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Combined portal vein and hepatic occlusion in regenerative liver surgery: a comprehensive multi-institutional analysis of the current world experience

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Background: The combination of portal and hepatic vein occlusion accelerates the growth of the future liver remnant as shown in single centre studies. This multi-centre study compares the kinetic growth rate observed after occlusion of portal and hepatic vein (PVO/HVO) with the gold standard portal vein occlusion alone (PVO).

Methods: Patients undergoing regenerative liver surgery were screened in 7 liver surgery centres participating in the prospective DRAGON trial of PVO/HVO retrospectively. All patients with preoperative PVO/HVO or PVO alone were included and compared. Primary endpoint was kinetic growth rate of standardized liver remnant volume (sFLR) and liver to body mass ratio (LBWR). Demographics, indications, and clinical outcomes were analysed.

Results: Between 01/2014 – 06/2019, 22 and 34 patients underwent PVO/HVO and PVO respectively. Occlusion of the respective vein was performed by embolization or ligation. The sFLR and LBWR were at a median of 0.25/0.55 for PVO/HVO and 0.23/0.51 for PVO alone prior to the intervention, and 0.40/0.88 and 0.38/0.82 after the intervention. The kinetic growth rate of the sFLR was 0.07 ± 0.05 /week in the HVO/PVO group and 0.02 ± 0.02 /week for PVE ($p < 0.0001$). Colorectal metastases were the most common type of tumour with 73% in the PVO/HVO and 85% in the PVO group. Complications after intervention occurred in only one case in both groups respectively.

Conclusion: Combination of portal and hepatic vein occlusion significantly accelerates kinetic growth of the FLR in this multicentre study. PVO/HVO will be studied prospectively and compared to the gold standard portal vein embolisation (DRAGON trials).

Early anastomotic biliary complications after liver transplantation; do they matter?

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Background: Biliary leaks and anastomotic strictures are common early biliary complications (EBC) following liver transplantation. The incidence of EBC, and their impact on long-term outcomes remains controversial.

Methods: National UK data on adult liver transplantation between 2006 and 2017 collected by NHSBT was reviewed. (n=8304). Adjusted cox regression was performed to assess impact of EBC on graft and patient survival. Variables were included in this adjusted analysis if they are known to impact graft survival (including DBD/DCD/living) or if they were significantly associated with EBC occurrence in our cohort. Multiple imputations were performed to account for missing data.

Results: Patients were split into four groups; No EBC (n=7505, 90.4%), biliary leak without stricture (n=344, 4.1%), biliary stricture without leak (n=335, 4.0%), and biliary leak plus stricture (n=120, 1.4%). Patients with EBC had longer median hospital stay (23 versus 15 days; $P < 0.0005$) and increased chance for readmission within the first year (56% versus 32%; $P < 0.0005$). Cox regression adjusting for 34 variables showed that EBC have a significant impact on graft survival (Leak- HR=1.315; $P=0.028$, Stricture- HR=1.496; $P=0.003$, Leak plus stricture- HR=1.529; $P=0.038$) and patient survival (Leak- HR=1.241; $P=0.105$, Stricture- HR=1.598; $P < 0.0005$, Leak plus stricture- HR=1.615; $P=0.020$). When a backwards stepwise cox regression was performed, EABC was retained as a significant predictor of graft and patient survival in all 20 imputed datasets.

Conclusion: EBCs are independent risk factors for diminished graft survival and increased mortality in liver transplantation. Further research into interventions to prevent EBC are vital to improve liver transplantation outcomes.

FP03

Short-term outcomes after total pancreatectomy: a European prospective modified-snapshot study

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Myosteatorsis is associated with poor physical fitness in patients undergoing hepatopancreatobiliary surgery

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Background: Body composition assessment using single computed tomography (CT) slice at L3 level and cardiopulmonary exercise testing (CPET) are widely used for perioperative risk assessment. The association of CT body composition and physical fitness have not been explored. In this study, we will assess the association of CT body composition with selected CPET variables in patients undergoing hepatopancreatobiliary surgery.

Methods: A pragmatic prospective cohort of 123 patients undergoing either pancreatic or liver surgery were recruited. All patients underwent preoperative CPET and preoperative single CT-slice at L3 level to assess skeletal muscle mass, adipose tissue mass and muscle radiation attenuation. Multivariate linear regression was used to test the central research question.

Results: 113 patients had good quality abdominal CT-scans available and were included. Of the CT-body composition variables, skeletal muscle radiation attenuation had the strongest correlation with VO_2 at Peak ($r = 0.57$, $p < 0.001$) and VO_2 at AT ($r = 0.41$, $p < 0.001$). In multivariate analysis, only skeletal muscle radiation attenuation was significantly associated with VO_2 at Peak (95%CI 0.15-0.34, $p < 0.001$, $R^2 = 0.42$) and VO_2 at AT (95%CI 0.05-0.21, $p < 0.001$, $R^2 = 0.20$). Skeletal muscle mass showed no significant associations.

Conclusion: There is a positive association between preoperative CT skeletal muscle radiation attenuation and preoperative fitness (VO_2 at AT and at Peak). This study demonstrates that myosteatorsis and not sarcopenia is associated with poor fitness. Combining both variables might provide additive accuracy during perioperative risk assessment.

FP05

Minimally invasive approach for liver resections in patients with hepatocellular carcinoma and advanced cirrhosis: shifting the paradigm

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Risk factors of positive resection margin in laparoscopic and open liver surgery for colorectal liver metastases: a new perspective in the perioperative assessment. A European multicentre study

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Background: The aim of this study was to analyze the independent risk factors associated with R1 resection in open (OLS) and laparoscopic liver surgery (LLS) for CRLMs.

Methods: All patients who underwent OLS and LLS for CRLMs in nine European high-volume centres between 2004 and 2018 were identified. The objective was to evaluate the risk factors for R1 in OLS and LLS.

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

Conclusion: This study describes the factors associated with R1 resection following liver resection for CRLMs, which may be used by liver surgeons to stratify the risk of R1 resection in OLS and LLS.

A nationwide training program for robotic pancreatoduodenectomy (LAELAPS-3): an analysis of the first 18 trained surgeons and first 226 patients

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Background: Safe implementation of minimally invasive pancreatoduodenectomy is essential. Data on nationwide training programs for robotic pancreatoduodenectomy (RPD) are lacking. The aim of this study was to investigate outcomes and learning curves of a nationwide training program for RPD including biotissue drills and the first consecutive patients.

Methods: A nationwide training program in RPD was designed in collaboration with University of Pittsburgh Medical Centre, which includes videos, virtual reality (VR) simulation exercises, biotissue drills and proctoring (March 2016-October 2019). Outcomes were evaluated for the entire training program in 8 centres including outcomes of RAPD. Cumulative sum (CUSUM) analysis was performed to assess the learning curve. Operative videos were assessed using an objective structured assessment of technical skill (OSATS).

Results: Overall, 18 surgeons from 8 centres performed VR simulation exercises, biotissue drills, and received proctoring. In total, 226 RPD procedures were performed in 8 centres. Baseline characteristics show a mean age of 66 years, median BMI of 25.5 kg/m², and pancreatic cancer diagnosis in 70 patients (31%). Conversion to open was performed in 14 patients (6.2%), median blood loss was 250 cc [IQR: 150-500], major complications in 109 patients (48.2%), in hospital mortality in 6 patients (2.6%), and median stay of 12 days. From the CUSUM operation time learning curve, two distinct phases of the learning process for each centre were identified. Similarly, learning curves were found with OSATS.

Conclusions: A nationwide training program was designed for RPD based on the UPMC method. RPD was safely introduced in 8 centres, hereby minimising the negative impact of a learning curve.

FP08

Added value of 3D-vision during robotic surgery in biotissue pancreatico- and hepaticojejunostomy (LAEBOT 3D2D): a randomised controlled cross-over trial

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Background: Consensus is lacking on the added value of 3D-vision during laparoscopic surgery. Given the improved dexterity with articulating instruments in robotic surgery, the added value of 3D-vision in robotic surgery is unclear.

Objective: We tested the added value of 3D-vision on procedure time and surgical performance during robotic biotissue pancreaticojejunostomy (PJ) and hepaticojejunostomy (HJ) as created during robotic pancreatoduodenectomy.

Methods: Participants: 20 surgeons and surgical residents. Participants performed robotic PJ and HJ anastomoses in a biotissue organ model using the da Vinci® system and were randomised to start with either 3D- or 2D-vision. Main outcomes and measures: Primary endpoint was the time required to complete both PJ and HJ. Secondary endpoint was the objective structured assessment of technical skill (OSATS) rating.

Results: The 20 participants completed 40 robotic PJs and 40 robotic HJs. Robotic 3D-vision reduced the combined operative time from 78.1 to 57.3 minutes (24.6% reduction, $P < .001$; 20.8 min reduction, 95% confidence intervals 12.8-28.8 min). This reduction was consistent for both anastomoses, $P < .001$. The reduction in operative time with 3D did not differ significantly between experts and residents, $P = .279$. Robotic 3D-vision improved OSATS performance by 6.1 points (20.8% improvement, $P = .003$) compared to 2D (39.4 to 45.1 points, SD 5.5).

Conclusions: This randomised trial confirmed that 3D-vision has a considerable added value during robotic PJ and HJ biotissue anastomoses with 25% time reduction and 21% improved surgical performance as compared to 2D-vision. New robotic systems are advised to include 3D-vision.

Supporting Documents:

[https://www.jotform.com/uploads/acsglobal/92194422281354/4476365512124508261/Biotissue%20pancreaticojejunostomy%20\(up\)%20and%20hepaticojejunostomy%20\(down\).jpg](https://www.jotform.com/uploads/acsglobal/92194422281354/4476365512124508261/Biotissue%20pancreaticojejunostomy%20(up)%20and%20hepaticojejunostomy%20(down).jpg)

Impact of neoadjuvant therapy in resected pancreatic ductal adenocarcinoma of the pancreatic body and tail on surgical and oncological outcome: a propensity score-matched multicentre study

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Background: Several studies have suggested a survival benefit of neoadjuvant therapy (NAT) for pancreatic ductal adenocarcinoma (PDAC) in the pancreatic head. Data concerning NAT for PDAC located in pancreatic body and tail are lacking.

Methods: Post-hoc analysis of an multicentre retrospective cohort of distal pancreatectomy for PDAC in 34 centres from 11 countries (2007-2015). Patients who underwent resection after NAT were matched (1:1 ratio), using propensity scores based on baseline characteristics, to patients who underwent upfront resection. Median overall survival was compared using the stratified log-rank test.

Results: Among 1,236 patients, 136 (11.0%) received NAT, most frequently FOLFIRINOX (25.7%). In total, 94 patients receiving NAT were matched to 94 undergoing upfront resection. NAT was associated with less postoperative major morbidity (Clavien-Dindo $\geq 3a$, 10.6% vs. 23.4%, $P=0.020$) and pancreatic fistula grade B/C (9.6% vs 21.3%, $P=0.026$). NAT did not improve overall survival [27 (95% CI 14-39) vs 31 months (95% CI 19-42), $P=0.277$], as compared to upfront resection. In a sensitivity analysis of 251 patients with radiographic tumour involvement of splenic vessels, NAT ($n=37$, 14.7%) was associated with prolonged overall survival [36 (95% CI 18-53) vs 20 months (95% CI 15-24), $P=0.049$], as compared to upfront resection.

Conclusion: In this international multicentre cohort study, NAT for resected PDAC in pancreatic body and tail was associated with less morbidity and pancreatic fistula but similar overall survival in comparison to upfront resection. Prospective studies should confirm a survival benefit of NAT in patients with PDAC and splenic vessel involvement.

AB01

Feasibility of a prehabilitation clinic for patients undergoing oncologic abdominal surgery: the first results

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Introduction: Despite improvements in perioperative care, major abdominal surgery continues to be associated with significant perioperative morbidity. Accurate preoperative risk stratification and optimization (prehabilitation) is necessary to reduce perioperative morbidity. This study aims to assess the feasibility of a prehabilitation clinic for patients scheduled for oncologic abdominal surgery.

Material & methods: Patients planned for abdominal surgery at the UMCG because of (the suspicion of) a tumour were screened at the prehabilitation clinic for six modifiable pre-operative risk factors by questionnaires, laboratory values or functional tests and, when necessary, referred for tailor made interventions.

Results: Since May 2019, 50 patients visited the prehabilitation clinic. Twenty patients performed a CPET, 8 (16%) patients had a low physical fitness (anaerobic threshold 5 units/week). One was able to stop. Five (10%) had a low psychological resilience. Three received psychological help.

Conclusion: This data shows that it is feasible to screen patients on the six risk factors at a prehab clinic, however it is a challenge to ensure that everyone receives all the necessary interventions.

AB02

Impact and risk factors for clinically relevant surgery-related muscle loss in patients after major abdominal cancer surgery: study protocol and preliminary results from a prospective observational cohort study (MUSCLE POWER)

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Introduction: Surgery-related muscle loss (SRML) occurs in at least 1/3 cancer patients within one week after major surgery. Though, this important phenomenon has hardly been investigated.

Methods: The MUSCLE POWER is a prospective, observational cohort study investigating the presence, impact, and predictors for clinically relevant SRML in 178 cancer patients after major abdominal surgery using ultrasound, squeeze and force measurements, and QoL questionnaires (Figure 1). Primary endpoint is the proportion of patients with clinically relevant SRML defined as $\geq 5\%$ muscle loss within one week after surgery, measured by the anterior-posterior diameter of three different muscles. Possible correlation with QoL and fatigue up to six months after surgery will be explored. Physical activity and protein intake during hospital stay will be monitored. Possible predictors for clinically relevant SRML—consisting of age ≥ 65 years, preoperative diabetes, preoperative sarcopenia, major postoperative complications (Clavien-Dindo \geq III), insufficient physical activity, and insufficient protein intake—will be investigated.

Results: Preliminary results of the first sixty patients will be presented at the ALPS 2020. We hypothesized that 50% of our patients will have clinically relevant SRML which will lead to a reduced QoL and fatigue up to six months after surgery.

Conclusions: The MUSCLE POWER study investigates the presence, impact, and predictors for clinically relevant SRML in cancer patients after major abdominal surgery. Crucial information to design future intervention studies to prevent postoperative muscle loss and improve postoperative outcome.

Sarcopenia by CT scan correlated with reduced kinetic growth of livers after portal vein embolisation

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Background: Portal vein embolization (PVE) increases the future liver remnant to appropriate size prior to resection in only 60-70% of patients, mostly due to insufficient growth. Kinetic growth rate (KGR) estimates the speed of growth and age, cirrhosis, diabetes and cholestasis may influence KGR. Malnutrition in patients with malignancy may be the only modifiable risk factor prior to PVE. This study investigates if sarcopenia indices correlate with KGR after PVE.

Methods: All patients requiring PVE and planned for liver resection at 3 centres between 2010 and 2019 were analysed retrospectively. Liver volumetry was assessed on pre- and postoperative CT and sarcopenia indices were assessed using Osirix Lite, Version 10.0.4.. Sarcopenia indices skeletal muscle area (SMI), subcutaneous adipose area (SAI) and visceral adipose area (VAI) were measured at the third lumbar vertebra (L3) and standardized to height (m²). Known factors impacting on KGR were assessed and a multivariate analysis performed using stepwise regression.

Results: Fifty-two patients were included. Mean age was 64 years. Gender distribution was 31:21 (m:f). Of these patients, 7% had diabetes, 13% cholestasis and 12% cirrhosis. After a median of 27 days median KGR was 2.91% (0.5%-11.2%). Sarcopenia was assessed by BMI and SMI and correlated significantly with KGR (R²=0.0796). P value SMI (p=0.0427) was more reliable than SAI (R²=-0.0008) and VAI (R²=0.0103).

Conclusion: Sarcopenia correlates with KGR and may be assessed when planning PVE. A prospective study could determine if nutritional intervention improves KGR and thereby increases resectability.

AB04

High intensity focused ultrasound for pancreatic cancer

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Background: In patients with locally advanced inoperable pancreatic cancer, treatment options are limited. High Intensity Focused Ultrasound (HIFU) treats solid tumours via thermal ablation. This non-surgical modality may be offered to patients unfit for surgery or with inoperable disease in conjunction with existing systemic therapy. There is currently evidence supporting its use for the treatment of pancreatic cancer in Western populations.

Method: This phase I/II trial will examine safety and efficacy of HIFU in the treatment of unfit or inoperable patients with non-metastatic pancreatic cancer. Twenty patients will be recruited from three UK HPB centres. Adverse events, mortality and 6 and 12 month tumour response data (RECIST) will be collected. Peripheral CD8 T lymphocyte receptor sequencing will be used to assess antigen specific immune responses.

Results/Discussion: The recruitment window opened in on 1.1.19. We anticipate that we will be able to report safety data on the initial patients by the ALPS meeting 2020. We will also share our experience of setting up an interventional early phase trial for pancreatic cancer which we feel will benefit the community.

AB05

Retrospective observational study of patient outcomes with local wound infusion vs epidural analgesia after major hepato-pancreato-biliary surgery

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Background: Epidural analgesia is conventionally used as the mainstay of analgesia in major abdominal surgery but has a small life-changing risk of complications (such as epidural abscesses or haematomas). Local wound-infusion catheters could be a viable alternative and are associated with fewer serious adverse effects. A retrospective observational study was conducted to compare outcomes of individuals undergoing open hepato-pancreato-biliary surgery, comparing these two methods of analgesia.

Methods: A retrospective observational analysis of individuals undergoing open hepato-pancreato-biliary surgery between Jan 2016 and Dec 2016 was undertaken. Patients either received epidural analgesia (EP) or a continuous wound infusion (WI) and were all part of an enhanced recovery program. Outcomes analysed included length of stay, post-operative complications, overall opioid use and commencement of oral diet.

Results: Between Jan 2016- Dec 2016, 95 patients were analysed (WI $n=30$, EP $n=65$). The median length of stay (days) was 9 in WI group and 8.5 in EP group ($p>0.05$), the median time to commencing oral diet (days) was 2.5 in WI group and 2 in EP group ($p>0.05$). The median amount of oromorph (mg), codeine (mg) and tramadol (mg) given to patients in the WI arm were 30, 240 and 600 respectively, compared to that of the EP arm of 30, 405 and 200, respectively ($p>0.05$).

Conclusions: Continuous wound infusion provided adequate analgesia to patients undergoing open hepato-pancreato-biliary surgery. It was non-inferior to epidural analgesia with respect to hospital stay, commencement of oral diet and post-operative complications.

AB06

Abstract Title: Impact of ERAS protocol with early oral feeding following pancreatic Whipple's procedure

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Background: Enhanced Recovery After Surgery (ERAS) following Whipple's pancreaticoduodenectomy is becoming increasingly popular. Early oral diet is fundamental to ERAS but often raises specific concerns following Whipple's procedure. Furthermore, there is a paucity of evidence supporting early feeding. This trial aimed to assess the impact of an ERAS protocol, including early oral feeding, on patient outcomes following Whipple's procedure.

Methods: An ERAS protocol with unrestricted diet commencing from postoperative day (POD) 1 was implemented for Whipple's patients at a tertiary hepatopancreaticobiliary unit. The intervention group was compared with a historical control group with a standard post-operative feeding regimen. Primary outcome was rate of delayed gastric emptying (DGE). Secondary outcomes were length of stay (LOS) and morbidity rates.

Results: 29 patients were prospectively recruited from February-August 2019. 36 matched patients from 2016-2017 were recruited into the standard care group. 82.8% of the ERAS group had established oral diet by POD 3. The rates of DGE were 3 (10.34%) in the ERAS group and 5 (13.98%) in the standard care group ($p=0.723$). There was no significant difference in rate of post-operative pancreatic fistula, overall LOS, or overall morbidity. However, there was a significant reduction in time spent in critical care (ERAS Median=3 [Range=1-7] days, standard care Median=6.5 [Range=1-8] days, $p=0.003$).

Conclusions: Early oral diet after Whipple's is a safe practice with no impact on DGE, LOS or morbidity. ERAS reduces time spent in critical care after Whipple's pancreaticoduodenectomy and therefore should be considered safe practice.

Real-time surgical margin assessment using ICG-fluorescence during laparoscopic and robot-assisted resections of colorectal liver metastases

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Background: Near-infrared fluorescence (NIRF) imaging using Indocyanine Green (ICG) is extensively studied for intraoperative detection of additional colorectal liver metastases (CRLM). However, lower dose of ICG injected 24 hours prior to surgery creates a highly specific fluorescent 'rim' around the CRLM caused by the accumulation of ICG in immature hepatocytes surrounding the metastatic lesion (fig. 1a,b). We hypothesize that by removing the entire fluorescent rim with the metastases included, the surgeon can effectively acquire a tumour-negative (>1mm) resection margin (fig. 1c,d).

Methods: A cohort of 16 subcapsular CRLM was composed using intraoperative NIRF images. CRLM were selected based on the presence or absence of NIRF signal in the resection plane, indicated by a protruding fluorescent rim (fig. 1e-h). A protruding fluorescent rim was registered as a potential tumour-positive resection, no fluorescent signal was registered as a tumour-negative margin respectively. Images were correlated to final histopathological outcome (fig. i-k).

Results: Eight robot-assisted and 8 laparoscopic procedures were performed respectively. CRLM which showcased a protruding rim *in vivo* were diagnosed as tumour-positive (<1mm) resections in 87.5% of cases. When no fluorescent signal was observed in the resection plane, 100% of cases were reported as tumour-negative resections. From this cohort, an intraoperative workflow was created to facilitate real-time margin assessment using NIRF imaging.

Conclusion: NIRF guidance has the potential to aid surgeons in acquiring a tumour-negative resection during minimal invasive resections of CRLM. The Dutch nationwide MIMIC-trial was designed to confirm results of this pilot trial in a prospective cohort (N=186).

Supporting Documents:

<https://www.jotform.com/uploads/acsglobal/92194422281354/4475748504819964853/ALPS%20abstract%20Achterberg.png>

Evaluating biomarkers for tumour-specific imaging of colorectal liver metastases

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Background: Surgical resection is currently the only curative treatment for patients with colorectal liver metastases (CRLM). Unfortunately, up to 29% of laparoscopic resections end in tumour-positive resection margins, resulting in impaired survival. Fluorescence-guided surgery using near-infrared imaging has been shown feasible during minimal invasive resections. Imaging tracers targeting tumour specific biomarkers are needed to enhance discrimination between malignant and normal tissue. The aim of this study was to identify suitable biomarkers present on CRLM using immunohistochemistry (IHC).

Methods: We evaluated the expression levels of carcinoembryonic antigen-related cell adhesion molecule 5 (CEACAM5), epithelial cell adhesion molecule (EpCAM), integrin $\alpha\beta6$, tumour-associated glycoprotein 72 (TAG-72) and urokinase-type plasminogen activator receptor (uPAR) in patients with colorectal cancer (CRC) and associated liver metastases. In a first cohort, IHC analysis was done in CRC and CRLM from 22 patients for biomarkers. Expression levels were compared to normal surrounding tissues. After an interim analysis the two most suitable biomarkers (CEACAM5 and EpCAM) were identified and selected for an expansion cohort of 59 patients.

Results: CEACAM5, EpCAM, integrin $\alpha\beta6$ and TAG-72 showed significant ($p < 0.001$) higher staining intensity and percentage tumour staining in CRLM compared to normal liver tissue (NLT). Furthermore, CEACAM5, EpCAM, integrin $\alpha\beta6$, TAG-72 and uPAR were expressed in respectively 94.4%, 98.8%, 77.3%, 77.3% and 14.3% of CRLM. CEACAM5 had a mean total immunostaining score (TIS) of 13.88 and EpCAM had a mean TIS of 17.20 in CRLM ($p < 0.001$)

Conclusion: CEACAM5 and EpCAM are optimal targets for tumour-specific near-infrared imaging in CRLM.

Supporting Documents:

<https://www.jotform.com/uploads/acsglobal/92194422281354/4475755484816179627/ALPS%20abstract%20Achterberg%20biomarkers.png>

AB09

Outcomes following surgery for liver and / or lung recurrence after liver resection for colorectal liver metastases

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Background: The recurrence rate after primary hepatectomy for colorectal cancer liver metastatic disease is approximately 60%. This study aimed to describe the timing and pattern of recurrence and evaluate the impact of repeated liver resections on overall survival.

Methods: Patients diagnosed with recurrent metastatic colorectal cancer (CRC) following primary hepatectomy were identified from our institutional prospective database, between January 2005 to April 2018.

Results: 158 patients were identified. Mean age was 66.7(SD 9.6) and 28%(n=44) were female. 52%(82/158) were diagnosed with isolated liver disease (LI), 32%(51/158) with isolated lung disease (LU) and 16%(25/158) with liver and lung disease (LL). Median recurrence free intervals were 10.5 months for LI group, 16.2 months for LU group and 5.7 months for LL group. Median overall survival periods were 43.4 months for LI group, 64.3 months for LU group and 24.3 months for LL group. Within the LI group patients that underwent repeated hepatic resections had a median overall survival of 62.8 months when compared to 34.5 months for the patients receiving chemotherapy alone. Patients who received repeated liver resections in the LL group had a median overall survival of 49.9 months when compared to 24.3 months in the LL group receiving chemotherapy alone.

Conclusions: Patients presenting early (< 6months) with recurrent CRC following primary hepatectomy are likely to have more than one site of metastatic disease. Repeated liver resections increase survival not only for patients presenting with liver disease alone, but also in those presenting with synchronous liver and lung metastatic disease.

AB10

Influence of patient factors and primary tumour factors on survival in patients undergoing curative surgery for colorectal cancer liver metastases

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Background: The best option for treatment with curative intent of colorectal liver metastases is liver surgery (resection or ablation). In this national registry study we examined primary tumour and patient factors at the time of surgery for the primary tumour which were prognostic also for survival after liver surgery.

Methods: Patients with radically resected primary colorectal cancer during 2009-2013 were identified in a population-based national colorectal registry and cross-checked in a national registry for liver tumours. Primary tumour and patient characteristics were analysed for prognostic factors.

Results: 20 853 patients had the primary tumour radical resected and in 39 percent (1325) of those registered with liver metastases surgery was performed. Age-standardized relative 5-year survival after radical resection of colorectal cancer was 81 percent (95 % CI: 80-81) and after surgery of colorectal liver metastases 50 percent (95 % CI: 46-53). High ASA score, postoperative complications after resection of the primary tumour, lymph node status and multiple sites of metastases were strong risk factors after both primary resection and after liver surgery. Gender, age and primary tumour location had no prognostic impact on mortality after liver surgery.

Conclusions: Some primary tumour and patient characteristics at the time of surgery of the primary tumour influence prognosis also after liver surgery. Lymph node status and complications after the primary resection have negative influence on outcome and also after liver surgery. On the contrary, old age and female gender while underrepresented in the liver surgery group, had no significantly negative influence on prognosis.

AB11

The benefit of adjuvant chemotherapy in the subtypes of resected ampullary adenocarcinoma: international propensity score matched study

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Background: At present, it is unclear whether patients with ampullary adenocarcinoma (AAC) gain a survival benefit from adjuvant chemotherapy and whether treatment effect differs between the histopathologic subtypes. The aim of this study was to compare survival between patients who did or did not receive adjuvant chemotherapy after resection of the various subtypes of AAC.

Methods: An international multicentre cohort study was conducted, including patients who underwent pancreatoduodenectomy for AAC (2006-2017). Propensity scores were used to match patients who received adjuvant chemotherapy to those who did not; in the entire cohort and in two subgroups (pancreaticobiliary/mixed and intestinal subtype). Survival was assessed using the Kaplan-Meier method and Cox regressions.

Results: Overall, 1163 patients underwent pancreatoduodenectomy for AAC. After excluding 179 patients, median survival in the resulting 976 patients was 67 months (95% CI 56-78). A total of 520 patients received adjuvant chemotherapy and 456 patients did not. In the matched cohort (194 vs 194 patients), median survival was not reached in patients receiving adjuvant chemotherapy group vs 60 months in the group without adjuvant chemotherapy, $P=0.05$. In the pancreaticobiliary/mixed subtype a survival benefit was seen; median survival was not reached in patients receiving adjuvant chemotherapy vs 32 months in the group without chemotherapy, $P=0.02$. The intestinal subtype did not show a survival benefit from adjuvant chemotherapy.

Conclusions: Patients with resected AAC of the pancreaticobiliary/mixed subtype may demonstrate a survival benefit with adjuvant chemotherapy whereas no benefit seems present in resected AAC of the intestinal subtype.

Towards personalized use of adjuvant therapy in patients with resected pancreatic cancer after neoadjuvant FOLFIRINOX: pan-European cohort

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Background: The aim of this study was to assess the treatment effect of adjuvant chemotherapy on overall survival (OS) in different subgroups who underwent pancreatic surgery following neoadjuvant FOLFIRINOX chemotherapy.

Methods: Retrospective multicentre, international cohort study within the European-African Hepato-Pancreato-Biliary-Association (E-AHPBA) including patients after resection of pancreatic cancer following neoadjuvant FOLFIRINOX chemotherapy (2012-2016). The effect of adjuvant chemotherapy on OS was evaluated in different subgroups by interaction terms in multivariable Cox analysis.

Results: In total, 494 patients (55% male, median age 61 years) were included by 29 centres from 22 countries. Of those, 331 patients (67%) received adjuvant chemotherapy. In the entire cohort, median OS was 37 months (95% CI 35-44 months). Including interaction terms for pathology parameters on multivariable Cox analyses, the interaction term for N stage reached significance (adjuvant therapy in pN+ patients HR 0.45 [0.25-0.80], adjuvant therapy in pN- patients HR 0.90 [0.49-1.65]). Median OS was 15 months longer in patients with pN+ status who received adjuvant therapy (35 vs. 20 months, $p < 0.001$), whereas in the pN- patients no survival difference was noted ($p = 0.34$).

Conclusions: In this international retrospective study, adjuvant chemotherapy appeared only useful in pancreatic cancer patients with node-positive (pN+) disease following neoadjuvant FOLFIRINOX. These findings should be confirmed by a randomised controlled trial.

AB13

Relation between quality of life and survival in pancreatic and periampullary cancer: a multicentre cohort analysis

Please contact registration@alpsbpbmeeting.org if you wish to contact the author.

AB14

Transatlantic comparison of design, baseline, and outcomes in nationwide audits on pancreatoduodenectomy in the USA, Germany, the Netherlands, and Sweden

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AB15

Ruptured hepatocellular carcinoma: Treatment with microwave ablation may offer additional benefit

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Background: The role of laparoscopic microwave ablation (MWA) for treatment of ruptured hepatocellular carcinoma (HCC) may serve to not only prevent hemorrhage but also have oncologic benefit.

Methods: Retrospective review identified patients with ruptured HCC between 2008 to 2018. Treatment algorithm consisted of trans-arterial embolization (TAE) then laparoscopic MWA with palliative intent.

Results: Fifteen patients were identified: 5 patients had one lesion, 5 patients had multifocal disease, and 5 patients had metastatic disease. Cirrhotic etiology included hepatitis C (n=6), hepatitis B (n=2), cryptogenic (n=4), alcoholic liver disease (n=1), and non-alcoholic fatty liver disease (n=2). Median tumour size on was 83mm (5-228). The majority (56%) underwent TAE followed by laparoscopic MWA and washout. Patients with contraindications to TAE (44%) went immediately for laparoscopic MWA. Three patients (20%) required additional treatment for bleeding after MWA: repeat TAE (n = 1) or return to operating room (n = 2). In-hospital mortality was 33% and 30-day mortality was 40%. Median follow-up was 18.2 months. Median survival, excluding 30-day mortalities, was 431 +/- 284 days. One-year survival was 72.2%; two-year survival was 44.4%; three-year survival was 22.2%. Six patients had post-operative imaging of which only one patient demonstrated recurrence. Possibility of recurrence was 11.1% in one-year.

Conclusion: We demonstrate improved rates of recurrence and survival in ruptured HCC; therefore, the role of laparoscopic MWA may serve to prevent hemorrhage and to have long-term oncologic benefit.

International validation and update of the Amsterdam model for prediction of survival after pancreatoduodenectomy for pancreatic cancer

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Background: The objective of this study was to validate and update the Amsterdam prediction model including tumour grade, lymph node ratio, margin status and adjuvant therapy, for prediction of overall survival (OS) after pancreatoduodenectomy for pancreatic cancer in a large international cohort.

Methods: All consecutive patients who underwent pancreatoduodenectomy for pancreatic cancer between 2000-2017 at 11 tertiary centres in 8 countries (USA, UK, Germany, Italy, Sweden, the Netherlands, Korea, Australia) were included. Model performance for prediction of OS was evaluated by calibration statistics and Uno's C-statistic. Validation followed the TRIPOD statement.

Results: Overall, 3,081 patients (53% male, median age 66 years) were included with a median OS of 24 months, of whom 38% had N2 disease and 77% received adjuvant chemotherapy. Predictions of 3-year OS were fairly similar to observed OS with a calibration slope of 0.72. Statistical updating of the model resulted in an increase of the C-statistic of 0.63 to 0.65 (95% CI 0.64-0.65), ranging from 0.62 to 0.67 across different countries. The area under the curve for the prediction of 3-year OS was 0.71 after updating. Median OS was 36, 25 and 15 months for the low, intermediate and high risk group, respectively (p<0.001).

Conclusions: This international study validated and updated the Amsterdam model for survival prediction after pancreatoduodenectomy for pancreatic cancer. The model incorporates readily available variables with a fairly accurate model performance and robustness across different countries. The risk groups and web-based calculator www.pancreascalculator.com facilitate use in daily practice and future trials.

AB17

GRRS (Glucose Relative Risk Score): a novel prognosis predictor of pancreatic ductal adenocarcinoma patients based on 3 cohorts

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Pancreatic ductal adenocarcinoma (PDAC) is one of the most deadly cancers worldwide. Most of cancer cells are irregularly highly dependent on glucose metabolism. And some of epidemiological research showed the positive relationship between Type II Diabetes and PDAC. However, the glucose related prognostic biomarkers are still being explored. Our study established a novel signature that can improve the ability to predict PDAC patients' prognosis. RNA expression data of tumour tissues from TCGA, ICGC and GEO were explored. A LASSO Cox regression model was utilized for choosing prognostic genes. A 21-mRNA signature that can distinguish high GRRS (Glucose Relative Risk Score) patients from low risk patients with significant differences in overall survival and progression-free survival (OS and PFS). We further validated this GRRS using both internal data and two independent cohorts and found that GRRS remained significant in different subgroups. Multivariate cox regression analysis showed that GRRS can be an independent prognostic marker in all cohorts. Receiver operating characteristic curve and C-index analysis showed that GRRS performed a better prognostic efficiency. Moreover, the gene set enrichment analysis (GSEA) analysis showed that several non-metabolism pathways are significantly associated with high GRRS, which means glucose-related genes could participate in tumourigenesis not only in metabolism way. In conclusion, GRRS could provide a novel method to evaluate clinical prognosis and enable individualized treatment for PDAC patients especially who has disorder of glucose metabolism. New therapeutic targets or drugs combination may be developed upon the functional analysis of the classifier genes and related pathways.

AB18

Conditional survival during follow-up after resection for pancreatic cancer: a population-based study and prediction model

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Treatment and survival of pancreatic cancer recurrence in the Netherlands – a nationwide analysis

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Background: Despite the high rate of disease recurrence after resection of pancreatic ductal adenocarcinoma (PDAC), Dutch and European guidelines for standardized follow-up are lacking. This has led to widely varying surveillance and treatment strategies. The impact of the current, non-standardized practice on incidence, treatment and survival of PDAC recurrence in the Netherlands is unclear.

Methods: A nationwide observational cohort study was performed, including all patients who underwent PDAC resection between 2014-2016. Data on follow-up and treatment of PDAC recurrence were collected retrospectively. Overall survival (OS) was evaluated by Kaplan Meier curves and multivariable Cox regression analysis, before and after propensity score matching. Survival analyses were stratified for symptomatic and asymptomatic patients.

Results: 836 patients with a median follow-up of 19 months (IQR 10-32 months) were analysed. 669 patients (80%) developed PDAC recurrence after a median disease-free interval of 11 months (IQR 6-17 months). Survival analyses showed that palliative treatment was independently associated with improved OS compared to best-supportive-care, for both symptomatic patients (HR 0.335 [95%CI 0.259-0.434]; $P < 0.001$) and asymptomatic patients (HR 0.345 [95%CI 0.216-0.550]; $P < 0.001$), in an unmatched and matched study-population ($P < 0.001$). Treatment was administered to 30% of patients with symptomatic PDAC recurrence and 44% of asymptomatic patients ($P = 0.002$).

Conclusion: This study shows that treatment of PDAC recurrence is independently associated with improved OS. As treatment was administered more frequently to asymptomatic patients, early detection and treatment of PDAC recurrence could potentially be beneficial. To determine the true value standardized follow-up imaging, however, prospective studies are needed.

Predicting early disease recurrence for individual patients after resection of pancreatic ductal adenocarcinoma

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Background: Despite treatment with (neo)adjuvant systemic therapy, almost all patients who undergo resection of pancreatic ductal adenocarcinoma (PDAC) develop disease recurrence. Especially PDAC recurrence within 12 months is associated with a very poor prognosis. The aim of this study is to identify pre- and postoperative risk factors for early disease recurrence after PDAC resection.

Methods: A nationwide observational cohort study was performed, including all patients who underwent PDAC resection between 2014-2016. Multivariable logistic regression was performed to identify pre- and postoperative risk factors for early recurrence (<12 months) after surgery. Preoperative predictors were used to develop a prognostic model. The discriminative ability of the model was quantified by the C-statistic.

Results: 836 patients with a median follow-up of 19 months (IQR 10-32) were analysed. 90 patients (11%) developed PDAC recurrence within 3 months; 191 patients (23%) within 6 months and 420 patients (50%) within 12 months. Preoperative risk factors were Charlson Age-Comorbidity Index (P = 0.004), CA 19-9 (P = 0.006) and tumour size (P = 0.001). The discriminative ability of the prognostic model including these factors was reasonable (C-statistic 0.63). Postoperative risk factors were venous resection (P = 0.006), R1 resection (<1 mm; P = 0.037), poor tumour differentiation (P = 0.004), neural invasion (P = 0.004), and number of positive lymph nodes (P < 0.001).

Conclusion: Various pre- and postoperative factors are independently associated with early disease recurrence after PDAC resection. After validation, the proposed model could contribute to shared-decision-making regarding management of PDAC patients in clinical practice.

The influence of patient age on treatment and survival in locally advanced pancreatic cancer

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Background: Treatment options and survival of patients diagnosed with locally advanced pancreatic cancer (LAPC) have improved due to the introduction of new chemotherapeutic regimens. It is unknown if elderly patients (i.e. ≥ 75 years) benefit from these improvements. This study aims to assess the influence of age on treatment and survival in patients with LAPC.

Methods: Consecutive patients diagnosed with LAPC were prospectively registered (April 2015 to December 2017). Patients were divided in groups according to age (<65, 65-74 and ≥ 75 years). Primary outcome was overall survival, compared for different age groups stratified by primary treatment strategy. Multivariable analyses were done to adjust for confounders.

Results: Overall, 422 patients with LAPC were included; 162 patients (38%) aged <65 years, 182 patients (43%) aged 65-74 years and 78 patients (19%) aged ≥ 75 years. All patient groups had comparable performance scores (WHO ps 0-1 in 89%, 81% and 73% respectively, $p=0.01$). Elderly patients were treated with chemotherapy less often (86%, 81% and 50%; $p<0.001$). Median overall survival in patients treated with best supportive care was 6, 3 and 4 months. Patients treated with chemotherapy had improved median overall survival (13, 14 and 10 months). Multivariate analyses demonstrated that an increase in age is associated with a decreasing probability to receive chemotherapy, but not with a decrease in overall survival.

Conclusion: Elderly patients with LAPC are less often treated with chemotherapy, despite good performance scores. Elderly patients, who are treated with chemotherapy have similar survival benefit as seen in younger patients with LAPC.

Treatment strategies and clinical outcomes in consecutive patients with locally advanced pancreatic cancer: the multicentre prospective PELICAN-cohort

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Background: Promising results of treatment strategies for locally advanced pancreatic cancer (LAPC) have been reported, mostly from single high-volume centers. Therefore, translation into daily clinical practice is unclear. The PELICAN-cohort provides data on treatment strategies and clinical outcomes within an unselected multicentre prospective cohort.

Methods: Consecutive patients with LAPC, were prospectively included from 14 centres (04/2015-12/2017). A restaging CT scan was performed after two months. A centralised expert panel reviewed response to chemotherapy and potential resectability. Primary outcome was survival.

Results: Overall, 422 patients were included. 77% (n=326) received chemotherapy, 21% (n= 87) best supportive care and 2% (n=9) other upfront treatment strategies. FOLFIRINOX was administered in 77% (252/326), gemcitabine monotherapy to 13% (41/326) and nab-paclitaxel/gemcitabine to 10% (33/326). mOS of the entire cohort was 10 months (95%CI 9-11). In patients treated with FOLFIRINOX, gemcitabine monotherapy or nab paclitaxel/gemcitabine, mOS was 14 (95%CI 13-15), 9 (95%CI 8-10), and 9 months (95%CI 8-10), respectively. A resection was performed in 10% (34/326) after chemotherapy, resulting in a 23 month (95%CI 12-34) mOS.

Conclusion: The PELICAN-cohort found a 10 month mOS in unselected patients with LAPC and 14 months after FOLFIRINOX treatment. These real world data will enable us to inform patients better and will support decision making in clinical practice.

Novel histology scoring system during normothermic machine perfusion of the liver

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Introduction: Ischaemia reperfusion injury (IRI) is an increasing problem in liver transplantation with the use of sub-optimal and donation after circulatory death organs. Currently, organ viability is judged on donor characteristics and macroscopic appearance at retrieval, which are both subjective. Normothermic machine perfusion (NMP) offers a platform for the dynamic assessment of liver function. we sought to devise a histological grading criterion capable of assessing the severity of IRI in a group of discarded liver grafts during NMP.

Methods: Core biopsies of livers during NMP (n=11) were assessed using PAS and standard H&E staining to identify features associated with IRI including steatosis, sinusoidal dilatation, bile duct necrosis, lobular necrosis, neutrophilic infiltration, and hepatocellular glycogen content. These histological criteria were used along with pump flow and pressure readings, in conjunction with biochemical and gas analysis of the perfusate and bile during NMP to assess their efficacy at predicting liver viability.

Results: The median histological IRI score at the beginning of perfusion was 5 (range 3 to 6). The score at the end of perfusion was 7 (range 4 to 11). We found that histological bile duct necrosis scores correlated inversely with perfusate alkaline phosphatase readings, suggesting traditional markers of liver damage may not be best suited in the NMP setting.

Conclusions: Our results demonstrate that NMP is a good platform for the histological assessment of IRI. Biopsy can be used in conjunction with donor history and standard NMP assessment criteria to aid organ viability decisions.

Supporting Documents:

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AB24

Perfusate glucose reflects tissue glycogenation during liver perfusion

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Introduction: Normothermic machine perfusion (NMP) is a novel method of organ preservation that aims to mimic the physiological environment during perfusion. This is achieved by perfusing the livers with a blood-based perfusate at physiological inflow pressures and temperature. NMP also permits viability assessment through evaluation of the perfusate flow rates through the portal vein and hepatic artery. In addition to this, biochemical assessment and perfusate gas analysis can be performed to provide an insight into the metabolic activity of the liver.

Methods: Discarded human liver grafts (n=11) were perfused for 24 hours. Core biopsies and perfusate samples were taken from each liver at 5 main time points: time 0, 1 hour, 6 hours, 12 hours, 24 hours. Core biopsies were fixed, stained with PAS, and subsequently analysed with Leica software to provide a quantitative estimate of hepatocellular glycogen content (HGC).

Results: HGC rose during the first hour, followed by a steady decline until the end of perfusion. Contrary to our initial hypothesis that glucose concentration within the circuit would show an inverse relationship to glycogen stores (as it was used up for glycogen synthesis), we found that it closely followed the same trend.

Conclusions: Change in HGC provides an important insight into the synthetic function of a liver destined for transplant. Our research suggests that glucose concentration can be used as a surrogate marker for synthetic liver function on NMP and provides valuable information on the glycogen-synthesising capability of hepatocytes. In future, this could aid organ viability decisions.

Supporting Documents:

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Methaemoglobinaemia can complicate normothermic machine perfusion of human livers

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Background: Normothermic machine perfusion (NMP) can improve early outcomes in liver transplantation and potentially act as a drug delivery platform. Several groups are researching novel therapeutics which require prolonged NMP of suboptimal grafts. Here we describe two cases of methaemoglobinaemia during prolonged liver NMP. Methaemoglobin (metHb) is the oxidised form of haemoglobin, and is incapable of peripheral oxygen delivery. Enzymes within red blood cells (RBC) usually convert metHb back to haemoglobin, preventing accumulation.

Methods: The NMP of two human livers rejected for transplantation are described. One liver was perfused using generic Medtronic™ perfusion equipment and one using the OrganOx metra®.

Results: The first liver (53yrs DBD) developed methaemoglobinaemia (metHb=2.4%) after 13 hours of NMP, increasing to metHb=19% at 16 hrs. Another liver (45yrs DBD) developed methaemoglobinaemia at 25 hrs (metHb=2.8%), which increased to metHb=28.2% at 38 hours of NMP. The following factors were present in both livers: severe steatosis on biopsy, weight over 2.2kg as well as excessive alcohol consumption in the donor (7-9Units/day). Neither liver was able to maintain physiological pH, and perfusate remained acidotic despite large volumes (<60ml) of additional sodium bicarbonate 8.4%. Delivery of methylene blue failed to reverse the methaemoglobinaemia.

Conclusions: Methaemoglobinaemia is a complication of prolonged perfusion of suboptimal liver grafts, and is not limited to a single machine or protocol. We hypothesise that a combination of impaired conversion of metHb into haemoglobin (haemolytic loss of protective RBC enzymes) and increased production (severe oxidative stress) shifts the balance towards accumulation of methaemoglobin.

Risk factors associated with anastomotic biliary complications in liver transplantation

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Background: Anastomotic biliary leaks and strictures are common early complications (EBC) following liver transplantation. We have previously demonstrated EBC can have a significant negative impact on graft and patient survival. Further analysis of the dataset was performed to identify operative factors amenable to intervention.

Methods: UK data on all adult liver transplants between 2006 and 2017 collected by NHSBT was reviewed (n=8304). Multiple binary logistic regression identified independent predictors of EBC, including adjusted analysis of 27 donor, recipient, and operative factors. Multiple imputations were performed to account for missing data.

Results: Overall, 464 patients (5.6%) and 455 patients (5.5%) experience biliary leak or stricture, respectively. Independent risk factors for biliary leak were: DCD donor (OR=1.37; P=0.02), Living donor (OR=9.30; P=0.04), split graft (OR=3.10; P<0.0005), second warm ischaemic time (OR=1.01; P=0.001), T-tube biliary anastomosis OR=1.54; P=0.03, and Chinese/Oriental donor ethnicity (OR=4.47; P=0.005). The only independent risk factor for biliary stricture was DCD donor (OR=1.351; P=0.017). Roux-en-Y biliary anastomoses significantly reduced risk of biliary stricture (OR=0.486; P<0.0005). Cold ischaemic time, donor/recipient age and UKELD/MELD score were not predictors of EBC. Leak rates stratified by biliary anastomosis type were: duct-to-duct=5.2%, T-tube=10.9%, Stent=10%, Roux-en-Y =6.4% (P<0.0005). Stricture rates were: duct-to-duct=6.0%, T-tube=4.2%, stent=2.5%, Roux-en-Y=3% (P<0.0005).

Conclusion: Grafts from DCD donors are at increased risk of EBC. To reduce this risk, surgeons should carefully consider the anastomosis type. Roux-en-Y anastomosis has the lowest biliary complication rate. Stents and T-tubes should be avoided in liver transplantation. Aggressive attempts should be made to minimise the second WIT.

AB27

Hilar cholangiocarcinoma is a high-risk indication for percutaneous internal biliary drainage – a single centre experience

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Background: Biliary drainage for hilar cholangiocarcinoma is most frequently indicated to facilitate potentially curative surgical resection, to facilitate palliative chemotherapy or for symptomatic relief of jaundice. Percutaneous drainage options include external drainage, intrahepatic biliary stenting alone, or transampullary internal drainage.

Methods: Retrospective review of outcomes for consecutive percutaneous biliary drainage procedures for hilar cholangiocarcinoma in a single high-volume centre from 1/1/2016 to 31/12/2018. All indications were included. Technical success defined as a decrease in serum bilirubin by 20% at day 7. Acute pancreatitis was diagnosed according to the revised Atlanta classification and cholangitis was recorded as a clinical diagnosis within 14 days.

Results: Over the three year study period, 58 patients with a diagnosis of hilar cholangiocarcinoma underwent percutaneous biliary drainage (11 with intention for surgery, 28 with intention for palliative chemotherapy and 19 for symptom control). Overall success of biliary drainage was 93%. However internal (transampullary) drainage was complicated by pancreatitis in 18.8% of patients and cholangitis in 33.3%. 3/11 (27%) of patients did not proceed to surgery and 50% (14/28) of patients did not proceed to palliative chemotherapy due to complications from PTBD.

Conclusions: This small single-centre study highlights hilar cholangiocarcinoma as a particularly high-risk group for percutaneous internal biliary drainage in our experience. Further research is required to determine if, in the context of a non-obstructed pancreas, drains or stents that traverse the ampulla should be avoided. EUS-guided trans-gastric intrahepatic biliary drainage may emerge as an attractive alternative solution.

AB28

Textbook outcome in patients undergoing laparoscopic versus open liver surgery using a propensity score-based analysis

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Background: Quality measurement regarding laparoscopic liver surgery(LLS) has relied on assessing individual surgical outcome parameters. Textbook outcome(TO) is a composite measure that captures the most desirable surgical outcomes into a single indicator reflecting on the whole surgical process and holistic patients' journey. The objective of this study is to define TO for liver surgery and assess the impact of LLS compared to open liver surgery(OLS) in a tertiary referral centre in terms of achieving TO using a propensity score matched analysis. In addition, we will evaluate factors affecting the achievement of TO in both groups.

Methods: Our database of liver surgery between March 2004 and March 2019 will be reviewed. Patients who underwent LLS or OLS for all indications will be included. An international survey will be conducted among all members of the European-African Hepato-Pancreato-Biliary Association (E-AHPBA) and International Hepato-Pancreato-Biliary Association (IHPBA) specialized in liver surgery to reach consensus on the definition of TO in LLS and OLS (November 2019).

Results & Conclusion: This study aims to define TO for LLS and OLS by conducting a survey among E-AHPBA and IHPBA members. TO parameters defined by this survey will be assessed and compared for LLS and OLS in our liver surgery database. Factors influencing TO will be investigated.

AB29

One-or two-stage laparoscopic right hemihepatectomy after portal vein embolization in patients with initially unresectable colorectal liver metastases: technical aspects and clinical results

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Background: The use of the laparoscopic approach in one-stage or two-stage right hemihepatectomy (RHH) after portal vein embolization (PVE) in patients with initially unresectable colorectal liver metastases (CRLMs) is technically demanding. Currently, there is limited data regarding the technique and results regarding safety and feasibility. This paper reports our results, techniques and variety of tips and tricks to facilitate this resection.

Methods: A prospectively maintained database of laparoscopic liver surgery between August 2003 and March 2019 was reviewed. Patients with initially unresectable CRLMs undergoing laparoscopic (extended) RHH after PVE in the context of a one or two-stage procedure were included.

Results: A total of 19 patients with initially unresectable CRLMs underwent laparoscopic RHH after PVE. Twelve patients (63.2%) had RHH in the context of a two-stage hepatectomy and 7 as a one-stage procedure. Mean operating time was 351.8 ± 80.5 minutes. Median blood loss was 850 mL (IQR, 475-1350 mL). Conversion to open surgery occurred in 2 of 19 cases (10.5%). Severe postoperative morbidity occurred in 2 patients. The mortality rate was 5.3%. Median postoperative hospital stay was 5 days (IQR, 4-7 days). Radical resection was obtained in eighteen patients (94.7%).

Conclusion: Laparoscopic RHH after PVE in the context of a one- or two-stage resection in patients with initially unresectable CRLMs is a safe and feasible procedure with favourable oncological outcomes.

AB30

Quality of life for patients undergoing major hepatectomy appears to be better with minimally invasive surgery

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Introduction: Factors related to quality of life (QoL) after major hepatic resection are unclear. We sought to determine if this could be assessed and measured.

Methods: Patients undergoing hepatic surgery were asked to complete the Quality of Recovery 15 (QoR-15) survey and Patient-Reported Outcomes Measurement Information System (PROMIS) survey perioperatively. Demographics, operative details, length of stay, and complications were retrospectively recorded. Data was analysed with student's t-test or χ^2 .

Results: Between April 2018 and September 2019, 105 patients planned for major hepatectomy were enrolled. 59 (56.2%) patients completed a QoR-15 survey while 27 (25.7%) patients completed a PROMIS survey. Patients with minimally invasive (MI) surgery were more likely to complete a survey (38.2% vs 66.2%; $p=0.0067$). No differences in demographics between the two groups were noted. MI hepatectomy patients had shorter length of stay ($p=0.0002$) and fewer complications ($p=0.0007$). Preoperatively, QoR-15 survey MI hepatectomy patients had more favorable responses to 7 elements, less favorable responses to 4 elements, and similar responses to 4 elements. Postoperatively, MI hepatectomy patients had more favorable responses to 6 elements, less favorable responses to 4 elements, and similar responses to 5 elements. For the PROMIS survey MI hepatectomy patients had more favorable responses to 2 elements, less favorable responses to 1 element, and similar responses to 7 elements.

Conclusion: This demonstrates that assessment of QoL after major hepatic resection is feasible. There are differences in QoL between open and MI hepatectomy patients possibly favoring MI hepatectomy however further studies are needed to elucidate these differences.

Supporting Documents:

<https://www.jotform.com/uploads/acsglobal/92194422281354/4475100153345194771/AHPBA%20Abstract%20Hep%20QoL%20Table%201.docx>

AB31

A randomised controlled trial of laparoscopic and robotic simulation training in gastrointestinal surgery

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Minimally invasive surgery (MIS) is increasingly becoming the standard technique for a range of surgical procedures. This is the first randomised controlled trial comparing laparoscopic and robotic training of novice surgeons and the surgically naive in human cadavers.

Junior surgical trainees (JST) were randomised to laparoscopic or robotic groups. Trainees were excluded if they performed >10 laparoscopic/robotic cholecystectomies. Each had standardised simulation training then performed cholecystectomy, continuous suturing of gastrostomy and interrupted suturing of an enterotomy on frozen cadavers. A cohort of medical students (MS) were similarly randomised, had standardised training then performed interrupted closure of gastrostomy. Procedures were timed and video recorded for independent scoring by two expert robotic and laparoscopic surgeons. Primary outcome was Global Rating Score (GRS).

10 JSTs and 10 MS were randomised to each of the laparoscopic and robotic groups. There was no difference in their baseline characteristics including previous laparoscopic and robotic surgery and level of training. In the JST cohort, the robotic group had a better GRS scores (27 +/-6) compared to laparoscopic group (18 +/-5, $p < 0.001$). They also performed significantly more suture loops per time unit and committed fewer suturing errors (8.25 +/-4 vs 29.50 +/-8 errors, $p < 0.001$). Similarly, in the MS cohort, the robotic group had a significantly higher GRS, performed more interrupted sutures per unit time and committed significantly fewer suturing errors.

Our data suggest a faster acquisition of MIS skills with robotic platforms compared to laparoscopy. Earlier introduction of robotic training in established procedures may result in rapid attainment of MIS proficiency.

HCC in obese patients: the role of laparoscopic hepatectomy

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Background: Obese population is increasing in the world including Japan, and the morbidity rate of obesity-related diseases is rising. While HCV-related or HBV-related hepatocellular carcinoma (HCC) is decreasing, the incidence of HCC with non-alcoholic fatty liver disease derived from obesity, diabetes and so on is increasing year by year. In this session, we verify the effect of obesity on surgery for HCC, including laparoscopic surgery.

Methods: We examined the influence of body mass index (BMI) on perioperative results by operative procedure and long-time results including survival time for 557 patients who underwent hepatectomy for HCC at Tokyo Medical and Dental University from 2005 to 2016. BMI was evaluated according to the criteria by WHO classification (Underweight, Normal range, Overweight and Obesity).

Results: In all cases, 154 patients (27.6%) were classified as overweight group ($25.0 \leq \text{BMI} < 30.0$), and 26 patients (4.7%) were as obesity group ($30.0 \leq \text{BMI}$). No difference was found in tumour factors (tumour diameter, AFP, PIVKA II) and surgical procedure in comparison between each group. High BMI was associated with nonB-nonC related HCC, high ICG - R 15 values, long operative time, and increased blood loss. However, there was no difference in postoperative complications and postoperative hospital stay for each BMI group. Laparoscopic hepatectomy was performed on 74 patients, and in laparoscopic hepatectomy, bleeding volume and morbidity rate was low, and postoperative hospital stay was short, regardless of BMI or surgical procedure than in open hepatectomy. Overall survival showed the poorest prognosis in the underweight group, and almost the same better survival rate in the other 3 groups including the Obesity group, and analysis of disease free survival revealed similar results.

Conclusion: Surgery for obese patients with HCC did not lead to an increase in complication rate or extension of hospital stay, and was feasible in long-term results. Laparoscopic hepatectomy for patients with high BMI contributes to reduction of blood loss and complication rate, and shortening of hospital stay.

The impact of enhanced recovery on open and laparoscopic liver resections

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Background: Enhanced recovery after surgery programs (ERP) have been implemented in many surgical specialties. Their impact in liver surgery is poorly understood and approach-specific ERPs have not yet been assessed. This retrospective study aims to analyse the effect of such programs on liver resection.

Methods: All patients undergoing liver resection at a tertiary referral centre between January 2009 and December 2016 were identified and length of stay, functional outcome, complications and readmission rates were measured. Patients in the ERP with different protocols for open, laparoscopic, major and minor resections were compared to a historical cohort.

Results: A total of 412 patients were included in the pre-ERP and 375 in the ERP group. After open surgery, days to functional recovery was shorter in ERPs [Oral intake 5 (4-5) vs 4 (3-5), $p<0.001$; first flatus 4 (3-4) vs 3 (2-4) $p<0.001$; mobilization 5 (4-7) vs 5 (4-6) $p=0.014$] and less patients developed major complications [22 (12) vs 8 (5) $p=0.036$]. Patients undergoing laparoscopic resection, ERP only led to a lower readmission rate [21 (9%) vs 8 (4%) $p=0.017$]. After open major resections, median LOS [8 days (interquartile range (IQR) 6-13) vs 7 days (IQR 5-9), $p=0.006$] in the ERP group. Uni- and multivariable analysis showed that ERPs and laparoscopy were associated with a shorter LOS.

Discussion: ERPs offer significant advantages in open liver surgery. Those advantages are less evident after laparoscopic resection. Laparoscopy itself appears to be one of the main attributable factor for benefits of an ERP.

Laparoscopic versus open right posterior sectionectomy: a multicentre propensity score matched evaluation

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Background: Although laparoscopic liver resection has now become the standard for minor resections, high level evidence is lacking whether it should be standard based practice for more complex resections such as right posterior sectionectomy (RPS). The aim of the current study is to compare surgical and oncological outcomes between laparoscopic (LRPS) and open right posterior sectionectomy (ORPS).

Methods: This was a multicentre retrospective analysis comparing patients undergoing LRPS or ORPS in 9 different centres from 6 European countries (January 2007 - December 2018). Patients were matched based on propensity scores in a 1:1 ratio. Co-variables selected for matching were: age (<75 or ≥75 years), sex, ASA classification, neoadjuvant chemotherapy, previous abdominal and liver surgery, cirrhosis and one or multiple lesions. Perioperative outcomes were blood loss, operative time, length of stay, the rate of Accordion score ≥ 3 complications and R0 resection rate.

Results: in total 399 patients were included of which 139 LRPS could be matched with 139 ORPS. Operative time, R0 resection rate and Accordion grade 3 or higher complications were not statistically significantly different for LRPS and ORPS, respectively. However, LRPS was associated with less blood loss [250 (190-400) mL vs. 400 (200-548) mL p=0.007] and a shorter length of hospital stay [5 (4-7) days vs. 7 (6-10) days, p=0.004].

Conclusion: This propensity score matched multicentre study showed an advantage in favour of LRPS in terms of blood loss and length of stay without differences in operative time, major complications and R0 resection rate.

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Laparoscopic duodenopancreatectomy vs open duodenopancreatectomy: learning curve and results

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Background: Laparoscopic duodenopancreatectomy (LDP) has rapidly expanded in the last years. Despite technical advances, LDP continues to be a surgical challenge entailing high morbidity and mortality. Progressive steps of technical refinement have been proposed for ensuring patient safety.

Methods: The aim of this study is to present our experience and results in the standardization of this procedure. Results Last 28 consecutive LDP for malignant conditions have been assessed and compared with an open duodenopancreatectomy (ODP) historical cohort. No significant differences were found in blood loss, length of stay, postoperative pancreatic fistula and Clavien–Dindo grades of complication. We had no mortality reported in this series. Conversion to an open procedure was needed in 8 (28.6%) patients, only in 4 patients (14.3%) for completing reconstruction. Lower median operative time (284 vs. 321 min; $P = 0.08$) observed in the OPD. No significant differences between both groups in oncological outcomes (number of lymph nodes retrieved and resection margins between) were found.

Conclusions: There are no statistically significant differences between LDP and ODP. Previous experience in pancreatic surgery and surgeon/institution volume are essential in surgical outcomes. Formal, structured and specific training is mandatory and should be encouraged for LDP implementation. Further studies are needed to clarify competency, learning curve and patient/oncological results of LDP.