% variation in 17/77 scans (22%). More than 5% discordance was noted in 50% with primary liver cancers in comparison to 22% with colorectal liver metastases ( $p=0.025$ ).

**Conclusion:** Distribution of liver function is non-homogeneous and is more significant in patients with primary liver cancers.  $^{99m}\text{Tc}$ -Mebrofenin SPECT-CT or equivalent should be considered in the pre-operative assessment of patients undergoing major liver resections.

#### PG02-11

### RELEVANCE OF ADIPOSE TISSUE ACCUMULATION AND MUSCULARITY IN PATIENTS UNDERGOING LIVER RESECTION

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**Introduction:** Nutritional status is known to affect the quality of liver parenchyma. This study aimed to evaluate the relevance of the amount of adipose and muscular tissue assessed on computed tomography (CT) in patients undergoing liver resection.

**Methods:** In this prospective observational study, 64 patients undergoing liver resection underwent preoperative CT assessment of height-normalized amount of visceral adipose tissue (VAT), subcutaneous adipose tissue (SAT) and total adipose tissue (TAT), smooth muscle (SM) and psoas muscle (PM). The primary outcome measure was early injury and function of remnant liver, as reflected by immediate (within 24 hours) and peak serum transaminases activity, international normalized ratio (INR), and bilirubin concentration.

**Results:** Median SAT, VAT, TAT, SM, and PM were 65.4, 41.0, 115.1, 47.8, and 5.9  $\text{cm}^2/\text{m}^2$ , respectively. TAT was significantly correlated with macro- ( $R=0.43$ ;  $p=0.001$ ) and microvesicular ( $R=0.36$ ;  $p=0.007$ ) liver steatosis, with stronger impact of subcutaneous than visceral fat. In

patients undergoing minor resections ( $n=29$ ), SM was positively correlated with early ( $R=0.53$ ;  $p=0.004$ ) and peak ( $R=0.43$ ;  $p=0.020$ ) bilirubin and SAT ( $R=0.43$ ;  $p=0.031$ ), VAT ( $R=0.51$ ;  $p=0.007$ ), and TAT ( $R=0.50$ ;  $p=0.010$ ) were positively correlated with early INR. Interestingly, in patients without relevant liver steatosis ( $<30\%$ ), SAT ( $R=0.48$ ;  $p=0.034$ ) was additionally positively correlated with early aspartate transaminase activity and VAT ( $R=0.48$ ;  $p=0.029$ ) and TAT ( $R=0.55$ ;  $p=0.010$ ) with peak aspartate transaminase activity.

**Conclusion:** Excessive amount of adipose tissue exacerbates injury and negatively influences early liver remnant function after minor liver resections. Increased muscularity may lead to increased bilirubin concentrations of undetermined clinical significance.

#### PG02-12

### INTRAOPERATIVE ICG FLUORESCENCE ALLOWS FOR IMPROVED ACCURACY IN LYMPH NODE HARVEST IN ROBOTIC GASTRIC CANCER SURGERY

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**Introduction:** Gastric cancer surgery requires adequate margin negative resection along with loco regional D1 and D2 lymphadenectomy. Traditionally, associated morbidity limited performance of D2 lymphadenectomy. Current technology utilizing robotic assisted techniques has allowed for safe performance of D2 lymphadenectomy. We describe using IndocyanineGreen (ICG) fluorescence technique to improve lymph node harvest and increase accuracy.

**Methods:** We inject indocyanine green dye into the sub mucosa around the tumor in four quadrants (5mm away from the tumor site) using intraoperative endoscopy in the operating room prior to proceeding with the gastrectomy. Robotic gastrectomy and lymphadenectomy is performed using standard JGCA guidelines. Lymphadenectomy is performed using robotic camera in the visual spectrum and near infrared fluorescence. All lymph nodes with fluorescence are removed. Pathologic evaluation of the lymph nodes is performed.

**Results:** 10 consecutive patients underwent robotic gastrectomy with lymphadenectomy from September 2017 to December 2019. Conversion rate was 0. Most common preop stage was uT3N1 Patients underwent preoperative chemo in 77% of patients and chemo radiation in 12%. Margin negative rate was 100%. Median lymph node harvest was 30 and median positive/total nodes percentage was 3/30 nodes. Median follow up is 18 months.

**Conclusion:** Utilizing ICG fluorescence in the OR to enable D2 lymphadenectomy improves lymph node harvest and serves as a sentinel mapping tool to allow for inclusive lymphadenectomy. Further evaluation using markers to study if the lymph nodes with fluorescence indeed presented with a higher positive rate of lymph node metastases needs to be done.

PG02-14

## LAPAROSCOPIC ULTRASONOGRAPHY IN HEPATO-PANCREATO-BILIARY SURGERY

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Laparoscopic surgery is now popular in the field of hepato-pancreato- biliary (HPB) surgery. Laparoscopic Ultrasonography (LUS) is more familiar to surgeons than other doctors because abdominal anatomy is well understood by them. Furthermore, combination of laparoscopy and ultrasonography in the operating theater can be a distinguishable tool for surgeons.

Between July 2009 and December 2018, we performed 521 Intra-operative ultrasonography at Bucheon St. Mary Hospital, Catholic University of Korea. LUS underwent 195 in HPB patients. The patients were liver malignancies (18), liver benign lesions(26), Gallstones and suspicious common bile duct stones (62), Gallbladder cancer (5), gallbladder benign disease(63), malignancy staging and biopsy (11) and pancreatic lesions(10).

LUS is usable for detection of tumor, discern relation of tumor with its surrounding tissue, determine resectability and to perform surgical procedures. LUS gives more information to the performing surgeon that generally leads to a better outcome. With LUS, surgeons can detect more additional nodules than conventional radiologic techniques. LUS makes surgeons available to detect unknown lesions, find out its characteristics and gather more information on surrounding vascular structures. LUS is also used in guided procedures.

After learning the LUS technique, HPB surgeon are able to provide optimal care for their patients by using the LUS. We conclude that the use of LUS is a minimal, less time consuming and highly accurate method during HPB surgery. HBP surgeons are not only capable of utilizing LUS skillfully, but also of developing numerous applications.

PG02-15

## CHOLESTEROL HEPATOLITHIASIS DETECTION WITH DUAL SPECTRAL CT

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**Introduction:** Hepatolithiasis with cholesterol stones can sometimes be difficult to diagnose in a dilated biliary system with standard CT abdomen. Dual Spectral CT reconstruction can allow better visualisation of stones including cholesterol stones.

**Methods:** This is a retrospective view of a Hepatolithiasis patient whose disease was diagnosed using Dual Spectral CT.

**Results:** A 53 yo male presented to our Emergency Department with recent RUQ pain. He had a previous open cholecystectomy overseas 15 years ago. CT showed a dilated Cystic duct with Extrahepatic Bile Duct stones and there was extra and intrahepatic duct dilatation but intrahepatic stones were not clear on standard CT abdomen. Reconstruction of the CT images using dual spectral

techniques (45keV) allowed us to visualize the intrahepatic cholesterol stones better and plan our surgery. He underwent Open Bile Duct Exploration with Clearance of intra (Right lobe sided) and extrahepatic ducts and Roux-en-Y HepaticoJejunostomy reconstruction.

Dual-Energy Spectral CT provides better visualisation of iso-dense stones (Cholesterol stones). Given the lower dose, it has less overall radiation exposure and can be used without using higher dose in arterial view. Iso-dense Gallstones have a similar density to surrounding bile and can be difficult to diagnose on CT.

**Conclusions:** Small Cholesterol stones in the liver can be better displayed on dual Spectral CT and can aid in diagnosis and management.

PG02-16

## INTRAOPERATIVE USE OF INDOCYANINE GREEN FLUORESCENCE IN HEPATOBILIARY AND PANCREATIC CANCER RESECTIONS: CURRENT STATE AND CONSIDERATIONS

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**Introduction:** Surgery for hepatobiliary and pancreatic malignancies often has unfavourable outcomes due to incomplete resection, with positive histopathological margins and locoregional metastases. Intraoperative use of indocyanine green fluorescence (ICG) with near-red infrared light can improve tumor detectability and achieve R0 status.

**Methods:** Review of current literature.

**Results:** ICG fluorescence and bile excretion allows for real-time visualisation of malignant tissues and assessment of resection margins. In liver surgery it can identify sub-capsular lesions, a property especially useful in minimally invasive surgery where there is loss of tactile feedback and direct visual inspection. It can also delineate hepatic segmental anatomy for anatomical resections. Hepatocellular carcinomas tend to uniformly uptake ICG, whereas primary or metastatic adenocarcinomas like cholangiocarcinomas and colorectal liver metastases as well as poorly differentiated hepatocellular carcinomas show rim enhancement.

In pancreatic cancer, fluorescence of the resection margin has been shown to correspond to presence of malignancy on histopathological assessment. ICG can also help to detect micrometastases and extrahepatic spread and distinguish between scar tissue and disease following neoadjuvant chemoradiotherapy.

However the technique has limitations: wide variability of method and dose of administration, no visualisation of deep seated lesions, high background fluorescence, false positives up to 40% requiring additional verification by other modalities like intraoperative ultrasound or frozen section for newly detected lesions.

**Conclusion:** ICG fluorescence can offer increased detectability of malignancy and improve post-operative outcomes in hepatobiliary and pancreatic resections. However there are limitations such as superficial depth of detection and

low specificity which need improvement to achieve maximum benefit.

PG02-17

### IS THERE A ROLE FOR SENTINEL LYMPH NODE BIOPSY IN HPB MALIGNANCIES? A SUMMARY OF CURRENT PRACTICE

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**Introduction:** In HPB surgery radical lymph node dissection is often necessary to achieve true R0 resections, but carries significant risks. Sentinel lymph node (SNL) biopsy has been rarely used so far but could help identify those patients who would most benefit. Herein we look into current state of practice.

**Methods:** Review of current literature.

**Results:** In hepatobiliary malignancies tumors commonly requiring radical lymphadenectomy are intrahepatic cholangiocarcinoma and gallbladder cancer. However hepatic lymphatic drainage is unpredictable and SNL mapping has been used to highlight first line nodes and thus avoid unnecessary dissection and increased morbidity from extensive hilar nodal clearance. Both methylene blue dye and ICG fluorescence have been used as tracer materials.

In colorectal liver metastases almost 15% of patients have nodal microinfiltration, but radical lymphadenectomy has been proven unnecessary for up to 80%. It is thought that site of involvement is the most crucial prognostic factor for recurrence, and again here SNL mapping can identify the subset of patients to benefit from nodal clearance.

In pancreatic cancer local recurrence reaches 30%. Lymphoscintigraphy with Tc99m and use of gamma probe intraoperatively has yielded good Results but does not allow for visual identification. ICG is also promising but methylene blue has shown poor penetration.

**Conclusion:** SNL biopsy can play a role in identifying patients with HPB malignancies who require radical lymphadenectomy. However data is still limited, the injected tracers used suboptimal and there is no consensus on technique or result interpretation. Hence more research is required before it becomes usual practice.

PG02-20

### AUGMENTED HOLOGRAPHIC HPB SURGICAL NAVIGATION USING EXTENDED REALITY: XR (VR/AR/MR)

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Surgical navigation have become essential for surgeons to accurately and safely perform HPB operations. HPB surgery requires a high degree of spatial awareness and orientation because of complex anatomies and procedures. The traditional navigation for HPB surgery was displayed only for 2D observation on a flat screen by surgeons, the image-based navigation interface is separated from the operating area, and the surgeon needs to switch the field of vision between the screen and the patient's lesion area. We

developed extended reality (XR) navigation that combines virtual reality (VR), augmented reality (AR), and mixed reality (MR), and holographic technology for HPB surgery to provide more spatial and intuitive information to surgeons.

From patient's individual CT data, organs and abnormal lesions were extracted into individually colored 3D polygons, and represented into real space with a transparent holographic wearable glasses built-in position sensors (HoloLens and MagicLeap) using our original XR application.

In Results, each organ was floated in the actual surgical space. These holographic organ models were able to share and move freely in all directions by gesture interface, and complex procedures could be confirmed with pointing by all surgeons. The ability to spatial awareness for understanding the extent of resection, blood vessel processing, and lymph node dissection were improved during surgery. Our XR navigation system has high accuracy and stability for registration.

Our patient-specific XR surgical navigation is highly effective and reduce surgical time, blood loss, and adverse event. This system must have value for future HPB surgeons

PG02-21

### CBD EVALUATION WITH MRCP IN ACUTE MILD BILIARY PANCREATITIS

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**Introduction:** Gall stones as an aetiology represent 40-60% cases of acute pancreatitis with variations due to diagnostic efforts and availability of imaging tools. Accurate diagnosis of acute biliary pancreatitis (ABP) is of utmost importance because clearance of lithiasis (gallbladder and common bile duct, CBD) rules out recurrences, very frequent otherwise, with 30% to 50% of the patients developing recurrent acute pancreatitis relatively soon after discharge (average time 108 d), some of them maybe more severe than the previous episode. Therefore, All patients should undergo specific imaging, preferably MRCP, to exclude choledocholithiasis as LFTs and ultrasonography are inaccurate in predicting common bile duct stones.

**Methods:** An analytical observational study was carried out at an eastern Indian Tertiary care centre from January 2012 to October 2019. All patients with mild acute gall stone pancreatitis were included in the study. MRCP was done at the time of index admission. All patients underwent laproscopic cholecystectomy. Additional ERCP was done for those with CBD stones on MRCP

**Results:** 70% (56 out of 80) patients came to the hospital within 1 week of onset of symptoms. The cumulative rate of choledocholithiasis (on MRCP) was 12.5% that is 10 out of 80 patients at index admission, of which 60% were within the 1<sup>st</sup> week of onset of symptoms.

**Conclusion:** Early performance of MRCP can help in selecting patients for ERCP before cholecystectomy. Therefore routine CBD evaluation should be encouraged in cases of mild biliary pancreatitis.

**PG03 - General HPB: Education**

PG03-02

**SHORTENING SURGICAL TRAINING THROUGH ROBOTICS: A RANDOMISED CONTROLLED TRIAL OF LAPAROSCOPIC VERSUS ROBOTIC SURGICAL LEARNING CURVES**

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**Objective:** To compare laparoscopic and robotic training.  
**Background:** Minimally invasive surgery is the gold standard technique for many operations. Laparoscopic training has a long learning curve. Robotic solutions may shorten the training pathway.  
**Methods:** Surgical trainees (ST group) were randomised to receive 6 hours robotic or laparoscopic simulation training. They then performed cholecystectomy; continuous suture closure of a gastrotomy and interrupted suture closure of small bowel in cadaveric specimens. Medical students (MS group) had two hours robotic or laparoscopic simulation training followed by interrupted suture closure of a gastrotomy. The Global rating scale score (GRS), number of suture errors and time to complete each procedure was recorded.  
**Results:** The median GRS score for the ST group was better after robotic training (total GRS score 27.00 +/- 6, n=10) compared to laparoscopic training (18.00 +/- 5, n=10, p< 0.001). There were less errors made for the robotic group compared to the laparoscopic group for continuous suture (7.00 +/- 5 and 22.25 +/- 5 respectively, p< 0.001) and interrupted sutures (8.25 +/- 4 and 29.50 +/- 8 respectively, p< 0.001). For the MS group, the robotic group completed 8.67 interrupted sutures with 15.50 errors in 40 minutes, compared to 3.50 sutures with 40.00 errors in the laparoscopic group (p< 0.001). Fatigue and physical comfort levels were better after robotic operating compared to laparoscopic operating (p< 0.001) for both groups.  
**Conclusions:** The acquisition of surgical skills in surgical trainees and the surgically naive takes less time with a robotic compared to laparoscopic platform.

PG03-04

**CLASSICAL MUSIC THERAPY AND PRE OPERATIVE ANXIETY IN THE OPERATING ROOM FATMAWATI CENTRAL GENERAL HOSPITAL**

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Surgery is a traumatic experience that threatens everyone who will undergo surgery. This anxiety is usually motivated by the threat of death, pain, bleeding. Several studies have found that 75% -85% of patients are anxious before surgery and thus require nursing intervention in the form of providing health education, relaxation training techniques, applying spiritual practices that are usually performed by patients such as praying, singing or listening to spiritual songs. This study aims to determine the success rate of anxiety reduction in the application of classical music

therapy. This research is cross sectional. This study uses a quasi-experimental method with one group pre-test and post-test without control group. The sample in this study were 20 patients who were going to undergo surgery in the preparation room of Fatmawati Hospital. Data collection tools using the HARS (Hamilton Anxiety Rating Scale) questionnaire. The Results of the study before being given an intervention have anxiety categories of mild (10%), severe (70%). Whereas after the intervention was given, it had mild (80%), severe (5%) anxiety. It can be concluded that there is a significant influence of patient anxiety before and after the administration of classical music therapy. It is expected that the results of this study can be applied as an SOP for the application of classical music therapy while the patient is in the preparation room of the Fatmawati General Hospital.

PG03-05

**ANZHPBA POST-FELLOWSHIP TRAINING IN HPB SURGERY: A COMPREHENSIVE REVIEW FROM THE FIRST 10 YEARS**

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**Introduction:** The Australian and New Zealand Hepatic, Pancreatic and Biliary Association (ANZHPBA) post-fellowship training program stands in the unique position of being one of only two worldwide to formalise post-fellowship education of hepatic, pancreatic, and biliary (HPB) surgeons. Over the ten years since its inception, the program has become the sought-after credential in the armament of aspiring HPB surgeons throughout Australia and New Zealand. Despite this, no formal review process has occurred to allow previous trainees to reflect on the training they received.

**Method:** The ANZHPBA endorsed the distribution of an electronic survey to the 50 trainees who had completed their training. The survey consisted of 41 questions describing the experience of HPB training during their fellowship. It was available for completion on-line between May and November, 2019.

**Results:** 39 respondents completed the survey resulting in a 78% response rate. Operative experience and surgical teaching during training was considered positive by 80% and 87% respectively. 64% of respondents felt adequately prepared for consultant practice upon completion of the program, with 85% currently employed as an HPB surgeon, and 67% working in a tertiary-level centre. Just over half of the respondents felt there could be changes made to the training program with the most frequent suggestions to increase the length of training and modernising the assessment and feedback process.

**Conclusions:** The ANZHPBA fellowship provides a surgical education that trainees describe as adequate for consultant HPB practice, with the majority of graduates

employed in that capacity following completion of the program.

PG03-07

### CELIAC ARTERY ANEURYSM AND PSEUDOANEURYSM CAUSED BY MEDIAN ARCUATE LIGAMENT SYNDROME (MALS) WITH DIFFERENT PRESENTATION: A CASE SERIES

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**Introduction:** The median arcuate ligament syndrome (MALS) is a rare vascular disorder caused by an extrinsic compression of the celiac artery from the median arcuate ligament. It is associated with aneurysmal dilatation due to compression. Although it usually comes with the classical triad of chronic abdominal pain, weight loss and epigastric bruit, it still manifests a wide variety of symptoms.

**Method:** We observed 3 cases of celiac trunk aneurysm associated with this condition presented to us initially with different symptoms and MALS were detected by computed tomography scan.

**Results:**

Case 1: a 67 year old lady presented with epigastric pain underwent CT showed superior and inferior pancreaticoduodenal artery aneurysm. Successful angioembolisation of aneurysm done and proceeded with release of median arcuate ligament.

Case 2: A 56 year old gentleman presented with symptoms of gastric outlet obstruction, CT scan showed duodenal mass with GDA pseudoaneurysms, Whipple procedure was performed.

Case 3. A 51 year old gentleman presented with obstructive jaundice and was diagnosed with pancreatic head carcinoma, proceeded with Whipple procedure, only to discover common hepatic and superior anterior pancreaticoduodenal artery pseudoaneurysm post surgery via digital subtraction angiography.

**Conclusion:** Aneurysms associated with MAL syndrome is quite rare and may present with different symptoms at time of diagnosis. Angioembolisation should be the treatment of choice and followup for recurrence is warranted.

PG03-09

### HPB AND TRANSPLANT OPERATIVE EXPERIENCE AMONG NEW ZEALAND GENERAL SURGERY TRAINEES

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Subspecialty surgery experience during General Surgery training in Australasia is influenced by many factors including duration of training, training location, and the introduction of post-fellowship training programs. Experience in hepato-pancreato-biliary (HPB) and transplant surgery is part of the general surgery curriculum, although trainee experience in these subspecialties has not been quantified in this region, which is relevant to post-fellowship training programs. Therefore, the aim of this was to quantify the HPB and transplant operative experience of New Zealand (NZ) General Surgery trainees.

Operative logbook data were analysed for all NZ trainees from 2013 to 2017, including procedures categorized as pancreatic, biliary, hepatic and transplant surgery only. The number of cases within each category were used to model the cumulative operative experience over a five year training program.

During the study period 118 trainees (303 trainee years) recorded 15,662 HPB and transplant procedures. Of these, 13,838 (88.4%) were cholecystectomies (mean cumulative experience 219.3 cases). Excluding cholecystectomy, trainees had a mean cumulative experience of 5.7 biliary, 7.5 pancreatic, 8.1 liver, and 4.2 transplant procedures during their training. Transplant experience was predominantly access for peritoneal dialysis (228/260, 86.7%), with cumulative transplant experience otherwise reaching 0.47 procedures over five years.

Exposure to HPB and transplant surgery during General Surgery training in NZ is limited beyond cholecystectomy. Expectations of first-year Fellows undertaking further HPB or transplant training must reflect these limitations.

PG03-10

### ASSOCIATION OF PREOPERATIVE SARCOPENIA WITH POSTOPERATIVE COMPLICATIONS FOLLOWING HEPATO-PANCREATO-BILIARY CANCER SURGERY

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**Introduction:** Sarcopenia is a syndrome characterized by progressive and generalized loss of skeletal muscle mass and strength with a risk of adverse outcomes such as physical disability, poor quality of life and death. At present, perioperative mortality has been decreased, but morbidity is still high. Sarcopenia is independently associated with poor prognosis across a wide range of oncology settings

**Methodology:** This is a prospective observational study of 31 cases from 15<sup>th</sup> April 2019 to 14<sup>th</sup> Oct 2019 conducted in Department of GI and General Surgery, TUTH, Kathmandu. All patients who underwent elective HPB cancer surgery at TUTH were included. Preoperative sarcopenia was calculated as skeletal muscle index = (skeletal muscle area at L3 in CECT) / (height in meter)<sup>2</sup>. The main aim was

to determine association of preoperative sarcopenia with major postoperative complication.

**Results:** The demographic characteristics (age, sex, performance status, albumin, BMI) of patients with and without sarcopenia were similar. The patients underwent various types of operation like: extended cholecystectomy, right extended hepatectomy and Whipple's procedure. The postoperative major complications were significantly higher in sarcopenic patients ( $p = 0.0001$ ). Sarcopenic patients also had longer hospital stay.

**Conclusion:** Preoperative sarcopenia is associated with major post-operative complications and longer hospital stay following hepato-pancreato-biliary cancer surgery.

### PG03-11

#### THE FEASIBILITY AND BENEFITS OF IN VIVO SWINE TRAINING MODEL FOR LAPAROSCOPIC LIVER RESECTIONS AMONG GENERAL SURGERY RESIDENTS

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**Background:** Laparoscopic liver resections (LLR) are gaining popularity worldwide, however, a proper and efficient training model is lacking, mainly for residents and young surgeons. The aim of our study is to assess the feasibility and benefits of a "step-by-step" training model in LLR created for residents as part of a continuous training program.

**Methods:** From May 2017 to October 2018, 30 residents who previously participated in laparoscopic surgery workshops at "Prof. Sergiu Duca" training centre, Cluj-Napoca, Romania, participated in a "step-by-step" guided LLR protocol workshop on swine (Stage 1) aiming to analyse its feasibility. The protocol consisted of performing cholecystectomy, liver mobilization, minor and major resections. Their performance Results in terms of operative time, blood loss, conversion, trainers' intervention and intraoperative mortality, were recorded. Twenty-four of these residents (6 dropped out as they turned seniors) were later compared to 24 senior surgeons who neither followed the protocol nor performed LLR previously (Stage 2), and to another 24 residents who weren't part of a training program but followed the protocol (Stage 3), aiming to assess its' benefits.

**Results:** All residents fully completed the surgical procedures. Trained residents obtained better operative times and less blood loss compared to senior surgeons ( $p < 0,017$ ), however, the remaining parameters were comparable. When compared to non-trained residents, the trained ones had significantly better results only in operative times ( $p < 0,001$ ).

**Conclusion:** A continuous LLR "step-by-step" training program on swine for residents is feasible. It can be successfully applied with clear benefits on practical skills.

### PG03-12

#### ROBOTIC SUGERY IN HBP FIELD: SINGLE CENTER EXPERIENCES

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**Backgrounds:** The robotic platform might offer superior ergonomics over other minimally invasive approaches. the use of a robotic system potentially broadens indications for minimally invasive surgery in HBP field.

However, the increased time required for instrument set-up, operations, and surgical training are perceived as major drawbacks. We report our experience at Chonbuk national medical center in HBP field.

**Methods:** From September 2017 to November 2019, all consecutive patients(n=112) who underwent robotic surgery were retrospectively analyzed. Variables of interest for this study were patient demographics, operative times for the procedure and morbidities.

**Results:** Among 112 patients, 98 from cholecystectomy, 7 from hepatectomy, 6 from pancreatectomy and 1 from bile duct resection. The mean age of recipients was 45.2 years with range of 15-68 years.. The Hepatectomy was performed in 2 HCC cases and 5 benign disease cases, The pancreatectomy(distal 3, pancreaticoduodenectomy 3) and bile duct resection were performed in benign diseases.

The mean docking and operating times were 8.7(83) mins in cholecystectomy, 14(289)mins in hepatectomy , 28(368)mins in distal pancreatectomy, and 25 (590)min in pancreaticoduodenectomy

Total numbers of open and laparoscopic conversion are 2 cases cause of sever adhesion.

Postoperative complications were bile leaks (1 case in bile duct resection) and cholangitis (1case in cholecystectomy).

**Conclusion:** In our Results, robotic assisted laparoscopic surgery in HBP filed is feasible and safe for a variety of procedures.

### PG03-14

#### AN INTERNATIONAL HEPATOBILIARY MULTIDISCIPLINARY TEAM MEETING: A CASE FOR ITS PERPETUATION

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**Introduction:** Multidisciplinary team meetings (MDTs) are integral to modern surgical oncology. With multiple specialists coming together to discuss patient care on a case-by-case basis, they have been shown to improve patient outcomes.

The global cancer burden appears to be shifting to less developed countries - patient load is high, resources are low, and clinicians often work in isolation, with little access to multidisciplinary care teams. With the use of videoconferencing, international MDTs can take place over great geographical distances, providing insight, exchange of

medical knowledge, protocols and guidelines amongst colleagues.

**Methods:** We implemented a unique model for an international hepatobiliary MDT in order to improve services in developing nations and enhance our own management of complex cases.

3-monthly meetings were conducted by a Chairperson at a coordinated time with 7 Hepatobiliary units worldwide contributing simultaneously. A secure web-based platform was used for case presentations.

**Results:** 6 MDTs have been successfully coordinated despite the 5 different time zones between the 7 different institutions (Table 1.). More than 40 patients have been discussed. Since overcoming the problems of internet connections and technical issues, the participating institutions enjoyed complex case-based as well as building the global peer group that has resulted in skills workshops.

**Conclusion:** We show it is possible to continually coordinate and implement an international hepatobiliary MDT meeting. Robust discussion, improvement in evidence-based practice in developing countries and building an international peer group were byproducts of such a process.

**Table 1**

Participating Locations	Local Time
Brisbane, Australia	2100H
Yangon, Myanmar	1730H
Kandy, Sri Lanka	1630H
Colombo, Sri Lanka	1630H
Manchester, U.K.	1100H
Edinburgh, Scotland	1100H
Dallas, U.S.A	0600H

### PG03-15

#### ALBUMIN AS A PREDICTOR OF OUTCOME IN PATIENTS UNDERGOING GASTROINTESTINAL (GI) AND HEPATO-PANCREATO-BILIARY (HPB) OPERATIONS: A PROSPECTIVE BI-COHORT STUDY

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**Introduction:** Serum albumin is a readily available biochemical parameter, shown to have a high positive predictive value for surgical complications and mortality. We aimed to study the relationship of pre-operative serum albumin levels with outcome in GI and HPB surgical patients.

**Methods:** All consecutive patients undergoing GI and HPB surgeries in geographically different two cohorts of population A and B (SGRH and KDMC respectively) were collected between 2019-2020 by the two principal

investigators. The serum albumin levels were arranged in 4 quartiles and the correlation and association of the levels with the outcome variables (length of post-op stay, ICU stay, Clavien-Dindo grading and mortality) and other demographic and pre-operative variables were studied using ANOVA and Kruskal-Wallis tests.

**Results:** There were a total of 602 patients in cohort A (M:F=1.5:1) and 172 patients in cohort B (M:F=0.8:1). The median (IQR50) serum albumin in cohort A was 3.3 gm/dl and 3.4 gm/dl in cohort B. There was a strong association of serum albumin levels with age, body mass index (BMI), Hemoglobin levels, bilirubin levels and nature of disease (benign or malignant) in both the cohorts of population ( $p < 0.001$ ). There was no significant association of outcome variables with albumin levels in both the cohorts. However, there was trend towards lower incidence of major complications (CD $\geq$ III) in the higher quartiles of albumin ( $p=0.03$ ).

**Conclusion:** Low pre-operative serum albumin levels could be a simple marker to predict the incidence of major complications in GI and HPB surgical patients of varying geographic ethnicity.

### PG03-17

#### DELAYED PRESENTATION FOR ONCOLOGICAL CARE AMONG PATIENTS WITH HEPATO-PANCREATO-BILIARY CANCERS IN ILE-IFE, NIGERIA

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**Introduction:** Hepato-pancreato-biliary cancers are associated with high mortality rate. It been projected that cancer incidence will rise by 70% in developing countries. Cancer mortality rate is high in Nigeria also late presentation is then norm. This study aims to identify the various factors responsible for delay by assessing both patients and health system factors.

**Methods:** This is a cross-sectional survey of all patients presenting with hepato-pancreato-biliary cancers in Ile-Ife. Socio-demographic details were documented in a proforma while an interviewer administered questionnaire were administered. Patients delay is defined as the time between identifying the first symptom and presentation at health facility while system delay is time from presentation to diagnosis and treatment.

Data were analysed using Statistical Package for Social Sciences version 24.

**Results:** One-hundred and twenty-three patients presented with hepato-pancreato-biliary cancers within three years. About 57% male and 43 females, 77.7% presented with stage III and IV disease. Patient delayed was found in 78.8% of cases, self-medication and financial constraints been the commonest reasons. 73.4% presented at primary health facility first before referral to tertiary hospitals. The system delay is seen in 37% of patients with mean time interval from diagnosis to treatment been 22.67days.

**Conclusion:** Delay in presentation is common leading to late presentation with resultant high morbidity and mortality.

PG03-18

### PALLIATIVE MANAGEMENT OF TERMINAL STAGE HEPATOBILIARY PANCREAS MALIGNANCY: HOSPICE CARE PERSPECTIVE IN THE ERA OF POLST

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**Introduction:** Hepatobiliary and pancreatic (HBP) malignancy remains a highly lethal disease, with nearly 70-80% of patients presenting with metastatic or locally advanced disease. Recent chemotherapy for metastatic pancreatic cancer (FOLFIRINOX) improves median survival. Even though this regimen increased survival, since the implementation of the POLST in Korea, paradigm it began to change. We described and analyzed the status of POLST and treatment in the real world and discuss about principle of palliative care focused on HBP malignancy.

**Method:** Between February 2018 and December 2019, we reviewed the terminal stage hepatobiliary and pancreas cancer patient who have already agree with POLST retrospectively.

**Results:** Total 158 patients of HBP malignancy were analyzed. The mean age was 65 years and proportion of hepatocellular carcinoma (HCC), cholangiocarcinoma and pancreatic cancer was 20.2% vs. 37.9% vs 41.9%. Symptoms were reported differently according to the types of cancer, In the case of hepatocellular carcinoma, 70% of patients suffered from abdominal distension due to malignant ascites, and 84% of patients of biliary tract cancer had jaundice and itching sense. Opioid analgesics were significantly used common in 96% of pancreatic cancer. Patients with HCC and biliary tract cancer had a high rate of treatment such as PTBD and PCD even after POLST.

**Conclusion:** In the era of POLST, palliative treatments have become a major issue. Depending on the symptoms associated with the type of cancer, appropriate treatment should be applied and it will be a good way to improve QOL in terminal cancer patients.

### PG04 - General HPB: Evidence Based Medicine PG04-01

#### PRE MORBIDITY AND MORTALITY HOSPITAL STAY INDEPENDENTLY PREDICT POST OPERATIVE MORBIDITY IN GASTROINTESTINAL AND HEPATOBILIARY SURGERY: A PROSPECTIVE ANALYSIS

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**Aim:** Aim of study was to study effect of perioperative hospital stay before onset of complications on subsequent morbidity and mortality.

**Materials and methods:** We evaluated all the patients operated for gastrointestinal and hepatobiliary surgery

between April 2016 and October 2019 prospectively for morbidity and mortality. We evaluated various factors responsible for morbidity and mortality including pre-morbidity and pre-mortality hospital stay. Morbidity defined as Clavien Dindo grade 3 and 4 complications. Statistical analysis was done using SPSS version 23. Categorical factors were evaluated using chi square test, continuous factors using Mann-Whitney U test. Multivariate analysis done using logistic regression method.

**Results:** Total 305 patients were evaluated prospectively. On univariate analysis Open surgery, prolonged pre morbidity hospital stay, blood products used, higher CDC grade of surgery, Higher ASA grade predicted 90 days morbidity. On multivariate logistic regression analysis only higher pre hospital stay predicted the morbidity. (p=0.029). On univariate analysis Higher pre morbidity or mortality hospital stay was not associated with mortality. However, Morbidity independently predicted mortality. (p=0.017).

**Conclusions:** Pre hospital stay is significantly associated with higher complication rates and morbidity. Unnecessary hospital stay should be avoided.

PG04-03

#### MODIFIED POSTOPERATIVE PANCREATIC FISTULA CLASSIFICATION SYSTEM: PROPOSAL AND CLINICAL VALIDATION

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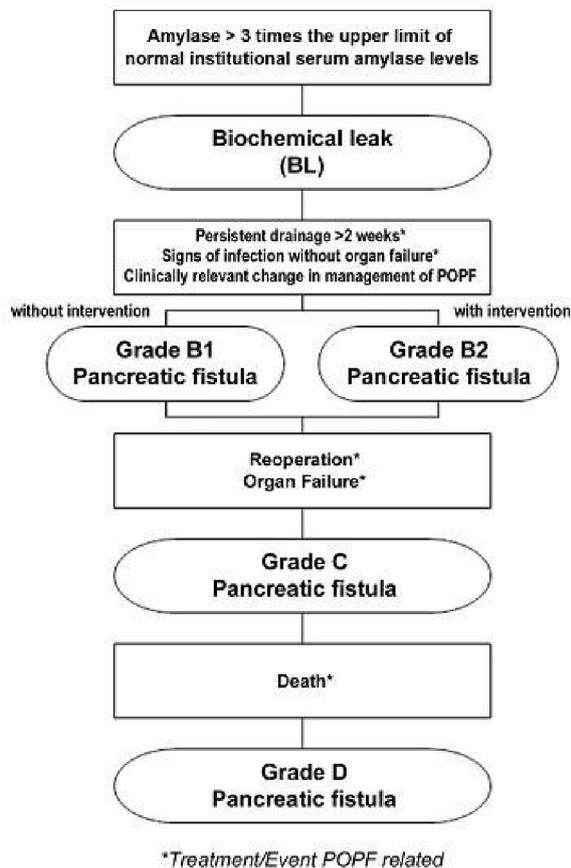
**Background:** Postoperative pancreatic fistula (POPF) is important complication influencing postoperative outcomes. Although the classification by the International Study Group on Pancreatic Fistula (ISGPF) is generally used to describe POPF, it can be improved.

**Methods:** The medical records of 528 patients who underwent pancreatectomy from 2011 to 2015 in a single center were retrospectively reviewed. The patients were divided into groups according to a modified POPF (mPOPF) classification. (No POPF: same as ISGPF, BL: previous BL patients except those who had a surgical drain over 2 weeks, B1: patients with clinically relevant change, but no need for interventional therapy (IT), B2: patients with IT, C: previous Grade C without mortality cases, D: mortality cases due to POPF) Postoperative outcomes were analyzed in comparison with the previous ISGPF POPF system.

**Results:** mPOPF showed significantly improved clinical and economic relevance according to the grades (length of hospital stay (day); No POPF vs. BL: 17 [13-23] vs. 14 [11-18], p=0.004, BL vs. B1: 14 [11-18] vs. 20 [15-26], p< 0.001, B1 vs. B2: 20 [15-26] vs. 34 [25-38], p< 0.001, B2 vs. C: 34 [25-38] vs. 47 [32-62], p=0.005, C vs. D: 47 [32-62] vs. 71, p=0.087, cost variation; No POPF: reference, BL: + 1%, B1: + 9%, B2: + 38%, C: + 90%, D: + 161%, p< 0.001).

**Conclusions:** The mPOPF classification could discriminate the severity of POPF better in terms of clinical relevance

and economics to complement ISGPF POPF. Further external validation in the form of a study is necessary.



[Flow chart for the mPOPF classification]

**Introduction:** To date, there are no prospective randomized studies that have studied the safest and most feasible method of liver parenchyma transection in laparoscopic liver resection (LLR). We aimed to compare the short-term Results of two methods of liver parenchyma transection during LLR in a prospective, randomized trial.

**Methods:** Two groups were compared after LLR with and ultrasonic surgical aspiration system (CUSA) and waterjet dissector (WJD). The samples size of 30 patients was calculated for 90% statistical power. Randomization in each arm was performed using envelopes. Inclusion criteria were benign liver tumors (hemangioma, focal nodular hyperplasia, hepatocellular adenoma, hydatid echinococcosis [only with total pericystectomy]) and malignant tumors (colorectal cancer metastases, hepatocellular carcinoma, intrahepatic cholangiocarcinoma). In addition to the standard criteria, specific exclusion criteria were liver cirrhosis and the inability to provide standard conditions for the bleeding prevention (high central venous pressure, fragile liver parenchyma due to severe steatosis and other advanced drug-induced changes). Primary endpoint was ratio of blood loss to resection area (mL/cm<sup>2</sup>).

**Results:** Totally 68 patients were enrolled with 32 and 36 patients included in WJD and CUSA groups, respectively. Tumor size was significantly large in WJD group without differences in other local parameters (table). No differences were found in immediate outcomes including blood loss, blood/resection area ratio, morbidity and others (table).

**Conclusions:** Specialized liver parenchyma transection devices (CUSA and WJD) have similar efficacy and safety in laparoscopic liver resection. The choice of instrument may be determined by the surgeon's preference.

**PG04-03**

Clinical and economic outcome measures according to the mPOPF classification

N = 528	No POPF 292 (55.3%)	BL 67 (12.7%)	Grade B1 107 (20.3%)	Grade B2 37 (7.0%)	Grade C 22 (4.2%)	Grade D 3 (0.6%)	p value
<b>POPF related re-admission</b>	0 (0.0%)	0 (0.0%)	0 (0.0%)	5 (13.5%)	6 (27.2%)	2 (66.7%)	<0.001
<b>Drainage duration (day)</b>	10 [7-13]	8 [7-10]	12 [9-15]	20 [15-28]	21 [13-36]	9	<0.001
<b>LOS (day)</b>	17 [13-23]	14 [11-18]	20 [15-26]	34 [25-38]	47 [32-62]	71	<0.001
<b>Cost (10<sup>3</sup>\$)</b>	12.1 [10.3-14.6]	12.2 [9.4-13.8]	13.2 [11.3-16.2]	16.6 [13.8-19.5]	22.7 [19.8-28.9]	31.6	<0.001
<b>Cost variation</b>	(reference)	+ 1%	+ 9%	+ 38%	+ 88%	+ 161%	

**PG04-04**

**A SINGLE CENTER PROSPECTIVE RANDOMIZED STUDY FOR COMPARISON OF WATER JET DISSECTOR AND ULTRASONIC ASPIRATOR IN THE DIVISION OF THE LIVER PARENCHYMA DURING LAPAROSCOPIC RESECTION**

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**Perioperative data in groups**

Parameters	Water Jet destructor n-32	CUSA n-36	P
Tumor size (mm)	71 (18-211)	51 (16-165)	0,049
Difficulty score (points)	7 (2-12)	7 (2-12)	0,386
Malignant/benign lesions, n	13/14	23/18	0,502
Blood loss (mL)	195 (10-400)	218 (10-1400)	0,604
Blood loss/resection area (mL/cm <sup>2</sup> )	3,9 (0,9-10,6)	5,0 (0,4-20,0)	0,385

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Parameters	Water Jet destructor n-32	CUSA n-36	P
Pringle maneuver (n, %)	15 (47%)	21 (58%)	0,862
Liver parenchyma transection time (min)	107 (19-305)	100 (20-300)	0,882
Severe morbidity (>II g, CD, n, %)	2 (6%)	2 (6%)	0,903
Hospital stay (day)	8 (5-16)	8 (4-19)	0,233

## PG04-05

### NON SURGICAL PROCEDURE RELATED POSTOPERATIVE COMPLICATIONS INDEPENDENTLY PREDICTS PERI OPERATIVE MORTALITY, IN GASTROINTESTINAL AND HPB SURGERIES: A RETROSPECTIVE ANALYSIS

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**Aim:** The Aim of the study was to evaluate relationship between non surgical procedure related complication and 30 days mortality.

**Material and methods:** All gastrointestinal and hepatobiliary procedures performed in last 2 years have been evaluated retrospectively. Non surgical procedure related post operative complications were defined as peri operative complications non related to surgical procedures or techniques and related to patients' physiological health or comorbidities (e.g acute kidney injury, ARDS, acute respiratory failure, pre existing sepsis etc.), Surgical related complications were defines as peri operative complications related to surgical procedures or techniques (e.g. bleeding, leaks, sepsis due to leaks etc.). Factors affecting 30 days mortality and morbidity were analysed using univariate and multivariate analysis. Statistical analysis was done using SPSS (IBM).

**Results:** Total 315 major hepatobiliary and pancreatic surgery were done in our institute in last 2 years. 30 days overall mortality rate was 6.3 percents. In univariate analysis mortality was significantly associated with non surgical procedure related complications was significantly associated with 30 days mortality. ( $p < 0.0001$ ). Surgical related complications was not associated with mortality. On univariate analysis other factors associated with mortality were open surgeries, emergency surgeries, advances age, high grade of surgery, higher ASA grades, increase operative duration, increased blood product requirements. However on multivariate analysis only non surgical procedure related postoperative complications independently predicted mortality.

(p=0.046, odds ratio 6.139).

**Conclusions:** Non surgical procedure related post operative complications (patient related) is strongly associated with 30 days mortality, suggesting improved perioperative care can help to reduce post operative mortality.

## PG04-07

### LONG-TERM DEPENDENCY OUTCOMES IN OLDER ADULTS FOLLOWING HEPATECTOMY AND PANCREATECTOMY FOR CANCER: A POPULATION-BASED ANALYSIS

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**Introduction:** Older adults (OA) (>70 years old) comprise over half of incident cancers. We evaluated homecare use and institution-free survival (IFS) following hepatectomy and pancreatectomy in OA.

**Methods:** Patients  $\geq 70$  undergoing hepatectomy or pancreatectomy (2007-2017) were analyzed using administrative datasets. Outcomes were receipt of homecare and IFS, defined as  $< 14$  days in healthcare institutions within one year. Time-to-event analyses accounted for competing risk of death.

**Results:** 982 patients underwent hepatectomy and 1283 pancreatectomy. Homecare use was highest in month-1 (72.3%) and decreased between year-1 (25.5%) and year-5 (18.3%). Female sex (HR 1.18) and adjuvant therapy (HR 1.56) were associated with increased hazards of receiving homecare. Ratio of nursing care vs. personal support services reversed from 68%/26% in year-1, to 29%/64% in year-5. IFS dropped most in year 1 (40.6%), then gradually to year 5 (28.1%). Ratio of acute care vs. nursing homes went from 77%/14% in year-1 to 23%/70% in year-5. Duodenal (HR 1.45) and pancreas (HR 1.20) cancer and rural residence (HR 1.24) were independently associated with inferior IFS, and systemic/radiation therapy (HR 0.88) with superior IFS. Increasing age was neither associated with homecare receipt nor IFS.

**Conclusion:** Following HPB cancer surgery, there is a high rate of healthcare dependency for OA. There is immediate need for homecare that reaches a new baseline after 6 months. Most will spend 2 weeks in one year in institution, the majority in the first year. This outlines the need for pre-operative transitional care planning, tailored by risk factors identified herein.

## PG04-08

### PANCREATIC COMPUTED TOMOGRAPHY STANDARDISED REPORTING TEMPLATES: CAN WE IMPROVE REPORT QUALITY IN PANCREATIC AND PERI-AMPULLARY MALIGNANT TUMOURS?

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Accurate pancreatic/periampullary cancer staging and resectability assessment is vital to optimise patient care and where appropriate, surgical management and outcomes.

Our tertiary hepato-pancreatico-biliary surgical centre receives referrals from several local hospitals. Imaging is performed and reported locally prior to referral, with subsequent heterogeneity of practice in protocolling and reporting prior to specialist GI radiologist review for multi-disciplinary team meeting (MDTM). Use of reporting templates has the potential to reduce heterogeneity and improve report quality and, ultimately, patient outcomes.

We searched our surgical database to identify all consecutive surgically-managed patients with confirmed diagnosis of pancreatic/periampullary malignancy over 18 months. CT imaging contemporaneous to decision to operate was anonymised and audited against a modified National Comprehensive Cancer Network® (NCCN) reporting template. The same imaging was reviewed by two experienced GI radiologists using the same template, new reports were compared to the originals. Statistical significance was assessed with Student *t*-test; *k*-values for inter-observer reliability were calculated.

59 consecutive patients (37 male, 22 female), mean age 66 (36-83), were managed surgically during this period. Histology confirmed 49 adenocarcinoma (ductal 25, periampullary 8, unspecified 19), 7 NET or mixed adenocarcinoma/NET.

Original reports (n=59) contained mean key features  $\pm$  standard deviation of  $5.05 \pm 1.94$  (range, 1-9). Template reports (incomplete data, n=13) contained  $13.69 \pm 0.63$  features (range, 12-14),  $P < 0.005$ . K-values and full Results to follow.

Utilising reporting template resulted in more complete and accurate disease evaluation and is likely to have improved interobserver reliability; therefore it is likely to lead to better surgical planning and improve patient outcomes.

#### PG04-10

### INCIDENCE OF DEEP VEIN THROMBOSIS IN HEPATO-BILIARY PANCREATIC PATIENTS

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**Aim and methods:** More than 20% of Japanese patients was reported to have asymptomatic postoperative deep vein thrombosis (DVT). Considering the aggressiveness of surgery, hepato-biliary pancreatic (HBP) patients may have higher incidence of DVT. To evaluate the risk, a consecutive 196 patients were examined by doppler ultrasonography before and after major HBP surgery since November 2015 until July 2019. All the patients received intermittent pneumatic compression of the lower thigh but did not receive prophylactic anticoagulant. D-dimer ( $\mu\text{g/ml}$ ) was also tested.

**Results:** Preoperative screening identified venous thrombi in the soleus or popliteal vein of 24 patients. DVT deteriorated in 5 of the 24 patients, and 4 new patients appeared out of the 172 DVT negative patients after the operation. The risk factors of preoperative DVT were age, female and elevated D-dimer. Those of postoperative development of DVT was pre-existing DVT and preoperative D-dimer elevation. The aggressiveness of surgery, such as types of surgery, operative time, or blood loss, did not relate to the

incidence of postoperative DVT. Postoperative D-dimer value ranged widely and was not useful in estimating risk of postoperative VDT. Elevated preoperative D-dimer level  $> 1.2 \mu\text{g/ml}$  was supposed to be a good marker of postoperative deterioration of DVT whose sensitivity and specificity were 89% and 73% respectively.

**Conclusion:** The incidence of DVT in HBP patients did not exceed general population. High risk patients would be distinguished by preoperative D-dimer values.

#### PG04-11

### OPTIMISING THE OUTCOMES OF INDEX ADMISSION LAPAROSCOPIC CHOLECYSTECTOMY AND BILE DUCT EXPLORATION FOR BENIGN BILIARY EMERGENCIES: A SERVICE MODEL

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**Introduction:** Despite overwhelming evidence of its clear benefit, the rate of early / index admission laparoscopic cholecystectomy (LC) +/- bile duct exploration (LDBE) for acute calculary biliary presentations remains low. We describe a service model designed for such patients.

**Methods:** Patients were identified from a prospectively maintained database containing 5555 consecutive cases. Referral to the dedicated biliary firm was made according to a predefined protocol which included ultrasound scanning, avoidance of MRCP/ERCP and routine intraoperative cholangiography. A bespoke surgical job plan with operational contingency to carry out up to 60% of the workload as unscheduled biliary care was also devised.

**Results:** 2399 (43.2%) emergency cases were undertaken. The median age was 52 years with 70% female. Patients were admitted with biliary colic (34%), obstructive jaundice (26%) and acute cholecystitis (16%). 63% were referred by another surgical team, 8% from external hospitals and 6% from internal physicians. 19% operated on the day of referral, 39% within 48 hours. 80% within 5 days. 44% were performed on an "elective list", 29% on semi-elective "CEPOD" lists and 26% while on-call. The median operating time was 75 minutes, median total hospital stay 7 days. The conversion rate was 0.7%, clavien 2+ complication rate 4.8% and mortality rate 0.1%.

**Conclusion:** Early index single stage admission intervention for calculary biliary emergencies is achievable for the majority of patients and within the constraints of current healthcare delivery systems. This current model suggests a potential blueprint for achieving more widespread quality improvement in this area.

#### PG04-12

### ROLE OF IMMUNIZATION PRIOR TO PLANNED SPLENECTOMY WITH DISTAL PANCREATECTOMY

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The Advisory Committee on Immunization Practices of the Center for Disease Control and Prevention (CDC) under the

United States Department of Health and Human Services release yearly recommendations on adult immunization schedules. This includes recommended adult immunization schedules based on medical condition. There is clear documentation that patients with asplenia (or complement deficiencies) receive multiple immunizations. Asplenia increases a patient's risk for fulminant bacteremia and septicemia caused by encapsulated bacteria and increases their mortality. Anatomic or functional asplenia is frequent in cancer patients. Patients who undergo splenectomy for a hematologic or structural malignancy have a higher risk of hospitalization or death from sepsis than patients who are asplenic due to trauma. It is recommended that patients be vaccinated at least 2 weeks prior to scheduled splenectomy and subsequent chemotherapy. The immune system of patients with hyposplenia only mount a small antibody response to polysaccharide antigens and can result in vaccine failure if given after splenectomy. The same ineffectiveness of vaccines may occur during active chemotherapy or immunosuppression making it strongly advisable to vaccinate well before splenectomy due to malignancy potentially requiring neoadjuvant chemotherapy. It is the obligation of the treating physician or advanced practice provider to have knowledge of clinical guidelines of vaccines and offer patients the potential life-saving intervention when available. There is also a professional, ethical, and legal obligation for licensed providers to educate patients of risks and benefits involving immunizations and obtain informed consent to any treatment that is invasive or poses a risk to the patient.

#### PG04-13

### PORTO SYSTEMIC SHUNT SURGERY - CASE SERIES OF 40 CASES PERFORMED AT A SINGLE TERTIARY CARE CENTRE

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**Introduction:** Portal hypertension is seen when there is pathological increase in hepatic venous pressure gradient. Portal hypertension is seen in a number of conditions like extra-hepatic portal venous obstruction, cirrhosis of liver, non cirrhotic portal fibrosis, portal vein thrombosis from various causes. Surgical Porto systemic shunts are a time proven modality for treating portal hypertension. These patients present as recurrent variceal bleeding, ascites, encephalopathy. This is a case series on Porto systemic shunting done in patients in a single tertiary care centre.

**Method:** Retrospective study of 40 cases performed in a single tertiary care centre performed over 5 years from 2012 to 2016, along with comparison with the existing data on Porto systemic shunt surgeries.

**Results:** From amongst the 40 patients cases of extra-hepatic portal venous obstruction were 75%, non cirrhotic portal fibrosis were 15%, portal vein thrombosis were 5%, cirrhotic patients were 5%. There was no immediate peri-operative mortality. 4 year shunt patency was 97%. Recurrent variceal bleeding was seen in 5%. Encephalopathy was seen in 1%. Re-intervention was required in 3%. 4 year survival was 96%.

**Conclusions:** Surgical Porto systemic shunts remain time tested efficacious modality in management of portal hypertension. Porto systemic shunts have good long term survival benefit with symptomatic relief and improvement of quality of life.

#### PG05 - General HPB: Cost Effectiveness

##### PG05-01

### SYSTEMATIC REVIEW OF RISK FACTORS PREDICTING SURGICAL SITE INFECTION FOLLOWING PANCREATIC AND LIVER RESECTIONS

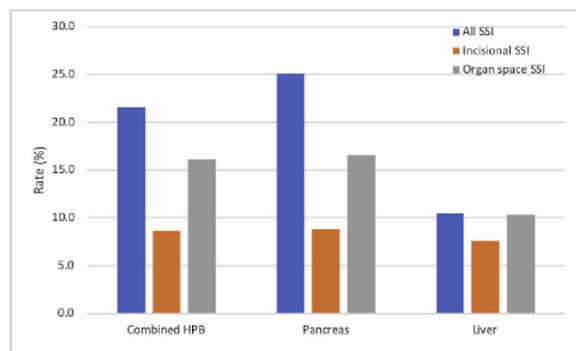
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**Introduction:** The risk factors for surgical site infection (SSI) after HPB surgery are poorly reported. This review aimed to identify the risk factor profile for SSI after pancreas and liver resection.

**Method:** The PUBMED, MEDLINE, EMBASE databases were systematically searched using the PRISMA framework. The primary outcome measure was pooled SSI rates. The secondary outcome measure was risk factor profile determination for SSI.

**Results:** Seventeen studies including 52,416 patients made the final analysis, of which 39,748 patients underwent pancreatic resection and 12,668 patients liver resection. The overall rate of SSI after pancreatic and liver resection were 25% and 10% respectively ( $p < 0.001$ ). 32% of pancreaticoduodenectomies (PD) developed SSI vs 28% after distal pancreatectomy ( $p < 0.001$ ). The rate of incisional SSI in the pancreatic group was 8.8% and organ space SSI 16%. Biliary resection during liver surgery was a risk factor for SSI (25% vs 16%,  $p=0.004$ ). After liver resection, the incisional SSI rate was 7.6% and organ space SSI rate was 10%. Pancreas specific SSI risk factors were male sex, pre-operative biliary drainage and chemotherapy. Liver specific SSI risk factors were smoking, open resections, significant blood loss and peri-operative blood transfusion.

**Conclusions:** The risk factors for SSI following pancreatic and liver resections are distinct from each other, with higher SSI rates after pancreatic resection. PD has increased risk of SSI compared to DP. Similarly, biliary resections during liver surgery increase the rates of SSI.



Rates of surgical site infection (SSI) by HPB surgery type

## PG05-02

**BUILDING A SUCCESSFUL ROBOTIC INSTITUTE IN A COMMUNITY HOSPITAL**

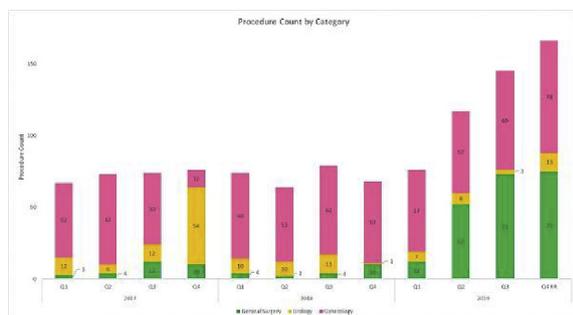
C. Doria<sup>1</sup>, J. Chung<sup>1</sup>, D. Visconti<sup>1</sup>, P. De Deyne<sup>1</sup>, R. Remstein<sup>1</sup>, L. Zarifian<sup>1</sup>, J. Fertel<sup>1</sup> and S. Kitchko<sup>2</sup>  
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**Introduction:** The purpose of this study is to demonstrate that certain community hospitals are efficient health care delivery organizations.

**Methods:** Capital Health Medical Center (CH) is a licensed acute care community hospital with 221 beds located in Hopewell Township, New Jersey. The organization competes primarily with the hospitals in the cities of Philadelphia and New York. In 2015, CH acquired one daVinci Xi platform that up until the beginning of Q4 of 2018 was underutilized and almost completely limited to gynecological procedures. An impressive number of patients seeking robotic surgery were going elsewhere for their procedures. Therefore, a decision was made to redirect the organization's priorities by implementing a number of initiatives, such as acquiring an additional robotic platform with plans to add a third one in the following 12 months, hiring 4 new robotic surgeons in different specialties, and pursuing the Robotic Center of Excellence accreditation. The details of these initiatives will be discussed in detail at the time of the presentation.

**Results:** The success of this new business plan is clearly demonstrated in the attached bar graph. In 2019 the robotic Hepato-Pancreato-Biliary (HPB) has grown by more than 400% from Q1 to Q2, and over 600% from Q1 to Q3. After recruitment of a new HPB surgeon, very complex procedures such as robotic assisted Whipple procedures were also successfully performed.

**Conclusion:** Community hospitals with vested financial interest and supportive administration can rapidly achieve a successful robotic surgery program to serve their patient populations.



bar graph

## PG05-03

**TRACKING, PRIORITISING, STREAMLINING AND AUDITING THE SURGICAL PATHWAY WITH THE SWALIS LIVE AUDIT MODEL. A FEASIBILITY-PILOT STUDY IN THE BARTS HEALTH HPB SERVICE**

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Elective surgery is insufficiently audited, especially pre-admission. Prospective audit is critical to manage capacity and control outcomes. Dynamic tools to monitor and prioritise waiting lists in real-time are essential to generate high-quality data. SWALIS (Valente et al. 2009) is a unique pre-admission management model, live-ordering the queue based on clinical urgency and waiting time, allowing patients' dynamic prioritisation.

This project was run in the London Barts HPB Service. We audited year-2016 waiting lists. The SWALIS prioritisation was simulated on such cohort. We then run a feasibility-pilot study, first assessing the feasibility of the SWALIS prioritisation (May-October 2017), then piloting the model (Nov-January 2017/18) by utilising a bespoke software (SurgiQ), assessing data availability on service performance and outcome, by a before-after design. Structured feedback was collected through questionnaires to each of the involved staff categories on specific domains rated on scores 1-5, on data model assessed benefits.

We pilot-tracked 200 patient pathways. The model allowed live information on waiting times, complications, service effectiveness and efficiency, tracking the entire pathway (5/5), with visibility of patient progression against harm (5/5), information for scheduling pre-assessment and theatres (5/5). By monitoring the workup, it reduces risk of inappropriate procedure preparations, postponements and cancellations, and unexpected escalations of level of care (5/5), delivering efficiency increase (+400%) and time/money savings 10%-16%.

The SWALIS model allows improvement in the multi-specialty integrated patient management, though requires wide staff and patient involvement. Software integration with clinical systems is essential for a realtime regular use.

**PT01 - Transplantation: Liver**

PT01-02

**USING DIRECT-ACTING ANTIVIRAL THERAPY BEFORE TRANSPLANTING HEPATITIS C VIRUS-POSITIVE LIVERS INTO HEPATITIS C VIRUS-NEGATIVE PATIENT: A CASE SHARING IN CHI-MEI HOSPITAL**

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Under current guidelines hepatitis C virus (HCV)-positive livers are not transplanted into HCV negative recipients because of adverse post-transplant outcomes associated with allograft HCV infection. However, HCV can now be cured post liver transplant (LT) using direct-acting antivirals (DAAs) with >90% success. Here we report a case of decompensated alcoholic liver cirrhosis (Model of End stage Liver Disease (MELD) score: 34). He received living donor liver transplantation from a HCV-positive donor treated with DAA agent regimens achieved SVR before liver transplantation in chi-mei hospital. The liver transplantation was done on 2019/3/08 without major complication except some minor complication like liver abscess, bile leakage. Patient (recipient) recovered gradually and then discharged smoothly on 2018/4/28. After nearly a year of trace, the patient is not detection of hepatitis C infection.

PT01-03

**LIVER ALLOCATION FOR RE-TRANSPLANTATION - IMPACT OF EARLY VERSUS LATE RE-TRANSPLANTATION ON OUTCOME**

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**Introduction:** Liver re-transplantation (LrTx) is necessary for 5-20% of recipients worldwide. Allocation schemes advantage recipients with early graft failure but the opposite is true for patients needing late re-transplantation.

The aim of this study was to assess the effect of early ( $\leq 30$  days) versus late ( $>30$  days) LrTx on 90-day mortality and long-term survival in our centre.

**Method:** A retrospective, single institutional analysis was performed, assessing all patients  $\geq 18$  years undergoing LrTx between 2009 and 2018.

**Results:** 1237 adult liver transplants were performed; 112 (9%) were LrTx: 98 first LrTx, 13 second LrTx and 1 third LrTx. The main indications for re-transplantation were: ischaemic biliopathy (25%), hepatic artery thrombosis (HAT, 23.2 %) and primary non function (PNF, 23.2 %). Early LrTx accounted for 44.6 % of cases; median 4 days (range 1-29) after initial transplant. 90-day mortality rate was higher in the early LrTx group (38%) compared to 11.3% for the late LrTx group,  $p < 0.0008$ . Reason for the high 90-day mortality rate following early LrTx was sepsis

in 53%. 1 year overall survival demonstrated no additional mortality in the late LrTx group but 2 additional deaths in the early LrTx group.

**Conclusions:** LrTx remains the curative option for graft-failure and allocation policies have favoured early LrTx for PNF and HAT. This analysis suggests that for early LrTx a cautious selection of recipients is mandatory to prevent futility associated with high 90-day mortality. Late LrTx candidates should not be disadvantaged by liver allocation policies.

PT01-04

**HEPATIC ARTERY THROMBOSIS IS ASSOCIATED WITH ANASTOMOTIC BILIARY STRICTURE AFTER ORTHOTOPIC LIVER TRANSPLANTATION**

M. Bailon-Cuadrado, P. Marcos-Santos, B. Perez-Saborido, E. Asensio-Diaz, P. Pinto-Fuentes, J. C. Sarmentero-Prieto and D. Pacheco-Sanchez

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**Introduction:** Anastomotic biliary stricture is a relevant complication after orthotopic liver transplantation. The aim of this study was to analyse factors involved in the appearance of this complication.

**Methods:** Inclusion criteria: patients who underwent orthotopic liver transplantation between November 2001 and December 2018. Exclusion criteria: liver retransplantation. Several variables were analysed, including indication and etiology, donor and recipient sex and age, Child-Turcotte-Pugh and MELD scores, presence of arterial anomalies, arterial reconstruction, hepatic artery thrombosis, biliary anomalies, use of Kehr tube, total, warm and cold ischaemia time. Student's T for continuous variables and Chi Square for discrete variables were used for univariate analysis. Logistic regression was used for multivariate analysis.

**Results:** Finally, 588 patients (78.1% males, median age of 56 years) were eligible for statistical analysis. Anastomotic biliary stricture appeared in 117 (19.9%) patients. After univariate analysis, up to six variables proved to be significant: preoperative presence of ascites ( $p=0.024$ ), Child-Turcotte-Pugh score ( $p=0.047$ ), MELD score ( $p=0.048$ ), donor arterial anomaly ( $p=0.032$ ), arterial reconstruction during bench surgery ( $p=0.025$ ) and hepatic artery thrombosis ( $p=0.049$ ). After multivariate analysis, only hepatic artery thrombosis (this complication appeared in 9.01% of our patients) turned out to be significant (OR=2.426, 95% CI of 1.120-5.255,  $p=0.025$ ).

**Conclusion:** Hepatic artery thrombosis seems to be an outstanding risk factor for anastomotic biliary stricture after orthotopic liver transplantation. Other arterial aspects, such as donor anomalies or the need of arterial reconstruction during bench surgery, might also have influence on the appearance of this complication.

PT01-05

### LONG GRAFT ARTERY AND ARTERIAL ANOMALIES ARE ASSOCIATED WITH HEPATIC ARTERY THROMBOSIS AFTER ORTHOTOPIC LIVER TRANSPLANTATION

M. Bailon-Cuadrado, P. Marcos-Santos, B. Perez-Saborido, E. Asensio-Diaz, J. C. Sarmentero-Prieto, P. Pinto-Fuentes and D. Pacheco-Sanchez

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**Introduction:** Hepatic artery thrombosis is one of the most feared surgical complications after orthotopic liver transplantation (OLT). The aim of this study was to analyse factors involved in global, early (less than a month) and late (more than a month) hepatic artery thrombosis (HAT) after OLT.

**Methods:** Inclusion criteria: patients who underwent OLT between November 2001 and December 2018. Exclusion criteria: liver retransplantation. Several preoperative and intraoperative variables were analysed. Graft artery was classified as long or short when the section was located distal or proximal to the proper/common hepatic artery bifurcation. In the same way, recipient patch for arterial anastomosis was classified as distal or proximal to the proper/common hepatic artery bifurcation. Student's T for continuous variables and Chi-Square for discrete variables were used for univariate analysis. Logistic regression was used for multivariate analysis (MVA).

**Results:** Finally, 588 patients were eligible for statistical analysis. Global, early and late HAT appeared in 53 (9.01%), 35 (5.95%) and 18 (3.06%) patients, respectively. For global HAT, two variables proved to be significant after MVA: hepatocellular carcinoma as indication for OLT ( $p=0.035$ ) and long graft artery ( $p=0.007$ ). For early HAT, two variables turned out to be significant after MVA: hepatocellular carcinoma as indication for OLT ( $p=0.012$ ) and arterial anomalies ( $p=0.036$ ). For late HAT, only long graft artery reached statistical significance after MVA ( $p=0.026$ ).

**Conclusion:** Technical factors involving arterial anastomosis, as the presence of arterial anomalies and the length of the graft artery, seem to be essential risk factors for HAT after OLT.

PT01-09

### CAN POST-TRANSPLANT OUTCOMES PREDICTED AT THE TIME OF LIVER GRAFT ALLOCATION?

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**Introduction:** Liver grafts are a scarce resource. Both medical urgency and expected post-transplant outcomes should be considered when allocating livers for transplantation. For allocation decisions, it is important to

identify variables known at the time of liver allocation that may affect transplant outcomes.

**Method:** Recipient and donor data from the Australia and New Zealand Liver Transplant Registry from January 1998 to May 2019 were used. All interactions between donor and recipient variables were included. The outcome was graft failure, including patient death. Penalised regression with elastic net analysis was performed to select variables for the final multivariable Cox model. The c-statistic was used to assess score discrimination.

**Results:** 3734 patients were included, with 636 graft failures. 714 recipient, donor and interaction variables were considered, with 35 variables selected using elastic net for the multivariable Cox model. Variables with the largest hazard ratios were transplant for liver tumour other than hepatocellular cancer (HR 2.47, 95% CI 1.33-4.61), retransplant with a donation after cardiac death donor (HR 2.08, CI 1.38-3.13) and split-liver graft (HR 1.5, CI 1.11-1.95). Internal validation on the same data used for model creation resulted in a c-statistic of 0.72.

**Conclusions:** Prediction of post-transplant outcomes from only variables known at the time of liver allocation is challenging. Further improvements are needed in the context of the prioritisation of patients for transplantation.

PT01-10

### NORMOTHERMIC MACHINE PRESERVATION OF MARGINAL LIVERS IN AUSTRALASIA - INITIAL BRISBANE EXPERIENCE USING A "BACK-TO-BASE" APPROACH

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**Introduction:** The assessment of marginal liver suitability using empirical criteria remains imprecise. *Ex-vivo* normothermic machine perfusion (NMP) allows for a period of graft assessment under near-physiological conditions, which might improve the selection of such livers for transplantation. We describe the first 11 clinical applications of NMP in Australasia using a "back-to-base" approach.

**Methods:** Eleven marginal livers were accepted for preservation and assessment on the OrganOx *metra* device following a period of static cold storage (post-SCS-NMP). Average donor risk index was 1.53 (1.08-1.93), with five grafts donated after brain death (DBD) and six donated after circulatory death (DCD). All DCD grafts were outside of established local criteria. Average cold ischaemic time and NMP time was 5.2 (4.2-6.5) hours and 12.0 (9.1-17.6) hours respectively. Recipient MELD score was 17 (11-20), including one combined liver-kidney transplant and one retransplant.

**Results:** All livers met pre-established viability criteria and were successfully transplanted. Five (45%) recipients developed early allograft dysfunction based solely on peak AST >2000 U/L (average 1860 (629-8910) U/L, Figure 1). Two patients (18%) required revisional surgery for biliary anastomotic complications following initial Roux-en-Y

hepaticojejunostomy. No clinically significant biliary problems were observed in the nine patients receiving duct-to-duct anastomosis. All cases have satisfactory graft function to date.

**Conclusions:** Post-SCS NMP was successfully implemented in 11 cases, enabling the safe utilisation of grafts deemed non-transplantable using static cold storage preservation alone. The technique was user friendly, improved transplant logistics and surgeon confidence, and increased local transplant activity by 10%.

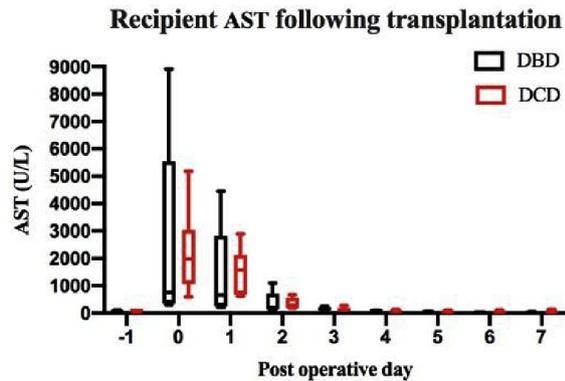


Figure 1.

#### PT01-12

### LIVER TRANSPLANTATION FOR METABOLIC LIVER DISEASE PATIENTS: A SINGLE-CENTER EXPERIENCE

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**Introduction:** Metabolic liver disease (MLD) is life threatening. The efficacy of liver transplantation (LT) for MLD patients are well reported. There are some options of surgical procedures, but a few reports of collecting data was reported from a single-center. Here we present our experiences of LT procedures including deceased donor (DD) LT, living donor (LD) LT and auxiliary partial orthotopic liver transplantation (APOLT), and outcome in those patients.

**Methods:** Medical records of 61 MLD adult ( $\geq 18$  years old) recipients underwent LT in our institute were reviewed retrospectively. Perioperative factors were investigated. The patient survival rate was calculated.

**Results:** The causes of LT were familial amyloid polyneuropathy in 42, adult-onset type 2 citrullinemia in 17, glycogen storage disease in 1 and Wilson's disease in 1. The median age at LT was 37.1 (range 18.8 to 58.4) years old. All DDLT recipients received whole liver graft (n=7). In all LDLT cases (n=54), the left liver grafts were used. The median volume of graft was 392g that was correspond to 38.0% of the recipient standard liver volume (range 230 (22.1) to 580g (58.8%)). In 18 cases of those, APOLT was selected because of extremely small size of graft or expectation of future gene therapy. The 10-year survival rate of MLD recipients was 86.8%.

**Conclusions:** Even though a graft is relatively small, LT for MLD patients could be successfully achieved with

APOLT. The 10-year survival rate of MLD recipient in our institute was thought to be satisfactory.

#### PT01-14

### LONG-TERM OUTCOMES OF PREVENTING HBV RECURRENCE AFTER LIVER TRANSPLANTATION FOR HEPATITIS B ASSOCIATED LIVER DISEASE WITH NUCLEOTIDE AND HBIG

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**Introduction:** Antiviral therapy with or without HBIG is a common strategy for the prevention of hepatitis B virus (HBV) reinfection. Antiviral therapy with HBIG for life-long was our strategy, but recently we change to discontinue HBIG after one year with those who had low serum HBV DNA levels at the time of liver transplantation and agreed to stop HBIG.

**Method:** We did 56 liver transplantations since June 2006. Among them, 34 liver recipients had liver cirrhosis associated with HBV, 10 with HCC and 24 without HCC. Three operative mortalities, three deaths within one year related with infection, and one follow up loss less than one year were excluded from analysis. We analyzed 27 liver transplantations retrospectively.

**Result:** We prevent HBV reinfection with entecavir (or tenofovir) lifelong with 7 days of daily intravenous HBIG 10,000 unit including operative day, and then once a week for next three weeks, and then once a month for one year. After then, 4000 or 6000 units per two or three months were given to maintain patients' serum hepatitis B antibody titer more than 200 mIU/mL. Median follow up period for HBV reinfection was 124.6 months. No one had reinfection till today.

**Conclusions:** Antiviral therapy with HBIG is an excellent prevention strategy for HBV reinfection after liver transplantation and changing to an antiviral agent only needs further research.

#### PT01-15

### COMPUTATIONAL FLUID DYNAMICS-BASED ASSESSMENT OF IMPAIRED HEPATIC VENOUS OUTFLOW AFTER LIVER TRANSPLANTATION

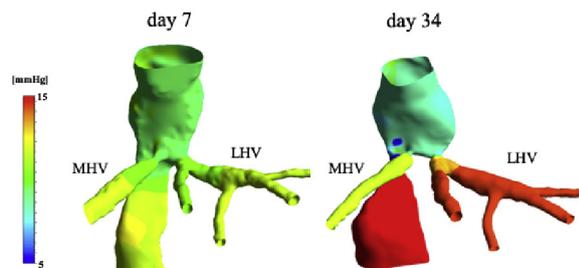
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**Introduction:** Hepatic venous outflow obstruction (HVOO) is a critical complication after living-donor liver transplantation (LDLT) potentially associated with graft insufficiency; however, modalities to detect the impaired hepatic venous outflow have not been established. This study investigated the usefulness of computational fluid dynamics (CFD) to analyze the hepatic venous outflow after LDLT.

**Method:** Vascular geometry was created using dicom data of computed tomography. The vein flow was simulated on a fluid analysis software and inflow condition was set based on the flow velocity measured on Doppler ultrasound. Hemodynamic parameters of the hepatic venous outflow, such as streamline and pressure gradient, were analyzed and their impacts on the post-transplant liver hypertrophy were evaluated. As a representative example, analyses for a 62-year-old female who developed HVOO 3 months after left-lobe LDLT is presented.

**Result:** Pressure gradient between left hepatic vein (LHV) and vena cava was estimated at 1.4mmHg on day7, and 5.1mmHg on day34 on CFD analyses, while that between middle hepatic vein (MHV) and vena cava was estimated at 1.3mmHg on day7, and 3.1mmHg on day34. A venography at 3 months revealed an LHV stenosis with a pressure gradient of 15 mmHg, treated with balloon angioplasty. Volumetric analyses showed hypertrophic rate of LHV-draining territory between day7 and day34 was only 4.37%. Whereas, that of MHV-draining territory was 38.5%.

**Conclusion:** CFD unveiled early and otherwise undetectable abnormalities of the hepatic venous outflow, which impaired graft liver regeneration. CFD would be useful to optimize the management of the graft liver outflow after LDLT.



Pressure distribution on CFD analyses

#### PT01-16 EFFECTS OF REOPTIMIZATION OF IMMUNOSUPPRESSIVE TREATMENT ON DONOR-SPECIFIC HLA ANTIBODIES AFTER LIVER TRANSPLANTATION

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**Introduction:** Donor-specific antibodies (DSAs) have negative effects on short- and long-term outcomes after organ transplantation. DSAs are prevalent in patients with low immunosuppression; thus, optimized immunosuppression is preferable even in patients with stable condition after liver transplantation. However, the effect of implementing immunosuppression reoptimization for patients with low immunosuppression remains unclear. In this study, we investigated long-term changes in DSA status and the effect of reoptimizing immunosuppression on DSA status.

**Methods:** We retrospectively reviewed DSA status in 66 patients after liver transplantation in our center.

**Results:** The median duration between first and second DSA evaluation was 50 months. Of the 66 patients, 43 were positive for class II DSAs in the first evaluation. Of these patients, 30 were found to have an insufficient dose of calcineurin inhibitor, or were immunosuppression free at the time of the first evaluation. Reoptimization of immunosuppression was then conducted for 20 of the 30 patients. Among the 20 patients, DSAs detected in the first evaluation became negative in 7 patients and mean fluorescence intensity (MFI) decreased in 9 patients. Compared with patients with sustained low immunosuppression, DSA levels significantly decreased in patients with reoptimized immunosuppression ( $p=0.005$ ).

**Conclusion:** The results of this study indicate that post-transplant reoptimization of immunosuppression improved DSA status after liver transplantation. Reoptimization of immunosuppression is considered to be especially preferable in patients with *de novo* DSAs, although the clinical significance of DSA negative conversion and/or MFI reduction needs to be further investigated.

#### PT01-17 SENSE OR NONSENSE: DEFINING THE ROLE OF ROUTINE GALLBLADDER HISTOPATHOLOGY IN DECEASED LIVER TRANSPLANTATION

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**Introduction:** In liver transplantation donor cholecystectomy followed by histological assessment is routinely performed as part of the operation. However, the evidence on this topic is scarce. The aim of this study was to evaluate the impact of this standard of care treatment.

**Methods:** A single centre retrospective analysis of all gallbladder histopathologies following liver transplantation between 01.01.2007 and 31.12.2016 was performed.

**Results:** A total of 1012 histologies of donor gallbladders were included in this timespan. The median donor age was 47 years (range 1-79). In total 634 (63%) of the histologies were completely normal and did not show any abnormalities. 378 (37%) patients showed abnormal pathology results; 343 (33.9%) chronic cholecystitis. Of the 35 remaining gallbladders, 1 demonstrated high-grade dysplasia and one had a T1a gallbladder cancer and the rest were not significant pathologies. Those donors with normal histology had a median age of 45 years versus 50 years for abnormal histology ( $p < 0.05$ ). Importantly, the recipient of the liver with T1a gallbladder cancer did not develop any signs of malignancy, although he required re-transplantation for unrelated reasons.

**Conclusion:** Donor gallbladder histopathological analysis in liver transplantation has been the standard of care but the role of this routine procedure has never been identified. This is an important first analysis of a significant number of donor gallbladder specimens. Based on the abnormalities detected in this single centre experience we do think donor gallbladders should routinely be sent for histopathology. Further high volume studies are needed to clearly answer this question.

### PT01-21 EARLY EXPERIENCES OF LIVER TRANSPLANTATION IN A NEWLY OPENED HOSPITAL

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Since the first human liver transplantation (LT) performed in 1963, LT has been most effective treatment for end-stage liver diseases and for selected patients with hepatic neoplasms. Herein we will report early experience of liver Transplantation in a newly opened hospital on April, 2019.

We have been operated eight LT from June, 2019 to December, 2019. In clinical features of recipients, mean age was  $50.5 \pm 7.7$  (years), six male and two female, the causes of LT were one autoimmune liver cirrhosis (LC), three alcoholic LC and four HBV-LC with HCC. MELD score (mean) was  $16.9 \pm 13.2$ , GRWR(%) was  $1.07 \pm 0.22$ , operative time(mean) was  $661 \pm 161.9$  minutes. Two transplanted graft was extended left lobe, five grafts were modified right graft and one was cadaveric donor whole liver graft. All bile duct reconstruction was conducted by duct to duct anastomosis. Mean post-operative hospital day was  $25.6 \pm 9.8$  (days), and there was some morbidity.

In features of seven living donors, mean age was  $29.7 \pm 11.3$  (years), six male and one female, post-operative hospital day was  $15.3 \pm 5.6$  (days), and there was two minor bile leakage but no mortality.

A multidisciplinary approach with surgical, anesthetic, radiologic and medical departments, and wide range of administrative supports, which can be provided with institutional and foundational support, is crucial. We thought that the multidisciplinary teamwork including thorough preparation for LT is most important for which first started the liver transplant in a newly opened hospital.

### PT01-22 OUTCOMES OF LIVER TRANSPLANTATION IN PATIENTS WITH SITUS INVERSUS

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**Introduction:** Situs Inversus was considered a contraindication for liver transplant in the past, due to the anatomical difficulties and the associated vascular abnormalities. Nowadays, several studies and series reported successful liver transplant in situs inversus recipients and also from donors. However, it is still rare. Therefore, we conducted a systematic review to assess the transplant techniques and their outcomes in situs inversus individuals.

**Methods:** We searched through four database engines; PubMed, EMBASE, Web of Science, and CINAHL. Articles were included if they reported our main outcomes of surgical technique, morbidity, and mortality of liver transplant in adult patients.

**Results:** 31 reports, including 35 situs inversus individuals, were included in this review. Of which 19 patients were situs inversus recipients, and 14 were donors. The most common reported transplant technique is orthotopic liver transplant with 180° rotation. HBV, HCV, and alcohol-related liver disease were the most common etiologies for end-stage liver disease in situs inversus recipients. The mean MELD score for the situs inversus recipients was 22 (ranged 9-36), the mean hospital stay was 19 days (ranged 7-45), and the operation time ranged from 3.5 to 11.5 hours. The overall complication rate was higher in situs inversus recipients than in patients who receive grafts from situs inversus donors 50% (9/18) and 33.3% (4/12), respectively.

**Conclusion:** Liver transplant in situs inversus recipients is feasible, and liver grafts from situs inversus donors are considered safe. Despite the anatomical intricacy, preoperative planning and the use of proper techniques can lead to successful outcomes.

### PT01-23 EARLY EXPERIENCE OF ABO- INCOMPATIBLE LIVING DONOR LIVER TRANSPLANTATION IN HAEUNDAE PAIK HOSPITAL

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**Introduction:** ABO-incompatible LDLT (ABOi-LDLT) could be a useful option for expanding pool of available organs. Since the introduction of rituximab in ABOi-LDLT, the incidence of AMR dropped dramatically and the paradigm of ABOi-LDLT in adult patients has changed.

**Methods:** We would like to present our initial experience of three cases of ABOi-LDLT. The protocol includes a single dose of rituximab ( $300 \text{ mg/m}^2$ ) 3 weeks before transplantation, several sessions of plasmapheresis to decrease the isoagglutinin (IA) titer to  $\leq 1:32$ , and a triple immunosuppressive regimen consisting of tacrolimus, mycophenolate mofetil, and steroid.

**Results:** All three patients performed a relatively large number of plasmapheresis to reach the target IA titers (16, 19, and 7 sessions, respectively). The IA titers immediately before transplantation were 32, 1024 and 128, respectively, while the peak titers during post-transplant period were 32, 128, and 32, respectively. In particular, case 2 patient has severe rebound elevation of IA titer even after administration of Bortezomib, a proteasome inhibitor that depletes plasma cells. As for this patient, we should perform LDLT at an IA titer 1:1024 with splenectomy and prophylactic intravenous immunoglobulin. Two patients (case 1, 2) are alive with no evidence of AMR until now, but one patient (case 3) died at POD51 due to hepatic artery thrombosis and sepsis.

**Conclusions:** Rituximab-based protocol is a cornerstone in the regimens of desensitization for ABOi-LDLT, but more study on pre-transplant target IA titer and effectiveness of pre-transplant plasmapheresis needs to be continued as seen in the present cases.

PT01-24

### LONG TERM OUTCOMES OF COMBINED LIVER KIDNEY TRANSPLANTATION IN CHILDREN WITH HERITABLE DISORDERS

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**Introduction:** Outcomes of combined liver kidney transplantation in children remains a largely unquantified yet potentially life transforming procedure for those with heritable disease. No case series assessing the impact of the CLK on patient outcome for children solely with heritable disease is available. We therefore sought to retrospectively analyse the practice in a large London quaternary centre.

**Methods:** Children undergoing liver kidney transplantation from 2003 onwards were analysed. Indication for transplant graft types, graft survival and patient survival were recorded. Disease specific metabolic parameters were also recorded.

**Results:** 9 children underwent liver kidney transplantation of which 7/9 were combined. All grafts in CLK group were deceased donor (1 whole liver, 1 right lobe, 5 left lateral segments). The mean age was 6.8 yrs. The indication was primary type 1 hyperoxaluria (n=1), Allagile (n=1) and autosomal recessive polycystic kidney disease (n=5). The median follow up was 5213 days. 1 year and 5 year liver and kidney graft survival was 100%. Mean GFR at one year was 66.6 mls/min and last follow up was 64.4mls/min. Mean AST level at last follow up was 44. One child required re transplant at five years due to chronic liver graft rejection. All current transplant grafts were functional at last follow up.

**Conclusions:** CLK is a safe practice in children with heritable and metabolic conditions. Excellent graft outcomes are possible. In countries where deceased donor organ pools are readily available this practice should be adopted as the mainstream of treatment.

PT01-31

### TREATMENT WITH EVEROLIMUS FOR BILE DUCT STENOSIS AFTER LIVER TRANSPLANTATION

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**Background:** Treatment of antibody mediated rejection (AMR) in post-liver transplant management has not been established at present. In some cases, it has been reported that everolimus (EVR) inhibits worsening of chronic rejection, and there is great expectation for the efficacy of EVR for chronic rejection.

**Aim:** To verify the hypothesis that use of EVR will improve the symptoms of mechanical biliary stenosis in LT recipients, which did not respond to any other treatments.

**Methods:** 107 recipients underwent LT from January 2007 to October 2018 were retrospectively analyzed. Biliary complications, donor specific antibody (DSA) and AMR were examined.

**Results:** The incidence of biliary stenosis was 16.8%. 3 cases (2.8%) were pathologically diagnosed as AMR. All of them experienced acute cellular rejection, and had poor outcome because of lack of EVR addition. DSA positive rate was 13.9% (6/43 cases). Rate of biliary stenosis in DSA positive was 83.3% (5/6 cases). On the other hand, rate of biliary stenosis in DSA negative was 16.2% (6/37 cases). EVR was used for 8 cases (7.4%), 7 of them (87.5%) had biliary stenosis, which did not respond to any other treatments. All of them could not be proved to be pathologically AMR but responded effectively to addition of EVR.

**Conclusions:** It is difficult to introduce EVR after pathologically proving de novo AMR. If therapeutic effect on the biliary complication is poor, chronic AMR may be present in the background. In such cases, EVR may be effective treatment.

PT01-33

### STANDARDIZING PURE LAPAROSCOPIC DONOR HEPATECTOMY (PLDH) - EXPANDING THE FIRST LARGEST SERIES FROM INDIAN SUBCONTINENT

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**Introduction:** Even after 2 decades of experience in laparoscopic hepatectomy, data on purely laparoscopic approach for donor hepatectomy in adult living donor liver transplantation (LDLT) is limited, especially from India. We report our series of 18 cases of pure laparoscopic donor hepatectomy from India, which is the largest reported series from the country.

**Method:** We report our initial experience of a purely laparoscopic approach for donor hepatectomy for adult recipients to explore its potential application in the management of donors. A retrospective data analysis of 18 consecutive patients operated between Jan 2018 and October 2019 was done.

**Result:** There were 16 right, 1 left hepatectomy and 1 left lateral sectionectomy. The median operative time was 486 minutes (range 294-684 minutes), and warm ischemia time was 6 minutes (4-12 minutes). Estimated blood loss was 300 mL (10-850 mL) and none of the patients required intraoperative transfusion. Two patients required conversion to Lap Assisted approach, due to unfavourable biliary anatomy. 2 patients had bile leak, both requiring ERCP and stenting and there was no mortality.

**Conclusion:** Purely laparoscopic donor hepatectomy for adult LDLT recipients seems to be a feasible option; with careful patient selection and when performed by experienced surgeons, it may afford results comparable to the open method. Further evaluation, including long-term results, may support these preliminary findings of comparative outcomes for donors undergoing PLDH.

PT01-34

## BIOMARKERS AND IMMUNOHISTOLOGICAL CHARACTERISTICS IN THE LIVER GRAFTS FROM DONORS AFTER CIRCULATORY DEATH AND DONORS AFTER BRAIN DEATH: A PROPENSITY SCORE MATCHING ANALYSIS

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**Introduction:** Donation after Circulatory Death (DCD) is related with an additional ischemia time and higher rates of biliary complications and graft loss comparing with traditional donors (DBD). We compare histological and biological markers of DCD and DBD liver grafts

**Methods:** From November 2014 to December 2018 were retrospectively collected the biopsy of the retrieval and we compare histological and biological markers of DCD and DBD liver grafts. The immunohistological analysis include markers p21, TERT, caspase-3 active, HIF1A, VEGF, CD90, CD44 and COX-2. A propensity score matching (PSM) was used to match patients receiving DCD and DBD livers.

**Results:** All samples analyzed were negative for VEGF, p21 and caspase-3 expression. The positive staining expression of COX-2, CD44, TERT, HIF1A and CD90 showed no statistically significant differences between DCD and DBD and with ischemic cholangiopathy. After PSM, there was a statistically significant relationship between CD90 and male donors [OR 0.26 (95% CI, 0.07-0.91)], TERT with donor sodium [OR 1.11 (95% CI, 1.02-1.2)], HIF1 with steatosis [OR 0.33 (95% CI, 0.13-0.83)] and CD44 with donor vasoactive drugs [OR 0.36 (95% CI, 0.13-1)] and GOT 1 week increase [OR 1.01 (95% CI, 1-1.03)]. The incidence of biliary complications (p=1) and ischemic cholangiopathy (p=0.35) was higher in DCD but without significance statistics.

**Conclusions:** In our experience, the immunohistological pattern of liver suffering between DCD and DBD was similar. In addition, the higher rate of biliary complications and cholangiopathy in DCD also does not appear to have a direct relationship with markers analyzed in the graft.

PT01-35

## INFLUENCE OF CONTROLLED DONATION AFTER CIRCULATORY DEATH (CDD) ON WAITING LIST MORTALITY FOR LIVER TRANSPLANTATION IN THE LAST 10 YEARS: THE SPANISH EXPERIENCE

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Controlled donation after circulatory death (cDCD) provides one third of liver donors in Spain nowadays. The aim of our work is to evaluate the impact that cDCD has had on the evolution of mortality on the waiting list for liver transplant at our hospital over the last 10 years. We retrospectively analyzed liver donation and transplant activity data at our center over the past 10 years through our records and those of the Spanish National Transplant Organization (ONT). Figure 1 shows the percentages of patients on the liver transplant waiting list who were transplanted, dropped-out from the list, or died on the list during the last 10 years (2010-2019). It should be noted that in the pre-cDCD era (before 2014) the mortality rate on the list was above 20%. However, in the age of controlled-DCD (from 2014 onwards) this percentage has decreased to 6% in 2019. As for the probability of liver transplantation per year (Figure 2), it has remained in progressive ascent despite the high rate of indication for liver transplantation in our group (69.4 pmp, year 2018), the highest in Spain. The successful introduction of the controlled donation after circulatory death program at our hospital has reduced the mortality rate on the waiting list for liver transplants by 19% in 5 years. The probability of liver transplantation per year has increased by up to 20%. Therefore, cDCD has allowed us to significantly reduce mortality on the waiting list for liver transplantation.

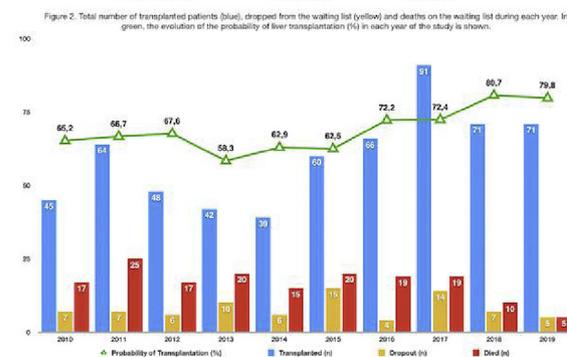
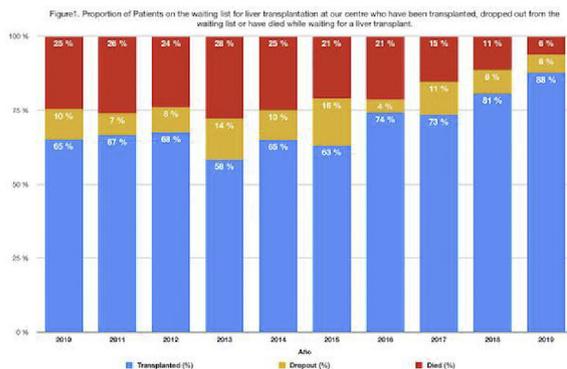


Figure 1 and 2.

PT01-39

### THE SHORT-TERM OUTCOME OF SALVAGE LIVER TRANSPLANTATION FOR PATIENTS WITH HEPATOCELLULAR CARCINOMA: A PROPENSITY SCORE MATCHING ANALYSIS

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**Background:** Long-term outcome of salvage liver transplantation (SLT) for a patient with hepatocellular carcinoma (HCC) is known to be associated with good results. However, some previous reports showed that SLT had higher potentials of post-operative bleeding, repeat operation, and early mortality. Though the background of SLT and PLT was different, there was no study using propensity score matching (PSM). The purpose of this study aimed to assess the morbidity of patients after SLT with PSM.

**Methods:** Data from 544 consecutive patients undergoing LT for HCC between 1994 and 2017 at a single center institution, were retrospectively reviewed. Fifty-six (10.3%) were submitted to SLT, and 488 (89.7%) were primary liver transplantation (PLT) as a control group. Comparisons between groups were performed using PSM.

**Results:** Patients with low BMI, low MELD score, low AFP, and a high number of tumors were more likely to perform SLT. After PSM, 55 SLT cases were matched to PLT controls. There is no significant difference between groups, vascular complications ( $p=0.297$ ), biliary complication ( $p=0.541$ ), intraabdominal bleeding/hematoma ( $p=0.170$ ), repeat-operation ( $p=0.463$ ) and early postoperative mortality ( $p=0.671$ ). As a Clavien-Dindo classification, there was also no significant difference between two groups, before and after PSM.

**Conclusion:** Short-term outcome of SLT were comparable with PLT after PSM.

PT01-41

### TUMOR PROGRESSION PATTERN IN PATIENTS WITH HEPATOCELLULAR CARCINOMA AWAITING FOR LIVER TRANSPLANTATION

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**Introduction:** Patients with hepatocellular carcinoma are at risk of tumor progression while awaiting for liver transplantation. Neoadjuvant treatment such as transarterial chemoembolization is performed with intention to extend the time without progression. The aim of this study was to evaluate the incidence of tumor progression before liver transplantation.

**Methods:** It was a retrospective, observational study performed on 175 patients with hepatocellular carcinoma who underwent liver transplantation. Tumor progression was defined as an increase of at least 20% in the sum of the diameters of lesions. Data on tumor morphology, alpha-fetoprotein concentration and neoadjuvant treatment were analyzed.

**Results:** There were 101 (57.7%) patients who developed tumor progression before liver transplantation. The progression rate was estimated for 48.6% and 74.4% after 6 and 12 months, respectively. Patients treated with transarterial chemoembolization presented significantly decreased progression rate (26.7%) in comparison to the rest of a group (73.3%;  $p=0.002$ ). In multivariate analysis transarterial chemoembolization independently decreases the risk of tumor progression (OR = 0.47; 95%CI 0.23-0.95;  $p<0.05$ ).

**Conclusion:** Transarterial chemoembolization significantly decreases the risk of progression before liver transplantation, however further studies have to be performed to select those patients who may benefit from neoadjuvant treatment the most.

PT01-43

### HEPATIC ARTERY THROMBOSIS IN LIVER TRANSPLANTATION RECIPIENTS AFTER NEOADJUVANT THERAPY WITH TRANSARTERIAL CHEMOEMBOLIZATION

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**Introduction:** Transarterial chemoembolization (TACE) prior to liver transplantation for patients with hepatocellular carcinoma may increase the risk of arterial complications after transplantation. The aim of this study was to evaluate the impact of neoadjuvant treatment with TACE on the risk of post transplant hepatic artery thrombosis (HAT).

**Methods:** It was a retrospective, observational study performed on 228 patients with hepatocellular carcinoma who underwent liver transplantation. The diagnosis of post transplant HAT was based on computed tomography. Factors such as treatment with TACE, number of TACE sessions, time between TACE and liver transplantation, donor age, total ischemic time, diameter of common hepatic artery in recipient, arterial reconstruction, intraoperative macroscopic artery assessment and type of arterial anastomosis were evaluated in univariate and multivariate analysis.

**Results:** HAT was observed in 13 (5.7%) patients. The incidence rate of HAT was 5.5% for patients after TACE and 5.9% for the rest of a group ( $p=0.876$ ). The only independent risk factor for HAT was poor intraoperative macroscopic artery assessment but there was no significant intercorrelation with TACE prior to liver transplantation (0.117;  $p=0.116$ ). Despite the analysis did not reveal the time between TACE and liver transplantation as an independent risk factor for HAT (OR=1.001; 95%CI 0.997-1.005;  $p=0.476$ ), there was a difference in median time for

patient with HAT (Me=12.0 days) and the rest of a group (Me=88.5 days;  $p=0.040$ ).

**Conclusion:** Neoadjuvant treatment with TACE does not increase the risk of HAT, however special caution should be taken when selecting the moment of liver transplantation after TACE.

#### PT01-45

### DOES TRANSARTERIAL CHEMOEMBOLIZATION IMPAIR LIVER FUNCTION IN PATIENTS WITH HEPATOCELLULAR CARCINOMA AWAITING FOR LIVER TRANSPLANTATION?

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**Introduction:** Transarterial chemoembolization (TACE) in patients on a waiting list may decrease liver function before liver transplantation. The aim of this study was to analyze the impact of the neoadjuvant treatment on a liver function status.

**Methods:** It was a retrospective, observational study performed on 225 patients with hepatocellular carcinoma who underwent liver transplantation. MELD score and ALBI score were applied to assess liver function. Laboratory findings were collected before TACE and before liver transplantation for patients with neoadjuvant treatment. Liver function for the rest of patients was evaluated before enlistment and before liver transplantation.

**Results:** TACE was performed for 108 (48%) patients. There was no difference in median change of MELD score between two groups ( $p=0.537$ ). Median ALBI score before TACE was -2.19 followed by -2.28 before transplantation. For the rest of patients it was -1.61 before enlistment and -1.75 before transplantation. The increase of liver function according to ALBI score was significantly higher for patients without neoadjuvant treatment ( $p=0.019$ ) with median change of -0.23 and -0.06 for patients after TACE, respectively.

**Conclusion:** The findings showed that neoadjuvant treatment with TACE does not decrease liver function before liver transplantation, however it may limit liver function restoration on a waiting list.

#### PT01-47

### LONGER WAITLIST TIME DOES NOT TRANSLATE TO POORER OUTCOMES FOR LIVER TRANSPLANT PATIENTS WITH HEPATOCELLULAR CARCINOMA

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**Introduction:** MELD exception points (MEP) allocated to hepatocellular carcinoma (HCC) patients on liver transplant (LT) waitlist remain arbitrary and differ between countries. We seek to determine if the current policy of allocating only 15 MEP to HCC patients disadvantages them.

**Methods:** A retrospective review of adult patients waitlisted for LT between January 2011 and July 2019 was conducted and their outcomes were analyzed.

**Results:** 176 patients were on LT waitlist, of which 87 (49.4%) had HCC. The natural MELD score of HCC patients was significantly lower than non-HCC patients (median 10 vs 18,  $p < 0.001$ ). Nearly 3 times as many patients in HCC group had MELD  $< 15$  (72.4% vs 27.0%,  $p < 0.001$ ). Despite allocating 15 MEP to HCC patients, their waitlist time was significantly longer (median 8.0 vs 2.0 months,  $p = 0.003$ ). Dropout rates were similar at 23.0% and 33.7% ( $p = 0.115$ ) over a median interval of 7.0 (1.0 - 79.0) and 2.5 months (1.0 - 53.0) for HCC and non-HCC groups respectively. 13 (65.0%) HCC patients dropped out due to HCC progression out of criteria. 67 (77.0%) HCC and 59 (66.3%) non-HCC patients were transplanted, and their 5-year OS were similar (HCC 82.1% vs non-HCC 89.8%,  $p = 0.402$ ).

**Conclusion:** HCC patients are waitlisted for significantly longer duration despite 15 MEP. Although LT outcomes are similar, many HCC patients progress beyond criteria due to prolonged duration on waitlist. Future studies should seek to identify subgroup of HCC patients who will benefit from additional MEP.

#### PT01-48

### LIVER TRANSPLANT CAN BE PERFORMED SAFELY IN ADULT PATIENTS WITH PORTAL VEIN THROMBOSIS IN A MEDIUM-SIZED TRANSPLANTATION CENTRE

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**Introduction:** Although the feasibility of liver transplant (LT) in patients with portal vein thrombosis (PVT) has been reported, its outcomes remain debated. Its safety is especially important in small to medium-sized LT centers with scarce organs and resources. We seek to evaluate the outcomes of patients with PVT receiving LT in our center.

**Methods:** A retrospective review of patients who underwent adult LT between January 2011 and January 2015 was conducted and their outcomes were analyzed.

**Results:** 124 patients underwent adult LT, of which 56 (45.2%) and 68 (54.8%) were living (LDLT) and deceased (DDL) donor LT respectively. More than one-tenth had PVT diagnosed at listing ( $n=15$ , 12.1%) whereby 4 had LDLT and 11 DDLT. There was equal number of patients ( $n=5$ ) with Yerdel grade 1 to 3 PVT. 12 (80.0%) had thrombectomy while 3 with grade 3 PVT (20.0%) had venous jump graft. Grade 4 PVT was

considered as contraindication to LT. There was no difference in post-operative PVT recurrence (no PVT 7.4% vs PVT 13.3%,  $p=0.351$ ). While re-operation was more common in PVT group (no PVT 10.2% vs PVT 33.3%,  $p=0.027$ ), none were related to PVT recurrence. Median duration of follow-up for no PVT and PVT groups were 78.0 months (1.0-106.0 months) and 82.0 months (63.0-97.0 months) respectively. 5-year OS was comparable between both groups (no PVT 91.4% vs PVT 100.0%,  $p=0.203$ ).

**Conclusion:** Yerdel grade 1 to 3 PVT does not affect LT outcomes and LT can be safely performed in patients with PVT in a medium-sized LT center.

#### PT01-49

### CHARACTERIZATION OF DECEASED LIVER DONORS IN A CHILEAN UNIVERSITY HOSPITAL IN THE LAST 5 YEARS

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**Introduction:** The standardization and progress of surgical techniques and postoperative care has improved the outcome of liver transplantation. However, limited access to viable allografts remains; fueling efforts to maximize existing donor pool such as the use of marginal grafts.

**Objective:** To characterize deceased liver donors of allografts procured by Universidad Católica Clinical Hospital (UC), with special attention to prevalence of expanded criteria donors.

**Methods:** Retrospective cohort study with data obtained from a prospectively collected liver donor database. We included all liver grafts retrieved by UC from April 2015 to January 2020. Descriptive statistics were used.

**Results:** During the given time period, a total of 112 liver grafts were retrieved for transplantation, two of which were split liver grafts (1.8%). These 112 grafts were allocated to 109 patients, and 2 were discarded (graft discard rate 1.8%). Sixty-four percent of deceased liver donors were male, with a median age of 49 (15-72), whose causes of death were stroke (65.5%), followed by traumatic brain injury (28.2%) and other (6.3%). Mean BMI was 26.67 kg/m<sup>2</sup> (SD 3.92). Donor/recipient compatibility was identical or compatible in all cases. Fifty-one donors were  $\geq 50$  years old (46.4%). Forty-five-point-five percent of grafts ( $n=51$ ) met expanded criteria: 23 donors were 60 years or over, 19 had cardiac arrest and 12 had cold ischemia time over 10 hours. Three met more than one criterion. The cohort's overall success rate was 95.5%.

**Conclusion:** Despite using a high percentage of expanded criteria donors, our university hospital maintains a high success rate.

#### PT01-51

### LONG TERM OUTCOMES OF ABDOMINAL WALL CLOSURE WITH EPTFE - GORETEX MESH IN PEDIATRIC LIVER TRANSPLANTATION

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**Background:** Massive transfusion and transient portal vein clamping during liver transplantation may cause abdominal compartment syndrome (ACS) related with mesenteric congestion. Especially in pediatric cases, the risk of ACS is increased due to the large for size syndrome caused by organ size mismatch. In the area of general pediatric surgery such as correction of gastroschisis or omphalocele, abdominal closure for correction of defect using ePTFE-GoreTex is the well-established method. The purpose of this study is to describe the ePTFE-GoreTex closure method in patients with or at high risk of ACS among pediatric liver transplant patients, and to investigate the long-term prognosis and outcomes.

**Methods:** From March 1988 to March 2018, 253 pediatric liver transplantation were performed in Seoul National University Hospital. We reviewed the cases who underwent abdominal closure with ePTFE-Goretex during liver transplantation retrospectively.

**Results:** Total 15 cases were performed abdominal closure with ePTFE-Gore-Tex graft. We usually used 2mm x 10cm x 15cm sized Goretex graft for extending abdominal cavity. Median follow up was 144.8 months, there was no ACS after transplantation, but 4 cases of the patients underwent repetitive exploration due to bleeding or vessel occlusion. In repetitive surgery, we reduced every Goretex that had already used in previous operation. There was no infectious complication related Goretex implantation.

**Conclusions:** It is important to select appropriate method for preventing ACS in pediatric liver transplantation. Abdominal closure using ePTFE-Goretex could be a good option for the case who have high risk factor of ACS.

#### PT01-52

### IMPACT OF MELD ALLOCATION SYSTEM ON THE OUTCOMES OF DECEASED DONOR LIVER TRANSPLANTATION: A SINGLE-CENTER EXPERIENCE

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**Background:** From the June of 2016, The Model for End-Stage Liver Disease (MELD)-based allocation system replaced the Child-Turcotte-Pugh (CTP) score-based system for organ allocation of the liver in Korea. The aim of

this study is to analyze the changes of outcomes and to describe arising issues before and after the MELD system. **Methods:** From June 2014 to June 2018, 129 patients were selected from recipients who underwent DDLT in Seoul National University Hospital. Pediatric cases were excluded. Patients were divided into two groups according to the allocation system (52 in the MELD group, 77 in the CTP group).

**Results:** The MELD score of the two groups differed significantly ( $37.8 \pm 2.0$  in the MELD group,  $31.0 \pm 8.2$  in the CTP group,  $P=0.001$ ). The etiology of patients was changed difference in etiology for liver transplantation, Proportion of Alcoholic cirrhosis is increased in the era of MELD allocation system. However, proportion of hepatitis B related liver cirrhosis and hepatocellular carcinoma were decreased. Long term survival rate in CTP group was 80.1% but it was decreased to 75% in MELD group. There were no differences of the complication rate in the CTP group and MELD group (35%, 31%). No one received a DDLT for hepatocellular carcinoma.

**Conclusions:** The MELD allocation system distributes the liver to severely ill patients, resulting in poor performance after surgery, and as proportion of alcoholic cirrhosis increase, problems such as re-drink failure may become an issue in the future. It is necessary to adjust MELD allocation system for increasing outcomes after DDLT.

#### PT01-53

### PERIOPERATIVE MANAGEMENT FOR LIVER TRANSPLANTATION WITH DSA POSITIVE PATIENTS

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**Background:** Liver transplantation is an accepted treatment for end-stage liver disease. Despite improvements of the surgical techniques, organ preservation methods, and immunosuppressive therapy, antibody mediated rejection is still big problem. It has been reported that the existence of donor-specific antibodies (DSA) is correlated with rejection and with an increased risk of early mortality. We described our treatment and prognosis about the patient who has undergone liver transplantation with DSA.

**Methods:** 16 patients among 87 patients of recipient who has undergone liver transplantation in our department from September 2011 to December 2018. In each patient, the type of DSA and the MFI were measured before liver transplantation. A high DSA titer was defined as a normalized, trimmed MFI value  $\geq 10000$ . Patients received the standard immunosuppressive protocol for liver transplantation, including steroids, tacrolimus, and mycophenolate mofetil, with addition of rituximab more than two weeks before transplantation and took medication such as tacrolimus and mycophenolate mofetil one week before the transplantation. During operation, each patient underwent splenectomy.

**Results:** 7 patients have high titer DSA, and each patient has a desensitization method that described before. Only one patient was dead because of other disease. 9 patients are still arrived without severe rejection.

**Conclusion:** If the patients who has DSA was undergone right desensitization methods, we can get good survival rate.

#### PT01-54

### SINGLE CENTER SERIES OF LIVER TRANSPLANTATION FOR CIRRHOSIS COMPLICATED BY PORTAL VEIN THROMBOSIS OR STENOSIS

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Portal vein thrombosis (PVT) is a known complication of liver cirrhosis with reported incidence up to 32% and the rate of LT of only 1.2%-6.6% due to surgical complexity and risk.

691 liver transplants were performed in a period of 2008-2019. The rate of LT for PVT was 6.2% (43/691). The PV reconstruction (PVR) technique depended on PVT grade, age, presence of shunts and was composed of thrombectomy (19), reno-portal transposition (8), jump and interposition graft (2), mesoportal (1), shunt-to-portal anastomosis (2) in adults and cava-portal transposition (7), confluent-portal (2), venoplasty(2) in pediatric patients.

The median age in PVR adults was compared to conventional PV anastomosis CPVA ( $p=0.08$ ). Median blood loss, the rate of AKI, EAD and new onset PVT were 2000 [800; 3500] vs 1200 [700; 1700] ( $p = 0.06$ ); 20% vs 15.7% ( $p = 0.7$ ); 10% vs 24.5% ( $p = 0.3$ ) and 10% vs 0.7% (0.07) in PVR compared to CPVA group.

The median age in PVR pediatrics was compared to CPVA ( $p = 0.12$ ).

Median blood loss, the rate of AKI, EAD and new onset PVT were 150 [100; 250] vs 150 [100; 250] ( $p = 0.04$ ); 9% vs 18.2% ( $p=0.9$ ), 27.3% in PVR group vs 37.2% ( $p=1$ ) and 10% vs 11.3% in CPVA ( $p = 1$ ) in PVR compared to CPVA group.

PV reconstruction is a challenging procedure in LT for PVT and associated with higher rate of complications but not mortality. The choice of PV reconstruction/thrombectomy depend on PVT grade, age, and presence of suitable shunts.

#### PT01-55

### FATE OF 500 REFERRALS TO A LIVER TRANSPLANT SURGICAL UNIT IN INDIA. ARE WE SAVING ENOUGH LIVES?

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**Background:** Living Donor Liver Transplant(LDLT) is the mainstay of Liver Transplants(LT) in India. Data on transplant referrals and their outcomes is lacking from the subcontinent.

**Material and methods:** This was a retrospective analysis of 500 referrals to the LT surgery team between November 2018 to July 2019. Patient particulars, diagnosis, MELD score, contact number, referring doctor, and plan as advised by the team was noted. A universal questionnaire was answered individually by each patient or primary caretaker after a minimum waiting period of 4 weeks from the clinic or inpatient visit.

**Results:** LT was advised in 450(90%) patients. 45(9%) patients were lost to follow up. Predominant etiology was alcohol in 240/500(48%) and median MELD score was 24(Range 11-40). 54 out of 450(12%) eventually underwent LT. Of the 43 patients transplanted at our center there was no inpatient mortality. 231/450(51.3%) patients did not agree for evaluation. Finance was the reason 88/450(19.5%), unavailable donor in 57/450(12.7%), lack of both finance and donor in 68/450(15.1%), patient or family refusal in 18/450(4%), and preferring a different hospital for transplant in 11/450(2.4%). 77/396(19.4%) patients who did not undergo LT for various reasons died. 30/450(6.6%) patients improved on follow up and did not require LT.

**Conclusions:** Lack of finances and living/deceased donors are the major impediments in LT. Improvement in organ allocation and deceased donation, public awareness, wider insurance coverage and financial support from government agencies can help in reducing mortality in patients eligible for LT.

#### PT01-56

### LIVER TRANSPLANTATION FOR EPITHELIOID HEMANGIOENDOTHELIOMA (EHE) - SHORT AND LONG-TERM OUTCOMES FROM 30 YEARS' EXPERIENCE

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**Aim:** We report our experience of liver transplantation (LT) for Epithelioid hemangioendothelioma (EHE) which is an uncommon vascular tumour of liver with intermediate malignant potential. Single centre experience remains limited.

**Methods:** Retrospective review of 13 LT patients between 1989 to 2019.

**Results:** 13 patients (male 6, female 7) (paediatric 5, adult 8) underwent LT. Median age at presentation was 28 years. Median duration from diagnosis to listing was 76 days and from listing to transplant was 46 days. Presenting symptoms were jaundice, abdominal pain and distension. Most common presentation were with jaundice in children and abdominal pain in adults. 3 patients had metastases (lung 2, lymph node1) pre-transplant. Median follow-up is 108 months. 2 patient had recurrence in the graft liver. One had liver resection and the other developed lung metastases. 4 patients died. Early mortality (2m, 38m) occurred in 2 children from sepsis. Two adults died of post ERCP pancreatitis and from metastases in liver and lungs respectively. 3 patients with pre-transplant metastases did not have disease progression. Overall mean survival is 222 months. The 1, 5, and 20-year overall survival is 92%, 83%, and 66% respectively. The 5 and 20-year disease progression free survival is 90% and 72% respectively.

**Conclusion:** Patients with EHE even with low volume metastases represent excellent candidates for transplant with long term survival. Disease recurrence can occur in the graft as late as 181 months post-transplant. Children who

had shorter time interval between diagnosis and transplant had poor survival.

#### PT01-58

### IS THERE A DIFFERENCE WITH AGED GRAFTS?

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**Introduction:** Donors for liver transplantation are accepted beyond "optimal" due to grafts shortage. We aim to analyze our results stratifying our donors by age.

**Methods:** Retrospective study: liver transplants from 2013 to 2018. Groups according donor's age: 1 (< 20); 2 (20 - 39), 3 (40 - 59) and 4 (> 60 years old). Statistical analysis with a significance level < 0,05.

**Results:** n=265 liver transplants, Group 1:41, 2:77, 3:106 and 4:41. Most frequent death diagnosis were stroke (53%), prevalent in older donors, and head injury (37%) in younger ones (p< 0,001). 68% of donors had overweight or obesity, being higher in groups 3 and 4 (p=0,006). There were no differences in liver enzymes, sodium, use of vasopressors, or cardiac arrest. 91% of splits were from groups 1 and 2 (p< 0,001). Hepatorenal transplants used grafts only from group 1 and 2 (p< 0,001). Analyzing recipients age: older livers for older patients (p=0,007). The mean cold ischemia time was longer in group 1 (520 min), 2 (477), 3 (429) and 4 (410) (p< 0,001). No significant differences in the liver enzymes peak, days of hospitalization, morbidity or mortality. There weren't cases of primary graft failure in groups 1 or 2, most were in 3 (p=0,039). Graft survival and overall survival did not yield significant results, though in group 4 overall survival at 3 and 5 years was lower (p=0,053).

**Conclusion:** The use of suboptimal donors is feasible with similar results but an adequate selection of the recipient is also essential.

#### PT01-60

### LIVER TRANSPLANTATION FOR THE CARRYOVER PATIENTS WHO HAVE THE HISTORY OF MULTIPLE LAPAROTOMIES INCLUDING KASAI'S OPERATION

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**Objective:** Forty-five years passed from Kasai's operation announcement for biliary atresia. And the adult liver failure cases so-called "the carryover cases after Kasai's operation" have increased. In these cases, there are many patients who underwent polysurgery. In the polysurgery cases, liver transplantation is occasionally difficult. It is reported that there are many complications which is caused by severe cholangitis, hepatic portal regional inflammation, and adhesion. We investigated the complications of our polysurgery cases including "the carryover cases after Kasai's operation".

**Methods:** From 1991 to 2019, we performed 198 cases of liver transplantation. We investigated the results of our carryover cases after Kasai's operation (Transplantation was performed over 16 years old) (n=22). Furthermore we investigated risk factors of complications.

**Results:** On five years overall survival, there were no significant differences between "the carryover cases after Kasai's operation" and the others (81.8%vs81.2%). The carryover case after Kasai's operation was not found to be the risk factor of any complications. But polysurgery was the risk factor for portal stenosis and biliary stenosis identified on our univariate analysis. We analyzed the relationship between biliary stenosis and the frequency of laparotomy using an ROC curve. The analysis showed that the cutoff point (maximum point of sensitivity plus specificity) was over two times of laparotomy before transplantation.

**Conclusion:** In our study, the carryover case after Kasai's operation was not found to be the risk factors of any complications. But the polysurgery case was identified to be the risk factors of portal vein stenosis and biliary stenosis.

PT01-61

### IMPACT OF PRESERVATION SOLUTION ON LIVER TRANSPLANTATION OUTCOME: COMPARATIVE ANALYSIS OF HTK AND IGL1

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Type of preservation solutions (PS) used for organ procurement and static cold storage before liver transplantation (LT) changed over time and are currently in our center mostly HTK and IGL1. Large registries analysis showed a shorter graft survival with HTK.

**Aim:** compare LT outcomes according to PS used.

Patients undergoing primary LT between 2013 and 2018 with grafts preserved with HTK or IGL1 solutions were retrospectively reviewed analysing postoperative short and long-term outcomes.

190 patients underwent a first LT, using IGL1 (n=107) or HTK (n=83). Recipients baseline characteristics were similar between both groups whereas HTK group had significantly more national allocation and higher median DRI and ET-DRI scores compared to IGL1 group. HTK had significantly higher rates of early allograft dysfunction (EAD) compared to IGL1 according to Olthoff (66 vs 55% p=0,033), Dhillon (35 vs 21% p=0,046) and MEAF>7 (18 vs 9% p=0,058) definitions. HTK had a significantly higher rate of non-anastomotic biliary strictures (NAS) compared to IGL, respectively 21% and 9% (p=0,042). The 3-year graft survival was higher in IGL1 group (83% vs 69%, p=0.025). At multivariate analysis, male gender, DCD donors, HTK solution and CIT >600 minutes were independent risk factors associated with NAS. Independent risk factors of graft loss were Donor age > 65 years and HTK

use. The analysis after propensity score matching showed the same results than in the global cohort of patients.

**Conclusions:** HTK showed to be an independent risk factor of NAS and graft loss compared to IGL1 PS after primary LT.

PT01-62

### LATE RE-TRANSPLANTATION OF THE LIVER IN ADULTHOOD FOLLOWING SUCCESSFUL PAEDIATRIC TRANSPLANTATION'

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**Introduction:** The survival outcomes of paediatric liver transplantation (LT) have improved from 30% in the 1970's to over 90% in the current era. Therefore a huge number of paediatric LT recipients are reaching adulthood. Non-compliance, chronic rejection and vascular related complications are common reasons for late allograft failure after a successful paediatric LT.

**Methods:** In this case series we specifically reviewed the outcomes of 11 patients who underwent a successful paediatric LT and underwent re-transplantation as an adult, due to primary graft failure at Queen Elizabeth Hospital Birmingham, UK.

**Results:** The mean age at the time of primary LT was 7.3 ( $\pm 6.2$ ) years and the most common indication was biliary atresia (36.4%). Chronic rejection was the most common reason for primary graft failure (77%) followed by hepatic artery thrombosis. The mean graft survival after paediatric LT was 13.1 ( $\pm 4.4$ ) years. Re-transplantation of liver as adults was performed at a mean age of 23.3 ( $\pm 4.2$ ) years. Vascular related complications were observed in 36% of patients and overall postoperative morbidity rate was 88.9%. After re-transplantation the median graft survival was 34 months (2-91 months). There was only 1 ninety-day mortality. One, three and five year survival rates were 82%, 73% and 73% respectively. A third transplant was needed in 18% of patients.

**Conclusion:** Re-transplantation of liver in paediatric patients as adults is technically very challenging. High morbidity and mortality rates are not unexpected as these patients are already immunosuppressed and undergoing a very complex vascular and biliary reconstruction.

PT02 - Transplantation: Living Donor

PT02-02

### A PROPOSED PREDICTIVE MODEL FOR HYPERPERFUSION SYNDROME AFTER LIVING DONOR LIVER TRANSPLANTATION USING PLATELET COUNT AND PORTAL VEIN FLOW AS SURROGATES FOR PORTAL PRESSURE MEASUREMENT

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**Background:** Graft hyperperfusion syndrome (HPS) is a deterrent to transplantation using partial grafts. Numerous risk factors were described but no predictive model exists. Thrombocytopenia early after LDLT mainly occurs secondary to graft/splenic sequestration, a product of Portal vein pressure (PVP). Post-operative Portal vein flow (PVF) monitoring unlike PVP, measures inflow, does not directly reflect sinusoidal pressure and predict graft dysfunction secondary to HPS. This study aims to determine whether post-LDLT platelet count (PC) can serve as a biomarker for PVP and present a predictive model for HPS.

**Methodology:** A single-center retrospective analysis of 757 consecutive adult-to-adult LDLTs from July 2010 to January 2018. Postoperative liver function, platelet count and graft hemodynamics recorded on days 1,3,5,7 and 14. Development of HPS, includes either delayed graft function (DGF) or small-for-size syndrome(SFSS). Correlation analysis and ROC analysis were done to determine cut-off points.

**Results:** 201 patients (29%) developed HPS. PC correlated with PVF ( $p < 0.001$ ,  $B = -0.01$ ) and HPS ( $p < 0.001$ ). PC was a better predictor ( $R^2 0.02$  vs  $0.003$  compared to PVF). PC of 67,000 yielded and PVF of 100mL/min/100g on POD5 79% and 82% sensitive respectively. Combining PC+PVF gave a logistic model “logit (HPS) =  $-2.19 + PC + 0.92 (PVF)$ ” with PPV of 43%, significantly higher than PC alone (23%,  $p < 0.001$ ) and PVF alone (22%,  $p = 0.001$ ).

**Conclusions:** PC after LDLT is a practical surrogate for PVP monitoring and can guide inflow modulation post-operatively. Combining PC+PVF in a predictive model significantly increases its predictive value and hence, when validated, can be used to guide clinicians in caring for recipients. This model also has the potential to monitor effectivity of inflow modulation strategies.

#### PT02-03

### LARGE VENOUS OUTFLOW RECONSTRUCTION USING DARON Y GRAFT AS COMMON ORIFICE OF MIDDLE HEPATIC VEIN AND GRAFT RIGHT HEPATIC VEIN FOR MODIFIED RIGHT LIVER GRAFT

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**Purpose:** The reconstruction of the vascular outflow tract of partial liver grafts has received considerable attention in the past, especially in the setting of right liver grafts with undrained segments. Hepatic venous outflow reconstruction is an important factor for successful LDLT outcome. The aim of this report was to introduce Large Venous Outflow Reconstruction technique using Daron Y graft as common orifice of MHV and graft RHV.

**Methods:** We compared clinical outcomes with two reconstruction techniques through retrospective review of 46 LDLTs using right lobe grafts at our institution from Nov 2013 to Nov 2019; group I (n = 29) received separate venous outflow anastomosis between MHV reconstructed

using various materials and RHV, group II (n = 16) received Large Venous Outflow Reconstruction using Daron Y graft as common orifice of MHV and RHV.

**Results:** The MELD, GRWR and graft volume were 13, 1.1, 723g in group I, 17.4, 1.0, 969g in group II. The 1, 3, 6-month patency rates of MHV in both groups were 100, 89.3% ( $p > 0.24$ ), 93.8, 51.9% ( $P > 0.004$ ), 66.7, 24.0% ( $P > 0.01$ ) respectively. RHV stent insertion in both groups occurred 2, 0 cases. Especially, MHV stent insertion did not occur in both groups during follow-up period.

**Conclusion:** Although small cases, our Large Venous Outflow Reconstruction technique using Daron Y graft as common orifice of MHV and graft RHV could be an effective method of overcoming technical difficulties and the outflow disturbance in right lobe LDLT without complex bench work to create large outflow.

#### PT02-04

### IMPORTANCE OF SYNCHRONIZED MRCP AND INTRAOPERATIVE CHOLANGIOGRAM IN DONOR LIVER TRANSPLANTATION: INDONESIAN SINGLE CENTRE EXPERIENCE

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Evaluations of donors' biliary anatomy in LDLT are obtained from MRCP and IOC. Bile leakage as one of the important complications can be minimized by detail acknowledgment of biliary anatomy by combining MRCP and IOC. This study aims to review donors' biliary anatomy and the impact of the acknowledgment to technique and duration.

This single centre retrospective study included 46 adult-to-pediatric and 7 adult-to-adult LDLTs performed in Cipto Mangunkusumo Hospital from 2010-2019. All patients were performed MRCP then synchronised with IOC. All results were classified by Huang Classification. Demographic data, surgical technique, duration, and radiologic discrepancy were collected.

There are 34 cholangiographies out of 53 LDLTs. No biliary complications detected. Forty-nine donors underwent left-lateral sectionectomy and 4 right hepatectomy. Operative duration ranged from 270-600 minutes. The frequency of each type on MRCP/IOC are as follows: Huang A1 40,5%/35,1%; Huang A2 37,8%;37,8%; Huang A3 13,5%/18,9%; Huang A4 5,4%/8,1%; and Huang A5 2,7%/0. Huang A1 has the shortest operative duration and the least blood loss (70cc). Huang A3 has the longest operative duration with the most blood loss (900cc). Discrepancy were found in 6 patients of which 2 underwent longest operative duration and lost the most blood.

Synchronised MRCP and IOC decrease operative duration therefore associated with better outcome. Low discrepancy showed that surgeon does not require nephrotoxic contrast media used in IOC hence reducing surgical duration except for rare cases like Huang A4 and A5 to avoid ligation of major intrahepatic duct.

PT02-06

### PURE LAPAROSCOPIC DONOR HEPATECTOMY IN PEDIATRIC LIVING DONOR LIVER TRANSPLANTATION: AN APPRAISAL OF THE SAFETY AND EFFICACY OF THE PROCEDURE

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**Objective:** This study aimed to assess the safety of this procedure in children, including surgical complications and survival outcome following LDLT, to evaluate the effectiveness of open donor hepatectomy versus pure laparoscopic donor hepatectomy in a high-volume LDLT center.

**Methods:** The medical records of 107 patients (aged  $\leq 17$  years) who underwent ABO compatible LDLT from May 2008 to June 2016 were analyzed. Of 107 patients, 76 underwent open donor hepatectomy and 31 underwent pure laparoscopic donor hepatectomy. To overcome bias from the differing distribution of co-variables among patients in the two study groups, a 1:1 propensity score matching analysis was performed using the nearest-neighbor matching method.

**Results:** The mean follow-up period was 92.9 months in the open group and 92.7 months in the laparoscopic group. The length of post-operative hospital stay of the donor was statistically shorter in the laparoscopic group than in the open group. The overall surgical complication rate did not differ between the groups. The 1-, 3-, and 5-year overall survival rates were 93.6%, 93.6%, and 93.6% in the open group and 96.8%, 93.6% and 93.6% in the laparoscopic group, respectively.

**Conclusions:** Laparoscopic hepatectomy may be more beneficial for the donor, and the use of laparoscopic methods on the donor does not adversely affect the recipient's outcome. Thus, laparoscopic hepatectomy is a safe, feasible, and reproducible procedure for pediatric liver transplantation.

PT02-07

### OSTEOPENIA PREDICTS POSTTRANSPLANT SURVIVAL AMONG LIVING DONOR LIVER TRANSPLANT RECIPIENTS

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**Introduction:** Osteopenia, loss of bone mineral density (BMD), was recently identified to be independently associated with early marker of deconditioning that precedes sarcopenia. However, little evidence about the prognostic value of osteopenia in patients undergoing LT has been reported. The aim of this study was to clarify the impact of osteopenia as the risk factor for mortality after living-donor liver transplantation (LDLT) compared with already-reported predictors in a large cohort of Japanese patients with liver cirrhosis.

**Methods:** Data were collected retrospectively for all consecutive 547 patients who underwent LDLT for decompensated liver cirrhosis at our institution between January 2001 and November 2019. BMD was evaluated with computed tomographic measurement of pixel density in the midvertebral core of the 11th thoracic vertebra by computed tomography. Data related to clinicopathological parameters and prognosis were analyzed.

**Results:** The median value of BMD was 171.6 Hounsfield units (HU), and osteopenia was identified in 251 (45.9%) of 547 recipients. The overall survival of the patients with osteopenia was significantly lower than the patients with non-osteopenia ( $P$ -value  $< 0.001$ ; 5y, 71.5% vs. 89.7%). In addition to the other predictors, such as preoperative admission in intensive/high care unit (ICU) (HR 2.268,  $P=0.029$ ) and no splenectomy during LT (HR 1.991,  $P=0.001$ ), osteopenia (HR 3.029,  $P=0.001$ ) was independent risk factors for mortality after LDLT by multivariate analysis.

**Conclusion:** Preoperative osteopenia was independently associated with post-LDLT mortality among patients with decompensated liver cirrhosis. Improving osteopenia with preoperative rehabilitation or medical therapy may improve post-LDLT survival.

PT02-09

### FEASIBILITY ASSESSMENT IN ANIMAL MODELS FOR PERITONEUM USE AS INTERPOSITION VESSEL GRAFT SUBSTITUTES DURING LIVING DONOR LIVER TRANSPLANTATION

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**Purpose:** Most of the grafts used as interposition conduits for the middle hepatic vein (MHV) in living donor liver transplantation (LDLT) have been allografts and autografts. Recently, peritoneum has been used for vessel substitutes during surgery. Thus, we performed animal lab tests to assess the feasibility of interposition vessel graft substitutes for MHV.

**Methods:** The inferior vena cava was replaced in three dogs and three pigs with autologous peritoneal vessel graft. After 28 days, patency rate, outer and inner diameter, intimal thickness, histology, and immunohistochemistry were evaluated according to interposition grafts.

**Results:** The vessel grafts made of the peritoneum were all animals at postoperative week 4. The outer diameter of the anastomotic site at four weeks was  $8.41 \pm 0.37$  and  $7.41 \pm 0.86$  mm in before surgery and after four weeks, respectively. The inner diameter of the interposition graft at four weeks was  $7.90 \pm 0.23$  and  $6.33 \pm 0.68$  in before surgery and after four weeks, respectively. In histologic findings, the intima of the anastomotic site was thickest in all animals. The proliferation of smooth muscle cells was most severe in the anti-alpha-actin antibody test at the anastomosis site. On the inner side of the peritoneum, endothelial cell migration was found over whole segments.

**Conclusion:** Our data implicate that the use of peritoneum as interposition vessel grafts are feasible for MHV reconstruction in LDLT.

PT02-10

### RANDOMISED CONTROLLED TRIAL TO STUDY THE OUTCOME OF INTRAVENOUS PHOSPHATE SUPPLEMENTATION IN LIVE LIVER DONORS (LLD) - RESULTS OF AN INTERIM ANALYSIS

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**Introduction:** Hypophosphatemia is a common phenomenon after hepatectomy. Current literature is not clear regarding its consequences and the role of perioperative phosphorous supplementation.

**Methods:** Between January 2019 and December 2019 out of 68 consecutive LLDs ; 6 did not meet the inclusion criteria. 62 LLDs were randomized (open label); 30 in intervention arm to receive phosphorous supplementation and 32 in the control arm. The primary outcome was to see the effects on the rate of Post hepatectomy liver failure (PHLF) and postoperative complications. Secondary outcomes were to see the trend of phosphorous levels and the normalization of liver function parameters, length of stay.

**Results:** Baseline characteristics, operative and graft parameters were comparable between the two groups. The overall incidence of hypophosphatemia was 74.1% (66.6% in intervention arm and 81.25% in control arm;  $p=0.126$ ). Post-operative complications were not significant between both the groups (20% in intervention arm and 15.62% in control arm;  $p=0.569$ ). In the whole cohort there was only one major complication (Clavien Dindo 3a) in the intervention arm. Nine patients in each group developed grade A PHLF according to the International Study Group on Liver Surgery (ISGLS) criteria ( $p=0.689$ ). The bilirubin and alkaline phosphatase were marginally higher on days 4 to 6 and day 7 respectively in the intervention arm.

**Conclusion:** In our interim analysis from the randomized trial routine phosphorous supplementation does not prove beneficial in reducing post-operative complications or speeding the recovery.

PT02-11

### EVOLUTION AND OUTCOME OF FIRST 100 ROBOTIC DONOR HEPATECTOMY

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Minimal invasive liver donor surgery was established as a feasible technique with comparable outcome to open liver donor surgery that was mainly for left lateral sectionectomy and left lobe resection. The limitation of conventional laparoscopy was clear in the right hepatectomy due difficult maneuvering and accessibility. Robotic approach was induced as an alternative to conventional laparoscopic approach. Few Paper was published with limited number of cases. Here we present own experience in Robotic Liver

Donor Surgery in King Faisal Specialist Hospital and Research Center which the largest number of cases up to our knowledge. A total of 100 Robotic liver resection was carried from November 2018 to October 2019. Male donors 72 and female 28. Median age 27 years. Left lateral was 38, left 19 and right 43. Average hospital stay was 4 days. No mortality was recorded nor conversion. Morbidity only 8 patients mainly in the left and right lobe group. Two bile leak in the right lobe donors and one patient in the left lobe. Three patient had wound hematomas at the extraction incision (Pfannenstiel) incision, one in each group. Over all graft survival was 93%. Here was can say Robotic donor hepatectomy is safe with comparable result to open surgery with better post-operative pain and shorter hospital stay and better cosmesis. Reproducibility and learning curve need further evaluation

PT02-19

### SURGICAL TECHNIQUES AND RESULTS FOR TOTALLY LAPAROSCOPIC DONOR HEPATECTOMY

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**Background:** Progress in surgical techniques and the development of surgical devices mean that donor hepatectomy can now be performed.

**Objective:** To assess the feasibility and short-term outcomes of totally laparoscopic donor hepatectomy (TLDH). **Material and methods:** Between January 2007 and December 2018, we performed 95 living donor liver transplantations. TLDHs was performed in 29 of the 95 donors.

**Surgical technique:** The pneumoperitoneum pressure was 10 mmHg. The right lobe graft was 6 ports, the left lobe and the left lateral lobe grafts were 5 ports. After liver mobilization, the right or left Glissonean pedicle was secured, ICG was injected intravenously (2.5 mg), and the transection line was confirmed. Parenchymal transections were performed by Clamp-Crushing method using the Pringle maneuver, after which the artery, portal vein, and bile duct were isolated. The bile duct was confirmed with intraoperative ICG fluorescence imaging and preoperative DIC-CT. The hepatic vein was dissected using Powered ECHELON FLEX 7.

**Results:** TLDHs were completed for 27 patients (93%). The median age was 35 years. Of the 29 TLDHs, 15 were right lobe grafts, 12 were left lobe grafts and 2 were left lateral lobe grafts. The median operating time was 422 minutes (range: 283-605 minutes), and the median blood loss was 59 mL (range: 21-2950 mL). There were no perioperative deaths or reoperations. Three patients (15%) experienced postoperative complications. The median postoperative hospital stay was 8 days (range: 6-16 days).

**Conclusions:** TLDH is a feasible and acceptable short-term solution that uses suitable surgical devices and techniques.

## PT02-20

**EXAMINATION OF USEFULNESS OF PELD SCORE FOR PEDIATRIC LIVING DONOR LIVER TRANSPLANTATION**

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**Introduction:** The PELD score is used for children younger than 12 years, but its usefulness has not been well reported. Thus, we examined whether the PELD score affects short-term and long-term outcome.

**Methods:** Of the 85 cases of pediatric living donor liver transplantation (PLDLT) performed from July 1991 to August 2020, 58 cases in which PELD scores could be calculated retrospectively using medical records. Of these, group A with a PELD score of less than 10 (n=34) and group B (n=24) with a score of 10 or more were compared.

**Results:** In 80% of all cases, the primary disease was biliary atresia. At the age PLDLT, group B was significantly younger than group A. Group B had significantly higher bleeding volume per body weight and intraoperative transfusion volume. Group B had a longer postoperative hospital stay and a lower overall survival rate than Group A, although this difference was not statistically significant. Postoperative rejection was common in group B. Five patients died postoperatively during the observation period, but there was no clear association with PELD score.

**Conclusion:** In PLDLT, surgery tends to be performed before progression to end-stage liver failure. Especially for patients under one year old, jaundice after Kasai surgery often prolonged, and the PELD score tended to be relatively low. The PELD score seemed to have some usefulness in short-term outcomes. Although, there was no significantly difference in long-term outcome.

## PT02-21

**ADULT-ADULT LIVER LIVING DONOR AFTER BARIATRIC SURGERY. FIRST REPORT OF 3 CASES**

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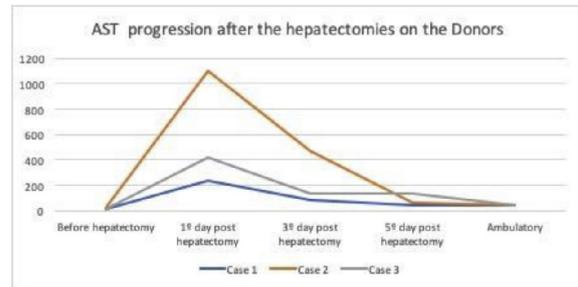
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**Introduction:** The increasing prevalence of bariatric surgery (BS) and the use of living donors for liver transplantation (LDLT), could potentially face us with donors with this surgical history. Due to association between obesity and non-alcoholic liver disease, we must beware of some level of liver damage. Furthermore, it's been demonstrated that BS decreases NASH progression and reverts simple steatosis cases.

**Methods:** Retrospective analysis of patients with previous BS, who underwent right donor hepatectomy for LDLT at Catholic University Clinical Hospital. The information was obtained from clinical reports and telephone interviews. Analysis with descriptive statistic.

**Results:** Case 1: 53 years-old male, who underwent laparoscopic sleeve gastrectomy (LSG) in 2013 for BMI 33,1. In 2016, before hepatectomy, his BMI was 21,5. Normal liver function tests. Case 2: 46 years-old female, she underwent

LSG(2009) and conversion to gastric bypass (2011) for severe obesity, BMI max 39,7. In pre-transplant study to become a donor BMI was 35(2016). Liver biopsy without steatosis and normal liver function tests. Case 3: 53 years-old female, LSG performed (2013), BMI max 31,5. Normal preoperative study with BMI 24,2 (2016). The three patients underwent successfully to right donor hepatectomy. No complications were observed and postoperative trend of liver function tests were in expected ranges. No transfusion requirements, mean operative time was 300 minutes, hospital stay 6,3 days, with adequate liver function in the recipients.  
**Conclusion:** The three patients underwent successfully to right donor hepatectomy. No complications were observed and postoperative trend of liver function tests were in expected ranges.



AST progression in donors

## PT02-23

**NO-TOUCH EN-BLOC TOTAL HEPATECTOMY TECHNIQUE IN LIVING-DONOR LIVER TRANSPLANTATION FOR HEPATOCELLULAR CARCINOMA**

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Although the survival benefit in patients with early HCC who underwent LDLT has been confirmed in clinical series, some studies suggested that LDLT has a higher HCC recurrence rate than DDLT. Their argument is that scrupulous dissection and mobilization of the liver might increase the possibility of tumor capsule violation or tumor dissemination through the hepatic veins. [51] To minimize these concerns, our institution, the Asan Medical Center, has its own surgical strategy named "No-Touch en-bloc total hepatectomy".

The operation of Lt. approach is performed as following sequence. Without hepatic mobilization, we first performed Hilar dissection & division. Then, the Liver was mobilized from Left & Caudate lobe, and HVs were divided. The Rt. Lobe was mobilized as a final procedure of Total Hepatectomy.

No-touch technique has been performed in 61 patients. 93% of them underwent Pre-LDLT treatment, and TACE was the most common treatment modality. Surgical resection of HCC comprise the 18%. After LDLT using No-touch technique, In-hospital mortality was absent. The 5-Year Recurrence free survival was 44%. However, the Overall survival was Extraordinary high, 80.5%.

The no-touch en bloc method can decrease manipulation of the native liver during dissection of the retrohepatic short hepatic veins, and can be suggested as a optimal surgical technique which can be minimized tumor spread by surgical manipulation for patients with advanced hepatocellular carcinoma to improve long-term oncological outcomes in LDLT.

PT02-24

### A CASE REPORT ON TACROLIMUS INDUCED TTP AND EARLY USE OF EVERLIMUS AS IMMUNOSUPPRESSANT IN PEDIATRIC LIVING DONOR LIVER TRANSPLANT

R

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**Objective:** In this case report, we describe our experience with Tacrolimus induced TTP in pediatric LDLT and early use of Everolimus as immunosuppression.

**Method:** Eight year old male child with DCLD due to cholesterol ester storage disorder Underwent LDLT. POD5 there was raised in bilirubin and thrombocytopenia (2.2 lakh to 20,000 /uL), elevated LDH (1660U/L) and PS showed schistocytes (5-6%) F/S/O TTP. Patient developed seizures. MRI brain showed F/S/O PRESS. Tacrolimus was withheld. Patient was started on Rituximab therapy and he underwent 5 cycles of plasmapheresis. Gradually LFT's and Blood pictures normalized and patient was discharged on POD20.

Thirteen year old male child presenting with cryptogenic cirrhosis underwent LDLT. POD 10 he developed seizures and hematuria. NCCT brain showed water shed area with infarcts. POD16 patient had elevated bilirubin, Thrombocytopenia, PS showed Schistocytes. Patient underwent 3 cycles of plasmapheresis. LDH and Schistocytes levels reduced. However we lost the child to sepsis on POD 30.

**Results:** Diagnostic criteria for TTP include Severe thrombocytopenia  $30 \times 10^9/L$ , Elevated LDH, Microangiopathic Hemolytic anemia, Schistocytes on the blood smear. Clinical presentation includes Brain 60% stroke, Heart ischemia 25%, Mesenteric ischemia 35% and Hematuria. Treatment includes plasmapheresis, steroids and Rituximab. Organ transplantation associated TTP is not the result of an immune-mediated ADAMTS13 deficiency and has the Worst prognosis.

**Conclusion:** Very few cases of post LDLT with TTP has been mentioned in literature review. To best of our knowledge this is the only case in which Everolimus has been used as immunosuppressant early post op period in TTP.

PT02-26

### MINIMALLY INVASIVE LIVING DONOR RIGHT HEPATECTOMY: INITIAL EXPERIENCE IN A SOUTHEAST ASIAN TRANSPLANT CENTER

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**Introduction:** While laparoscopic left lateral sectionectomy is increasingly adopted in pediatric donors, laparoscopic donor right hepatectomy (LDRH) is only performed in a small number of highly experienced centers. We report our initial experience with LDRH as a medium-sized liver transplant center.

**Methods:** Retrospective analysis of living donor adult liver transplantations (LDLT) between January 2018 and December 2019 was conducted. A total of 25 LDLTs were performed, of which 7 were LDRH. Patients with anatomical variation seen on pre-operative imaging were excluded from LDRH. All cases performed were without the middle hepatic vein.

**Results:** Amongst LDRH cases, 3 (42.9%) were performed via laparoscopic-assist while the remaining cases (57.1%) were pure LDRH. There were 4 males (57.1%) in this group, and the median age was 41 years old (29-53 years old). Most patients (57.1%) had a body mass index of less than 25kg/m<sup>2</sup>. Median graft volume was 798mls (622-1115mls), while the median total liver volume was 1364mls (949-1728mls). Median operative time was 435 minutes (391-592 minutes) and estimated median blood loss was 300 mls (150-900 mls). The first two cases in this series were planned conversions, while the other was due to short hepatic vein bleeding. There were no post-operative morbidity and mortality reported and all patients were discharged within the first week after surgery (4-7 days).

**Conclusion:** LDRH is safe and feasible in a medium-sized liver transplant center. Careful case selection and planned conversions can mitigate the initial steep learning curve. Larger sample size and long-term follow up data is required.

PT02-30

### LIVING DONOR HEPATECTOMY USING MINIMAL INCISION: AN EXPERIENCE OF CONSECUTIVE 63 CASES BY A SINGLE SURGEON

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**Introduction:** Living donor hepatectomy (LDH) is performed widely as a part of living donor liver transplantation. The type and length of incision have been considered important because of the quality of life, such as the cosmetic effect. We describe herein the minimal incision for LDH to evaluate the safety and feasibility.

**Methods:** We enrolled 63 consecutive cases of donor hepatectomy using a subcostal or upper midline minimal (9-12cm) incision depending on graft type and size between Jul and Dec in 2019 at a single center. Donor demographics, preoperative data, and postoperative outcomes were analyzed.

**Results:** The mean age of the donors was  $32.8 \pm 10.3$  years old, and 32 (50.8%) donors were male. The mean operation time was  $400.5 \pm 69.5$  minutes and the mean hospital stay

was  $9.4 \pm 3.7$  days. The graft types comprised 52 (82.5%) of the modified right lobe, 6 (9.5%) of the modified extended right lobe, and 5 (7.9%) of the extended left lobe. The portal vein types were I, II, and III in 59 (93.7%), 1 (1.6%), and 3 (4.8%), respectively. The bile duct types were A, B, C1, and C2 in 46 (73.0%), 8 (12.7%), 3 (4.8%), and 6 (9.5%). There were two cases of major complications, one (1.6%) case of bile leakage and one (1.6%) case of abdominal wall bleeding after donor hepatectomy.

**Conclusions:** LDH using minimal incision was a safe and feasible option showing an acceptable incidence of complications despite anatomical variations.

## PT02-32

### THE IMPACT OF PORTO-ARTERIAL FLOW RATIO ON SURVIVAL FOR PATIENTS UNDERWENT LIVING DONOR LIVER TRANSPLANTATION

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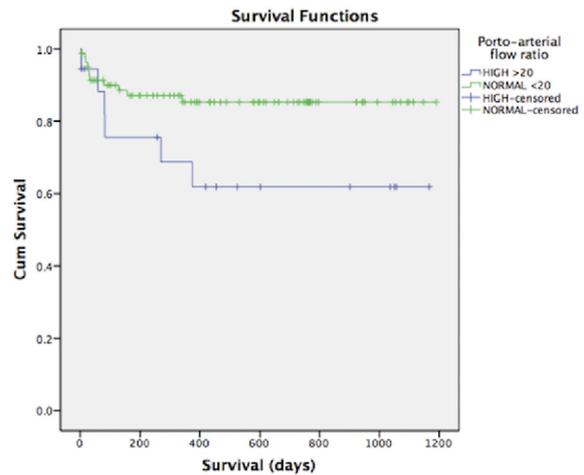
<sup>1</sup>Surgery, <sup>2</sup>Infectious Diseases, <sup>3</sup>Anaesthesiology and Reanimation, <sup>4</sup>Radiology, and <sup>5</sup>Pediatric Surgery, Ankara University, Turkey

**Introduction:** Optimal portal and hepatic arterial flow to the liver graft is essential for the successful liver transplantation. In here analysis of hepatic inflow measurements and outcomes are presented in the setting of adult living donor liver transplantation.

**Method:** Liver transplantations which were performed between October 2016 December 2019 at Ankara University Hospitals were included the study. Pediatric and cadaveric cases were excluded from the study. Intra-operative arterial and portal flow was measured with a doppler flowmeter device at the end of the operation and repeated if splenic artery was ligated.

**Results:** A total of 103 patients were included. Mean BMI  $26.61 \text{ kg/m}^2$  (16.0-36.1). Sixty-six (64.1%) patients were male. Right lobe grafts were utilized for 89 (86.4%) patients. Mean GRWR was 1.07 (0.36-1.81). Mean arterial flow was 107.2 ml/min and mean portal flow was 1462 ml/min. Splenic artery was ligated in 32 cases for inflow modulation. When portal flow over hepatic arterial flow ratio (PAFR) higher than 20 representing high portal flow and low arterial flow was chosen as cut-off value and patients compared in terms of survival with Kaplan-Meier curves and Log-Rank Test, high PAFR was found to be associated with survival ( $p=0.043$ ). GRWR of patients were similar between groups ( $p=0.833$ )

**Conclusion:** In this study final PAFR is related survival benefit. Maneuvers for graft inflow modification to decrease PAFR below 20 might be useful to improve outcome. Coefficients which can be calculated with larger cohorts may be useful for prediction of outcomes



Kaplan Meier curves of patient groups porto arterial flow ratio higher than 20 vs below 20

## PT02-35

### COMPROMISED AMPK-PGC1 $\alpha$ AXIS EXACERBATED STEATOTIC GRAFT INJURY BY DYSREGULATING MITOCHONDRIAL HOMEOSTASIS IN LDLT

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**Introduction:** The utilization of steatotic graft expands the donor pool for living donor liver transplantation (LDLT). However, it remains controversial due to its high morbidity and mortality. Thus determining the safety degree of graft steatosis and elucidating the mechanism of steatotic graft injury is crucial to develop therapeutic strategies targeting at graft injury and to further expand the donor pool.

**Methods:** Five hundred and thirty patients receiving LDLT were prospectively included for risk factor analysis and outcome comparison. Rat orthotopic liver transplantation, in vitro functional experiments and mouse hepatic ischemia/reperfusion models were established to explore the mechanisms of steatotic graft injury.

**Results:** We identified that graft with  $>10\%$  steatosis was an independent risk factor for long-term graft loss after LDLT (HR=2.652,  $p=0.001$ ), and was associated with shorter cancer recurrence-free survival and acute phase liver injury in LDLT patients. Steatotic graft displayed distinct mitochondrial dysfunction, including membrane, calcium and energy homeostasis failure. Specifically, the mitochondrial biogenesis was remarkably down-regulated in steatotic graft.

Inhibition of AMPK-PGC1 $\alpha$  axis impaired mitochondrial biogenesis and was lethal to fatty hepatocyte in vitro, whereas reactivation of AMPK promoted PGC1 $\alpha$ -mediated mitochondrial biogenesis and attenuated liver injury via restoring mitochondrial function in animal model.

**Conclusion:** We provided a new mechanism of compromised AMPK-PGC1 $\alpha$  axis exacerbated steatotic graft injury in LDLT by driving mitochondrial homeostasis failure through impairment of biogenesis.

### PT03 - Transplantation: Science (Immunology)

PT03-05

#### NEUTROPHIL CD 64 - IS IT AN ACCURATE MARKER FOR PREDICTING SEPSIS IN POST LDLT SCENARIO?

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**Introduction:** Sepsis continuous to be a major cause of post op mortality following Liver transplantation[LT]. Survival in sepsis hinges around early diagnosis & source control. Search for early marker for sepsis continues. Expression of Fc receptor CD64 on surface of neutrophils [Ncd64] has been shown in many studies to be an accurate biomarker in detecting sepsis.

**Methods:** Prospective observational study, to evaluate diagnostic accuracy of neutrophil CD64, comparing it with C-reactive protein (CRP) and procalcitonin (PCT) for the diagnosis of sepsis in adult patients undergoing LT. Blood samples were collected D -1, D1, D3, D7. All samples were tested for CRP, PCT & Ncd64 using flow cytometry. Ncd64 values were expressed both as % and mean fluorescence intensity[MFI]. Gold standard for diagnosing sepsis was blood/Drain culture positivity.

**Results:** Preliminary results from 24 patients were analysed. In 6 patients who were diagnosed sepsis neither CRP, PCT nor Ncd64 had statistically significant P value in diagnosing sepsis. But while analysing trend of elevation from Baseline to D7, estimation of Ncd64 and CRP looks hopeful in predicting sepsis.

**Conclusion:** As these are preliminary results & study is ongoing, role of Ncd64 is yet to be discovered in post LT scenario.

Table 1

	No sepsis [18]		Sepsis[6]		P value
	Median [IQR]	P value	Median [IQR]	P value	
<b>Baseline CRP</b>	4.01[6.26]		3.96[8.74]		0.594
D1 CRP	15.15[13.30]	0.005	14.71[21.39]	0.046	0.689
D3 CRP	27.48[19.12]	0.00	33.8[27.70]	0.028	0.351
D7 CRP	44.15[35.99]	0.001	87.01[90.90]	0.028	0.28
<b>Baseline procal</b>	0.14[0.13]		1.14[35.41]		
D1 Procal	8.45[5.83]	0.00	9.34[9.77]	0.345	0.589
D3 Procal	5.13[4.60]	0.00	4.95[4.77]	0.345	0.894
D7 Procal	1.10[0.14]	0.00	1.21[3.65]	0.463	0.463
<b>Baseline CD64%</b>	62.50[32.58]		54.75[33.73]		
D1 CD64%	91.6[19.48]	0.001	84.95[40.55]	0.028	0.424
D3 CD64%	94.2[12.90]	0.00	85.9[31.05]	0.028	0.594
D7 CD64%	78.25[31.90]	0.06	95.45[58.18]	0.345	0.317
<b>Baseline CD64[MFI]</b>	582[367]		353[580]		
D1 CD64%	997[512]	0.001	620[565]	0.075	0.089
D3 CD64%	1012[880]	0.001	722[2233]	0.028	0.351
D7 CD64%	704[562]	0.010	1341[1500]	0.028	0.386

PT03-06

#### OUR STRATEGY TO OVERCOME HEPATIC ISCHEMIA REPERFUSION INJURY -FROM BENCH TO BEDSIDE-

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**Background:** In the field of liver surgery, especially transplantation, ischemia reperfusion injury (IRI) causes approximately 10% of early graft failure and leads to a higher incidence of acute and chronic rejection. It is an urgent issue to overcome IRI from the viewpoint of organ preservation. This study aims to reveal the molecular mechanism and develop the effective protective way to prevent the liver IRI for a safer liver surgery. Methods :We applied the established partial warm hepatic IRI model in mice and investigated changes of immune responses due to IR, and compared the efficacy of various biological molecules (neutrophil elastase inhibitor, recombinant Galectin-9, recombinant thrombomodulin and so on), antioxidant agents (vitamins C and E) and maneuvers (preoperative short-term fasting). The liver damage was assessed by serum alanine aminotransferase (sALT) level, histological observations, change in expression profile of various cytokines and analysis of intracellular molecules.

**Results:** The most effective way to improve IRI was the preoperative short-term (12 hours) fasting. It exhibited a remarkable therapeutic effect compared with any other drug or diet we have so far examined. The up-regulation of Forkhead Box O1 (FOXO-1) induced by the raised acetylated histone and  $\beta$ -hydroxybutyric acid was a crucial factor for the short-term fasting to ameliorate the liver injury due to IR.

**Conclusion:** Preoperative short-term dietary restriction might play an important role to overcome liver IRI and have a therapeutic potential for clinical setting.

### PT04 - Transplantation: Pancreas

PT04-01

#### PANCREAS TRANSPLANT - EXPERIENCE FROM TAIPEI VETERANS GENERAL HOSPITAL, TAIWAN

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Pancreas transplant is a rare surgical procedure in Taiwan, even in Asian. Taipei Veteran General Hospital is one of the qualified 6 medical centers to do pancreas transplant in Taiwan. Our hospital has been on the leadership in not only quantity but also quality of pancreas transplant in Taiwan. We have performed more than 89% cases of pancreas transplant in Taiwan. Our pancreas transplant team have the ability to perform all techniques of pancreas transplant , not only the common ones including pancreas transplant alone

(PTA), pancreas after kidney transplant (PAK) and simultaneous pancreas and kidney transplant (SPK), but also the unique technique “pancreas Before Kidney Transplant (PBK)” which is developed at our hospital and is not performed at other countries in the world, and pancreas after liver transplant (PAL) which is very rare in other countries. Our technical success rate in pancreas transplant is 97%. The 1-year pancreas graft survival rate is 98%, 5-year pancreas graft survival rate 91%, 10-year pancreas graft survival rate 59%.

#### PT04-02

### PANCREAS TRANSPLANT FOR T2DM

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Type 2 diabetes mellitus (T2DM) was once considered a contraindication to simultaneous pancreas-kidney transplant, a growing body of evidence has revealed that similar graft and patient survival can be achieved when compared to type 1 diabetes mellitus recipients. 146 cases of pancreas transplantation were included for study, with 115 (79%) for T1DM and 31 (21%) for T2DM. Pancreas transplantation for T2DM was mainly indicated for the uremic groups such as SPK (32%), PAK (19%) and PBK (42%).

After pancreas transplantation, 106 (73%) patients suffered from complications, including 70 (48%) early complications before discharge and 79 (54%) late complication during follow-up period. There was no significant difference regarding the complications between T1DM and T2DM groups. Overall, rejection of pancreas graft occurred in 37 (25%) patients, including 27 (19%) acute rejection and 13 (9%) chronic rejection. Rejection rates were also of no significant difference between T1DM and T2DM groups. The graft loss occurred in 35 (30%) T1DM patients and 12 (39%) T2DM patients. Endocrine outcomes regarding fasting blood sugar and serum HbA1c before and after pancreas transplantation were of no significant difference between T1DM and T2DM groups. T2DM patients presented significantly higher levels of serum C-peptide either before or after pancreas transplantation, as compared with T1DM patients. There was no significant difference regarding the graft survival between T1DM and T1DM groups.

In conclusion, outcomes for T2DM were similar to T1DM after pancreas transplantation. Therefore, pancreas transplantation could be an effective option to treat uremic T2DM patients without significant insulin resistance.

#### PT04-03

### SIMULTANEOUS PANCREAS AND KIDNEY COMPOSITE GRAFT TRANSPLANT

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**Purpose:** Limited vascular access could be encountered in an obese or re-transplant patient. We described modifications that facilitated an en bloc simultaneous pancreas and

kidney (SPK) composite graft transplant in an obese type 2 diabetic patient with renal failure under hemodialysis.

**Methods:** At the back-table, the superior mesenteric artery and splenic artery of the pancreas graft were reconstructed with a long "Y" iliac artery graft. The smaller left renal artery is anastomosed end-to-side to the larger and longer common limb of the arterial Y graft and the shorter portal vein is anastomosed end-to-side to the longer graft left renal vein. Thus, this en bloc composite graft allowed to facilitate “real” SPK transplant using single common graft artery and vein for anastomosis to one recipient arterial and venous site. The en bloc pancreas and kidney composite graft was implanted by suturing the graft left renal vein to IVC and graft common iliac artery the recipient distal aorta. Exocrine drainage was provided by anastomosis of the graft duodenum to a roux-en-y jejunum limb in an side-to-side fashion. Immunosuppressants included basiliximab, tacrolimus, mycophenolate mofetil, and methylprednisolone.

**Results:** The operative time was 7 hours with cold ischemic time of 6 hours and 25 min. and warm ischemic time of 47 min. The patient was discharged on postoperative day 20, with a serum creatinine level of 1.4 ng/ml and a blood glucose level of 121 mg/dL.

**Conclusion:** En bloc pancreas and kidney composite graft might be an option for patients with limited vascular access.

#### PT04-04

### REDUCED THE OCCURRENCE OF GRAFT THROMBOSIS USING THE TECHNIQUE OF ALLOGRAFT “TRIPLE INFLOW” ARTERIAL RECONSTRUCTION FOR PANCREAS TRANSPLANTATION

S. Li, A. Hawxby and A. Sebastian

*Oklahoma Transplant Center, OU Medical Center, United States*

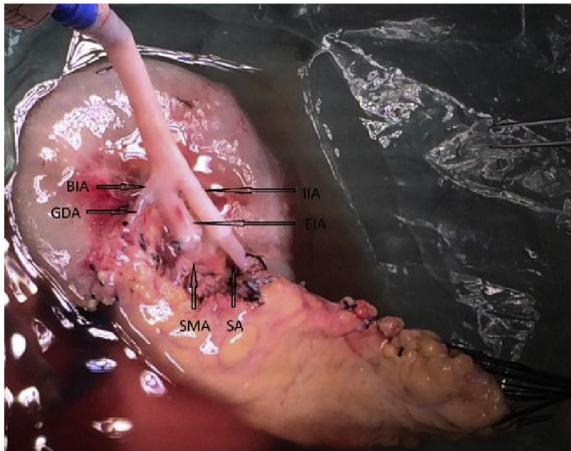
Graft thrombosis (GT) accounts for the majority of graft loss in the early postoperative phase of pancreas transplantation (PT). Low microvascular flow in the allograft makes it vulnerable to GT. The technique of allograft "dual inflow" (DI) arterial reconstruction is currently practiced. We herein describe another technique of allograft "triple inflow" (TI) arterial reconstruction to reduce the occurrence of GT.

Of the last 33 PT (26 simultaneous pancreas-kidney transplants, 6 pancreas-after-kidney transplants and 1 pancreas transplant alone) in our center, the techniques of DI and TI were used in 22 and 11 allografts separately. The DI technique includes ligation and division of the gastroduodenal artery (GDA) followed by anastomoses of the superior mesenteric artery (SMA) and splenic artery (SA) of the pancreatic graft to the external iliac artery (EIA) and internal iliac artery (IIA) of the donor “Y” iliac artery (YIA). The TI technique includes preservation of the GDA during procurement. More branches of the donor YIA are preserved. Of these branches, the largest small branch (BIA) is used for the “third” anastomosis to the GDA of the pancreatic graft as well as with the SMA and SA anastomoses described in the DI technique. (Fig.)

Following PT, 3 of 22 (13.6%) allografts using DI technique developed GT 24-48 hours postoperatively

which resulted in graft losses. None of the 11 allografts using TI technique developed GT.

The technique of allograft TI arterial reconstruction used for PT increases blood flow to the pancreas transplant and reduces the risk of GT.



Allograft "triple inflow" arterial reconstruction for pancreas transplantation

#### PT04-05

### KIDNEY-PANCREAS TRANSPLANT RECIPIENTS EXPERIENCE HIGHER RISK OF COMPLICATIONS COMPARED TO THE GENERAL POPULATION AFTER UNDERGOING CORONARY ARTERY BYPASS GRAFTING

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**Introduction:** Kidney-pancreas transplant (KPT) is treatment for type 1 diabetics with renal failure. Due to their risk of developing coronary artery disease, there is a need to identify the outcomes associated with KPT undergoing CABG.

**Methods:** NIS data from 2005 to 2014 were analyzed. KPT who underwent CABG were evaluated for complications, length of stay and total hospital charges. Weighted data were analyzed using multivariate logistic regression test and linear regression test.

**Results:** We identified 1,799,302 CABG patients with 438 having a history of pancreas transplant (184 pancreas-alone and 254 pancreas and kidney). The weighted multivariate analysis revealed KPT was associated with a significant odds ratio for developing any complication for CABG

(OR 3.103,  $p < 0.001$ ) and emergency CABG (OR 4.952,  $p < 0.001$ ). Emergency CABG patients with a history of KT alone were more likely to develop complications while pancreas alone showed no statistical significance in the occurrence of complications. The same pattern was

observed in transplant centers. The odds ratio of KPT was greater (OR 7.906,  $P < 0.001$ ). CABG patients with history of PT alone showed higher chance for increased total hospital charge and length of stay.

At transplant centers the same escalating rise of OR for developing any complication was noted in kidney alone (OR 1.362), pancreas alone (OR 2.542), and KPT (OR 3.045).

**Conclusion:** KPT experience higher risk of complications compared to the general population after undergoing CABG in both transplant centers and non-transplant centers. These outcomes should be considered when providing perioperative care.

#### PT04-06

### OUTCOMES OF PANCREAS TRANSPLANT PATIENTS UNDERGOING COLORECTAL RESECTION

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**Introduction:** This study analyzes differences between pancreas transplant patients and non-transplant patients undergoing colorectal resection at both transplant and non-transplant centers in order to identify areas of surgical risk.

**Methods:** Multivariate logistic regression tests and linear regression tests computed odds ratios (OR) by analyzing weighted data from the National Inpatient Sample from 2005-2014 to identify differences in mortality, complications, length of stay (LOS), and total hospital charges between four patient groups 1)pancreas transplant alone (PTx), 2)kidney transplant alone (KTx), 3)pancreas with kidney transplant (PKTx), and 4)non-transplant patients (non-Tx) undergoing colorectal resections at transplant and non-transplant centers.

**Results:** Of the 2,452,422 colorectal resection patients identified, 215 patients had a history of pancreas transplant with 118(54.9%) of those patients experiencing a complication. Complication occurrence was more likely in PKTx ( $p < 0.003$ ;OR1.958) compared to non-Tx. Prolonged LOS was more likely in PTx ( $p < 0.001$ ;OR0.007) and PKTx ( $p < 0.001$ ;OR0.002) compared to non-Tx. Costs were more likely to be higher for PTx ( $p < 0.001$ ;OR0.006) and PKTx ( $p < 0.003$ ;OR0.002) compared to non-Tx. There was no significant difference in hospital mortality between transplant and non-transplant groups. In transplant centers, PTx and PKTx were not more likely to experience complications compared to non-Tx.

**Conclusion:** PKTx experience higher complication rates. PTx and PKTx are more likely to have higher hospital costs and LOS compared to non-Tx undergoing colorectal resection. However PTx and PKTx did not experience higher complication rates in transplant centers. Surgeons and pancreas transplant patients should be aware of the increased risk of complications when considering a colorectal resection.

Table 3: Weighted Multivariate Adjusted Outcome for Pancreas Transplant Patients			
	p-value	Adjusted odds ratio	Confidence interval
<b>In hospital mortality</b>			
Colorectal no transplant no immunosuppression	Reference		
Kidney alone	.762	1.023	.885 to 1.182
Pancreas alone	.925	1.046	.410 to 2.668
Pancreas and kidney	.996	.000	-
<b>Any complication</b>			
Colorectal no transplant no immunosuppression	Reference	--	--
Kidney alone	.985	1.001	.927 to 1.081
Pancreas alone	.113	1.488	.910 to 2.435
Pancreas and kidney	.003	1.958	1.266 to 3.030
<b>Length of stay</b>			
Colorectal no transplant no immunosuppression	--	---	---
Kidney alone	.220	-.001	-.523 to .120
Pancreas alone	.000	.007	9.294 to 12.787
Pancreas and kidney	.001	.002	1.287 to 5.018
<b>Total charge</b>			
Colorectal no transplant no immunosuppression	--	--	--
Kidney alone	.000	.003	7002.6 to 14215.2
Pancreas alone	.000	.006	79022.2 to 117951.8
Pancreas and kidney	.003	.002	10608.3 to 52187.8

PT04-07

### OUTCOMES OF PANCREAS TRANSPLANT PATIENTS UNDERGOING APPENDECTOMY

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**Introduction:** This study analyzes differences between pancreas transplant patients and non-transplant patients undergoing appendectomy in transplant and non-transplant centers to identify areas of surgical risk.

**Methods:** Multivariate logistic regression tests and linear regression tests computed odds ratios (OR) by analyzing weighted data from the National Inpatient Sample database from 2005-2014 to identify differences in mortality, complications, length of stay (LOS), and total hospital charges between 4 patient groups 1)pancreas transplant alone (PTx) 2)kidney transplant alone (KTx), 3)pancreas and kidney transplant (PKTx), and 4)non-transplant patients (non-Tx) undergoing appendectomy for the diagnosis of appendicitis in transplant and non-transplant centers.

**Results:** Of the 1,819,283 appendectomy procedures, 145 pancreas transplant patients were identified. No mortalities occurred among pancreas transplant patients. On univariate analysis, pancreas transplant patients had higher complication rates compared to non-transplant patients (17.0% vs 10.0%, p=0.012). On multivariate analysis, PKTx demonstrated a decreased odds ratio for developing any complication (OR 0.343; p0.003) compared to non-Tx. This was not observed in PTx or KTx. In transplant centers, PKTx (OR 0.196; p=0.002) and KTx (OR 0.461; p< 0.001) demonstrated significantly decreased odds ratios for developing any complication. In transplant centers, there were no significantly higher odds ratios for LOS or total charges in PTx or PKTx groups.

**Conclusion:** PKTx were less likely to develop a complication when undergoing an appendectomy. In transplant centers, PKTx and KTx were both less likely to develop a complication. It appears pancreas transplant patients

undergoing appendectomy are not at higher risk for complications compared to the general population.

PT04-08

### IS THERE AN INCREASED RISK OF SPINAL ISCHEMIA IN PANCREAS TRANSPLANTATION?

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**Introduction:** This study investigates if there is an increased risk for spinal cord ischemia in patients undergoing pancreas transplantation.

**Methods:** The National Inpatient Sample (NIS), a large U.S. national database, identified patients from 2004 to 2015 who underwent a pancreas transplantation procedure (ICD 52.8\*) and had either a diagnosis of spinal cord ischemia (ICD 336.1 vascular myelopathies), MRI of the spinal cord (ICD 88.93), or MRI of the brain and brain stem (ICD 88.91).

**Results:** Of the 2,346 pancreas transplant patients (PTx) identified, 1,440 (61.4%) also underwent a kidney transplant. Zero PTx were identified who had a pancreas transplant procedure code and a diagnostic code for spinal cord ischemia (336.1). Zero PTx received a MRI of the spinal cord (88.93). Four PTx underwent MRI of the brain and brain stem (88.91).

**Conclusion:** A previous U.K. study by Phillips et al. proposed a 1:440 risk of spinal cord ischemia in pancreas transplantation procedures. The NIS database yielded no PTx with spinal cord ischemia and in addition, no MRI of the spinal cord. Four PTx underwent MRI of the brain and brain stem but those cases were most likely due to cerebrovascular accidents. This discrepancy indicates large databases do not capture rare conditions. Better reporting systems may be needed if this association is to be further explored.

PT04-09

### A "PANCREATECTOMY FIRST" APPROACH IMPROVES BOTH HEPATECTOMY AND PANCREATECTOMY TIMES IN CADAVERIC MULTI-ORGAN ABDOMINAL RETRIEVAL

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**Introduction:** The aim of organ retrieval is safe procurement of transplantable organs with acceptable warm ischaemia times. In the United Kingdom, organ retrieval is a centrally coordinated service delivered by 10 teams. Despite this, there is no standardised retrieval technique. Practiced techniques include hepatectomy first or en-bloc organ retrieval. Hepatectomy first approach exposes the pancreas to prolonged warm ischaemia while the liver is being retrieved and packed. While the en-bloc technique ensures swift and timely removal of both organs, extra time is spent at the back-table splitting the organs. We report on the Manchester "pancreatectomy first approach" which we believe is safe and time efficient for both organs.

**Methods:** A retrospective analysis of a prospectively maintained database of a single centre's organ retrieval activity between 2016-2019 was performed. Primary outcomes were hepatectomy and pancreatectomy times. Secondary outcomes were organ damage and transplant outcomes.

**Results:** 546 donor operations were conducted. Using the hepatectomy first approach, mean hepatectomy time when performing liver alone was comparable to liver/pancreas (30mins vs 33mins). The proportion taking more than 30 minutes increased when both organs were retrieved (41.3% vs 56.3%). Mean pancreatectomy time was 14mins after hepatectomy. 10 operations were performed using a "pancreatectomy first" approach. Median pancreatectomy time was 21 minutes with hepatectomy occurring 6 minutes later. There was no difference in organ damage or transplant outcomes.

**Conclusion:** This small case series suggests that a pancreatectomy first approach at multi-organ retrieval is

feasible, safe, efficient, and reduces warm ischaemia times for both liver and pancreas.

PT04-10

### PANCREAS TRANSPLANTATION IN CLINICA SANTA MARÍA, CHILE. RESULTS AFTER 5 YEARS OF SUSTAINED GROWTH

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**Introduction:** Since the opening of the pancreas transplant program in our institution in 2014, this treatment alternative has been reactivated in Chile. To date, 36 patients have been successfully transplanted. The aim of this study is to report our experience and results.

**Method:** Descriptive and prospective study of a case series of single center experience, from 2014 to January 2020. Complete follow-up has been achieved. Analysis in SPSS 20.0.

**Results:** Since March 2014, 36 patients, 34 simultaneous pancreas-kidney transplants and 2 Pancreas Transplant Alone have been transplanted. Main indication was DM1 and end stage renal disease. 61.1% were women, median age 36,4 years (23-51), 83.3% of the patients were on dialysis. 11.1% of patients are type 2 diabetics. Average waiting list is 18 months. No delayed function (DGF) of the pancreatic graft was observed, 2 patients presented renal DGF. All patients are free of insulin from the time of reperfusion. 1 patient died at 20 months post transplant secondary to lower limb sepsis with both functioning grafts. 2 patient have lost the renal graft, one has been retransplanted. Median follow-up is 28.4 months. Overall survival is 100% per year and 97.2% at 2 years.

**Discussion:** This series represents the largest experience in the country and demonstrates the consolidation of a program that few years ago showed its initial results. Our program has undergone a cautious maturation process, increasing number of transplants year after year with outstanding results.

PTT - TRICKS OF THE TRADE

PTT-02

**MEDICAL CAPACITY BUILDING IN WAR-TORN NATIONS: KURDISTAN, IRAQ AS A MODEL**

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Medical capacity building is an arduous endeavor, particularly in war-torn, politically unstable regions. Regardless, medical capacity can be built through perseverance and careful deliberation. We present our 28-year experience of capacity building in Kurdistan, Iraq.

**Methods:** We annotated our experience with surgical capacity building in Kurdistan, Iraq since 1992. Annually, 1-2 trips were undertaken. Prior to each trip, colleagues with desired surgical expertise were invited. A symposium was also organized at the end of each trip.

**Results:** Over 80% of cholecystectomies are now done laparoscopically, compared to none prior to our arrival. Other advanced laparoscopic operations include adrenalectomy, splenectomy, nephrectomy, Nissen fundoplication, and gynecologic procedures. More than 3,000 renal transplantations have been performed since 2004. Complex neurosurgical procedures such as craniotomy, spinal decompression/stabilization, and complex HPB and surgical oncology operations such as Whipple, liver resections, gastrectomies, and pelvic exenterations are now routinely performed. Care of trauma patients includes prehospital patient care, mass casualty triage, and management of patients exposed to chemical weapons. Other accomplishments include helping local surgeons to gain membership to the American College of Surgeons, supporting the establishment of a medical journal, and assisting with the creation of a new medical school.

**Conclusion:** With good intentions and perseverance, it is possible to empower war-torn nations to build advanced surgical programs. What we have achieved in Kurdistan over two decades is testament to effective and meaningful collaboration with major stakeholders.

PTT-03

**IS RIGHT OR LEFT HEPATIC RESECTION BETTER FOR PERIHILAR CHOLANGIOCARCINOMA? A CADAVERIC STUDY ON THE LENGTH OF THE RIGHT AND LEFT HEPATIC DUCTS**

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**Introduction:** The optimal surgical procedure for perihilar cholangiocarcinoma is based on tumor location and the longitudinal and horizontal extensions. Right-sided hepatectomy is often used because it appears to be oncologically advantageous assuming that, in addition to possible arterial involvement, the left hepatic duct is longer than the right and a negative ductal margin is expected. However, few studies addressed the length of the duct in normal livers. The aim of this study is to examine the lengths of the right and left hepatic ducts to guide surgical strategy for perihilar cholangiocarcinoma.

**Methods:** Twenty-seven adult cadavers were used in this study, preserved in 10% formaldehyde. After entering the abdominal cavity, the entire liver, with the retro-hepatic vena cava, hepatic artery, portal vein and bile duct, was removed, in a manner similar to harvesting a liver for transplantation. The bile duct was opened longitudinally and the intraluminal lengths of the right and left ducts measured.

**Results:** The right and left hepatic ducts measured  $13.7 \pm 7.5$  and  $11.9 \pm 6.6$  mm, respectively ( $p=0.11$ ). In each specimen, the right duct was longer in 13 (48%), the left in 11 (41%) and the same length in 3 (11%) with no statistically significant difference ( $p=0.30$ ).

**Conclusions:** The left hepatic duct is not significantly longer than the right in a majority of specimens examined. Judicious selection of the surgical procedure is necessary for Bismuth type IV perihilar cholangiocarcinoma with similar ductal extension.

PTT-05

**A TINY CHOLEDOCHOTOMY KEEPS T-TUBE TROUBLES AWAY. INSERTION AND REMOVAL TRICKS TO MINIMIZE T-TUBE RELATED COMPLICATIONS IN LIVER TRANSPLANTATION**

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**Introduction:** The use of T-tubes in duct-to-duct biliary anastomoses in liver transplantation (LT) has been debated for decades. Beside skepticism around real benefits, many centers use T-tubes as little as possible due to the fear of complications related to accidental removal, leak around the insertion site and post-removal biliary peritonitis.

We have continued to use T-tubes per routine; refined our insertion technique and adopted a removal protocol to minimize T-tube-related complications.

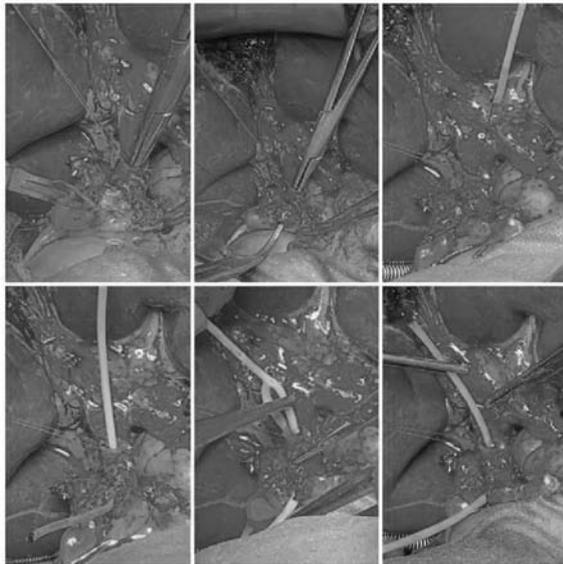
**Methods:** *Insertion procedure.* With a n.11 blade we create a < 2 mm-long choledochotomy. Using a silk tie, a mountable stitch and our smallest right-angle, we position a 5 Ch rubber T-tube (Figure 1). Our original technique allows not to grab the T-tube directly and keep the choledochotomy just the size of the tube.

*Removal procedure.* We remove T-tubes three months later as an in-patient procedure, position a temporary Nelaton drain to capture possible bile leaks and avoid

biliary peritonitis. The drain is removed as bile discharge stops.

**Results:** Since we started to use the 5 Ch T-tube, we have completed our T-tube insertion/removal protocol in 66 LTs. There have been no perioperative bile leaks. After elective T-tube removal, there have been no episodes of biliary peritonitis requiring surgery and 16 patients had a controlled biliary fistula out of which 4 required endoscopic stent.

**Conclusions:** The use of T-tube is safe and the risk of complications related to its use can be mitigated by adopting insertion and removal precautionary measures.



t-tube insertion in LT

#### PTT-07 DECREASING MORBIDITY OF PANCREATIC FISTULA AFTER PANCREATODUODENECTOMY BY PAIR WATCH SUTURING TECHNIQUE DUCT TO MUCOSA PANCREATICOJEJUNOSTOMY (PWS- PJ)

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**Methods:** Pair watch suturing technique duct to mucosa pancreaticojejunostomy (PWS-PJ) perform by absorbable-monofilament totally 12 stitches, start at 9 o'clock of pancreatic duct to 3 o'clock of jejunal side, 7 stitches at posterior side and 5 stitches at anterior side. Post operative pancreatic fistula was diagnosis using amylase activity on post operative day 3 and day 7.

**Objectives:** Investigated pancreatic fistula rate and related complication of conventional duct to mucosa pancreaticojejunostomy (C-PJ) and PWS-PJ.

**Results:** 86 Pancreaticoduodenectomy during Jan 2009 to Dec 2019 were retrospective cohort analysis. 48 C-PJ performed from Jan 2009 to Dec 2016 whereas 38 PWS-PJ started since Jan 2017 to Dec 2019. There is no significant different of PF on POD3 (C-PJ 26.9% (95%CI 9.9-43.9) while PWS-PJ 31.6% (95%CI 29.2-34)(P=0.689)) and on POD7 (C-PJ 23.1% (95%CI 7-39.2) while PWS-PJ is 15.8% (95%CI 4.3-27.3) (P=0.525)), Odd ratio 1.6 (95%CI 0.45-5.65). Base on international study group of pancreatic surgery, PWS-PJ lower rate of grade B/C 15.8% while C-PJ 27.1% (p=0.21), Odd ratio 1.98 (95%CI 0.67-5.83). We reviewed that the C-PJ was perform by multi-surgeons but PWS-PJ has been done by single surgeon and more aggressive surgery on pancreatic cancer, the most common location of cancer on C-PJ was ampulla 50%, Head of pancreas 16.7% whereas PWS-PJ ampulla 23.7%, Head of pancreas 55.3% (p=0.020), however, blood loss, hospital stay, complication related and death related shown no significant different on both anastomotic technique.

**Conclusions:** Pancreatic fistula and relate complication reduced by Pair watch suturing technique even more aggressive radical surgery on pancreatic cancer.

#### PTT-08 MODIFIED MESO-REX BYPASS FOR PORTAL VEIN CAVERNOUS TRANSFORMATION

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**Objective:** The aim of this study was to evaluate the utility of modified meso-rer bypass(MRB) for portal vein cavernous transformation(PVCT).

**Methods:** From July 2013 to June 2019, 20 patients underwent MRB surgery. The MRB surgery anastomosis way including left portal vein or umbilical vein-bypass end- to-side anastomosis, Bypass-superior mesenteric vein, -splenic vein or -coronary vein end- to-end or end-to-side anastomosis. The follow-up endpoint was set at January 2019.

**Results:** All patients underwent surgery successfully and were able to obtain decompression effect after bypass surgery. Intraoperative SMV pressure dropped from  $36.13 \pm 4.37 \text{ cmH}_2\text{O}$  to  $23.45 \pm 5.18 \text{ cmH}_2\text{O}$  ( $p < 0.01$ ). The opening time of bypass were 0-72 months (median 18.5months). By the end of follow-up, 12 MRB kept opening. 6 patients underwent surgery or interventional treatment of the thrombus or stenosis of bypass vessels. Bypass diameter were 2-7,5mm (median 5mm), MRB thrombosis occurred in all patients with the diameter less than 4mm. 11 patients used allograft vein and the others used internal jugular vein. Patients who used allograft vein were susceptible to bypass thrombosis ( $p < 0.05$ ). Different surgical methods had no significant effect on the effect of bypass.

**Conclusion:** MRB is an effective method to treat PVCT, which can reduce portal venous pressure through different surgical methods.

PTT-09

## HOW TO RESCUE A EXTREME VASCULOBILIARY INJURY FROM LIVER FAILURE

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To describe a case treated with "tricks of the trade", in order to avoid liver transplantation in a patient with extreme vasculobiliary injury (VBI).

A 22 years old woman underwent an open cholecystectomy with bile duct exploration. An important inflammatory process was found and massive bleeding from the hepato-duodenal pedicle, requiring several stitches of hemostasis, ending the surgery without proper identification of the pedicle structures.

Patient developed jaundice and commitment of conscience.

Three days after, she was transferred due to increased deterioration of clinical condition. A CT scan was performed revealing a right liver lobe infarct, absence of the right and left hepatic artery, normal flow of an accessory artery from left gastric artery, portal vein thrombosis.

Patient was taken to the OR. Surgical findings where: bile peritonitis, right hepatic lobe necrosis and ischemia of left lobe, complete resection of the common bile duct at the level of the confluence of right and left ducts, thick stitches on main portal vein and complete section of the hepatic artery. The accessory artery of the left gastric was not damaged. With those findings, a right hepatectomy was performed with revascularization of the left hepatic lobe using a jump-graft from superior mesenteric vein to left portal branch at the level of REX process, with a cadaveric iliac vein and Roux-en-Y hepaticojejunostomy to the left hepatic duct. After four months, patient has adequate biliary drainage and normal portal and arterial flows with good regeneration of the left hepatic lobe.

PTT-10

## LIVER TRANSECTION FIRST APPROACH FOR LIVING-DONOR HEPATECTOMY WITH COMPLEX BILIARY AND VASCULAR ANATOMY

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**Introduction:** Aberrant donor anatomy is a challenge in living-donor liver transplantation (LDLT), potentially associated with recipient complications. The concept of minimal hilar dissection has been reported to avoid biliary ischemia and intimal damage to hepatic artery, which result in recipients' biliary complications and hepatic arterial thrombosis, respectively. However, complex donor anatomy forces extensive dissection and retraction when isolating vessels in the limited field at the liver hilum. Herein, we present the liver transection first approach

(LTFA) for living-donor hepatectomy, which is beneficial especially in donors with complex anatomy to facilitate hilar dissection and prevent vascular/biliary damage.

**Methods:** The graft-side Glissonean pedicle is first isolated en bloc at liver hilum, without dissecting each vessel, and cholangiography is performed to decide the division line of biliary ducts and liver parenchyma. Following graft liver mobilization, the graft-side hepatic vein is isolated and a hanging tape is placed onto the retrohepatic vena cava and above the Glissonean pedicle so that liver parenchyma is transected towards the tape. In the wide surgical field after completing parenchymal transection, graft-side hepatic arteries and portal veins are isolated with minimal dissection and the remaining tissue within the Glissonean pedicle is divided concomitantly with graft-side bile ducts.

**Results:** LTFA was used in 23 of 41 donor hepatectomy for adult-to-adult LDLT between 2017 and 2018. Biliary complication was observed in 9.8%, without any differences between donors with a single versus multiple bile ducts, and hepatic artery complications was zero.

**Conclusions:** LTFA is helpful to decrease morbidity after LDLT.

PTT-11

## WHERE IS THE OPTIMAL SITE FOR DIVISION OF DONOR AND RECIPIENT BILE DUCT FOR DUCT-TO-DUCT ANASTOMOSIS DURING LIVER TRANSPLANTATION?

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**Background:** The blood supply of the bile duct (BD) is a key to minimizing biliary complications (BC) after liver transplantation (LT).

**Method:** A literature review was performed.

**Results:** The retroportal artery (RPA) and 3 and 9 o'clock arteries were first reported by Northover and Terblanche in 1979. They found the RPA in all 21 human resin casts and classified it into two variants; type I RPA arising from the superior mesenteric artery or the Coeliac trunk, and crossing the back of the portal vein to join the posterior superior pancreaticoduodenal artery; and type II RPA which crosses the posterior surface of the supraduodenal BD, and ascends to join the right hepatic artery. They recommended making the donor BD as short as possible.

Rath et al described 6 types of marginal arteries of the BD. They suggested dividing both donor and recipient BD just below the confluence of the cystic duct.

According to anatomical descriptions of the RPA, which should be included in any description of connective tissue related to the pancreatic head, and contains the BD innervation from the coeliac and superior mesenteric nerve plexuses. Higher division is preferable in order to avoid injury to the recipient RPA and accompanying nerves, which may cause ampullary dysfunction on the recipient.

**Conclusion:** The focus has always been on the donor, but we identify preservation of arterial inflow and innervation

of the recipient BD as being important. Deeper consideration and modification of techniques for these small structures may reduce BC after LT.

#### PTT-12

### SAFE AND RELIABLE TECHNICAL STRATEGIES OF PANCREATICOJEJUNOSTOMY IN THE SOFT PANCREAS IN PANCREATODUODENECTOMY IN A NON-HIGH VOLUME CENTER

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The standardization and step-by-step renovations of technical skills is indispensable for the improvement of surgical outcome even in non-high volume centers. We demonstrate our technical strategies of pancreaticojejunostomy in the soft pancreas for the last decade.

**Technical tricks:** (1) Pancreatic parenchyma is transected by ultrasonic scalpel. (2) Saline-irrigating bipolar electrocautery is used for sealing and hemostasis of the pancreatic stump to prevent minor pancreatic leakage from minute peripheral ducts and the laceration of soft pancreatic parenchyma by suturing hemostasis. (3) To tightly approximate the pancreatic stump to the jejunal wall, the modified Blumgart anastomotic technique (Fujii, et al. *J Gastrointest Surg* 18:1108) is applied. One to three transpancreatic/jejunal seromuscular sutures are made to completely cover the stump by the jejunal wall using double-armed long-needle 3-0 Prolene sutures. One suture always crosses the pancreatic duct. (4) Duct-to-mucosa anastomosis is performed using 6-0 strongly-curved absorbable PDS sutures by watch dial method, which enables at least 6 sutures even in a very small duct without lacerating the duct wall. The 6-0 PDS suture is appropriate for tight ligation. (5) A 4-0 polyvinyl tube shortly cut for internal drainage is placed in the pancreatic duct in patients with a non-dilated duct (less than 5mm after extension).

**Results:** The incidence of pancreatic fistula (PF) Grade B (ISGPS 2016 definition) in the soft pancreas is 6.6% (5/76) since January 2014, and no PFs have developed in consecutive 26 cases since January 2018.

#### PTT-13

### THE COMPLEXITIES OF HCC IN MONGOLIA FROM A-Z

J. Chinburen  
*Hepato-Pancreato Biliary Surgery, National Cancer Center of Mongolia, Ulaanbaatar, Mongolia*

HCC accounts for 43% of all male cancers and 35% of female cancers. It's the leading cause of cancer death for both sex in Mongolia. In 2018, a total of 2,241 incident cases of HCC were diagnosed and 1,773 HCC deaths were recorded in Mongolia (population 3 million). Among HCC patients, about 46% had HCV, 34% had HBV, and 14%

had co-infection. The government initiated a Healthy Liver Program nationwide. Through this program, more 1.7 million people have been screened for HCV and HBV.

January 2020, additional changes have been made on health law to screen 7 types of common cancers in Mongolia for targeted population.

HPB surgical department was founded at 2008 with help of Swiss surgical team and Japanese HPB society. We used to perform 60 HPB cancer surgeries at beginning stage, increased to 700 in 2019. The Post-operative mortality rate is 1.8%. LDLT program was started in 2018, until now within 2 years we have performed 16 LDLT and 4 DDLT cases.

We are now paying more attention on molecular biology studies. We propose to apply high-throughput genomic profiling to identify key biomarkers and drivers relevant to HBV-HDV coinfection in Mongolian HCC patients. These studies may provide a genomic landscape of HDV-HCC in Mongolian patients. Another study aims to perform the first molecular HCC characterization in a large Mongolian cohort, with high HBV-HDV prevalence.

We are sharing our ingenuous experience to IHPBA community, how Mongolian HPB society together with politicians are fighting against HCC burden in Mongolia.

#### PTT-15

### TELESCOPIC INVAGINATION TRANSPANCREATIC END-TO-END PANCREATOJEJUNOSTOMY

M. Levy  
*Surgical Department, Thomayer Hospital, Charles University Prague, Praha, Czech Republic*

**Background:** Postoperative pancreatic fistula is the main cause of operative morbidity and mortality in patients who undergo pancreatoduodenectomy. Various pancreatoenteric anastomosis techniques have been reported to minimize the postoperative fistula rate. No consensus exists regarding the most effective form of pancreaticojejunostomy. In this presentation the telescopic invagination transpancreatic end-to-end pancreatojejunostomy is described.

**Method:** Especially in soft pancreas we are using the telescopic invagination method. We are using two double-armed PDS mattress sutures going through two layers of jejunum making an intestinal cuff, after that through the pancreas, another two layers of jejunum and the same on the way back. After suturing the invagination is created. Another two PDS sutures on the edges of anastomosis are usually sufficient.

**Results:** There were 81 pancreatoduodenectomies in 3 years provided in our surgery, 10 of these were operated with described telescopic method (one surgeon). In this group the rate of pancreatic fistula is 10%, in other group (different methods and surgeons) the pancreatic fistula rate is 21%.

**Conclusion:** Telescopic invagination transpancreatic end-to-end pancreatojejunostomy seems to be good technique. Further studies with more patients are needed.

## PTT-18

### THE USE OF BARBED SUTURES IN ROBOTIC SURGERY DECREASES THE RISK OF FISTULAS

E. Jiménez-Chavarría<sup>1</sup>, H. F. Noyola Villalobos<sup>1</sup> and S. Pimentel-Meléndez<sup>2</sup>

<sup>1</sup>*Surgery, and* <sup>2</sup>*HPB, Hospital Central Militar, Mexico*

Among the most frequent complications in pancreatic surgery are leaks or fistulas, pancreatic fistula being the most common, however leaks can occur in any of the three anastomoses that are performed in the reconstruction of pancreatoduodenectomy with pyloric preservation (PPDP), resulting in a headache for the patient and the surgeon, remembering that the PPDP has a first phase of resection and a second phase of reconstruction, in robot-assisted surgery, in the second phase we perform the anastomosis with continuous surging with Barbed sutures, first the hepatojejunum anastomosis is performed using barbed sutures of absorbable material with continuous surging with V-loc 3-0 suture, then we perform the pancreato jejunum anastomosis with 2-0 non-absorbable beard suture with double needle starting at the distal vertex of the stump pancreatic with continuous surge in two planes, performing the mucosal duct anastomosis with PDS 4-0, in this anastomosis, the posterior plane is first made, covering the posterior aspect of the pancreas to the jejunum serosa with a barbed suture with continuous surget and at the end of the surjete the suture is left as a reference, the serous is opened and the the mucosal duct anastomosis with separate points by placing a silastic endoprothesis, taking advantage of the excellent exposure and magnification that is obtained with the use of the robot, continuous surget is performed on the anterior face of the pancreas with the same suture closing both vertices, until now. They have performed 10 cases without fistulaor leakage.

## PTT-19

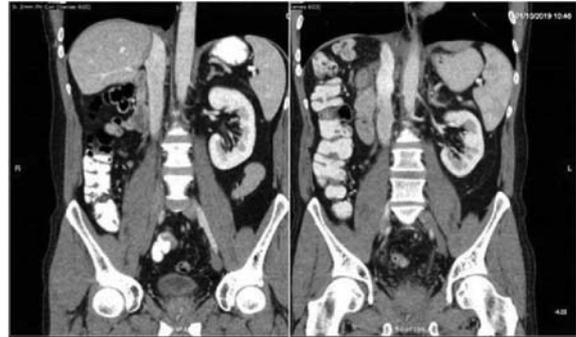
### THE USE OF AUTOLOGOUS FALCIFORM LIGAMENT AS A VASCULAR GRAFT

G. Wu<sup>1</sup>, A. Boue<sup>1</sup>, P. Fagan<sup>1</sup>, P. Johnston<sup>1</sup>, W. Meyer-Rochow<sup>2</sup> and A. Bartlett<sup>1</sup>

<sup>1</sup>*Auckland City Hospital, and* <sup>2</sup>*Waikato Hospital, New Zealand*

As a consequence of taking on more complex hepatic resections, vascular reconstruction is frequently required. We report an innovative technique in which autologous falciform ligament was used to reconstruct the inferior vena cava (IVC). A 57-year-old male presented with recurrence of a retro-peritoneal low-grade spindle cell carcinoma 7 years following radical resection of a right supra-renal retroperitoneal tumour in 2012. The recurrence was situated posterior to the liver, involving the dorsal aspect of the right liver and retro-hepatic IVC, up to but not including the confluence of the hepatic veins (HV). The liver was transected on the middle HV, leaving the tumour attached to the right liver and IVC. The segment of involved IVC was isolated with complete caval occlusion. Single catheter

veno-venous bypass via the left femoral vein to the left internal jugular was established. The segment of IVC that was resected en bloc with the right liver was reconstructed using autologous falciform ligament. At six months post-operatively the patient has a patent IVC with no evidence of tumour recurrence. Falciform ligament is an autologous graft that is readily accessible, and as it is a double membrane structure, is sufficiently strong to be used for venous reconstruction.



**Figure 1** Left. Pre-operative CT showing a previous right adrenalectomy, right nephrectomy, and partial hepatectomy. Right. Post-operative CT showing extensive liver resection and IVC reconstruction

## PTT-20

### AT CENTRES WITH LIMITED ACCESS TO ULTRASONIC DISSECTOR, BIPOLAR ELECTROSURGICAL ENERGY CAN ACCOMPLISH LAPAROSCOPIC CHOLECYSTECTOMY (LC) IN PATIENTS WITH CARDIAC IMPLANTABLE ELECTRONIC DEVICE (CIED)

S. Singhal, K. Murty, S. Mishra, S. Pandey and M. K. Maheshwari

*Surgery, Chatrapati Shivaji Subharti Hospital, India*

**Background:** Patients with symptomatic cholelithiasis and CIED (e.g. pacemakers) present challenging clinical scenario for smooth LC for surgeons practicing in low - middle income countries (LMIC).

Monopolar electro-surgical energy (MEE) is not recommended for use in such patients while use of ultrasonic dissector (UD) may be restricted by lack of equipment or cost constraints.

For more than 2 decades, bipolar electro-surgical energy (BEE) is recognized to be safe and its use recommended for laparoscopy especially in anatomically crowded areas.

BEE has several attributes that make it particularly suitable for LC in patients with CIED.

**Key Steps:** Standard 4 port LC with BEE as sole energy source (video)

- Calot's triangle dissection
- Gallbladder dissection from liver bed

**Outcomes:**

- Patients: 6 patients with symptomatic cholelithiasis with CIED
- Setting: Tertiary care hospital
- Period: August 2017 - December 2019
- Operation time (mean): 48 minutes
- No adverse cardiac event
- Number of times the camera lens cleaned (mean): 1.5
- Gallbladder perforation: 1/6
- No major bilio-vascular injury or conversion

**Advantages** - Safety profile

- Current flow limited only to tissue between the arms of forceps electrodes; no adverse effect on CIED
- prevents damage to adjacent structures
- less chances of accidental burns to the patient
  - Ease of use - less smoke
  - Easy availability of equipment with no recurring costs

**Conclusion:** LC can be safely performed using BEE as sole energy source.

BEE: Particularly useful in CIED patients in LMIC hospitals with limited access to UD

## PTT-21

### SMALL BOWEL SKEWER TECHNIQUE FOR PANCREATIC STENTING IN ROBOTIC WHIPPLE

D. Cavallucci<sup>1</sup> and L. Webber<sup>2</sup>

<sup>1</sup>Royal Brisbane and Women's Hospital, and <sup>2</sup>Fiona Stanley Hospital, Australia

Use of an external pancreatic stent is a proven fistula mitigation strategy for high risk anastomoses during PD.

We propose a novel technique for passing and securing an internal - external pancreatic stent from skin via small bowel limb and into pancreas during PJ to facilitate totally robotic reconstruction phase in high fistula risk situations.

This will be several slides and a 3 minute video outing the process and technique to be presented in Tricks of the Trade.

## PTT-22

### EMERGENCY SURGERY FOR SEVERE LIVER INJURY THROUGH THE INFERIOR VENA CAVA

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*Hepato-Biliary-Pancreatic Surgery Division, Department of Surgery, National Center for Global Health and Medicine, Japan*

**Background:** Hepato-biliary-pancreatic surgeons are also required to have knowledge of trauma to the hepatobiliary-pancreatic region. Hepatic venous trauma is an area in

which hemostasis is difficult with IVR and requires the knowledge and skills of surgeons.

**Results:** A 20-year-old man is transported in emergency by shock due to abdominal stab wound. The FAST examination was positive and the blood pressure did not respond to the infusion, the patient underwent an emergency laparotomy in the emergency room.

Emergent left hemihepatectomy was done under the Pringle maneuver and with the bleeding point compression, however, the bleeding did not subside at all. The stab wound was deeper than the cross section of the hepatectomy and was switched to damage control surgery. A second-look surgery was then performed on the 3rd operative day. Intraoperative ultrasonography confirmed a free fluid anterior to the IVC, suggesting an IVC injury. Total vascular exclusion (TVE) was planned to stop the persistent bleeding. The anterior wall of IVC was sutured together with the liver parenchyma. TVE time was 27 minutes in total.

**Conclusion:** Emergent surgery for the hepatic injury to the inferior vena cava was done successfully, which enabled to save the life. It was a rare case and we would like to display videos and share policies and procedures.

## PTT-23

### TECHNIQUE OF SAFE PANCREATICOJEJUNOSTOMY FOR SMALL PANCREATIC DUCT DURING PANCREATICODUODENECTOMY

G. Desai, P. Pande, N. Chavan and P. Wagle  
*Surgical Gastroenterology, Lilavati Hospital and Research Centre, India*

Pancreaticojejunostomy is the Achilles heel of pancreaticoduodenectomy. Despite technical advances, better understanding of patient selection criteria and perioperative care, pancreatic fistula rates still remain high at 7-13%. A lot of techniques have been described for pancreaticoenteric anastomosis. We perform modified Blumgart technique for pancreaticojejunostomy under magnification using loupes. In presence of a small duct < 3 mm, we have used a specific sequence of steps to ensure a safer anastomosis which is described here (Figure 1).

The first step is to mobilize the pancreas 1 cm beyond the resection margin so as to allow the full thickness 'U' stitch of modified Blumgart technique. The pancreatic transection after taking the corner hemostatic stitches should be done with the knife at 75° angle to the horizontal so that the pancreatic cut surface faces towards the jejunal loop. After this, for a duct of around 1 mm (< 3 mm), the trick is to use an infant feeding tube of 4/5 French size cut obliquely. This end of the infant feeding tube is then used to feed the pancreatic duct for upto 5 cm depth after cutting. It is kept there for 10 minutes. When you remove the feeding tube, you will see that the duct has dilated to more than twice its pre-procedure size thus, enabling the anastomosis using the standard modified Blumgart technique with 6-0 PDS for inner layer and 3-0 PDS for 'U' stitch.

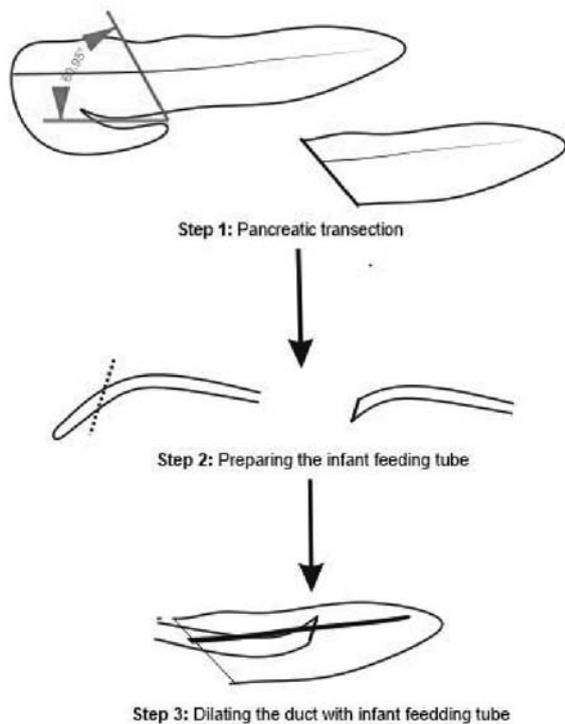


Figure 1 Steps for facilitating a safe anastomosis using an infant feeding tube

**PTT-26**  
**PANCREATIC FISTULA TREATMENT USING CONTINUOUS WALL SUCTION AS AN EASY, EFFECTIVE, AND SAFE PROCEDURE**

A. Yuda Handaya<sup>1</sup> and V. A. P. Werdana<sup>2</sup>  
<sup>1</sup>Surgery, and <sup>2</sup>Gadjah Mada University/Sardjito Hospital, Indonesia

**Introduction:** Postoperative pancreatic fistula (POPF) is still becomes a nightmare for digestive surgeons. The prevalence of POPF is estimated at 13% - 41%. The mortality rate of patients with major pancreatic fistula is up to 28%. It requires complex treatment with a large cost burden.

**Presentation of case:** Here we report a patient with pancreatic injury repair of pancreatic laceration with unidentified intraoperative pancreatic duct injurie. In the hospital ward, the patient developed wound dehiscence and a clear viscous pancreatic juice came out from the wound with high output. The patient is then placed abdominal wall suction with continuous pressure according to the number of products per day, where the pressure is -150mmHg for products more than 500cc, -100mmHg for products 250-500cc, -50mmHg if less than 250cc, and if less than 50cc patients can be treated on the road. After 4 weeks, the patient showed good outcomes, the pancreatic juice output decreased and diminished, the wound also narrowed and closed.

**Discussion:** Continuous wall suction with NPWT principle can reduce pooling of fluid, reducing shear stress and tissue hypoxia at the wound edges, and stimulating the release of vascular endothelial growth factor in pancreatic fistula wound milieu. It is possible to accelerates wound healing and closure of the pancreatic fistula.

**PTT-27**  
**RECIPIENT HEPATIC ARTERIAL DISSECTION DURING LIVING DONOR LIVER TRANSPLANTATION - A TRICK FOR THE TRICKY SITUATION**

G. Desai<sup>1</sup>, N. Chavan<sup>1</sup>, A. Bharadwaj<sup>1</sup>, A. Kirange<sup>1</sup>, T. Shaikh<sup>2</sup> and N. Mehta<sup>2</sup>

<sup>1</sup>Surgical Gastroenterology, and <sup>2</sup>Liver Transplantation, Lilavati Hospital and Research Centre, India

Dissection of Recipient hepatic artery although rare, can lead to difficult and tricky situation during living donor liver transplantation. We would like to share our experience of this rarely reported event and its subsequent management.

Ideally in living donor liver transplantation, a high hilar dissection followed by preservation of long length of recipient arteries is desirable. In some cases, proximal 'dissection' of the hepatic artery is observed. If right and left hepatic artery is deemed un-usable due to proximal 'dissection', some surgeons prefer using gastroduodenal artery. However, it may be difficult to safely isolate it due to severe portal hypertension. Also, length of GDA may be insufficient to reach the right lobe artery. In such case, another alternative is to use the right gastroepiploic artery. It is separated from the greater curvature of stomach upto its origin from the gastroduodenal artery, thereby proving a good length which is then brought upto the right liver graft by mobilizing through retro-gastric space and allowing a tension-free anastomoses. Adequate arterial flow is confirmed on intra-operative doppler study.

We continued to record doppler flows of the liver graft for 7 days post operatively. The patient had an uneventful recovery and was discharged at 2 weeks from the date of surgery. Step-wise management of this situation is described here (Figure 1). Hence, Right Gastro-epiploic artery may be used in this tricky situation where no other local artery is available for hepatic arterial anastomoses.

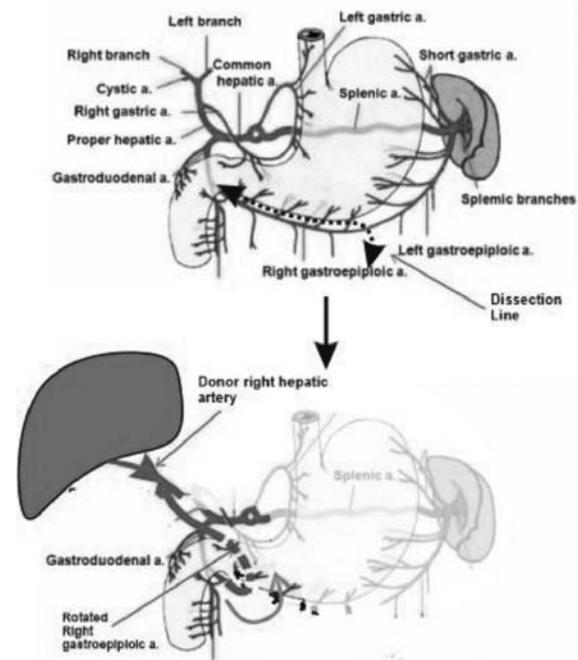


Figure 1 Steps for rotating the right gastro-epiploic artery for anastomosis

### PTT-29 PANCREATIC ANASTOMOSIS FOR SOFT PANCREAS AND SMALL PANCREATIC DUCT WITHOUT PANCREATIC FISTULA

T. Inggakul<sup>1,2</sup>

<sup>1</sup>*Surgery, Bangkok Hospital, and* <sup>2</sup>*Surgery, Phramongkutklao Hospital, Bangkok, Thailand*

Postoperative pancreatic fistula (POPF) is one the most concerned postoperative complication of pancreaticoduodenectomy (PD), its incidence was up to 45%. The predictors of the occurrence of POPF included soft texture of pancreas and small main pancreatic duct (MPD). Currently several techniques of pancreatic anastomosis were proposed to reduce the POPF especially for the soft pancreas and small pancreatic duct. The modified Blumgart technique with internal stent was planned for the pancreatic anastomosis. After preparing the jejunal limb and mobilization of the posterior side of the pancreatic remnant, the internal pancreatic duct stent was placed, the double-arm Prolene 3-0 was used for trans-pancreatic sutures and placed through the full thickness of the pancreas, from the anterior side of pancreas, then sutured the seromuscular layer of jejunum and from the posterior side through pancreas, usually 2-3 stitches depending on pancreatic width. At this step we carefully sutured and avoided the MPD injury. Duct-to-mucosa anastomosis sutures were performed at 3, 6, 8, and 12 o'clock positions with Prolene 5-0, pancreatic duct stent was fixed with suture of 12 o'clock. The needles of Prolene 3-0 was sutured through seromuscular layer of jejunum then tied. This technique created an invagination of the jejunum and cover the pancreatic cutting surface. It also prevented pancreatic parenchymal tearing and decreased tension of duct-to-mucosa anastomosis. This technique is suitable for small MPD and soft pancreas with lower rate of pancreatic leak and no clinical-relevant POPF.

### PTT-31 HYBRID MINI ALPPS AS A SOLUTION FOR A COMPLEX BIG SIZE TUMOR

C. Muñoz, D. Palominos, M. Naranjo, J. Morales, C. Varela, G. Sepúlveda, F. González, S. Sótelo and J. Rojas Lizana

*Hospital Regional de Talca, Chile*

**Introduction:** ALPPS procedure is probably the last significant progress in the liver surgery. ALPPS didn't more morbidity than classic approach 2-stage for colorectal liver metastases but its utility in another tumor is controversial. To reduce aggressiveness in the first surgical stage, Hybrid mini-ALPPS (intraoperative embolization portal, parenchymal transection and minimize liver mobilization) was developed with minimal cases reported. Our aim is to present the approach using Hybrid mini-ALPPS in a complex big size tumor.

**Methods:** A 43 years old patient with a complex big liver tumor that involves the right hepatic lobe, medial sector and Inferior vena cava vein (IVC). The preoperative evaluation is concordant with resectable intrahepatic cholangiocarcinoma (ICC) with a future liver remnant (FLR) of 433cc (lower < 20%).

Our video shows how first surgery time was performed through a laparoscopic approach partial parenchymal transection (90%), with bipolar using Pringle technique and

intraoperative embolization of the right hepatic vein through cannulation of the inferior mesenteric vein (VMI).

The second surgery time was performed after 2 weeks with a new manometry that shows an increase in FKRP to 883cc (an increase in 204% of the FLR). Right trisectionectomy and resection of IVC tumor and diaphragm was performed. The 5th postoperative day is discharged in good condition with a slight increase in transaminases levels.

**Conclusion:** The Hybrid mini-ALPPS is a feasible technique and could be considered in complex big tumour not colorectal liver metastases when a short time solution of surgical problem is necessary for a multidisciplinary team approach.

### PTT-32 DEVELOPMENT AND EVOLUTION OF LAPAROSCOPIC RADICAL CHOLECYSTECTOMY FOR INCIDENTAL AND NON-INCIDENTAL GALLBLADDER CANCER

C. Muñoz<sup>1,2</sup>, J. Rojas<sup>1</sup>, D. Palominos<sup>3</sup> and G. Sepúlveda<sup>4</sup>

<sup>1</sup>*Digestive and HPB Surgery Unit, Universidad Católica del Maule,* <sup>2</sup>*Digestive and HPB Surgery Unit, Hospital Regional de Talca,* <sup>3</sup>*Hospital Regional de Talca, Universidad Católica de Maule,* and <sup>4</sup>*Hospital Regional de Talca, Universidad Católica del Maule, Chile*

Laparoscopic radical cholecystectomy for the treatment of incidental and non-incidental gallbladder cancer is a less developed surgical technique around the world compared to other HPB surgeries. Chile is a country with a high incidence of gallbladder cancer and our unit adopted 5 years ago laparoscopy as an initial approach for all patients with incidental gallbladder cancer and preoperative suspicion. In the last 5 years we have evaluated more than 250 patients with gallbladder cancer (incidental and preoperative suspicion). In 30 patients the surgery has been completely completed by laparoscopy. Our objective is to present through videos the evolution of the technique that we have developed, the tips to facilitate intercavaortic sampling and laparoscopic lymphadectomy as well as hepatic transection of segments IVB and V. The use of the systematic approach for laparoscopy of gallbladder cancer It has allowed us to reduce non-therapeutic laparotomy as well as develop a learning curve for laparoscopic radical resection with minimal complications and excellent long-term results that are absolutely comparable with patients operated by open surgery.

### PTT-34 TEMPORARY PORTO-CAVAL SHUNT- 3-9 O CLOCK TECHNIQUE IN LIVER TRANSPLANT- TRICKS OF TRADE

S. Daga

*HPB & Liver Transplant, Medicover Hospital, Hyderabad, India*

**Introduction:** Temporary porto-caval shunts is done during liver transplant to decrease blood transfusion, improve renal perfusion and reduce hepatic injury in liver transplantation

**Methods:** During liver transplant performing temporary pcs is challenging when caudate lobe is enlarged, hilum is shortened or patient is more antero-posterior depth. In such

situation or as a part of routine if temporary pcs can be performed using single suture, starting from 3 o clock and moving towards 9o clock on either sides, a technically simple and easy anastomosis can be performed.

**Results:** When a temporary pcs is performed using this technique it can be under vision as compared to a technique of performing from 6o clock to 12 o clock first posteriorly and then anteriorly. Appropriate angle sutures can be taken under vision.

**Conclusion:** Temporary PCS performing from 3-9 o clock is technically simple, under vision with less time required than as compared to 6-12 o clock anastomosis.

### PTT-35

## LIVER MOBILISATION DURING RECIPIENT HEPATECTOMY USING ARGON PLASMA COAGULATION - TRICKS OF TRADE

S. Daga

*HPB & Liver Transplant, Medicover Hospital, Hyderabad, India*

**Introduction:** Recipient hepatectomy is one of the difficult and challenging procedure during liver transplant. Blood loss during recipient hepatectomy is one of the main determinants of outcome during liver transplant. In a patient with recurrent spontaneous bacterial peritonitis there are dense adhesion between liver and peritoneum which are highly vascularized. It is difficult to find plains for blood less dissection. In order to over come this problem we have developed our own technique of mobilization of liver.

**Methods:** There are many energy devices available for blood less dissection during mobilization of liver. Right from electrocautery, bipolar, harmonic scalpel, ligasure, argon plasma coagulation and many more. We have developed our own technique for mobilization of liver when dense adhesions are present between liver and peritoneal area. We use APC for releasing right and left triangular ligament. Using gentle traction on liver and spraying APC between liver and adherent area.

**Results:** With use of APC a blood less dissection is feasible particularly in the areas where there is no clear plain for dissection. Moreover, it helps in prevention of rents of diaphragm. If dissection is done either with other devices there is need to dissect plain which leads to bleeding from newly formed collaterals and if they are used without dissection can lead to rents in diaphragm.

**Conclusion:** A blood less dissection is feasible in recurrent SBP patient using APC.

### PTT-36

## PERI-ADVENTITIAL SMA DISSECTION DURING PANCREATOCODUODENECTOMY FOR RESECTABLE PANCREATIC CANCER

F. Giovanazzo, S. Sahay, K. J. Roberts and N. A. Chatzizacharias

*Queen Elizabeth Hospital Birmingham, United Kingdom*

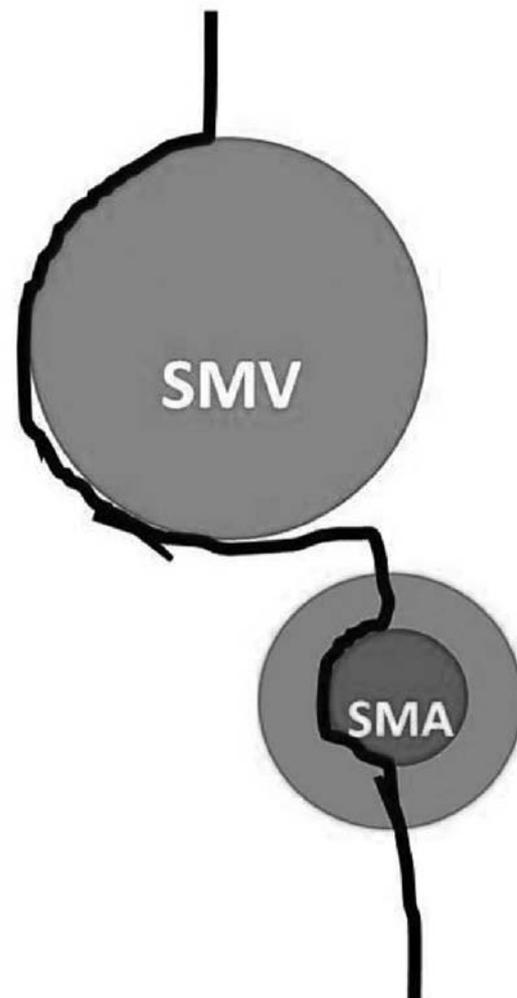
**Background:** The incidence of R1 resection after Pancreaticoduodenectomy is variable and is directly correlated with worse long-term survival. Retrospective data suggest that

periadventitial SMA dissection may decrease the R1 rate and improve the survival outcome. However, the utilisation of this surgical technique varies amongst surgeons.

**Technique.**

SMA could be approached in different ways based on the surgeon's preference (artery first, posterior, anterior, combination). In our institution, peri-adventitial dissection describes the clearance of the right side of the SMA from lymphoneural tissue for at least 180 degrees and from the "angle" of the artery to the level of inferior border of the uncinate process. The retroperitoneal soft-tissue of the uncinate process is dissected. The small vascular structure in this area are carefully tied and the right lateral margin of the SMA is skeletonized, removing all pancreatic tissue and draining lymphatics from the peri-vascular plan. In the presence of an accessory or replaced right hepatic artery the peri-adventitial dissection should also be carried out around this vessel as well.

**Results:** Routine practice of peri-adventitial dissection during pancreaticoduodenectomy for resectable tumours has been performed in a subset of patients. The results suggest a R1 rate of 20%, with SMA margin positivity 5%, compared to a rate of 44% margin positivity within the same unit. There have been no incidences of vascular related injury or complication related to the technique; or persistent chyle leak (one episode of chyle leak grade A recorded that was managed conservatively).



Periadventitial dissection

## PTT-37

### AMNIOTIC MEMBRANE OVER PANCREATIC ANASTOMOSIS AFTER HIGH RISK PANCREATICODUODENECTOMY: PRELIMINARY EXPERIENCE OF A PROSPECTIVE STUDY

I. Frigerio<sup>1</sup>, E. Bannone<sup>2</sup>, D. Trojan<sup>3</sup>, P. Regi<sup>1</sup>, R. Girelli<sup>1</sup>, A. Giardino<sup>1</sup>, V. Allegrini<sup>1</sup> and B. Giovanni<sup>1</sup>

<sup>1</sup>Pancreatic Surgical Unit, Pederzoli Hospital, <sup>2</sup>Department of General and Pancreatic Surgery, The Pancreas Institute, University of Verona Hospital Trust, and <sup>3</sup>Treviso Tissue Bank Foundation, Italy

**Introduction:** Relevant pancreatic fistula (CR-POPF) after pancreatic resection is a life-threatening complication. None of the existing strategies is effective in reducing its incidence. Many studies suggest that amniotic membrane (AM) is effective in tissue regeneration and prevention of fluid leakage at many surgical sites. We reported the first case of AM implantation after pancreaticoduodenectomy (PD).

**Aim:** We present the results of the prospective study ongoing in our Institution to determine whether AM implantation can reduce CR-POPF.

**Patients and methods:** Patients undergone PD were intraoperatively enrolled in the study if Fistula Risk Score (FRS) was between 5-10. AM was provided by Fondazione Banca Tessuti Treviso Onlus and displaced as in Figures. Pre and post-operative data were recorded and compared with same risk population without AM.

**Statistics:** Continuous variables were analysed using Student's t-test or Mann-Whitney U test. Categorical variables were compared using Chi-Square test or Fisher's exact test when appropriate. A p-value < 0.05 was considered as statistically significant.

**Results:** Thirteen patients in each group were included in the analysis: the two groups were comparable regarding preoperative and intraoperative data. No significant differences were found in postoperative course regarding abdominal complications pancreatitis, DGE, fluid collection, need for reoperation and length of stay. POPF occurred in 53,8% and 92,3% in AM and noAM patients respectively (p=0.073) and may reflect a trend in AM efficacy to reduce POPF.

**Conclusion:** AM seems to improve POPF after PD in high risk patients but this trend needs to be validated in a bigger population.



AM displacement after pancreatic anastomosis

## PTT-38

### THREE PORTS LAPAROSCOPIC DISTAL PANCREATECTOMY (ANTERIOR RAMPS, POSTERIOR RAMPS AND SPLENIC PRESERVE): SYSTEMATIC ANTEGRADE DISSECTION IS THE KEY POINT TO SUCCESS

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Many literature had described standardize technique for laparoscopic distal pancreatectomy (LDP) using 5 ports. In our experience, only three ports suffice for LDP whether it is anterior RAMPS, posterior RAMPS or splenic preservation. Another 2 ports for stomach and colon retraction were not necessary. Systematic antegrade dissection and vascular approach from infero-posterior border of pancreas is the key to success. Our step begin with opening the gastrocolic ligament from medial toward splenic flexure of colon. Then we divide splenocolic ligament and dissected Colon from inferior border of pancreas by dissecting back from left to right until reaching portal vein. Lifting pancreas toward abdominal which will also lift the stomach upward. By dissecting the pancreas from inferior border and lifting the neck of pancreas, spleno-portal vein junction can easily identified from posterior surface of pancreas. From this caudal view, we can see common hepatic artery and superior border of pancreas (Figure 1). Now we can encircled neck of pancreas and divided. After pancreas was divided, we can encircled splenic vein and divided. By lifting pancreas to the left, we can continue dissecting upper border of pancreas from retroperitoneum and hepatic artery until reaching splenic artery take-off. In this step, we can now divided the splenic artery at its origin. After that, continue dissection the pancreas from retroperitoneum along the plane of anterior or posterior RAMPS. If the spleen is to be preserved, it can be done with this approach. With this technique, we can reduce ports insertion thus reduce pain.

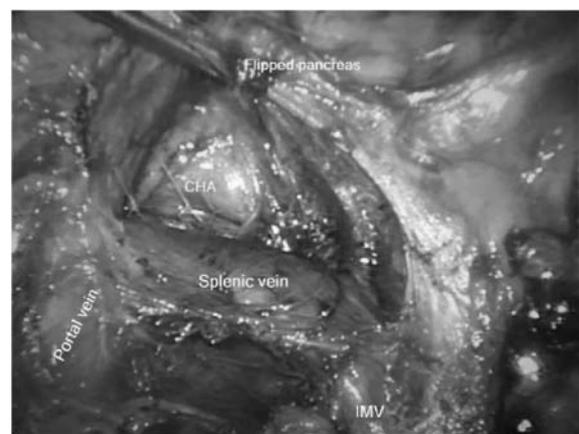


Figure 1

PTT-40

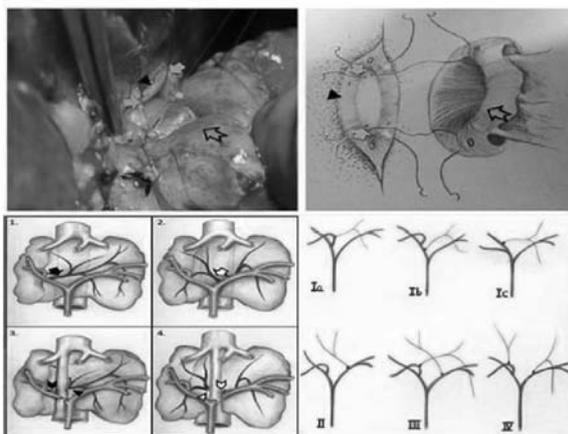
### TECHNIQUE OF BILIARY ANASTOMOSIS: TARGETING THE “ACHILLES’ HEEL” OF ADULT LIVING DONOR LIVER TRANSPLANT

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Biliary complications are regarded as the Achilles’ heel of liver transplantation, especially for living donor liver transplantation (LDLT) due to smaller, multiple ducts and difficult ductal anatomy. In most series, overall biliary complications (biliary leaks and strictures) were reported between 10%-30%.

At our center, we have made few innovations/modifications in surgical technique of biliary reconstruction, which have significantly reduced incidence of biliary complications (< 5%).

1. The standard technique of biliary anastomosis (minimal hilar dissection during donor duct division, high hilar division of the recipient bile duct, and preservation of the recipient duct periductal tissue) was used. In addition, modified technique: corner-sparing sutures and mucosal eversion of the recipient duct was done. The technical factors mentioned above are aimed at preserving the blood supply of the donor and recipient ducts and hold the key for minimizing biliary complications in adult-to-adult LDLT.
2. Bile leak may occur from anastomotic site, cystic duct stump, cut surface pedicles or from divided caudate ducts. The first three sites are amenable to post-operative endoscopic stenting as they are in continuation with biliary ductal system. However, leaks from divided isolated caudate ducts can be stubborn. We have defined and classified the biliary drainage/anatomy of the caudate lobe in liver donors based on intraoperative cholangiograms (IOCs) with special attention to cross-over caudate ducts. Proper intraoperative identification and closure of divided isolated caudate ducts can prevent bile leak in recipients as well as donors.



Technique of Biliary Anastomosis: Corner sparing & Mucosal eversion/  
 Biliary Anatomy of Caudate Lobe

PTT-41

### HYDATID SURGERY RESURGENCE IN AUSTRALIA: HOW TO PERFORM SAFE EFFECTIVE LIVER SURGERY FOR HYDATID DISEASE

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**Introduction:** Hydatid disease has had a recent resurgence in Australia probably due to immigration from endemic countries. Echinococcosis can lead to formation of Hydatid Cysts in the Liver, which sometimes need surgical intervention.

**OPERATIVE TECHNIQUE - TRICKS OF THE TRADE:** Spillage can cause anaphylaxis and care should be taken during Hydatid surgery. After rooftop incision and liver mobilisation, stay sutures with 3-0 PDS are applied to the thick cyst wall. Chlorhexidine soaked sponges are placed around the large cyst. 5 mm Laparoscopic port is inserted into the cyst around stay sutures and sucker attached to drain the turbid light grey fluid. The port is then converted to 12 mm port to allow cyst wall/germinal layer to come up the sucker and sent as specimen. Scolocidal agent Chlorhexidine with Cetrimide is then poured into the cyst wall and aspirated multiple times. Minor spillage onto a soaked sponge should be suctioned out. Harmonic scalpel is used to open cyst wall and Echelon flex 60 white staplers are used to take cyst wall of the liver edge. No scraping of the cyst base is done to avoid bile leak. Daughter cysts are removed. Whole abdomen is washed with Chlorhexidine with Cetrimide solution. Then whole abdomen is washed with Normal Saline to prevent fibrosis from Chlorhexidine. Haemostasis is achieved using diathermy, floseal and Tisseel. Omentum is mobilised and sutured to cyst side wall with 2-0 Chromic. Blake drain is placed, pain catheters in the wound and closed in layers.

PTT-42

### “FRENCH POSITION” FOR OPEN PANCREATICOUDODENECTOMY: COMING BACK FROM LAPAROSCOPY TO OPEN SURGERY

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**Introduction:** Minimally invasive surgery has arrived slowly in pancreaticoduodenectomy (PD). Even that, most of PDs remains performed Open. Some advantages of laparoscopy can be reintroduced to Open surgery. We propose the “French position” to Open PD, to facilitate the access of the second assistant (usually a Fellow or Resident).

**Methods:** After a pair of conversions of laparoscopic PD to open, we realized that French position (supine with open legs) allows a better performance for the surgical team, specially the second assistant participation. After that, one of the authors (HF) proposed to start open PDs using the advantages of French position.

**Results:** In last 20 Open PDs we start with the patient in French position. Surgeon remains on the right side of the

patient, first assistant of the left side and second assistant between the patient legs. We feel that this position allows a better participation of the second assistant and the surgeon have more room to work. In some cases, the surgeon changed the position between the patient's legs, during uncinata process dissection, taking advantage for dissection parallel to mesenteric vessel instead of perpendicular fashion. Another advantage is to get open the patient's arms if it is required for the anesthetist. Some limitations: it requires special attention to avoid pressure areas.

**Conclusion:** French position to perform Open PDs can facilitate the disposition of the surgical team and in some cases the surgeon can operate in front of the uncinata process changing the direction in parallel instead of perpendicular.

#### PTT-44

### FLURBIPROFEN AXETIL INJECTION TEST REDUCE BILE LEAKS FOR LAPAROSCOPIC HEPATECTOMY

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**Aim:** Among the postoperative complications, bile leaks represents a primary one and frequently requires for treatment of invasive diagnostic and therapeutic interventions undergoing laparoscopic liver resection. Here we report Flurbiprofen Axetil injection test can reduce the bile leaks for laparoscopic liver resection.

**Methods:** Flurbiprofen Axetil injection test was injected through cystic duct or common bile duct after finishing liver parenchymal transection. From January 2017 to December 2019, patients with liver tumor who underwent minimally invasive liver resection were enrolled in this study. Perioperative bile leakage were recorded. Variables associated with bile leaks were identified using multiple logistic regression analysis.

**Results:** During the study period, 237 patients perform laparoscopic liver resection. 16 patients (6.8%) in the series were presented with post-resection bile duct leaks. Tumor size, type of liver cancer, operation time, blood loss and blood transfusion were independent risk factors for BL. Propensity score-adjusted multivariable regression identified Flurbiprofen Axetil injection test can reduce the incidence of bile leaks.

**Conclusion:** Our data suggest the incidence of bile leaks can be reduced with Flurbiprofen Axetil injection test through cystic duct or common bile duct injection.

#### PTT-45

### IS THERE AN ANSWER TO POST-OPERATIVE CHOLANGITIS AND DELAYED GASTRIC EMPTYING AFTER PANCREATODUODENECTOMY?

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**Background:** Pancreaticoduodenectomy (PD) is associated with high morbidity. Delayed gastric emptying DGE (>15%) is the most common complication and Cholangitis (>5%) is the most dreadful infectious

complication in the post-operative period. A change in our technique and alteration in post-operative care has minimized the both.

#### **Technique:**

1. Unlike resection in conventional PD, after transection of distal stomach, we ligate the GDA and then uncinata is dissected from SMA before pancreas is resected. The advantages are that there is less bleeding during the pancreas transection and there is minimal handling of the portal vein.
2. The bile duct is never clamped during the dissection procedure allowing free flow of bile into the enteric system. Hilum is dissected and bile duct is transected at the end.
3. The patients received levosulpiride (75mg/day) starting immediately after the surgery.

**Data:** The above mentioned technical alterations were brought into practice in Sep 2018. A total of 25 patients underwent PD. All of them had pre-operative biliary stenting. Grade A pancreatic leak occurred in 5 (20%), Grade B in 1 patient (4%). Post-operative cholangitis was noted in none of the patients. Delayed gastric emptying was noted in 2 patients (8%).

**Conclusions:** We believe that minimal handling of portal vein during dissection, delaying the clamping/transecting the bile duct is associated with fewer cholangitis / infectious -complications in the post-operative period. We also noticed there is less delayed gastric emptying in these patients and whether it is due to Levosulpiride/ the technique needs to be discussed.

#### PTT-46

### HEPATICOJEJUNOSTOMY- THREE CRITICAL SUTURES TO EXTERMINATE THE DREADED COMPLICATION BILE LEAK

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**Background:** The dreaded complications after Hepaticojejunostomy were bile leak and stricture. Bile leak is reported as high as 6% and long-term stricture rate as high as 13%. Most commonly utilized technique for Hepaticojejunostomy (HJ) described by Blumgart, is retrocolic roux-en-Y Hepaticojejunostomy with multiple interrupted absorbable sutures.

**Technique:** A retro-colic Roux-loop of jejunum is anastomosed to the bile duct with end to side fashion. PDS 4-0 suture is used for the anastomosis. Three critical stitches taken on either side:

1. Corner but posterior
2. Corner
3. Corner but anterior.

After the three critical stitches were taken, firstly the corner but posterior suture is tied on either side. Then the posterior layer is anastomosed with intermittent sutures

with knots inside lumen. Then corner suture is tied. Then anterior layer is anastomosed with intermittent sutures with knots outside. Then the corner but anterior suture is tied. Fewer sutures are required than the standard Blumgart technique to complete the anastomosis. Two anchoring sutures with silk were taken from jejunal loop to the hilar plate/adjacent fibrous tissue to relieve the tension on anastomosis.

**Results:** Over the last 5 years, 320 patients underwent hepaticojejunostomy for various reasons (benign and malignancy). Bile leak was noticed in 6 patients (1.9%).

**Conclusions:** The three critical sutures described are vital for the hepaticojejunostomy anastomosis. These three sutures should be taken and tied diligently to prevent bile leak.

#### PTT-47

### EARLY SPLITTING OF THE LIVER FOR RETROPERITONEAL ADRENAL MASS

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Adrenocortical carcinoma often invades surrounding anatomical structures and surgical resection can be extremely challenging even in experienced hands.

Some of the surgical challenges are exposing the entire circumference of these giant tumors, the inferior vena cava, the renal vasculature, and the aorta while maintaining oncological principles and a proper vascular control. Injudicious mobilization of the tumor may lead to excessive bleeding caused by avulsion of the renal/adrenal veins, iatrogenic tumor rupture, and spillage of cancer cells into the systemic circulation. To avoid the aforementioned disadvantages, our approach is to split the liver early. The technique involves initial vascular inflow control, parenchymal transection of the liver, and complete venous outflow control, prior to the tumor mobilization. In this manner the difficult aspects of the resection, such as mobilization of the tumor from the cava and diaphragm, retroperitoneal mobilization in the retrohepatic space, and possible caval replacement, are more straightforward and better visualized.

#### PTT-48

### EX-VIVO RESECTION WITH SMALL-BOWEL AUTO-TRANSPLANTATION FOR TUMORS AT THE ROOT OF THE MESENTERY

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Tumors involving the root of the mesentery can be extremely challenging and even defined non-resectable when considering conservative surgical techniques alone. Surgical resection of these tumors can result in resection of large portions of the intestine. As a consequence, patients may develop short bowel syndrome and remain dependent on either total parenteral nutrition or need for intestinal transplantation for survival.

In these cases of complex involvement of the superior mesenteric artery, Ex-vivo resection and auto-transplantation may prevent excessive bleeding and ischemic related damage to the small intestine and other abdominal viscera. Additionally, this technique provides better exposure that may assist in obtaining better oncological resections.

In this manner the difficult aspects of the resection such as resections with negative margins, proper exposure, are more straightforward and better visualized, with less ischemic damage to the bowel.

#### PTT-49

### DIFFERENT APPROACHES TO MANAGEMENT OF COMMON DUCT STONE (CBDS) IN PATIENTS WHO HAD ROUX-EN-Y GASTRIC BYPASS (RYGB)

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**Introduction:** Symptomatic CBDS are commonly diagnosed in obese patients after Roux-en-Y gastric bypass RYGB. Management can be challenging due to the altered gastrointestinal anatomy. Various techniques are available, we present a cohort of patients who were safely managed with three different approaches to remove CBD stones.

**Method:** A retrospective chart review of patients who had symptomatic CBDS after RYGB underwent: Percutaneous trans-hepatic CBDS removal, Laparoscopic assisted trans-gastric/ ERCP, Robotic CBD exploration & choleduoduodenostomy/choleducho-jejunostomy.

**Results:** From April,2011 to June,2019 a total of 25 patients (93.3% Caucasian; 70% female; age ranges from 38-90 years) were successfully managed with PTC, balloon sphincteroplasty and stone forced down to the duodenum (#18). Laparoscopic trans gastric ERCP (#4) and Robotic CBD exploration & CBD bypass & cholecystectomy (#3). There were four complications, two hemobilia, one bile leak and one enterotomy and no mortality.

**Conclusion:** We have presented three different safe approaches to manage CBD stones in patients with gastric bypass with low morbidity and no mortality.

#### PTT-50

### PARENCHYMAL TRANSECTION AND DISSECTION WITH ULTRASONIC SCALPEL AS A SINGLE DISPOSABLE INSTRUMENT IN LAPAROSCOPIC LIVER SURGERY

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Parenchymal transection techniques are an ever-going discussion between liver surgeons and remain largely a

matter of equipment availability and personal preference. This video shows how transection can be performed with the use of a single disposable device, the ultrasonic scalpel. Dissection can be performed opening the jaw, exposing the active blade and moving the tip sideways, without pressure on vessels and without blind insertion inside the parenchyma. Vessel sealing is applied with the common use of the equipment, closing the tip around the dissected vessel (after hemostatic clips when needed). Three short videos are shown:

- 1) left hepatectomy in healthy liver parenchyma bearing an biliary cystic neoplasia closely related to the middle hepatic vein;
- 2) segment 5 resection in a post-chemotherapy parenchyma for metastatic colorectal carcinoma and
- 3) another segment 5 resection for HCC on a cirrhotic patient. Our institution has performed 424 minimally invasive liver operations, 267 of those were totally laparoscopic approaches. The ultrasonic scalpel was applied in 202 cases.



**Figure 1** Correct use of the ultrasonic scalpel's active blade

### PTT-51 PURE LAPAROSCOPIC DONOR RIGHT HEPATECTOMY (PLDRH) - MANEUVERS TO ACHIEVE ADEQUATE EXPOSURE WITH TECHNICAL TIPS AND TRICKS

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Pure Laparoscopic Donor Right Hepatectomy is a technically challenging surgery requiring long hours of focussed team effort.

#### Access and mobilisation:

- Placement of camera ports as high as possible in the line of hilum, right subcostal region
- Goldfinger/Snake Liver Retractor 5mm via epigastric port for adequate right lobe liver retraction
- Use of endoloop for traction of Gall bladder and divided end of falciform ligament.

#### Hilar dissection:

- Gold finger passed anterior to the cava and brought out in the space created between the right hepatic vein and middle hepatic vein in the suprahepatic space.
- Umbilical tape passed in the space created by the gold finger which helps achieve hanging, useful for parenchymal transection .
- ICG guided Liver parenchymal surface marking for accurate parenchymal transection

#### Parenchymal transection:

- Use of rubber band traction for sustained and firm liver traction.
- Use of CUSA excel (CUSA with monopolar cautery in the same device) for adequate hemostasis while parenchymal transection
- Gold finger is used to encircle the entire right portal pedicle, and umbilical tape is brought in this space which helps in completing the remaining parenchymal transection by hanging manoeuvre.

#### Organ procurement via pfannensteil incision:

- Right hepatic duct is encircled with hilar sheath using ICG guidance and divided with scissors sharply after placing a clip to the right hepatic duct orifice.
- Right hepatic artery clipped, right portal vein stapled and divided while the right hepatic vein and IVC ligament is divided using a stapler.

### PTT-52

### INTRA-OPERATIVE INDOCYANINE GREEN (ICG) CHOLANGIOGRAPHY: AN IMPROVED SENSITIVE METHOD TO IDENTIFY BILE LEAKAGE AFTER HEPATIC RESECTION

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Bile leakage remains the most important complication after a liver resection, affecting 3 to 33% of patients. In order to prevent bile leak, the meticulous control of the cut surface of the liver has been advocated. The intraoperative identification and ligation of any leaking bile duct is mandatory to limit postoperative complications' occurrence. The intraoperative trans-cystic injection of ICG solution is our preferred method to identify bile leak.

Fluorescent cholangiography with ICG shows a high detection rate for small bile leaks compared to white-lap or blue tests.

The ICG dye is injected through a trans-cystic catheter in the biliary tree, the common bile duct is then clamped distally to the catheter and near-infra-red

fluorescent imaging is performed. Any side-effects were observed.

The fluorescent cholangiography shows a powerful enhancement of tissue contrast and allows the fine detection of small leaking ducts. The major contribution of this technique is to show all the bile-ducts on the cutting surface (deep 8-10 mm) and not only those are leaks. In contrast to the others techniques, with the ICG test we focused major attention on these fluorescent sites. In our experience, fluorescent ICG cholangiography may represent a most sensitive method for intra-operative detection of bile leak.

#### PTT-53

### **A TECHNIQUE OF HEPATIC ARTERY ANASTOMOSIS IN LIVING DONOR LIVER TRANSPLANTATION: BACK-WALL FIRST TECHNIQUE**

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Microvascular technique of placing three stay sutures at 120° intervals around the circumference of the arteries to be anastomosed is limited in its usefulness in LDLT as hepatic

artery (HA) is shorter, smaller, and thin-walled hindering the surgeon's ability to rotate it with the vascular clamps in situ whilst completing the anastomosis. Our technique of HA reconstruction overcomes this problem by placing two adjacent sutures at 6 O'clock in the posterior wall after preparing and positioning donor's and recipient's HAs (A). These two posterior wall sutures are knotted and they help in holding the arteries in position for anastomosis. Then interrupted sutures are placed on either side of these two knots under vision on the posterior wall and knotted till the corners are reached (B). The posterior wall of anastomosis is kept short and straight than the anterior wall to prevent posterior wall being caught by the anterior sutures. Two stay sutures are placed on the corners and interrupted sutures are placed on the anterior wall of the anastomosis without the need to rotate the arteries (C). Anterior wall sutures are knotted after flushing with heparinized saline and removing the distal vascular clamp (D). Bleeding from the interrupted suture lines is not a problem and can be managed with additional sutures. Another advantage is that size mismatch between the donor and recipient HAs can be easily adjusted.

During 90-day post-operative period, eleven patients (1.2%) developed anastomotic complications [thrombosis in eight; pseudoaneurysm in three] in 923 consecutive adult and pediatric LDLTs.