P 22. A NOVEL TOOL TO PREDICT NODAL METASTASIS IN SMALL PANCREATIC NEUROENDOCRINE TUMORS – A MULTICENTER STUDY

AA Javed, A Pulvirenti, J Zheng, T Michelakos, Y Sekigami, S Razi, CA McIntyre, E Thompson, DS Klimstra, V Deshpande, AD Singhi, MJ Weiss, CL Wolfgang, JL Cameron, AC Wei, AH Zureikat, CR Ferrone, J He, Pancreatic Neuroendocrine Disease Alliance (PANDA)
Presenter: Ammar A. Javed MD | Johns Hopkins University School of Medicine, United States

Background: NF-PanNETs display a wide range of biological behavior and ND is associated with metastatic disease and poorer survival. The aim was to develop a tool to predict nodal disease in patients with small (≤2cm) Non-functional pancreatic neuroendocrine tumors (NF-PanNETs).

Methods: A multicenter retrospective study was performed on patients undergoing resection for small NF-PanNETs. Patients with genetic syndromes, metastatic disease at diagnosis, neoadjuvant therapy or positive resection margin were excluded. Factors associated with ND were identified to develop a predictive model. Internal validation was performed using bootstrap with 1000 resamples.

Results: ND was observed in 39 (11·1%) of the 353 patients included. Presence of ND was significantly associated with lower 5-year disease-free survival (71·6% vs 96·2%, p< 0·001). Two predictors were strongly associated with ND: G2 grade (OR:3·51, 95%CI:1·71-7·22, p=0·001) and tumor size (per mm increase, OR:1·14, 95%CI:1·03–1·25, p=0·009). Adequate discrimination was observed with an area under curve of 0·71 (95%CI:0·63–0·80). Based on risk distribution three risk groups of ND were identified; low (< 5%), intermediate (≥5% to < 20%), and high (≥20%) risk. The observed mean risk of ND was 3·7% in the low-risk, 9·6% in the intermediate-risk, and 30·4% in the high-risk patients (p< 0·001). The 10-year disease free survival in the low-, intermediate-, and high-risk groups was 100%, 88·8%, and 50·1%, respectively.

Conclusion: Our model using tumor grade and size can predict ND in small NF-PanNETs. Integration of this tool into clinical practice could help guide management of these patients.

P 23. NECROTIZING PANCREATITIS-ASSOCIATED ANXIETY, DEPRESSION, AND STRESS: INCIDENCE, RISK FACTORS, AND TARGETS FOR INTERVENTION

S McGuire, T Maatman, K McGreevy, A Montero, E Ceppa, M House, A Nakeeb, T Nguyen, C Schmidt, N Zyromski

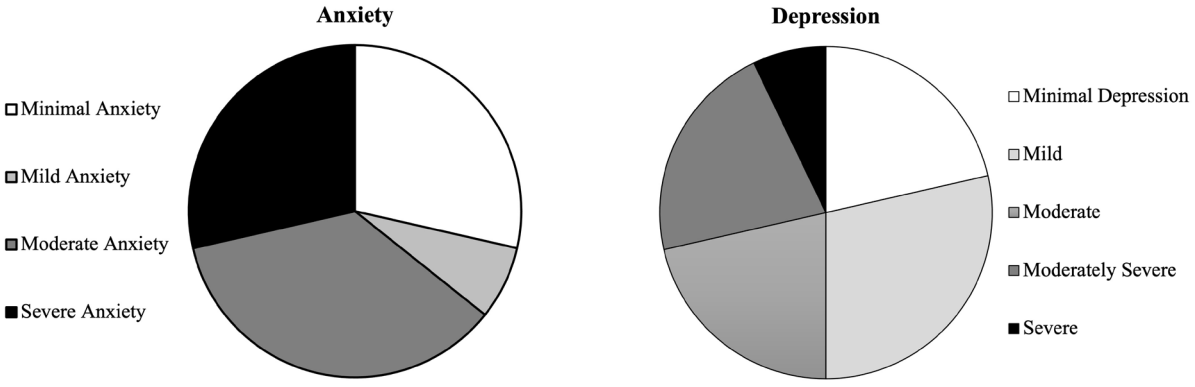
Presenter: Sean McGuire MD | Indiana University School of Medicine, United States

Background: Mental health sequelae of necrotizing pancreatitis are unknown. We sought to prospectively quantify symptoms of anxiety, depression, and post-traumatic stress disorder (PTSD) in patients with necrotizing pancreatitis.

Methods: Adult patients with active necrotizing pancreatitis were prospectively screened for anxiety using the General Anxiety Disorder-7 (GAD7), depression using the Patient Health Questionnaire-9 (PHQ9), and PTSD using the PTSD Checklist for DSM-5 (PCL5).

Results: Fifteen patients were screened at an average of 3.5 mos. after disease onset. Positive screening for anxiety and depression was extremely common: 73% met criteria for anxiety and 80% met criteria for depression (Figure). PTSD was less common (13%) at this screening timepoint. Prior mental health diagnoses, time from disease onset to screening, readmission profile, and mechanical intervention profile were not risk factors for the development of anxiety, depression, or PTSD symptoms. Patients diagnosed with anxiety and/or depression had more severe necrotizing pancreatitis: computed tomography severity index (CTSI) was higher in patients with anxiety (6.7 $\pm$ 2.1 vs 6.5 $\pm$ 1.0, p = 0.05) and depression (6.9 $\pm$ 2.0 vs 5.7 $\pm$ 0.6, p = 0.04). Infected necrosis, ICU admission, and organ failure were higher in patients with anxiety and depression though not reaching statistical significance. Patients are currently being enrolled in a mindfulness-based intervention.

Conclusion: Necrotizing pancreatitis carries a high risk of impaired mental health. Severe disease carries a higher risk of impaired mental health. Identifying and treating impaired mental health during necrotizing pancreatitis disease course should be standard.



P 24. THE ROLE OF MARGIN CLEARANCE ON PROGNOSIS AMONG STAGE IIB AND III PANCREATIC DUCTAL ADENOCARCINOMA PATIENTS ACCORDING TO STANDARDIZED HISTOPATHOLOGICAL EVALUATION.

R Ahola, E Zwart, B Kurlinkus, A Halimi, BS Yilmaz, G Belfiori, K Roberts, R Pande, P Maisonneuve, C Verbeke, GO Ceyhan, J Laukkarinen

Presenter: Reea Ahola MD, PhD | Tampere University Hospital, Finland

Background: The aim of a pancreatic resection for pancreatic ductal adenocarcinoma (PDAC) is R0 resection. The proportion of R0 is depended on the histopathologic slicing technique. The aim of this study was to analyse the effect of margin widths on survival and recurrence among PDAC patients whose specimens were analysed according to a standardized axial method.

Methods: Multicentre databases were searched for pancreatic resections performed for stage IIB PDAC between 2012 and 2017. Patients with R2 resection or neoadjuvant therapy were excluded. The TNM-classification was updated according to the 8th version and stage IIB and stage III were analysed separately. Data on demographics, histopathology and oncologic treatment was recorded. The overall survival (OS) and disease free-survival (DFS) was analysed according to the minimum reported margin clearance (MRM) cutoffs 0mm, 0.5mm, 1mm and 2mm. Both uni- and multivariate analysis were performed.

Results: The study population consisted of 302 stage IIB and 360 stage III PDAC patients. Among stage IIB patients 22% had an MRM of 0 mm, 59% over 0.5mm, 36% over 1mm and 12% over 2mm. Sixty-six percent of them received adjuvant therapy. Multivariable analysis showed that preoperative larger tumour size, not receiving adjuvant therapy and poor differentation stage were associated with shorter OS. Among stage III 22% of the patients had an MRM of 0mm, 54% over 0.5mm, 33% over 1mm and 7.8% over 2mm. Sixty-one percent of patients with stage III disease received adjuvant therapy. Multivariable analysis showed that not receiving adjuvant therapy, male sex was, ASA-class 3-4 and high preoperative CA19-9 value were associated with shorter OS.

Multivariate analysis showed that among stage IIB patients, shorter DFS was associated with larger tumour size. Among stage III, shorter DFS was associated with high preoperative CA19-9 value, not receiving adjuvant therapy and MRM under 0.5mm.

Conclusion: Overall MRM seems to not play a dominant role in the overall survival of PDAC among patients with nodal involvement. Receiving of adjuvant therapy is associated with longer OS.

P 26. SHOULD SERUM CA125 BE USED IN CLINICAL PRACTICE AS PREDICTIVE MARKERS OF SURVIVAL IN PANCREATIC DUCTAL ADENOCARCINOMA?

N Napoli, EF Kauffmann, M Ginesini, C Gianfaldoni, A Salomone, A Di Dato, M Caradonna, M Vimercati, C Cappelli, D Campani, F Vistoli, U Boggi
Presenter: Niccolo Napoli MD | University of Pisa, Italy

Background: Carbohydrate antigen 125 (CA 125) encoded by mucin 16 (MUC16) and up-regulated by KRAS/ERK axis (Mol cancer Res, 2017) is emerging as a new serum marker of poor prognosis in pancreatic ductal adenocarcinoma (PDAC) (Oncotarget, 2016), probably promoting pancreatic cancer cell motility and development of distant metastasis (Sci Rep, 2013).

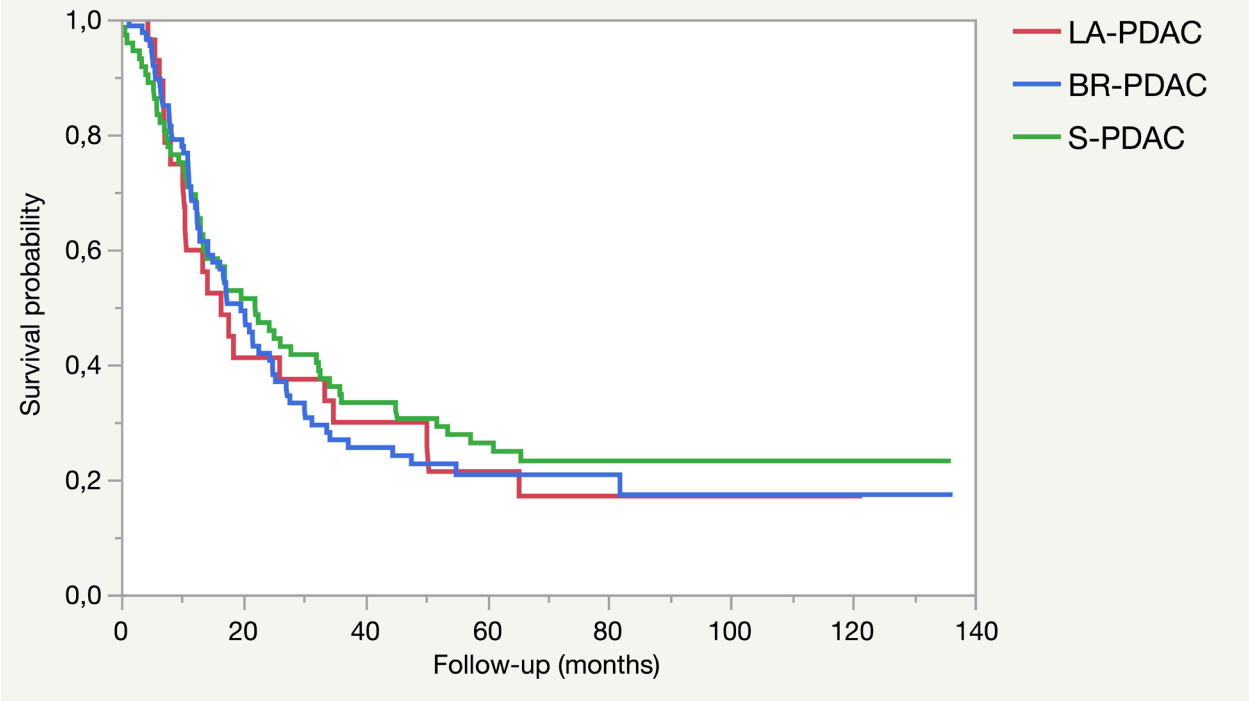
Nevertheless, it appears strange that this marker has not yet been extensively introduced into clinical practice to evaluate the survival of patients with PDAC. To further investigate this role, herein we evaluated its ability to predict survival in our patient underwent surgical resection for PDAC, taking into account the stage of neoplasm.

Methods: Data regarding patients with PDAC underwent pancreatic resection at our institution between 2010 and 2016 were prospectively collect and retrospectively analyzed. Only patients with all preoperative and follow-up data available were considered. Patients operated before 2010 were excluded due to the lack of effective neoadjuvant therapies for locally advanced PDAC. Patients operated after 2016 were excluded due to the short duration of follow-up. Kaplan-Meier curve and Log-rank test were used to evaluate the overall survival (OS) in patient with standard (S-PDAC), borderline (BR-PDAC) and locally advanced (LA-PDAC) PDAC. Cox proportional-hazard regression was used to evaluate the role of CA125 in predicting survival. The last value of CA125 before surgery was considered.

Results: We considered 188 patients with PDAC underwent to pancreaticoduodenectomy (n=118; 62.8%) and total pancreatectomy (n=70; 37.2%). Seventy-three (38.8%) S-PDAC (localized to the pancreas), 87 (46.2%) BR-PDAC and 28 (14.9%) LA-PDAC were included. The median OS was 22.1 (10.3-61), 19.7 (11.1-44.6) and 16.4 (8.1-50.5) months in the S-PDAC, BR-PDAC and LA-PDAC (p=0.75), respectively (figure 1). Preoperative serum level of CA125 predicted survival in patient with BR-PDAC (RR= 6.17, IQR=1.20-22.4, p=0.01) and LA-PDAC (RR=18.7, IQR=2.42-123.1, p=0.003), but not in S-PDAC (RR= 4.53, IQR=0.57-18.26, p=0.13).

Conclusion: In our patient cohort serum level of CA125 predicts OS in BR-PDAC and LA-PDAC, but not in S-PDAC. Probably, in the first two groups the up-regulation of CA125/MUC16 favors the onset of distant micro-metastases, which lead to a poor long-term prognosis despite the effective neoadjuvant chemotherapy and the radical surgery. In the latter group, this pattern fails to affect prognosis with the same significance.

Even if these results need to be confirmed in large series, they suggest as the serum level of CA125 should be introduced extensively into clinical practice of PDAC.


1,0
0,8
0,6
0,4
0,2
0,0
Survival probability
0
20
40
60
80
100
120
140
Follow-up (months)
LA-PDAC
BR-PDAC
S-PDAC

P 29. AN AGE-BMI COMPOUND VARIABLE PREDICTS MORBIDITY AND MORTALITY FOLLOWING WHIPPLE: A NSQIP ANALYSIS

HH Khachfe, AY Hammad, S AlMasri, H Liu, A deSilva, KK Kraftician, K Lee, AH Zureikat, A Paniccia
Presenter: Hussein H. Khachfe MD | University of Pittsburgh Medical Center, United States

Background: Pancreaticoduodenectomy (PD) is the surgical therapy of choice for periampullary lesions including pancreatic head tumors and select iatrogenic and inflammatory conditions. We sought to explore the impact of age and BMI in determining outcomes of PD.

Methods: The ACS-NSQIP pancreatectomy targeted file was used to identify PDs from 2014-2019. Patients were stratified into eight different categories according to a compound age-BMI variable and risk-adjusted. Age of 65 years was set for young vs elderly. Obesity was classified as class I (BMI 30-35), class II (BMI 35-40), and class III (BMI >40). Young-normal/overweight-(BMI< 30) was considered as the reference group.

Results: A total of 6,727 patients who underwent PD were included in our study. Thirty-day mortality occurred in 119 (1.7%) patients, with the highest rate in elderly obese-class II in 13 (5.95%). Overall morbidity was evident in 49.1% (n=3305) of patients. Elderly-obese class II patients also had the highest rate of any complication at 61.9% (n=135). On multivariate analysis, elderly-obese class II patients had the highest risk of developing any complication (OR 1.92, p-value < 0.001), while elderly-obese class III (OR 7.91, p-value < 0.001) had the highest risk for 30-day mortality. Young-obese class III patients demonstrated the highest risk (OR 2.43, p-value < 0.001) for development of clinically relevant postoperative pancreatic fistula. Male sex and Hispanic race are predictors for morbidity and mortality.

Conclusion: Patients may be stratified preoperatively based on a combined age-BMI variable. Sex and Hispanic race are also major predictors of adverse postoperative outcomes. Further refinement of the compound variable might still be necessary, but the current model allows for improved risk stratification of patients undergoing PD.

		Overall Morbidity				CR-POPF			
			95% CI				95% CI		
		Odds Ratio	Lower	Upper	p-value	Odds Ratio	Lower	Upper	p-value
Sex (Female)		0.82	0.74	0.91	0.88	0.72	0.63	0.83	<0.001
Race	White	**REF**				**REF**			
	African American	0.98	0.81	1.18	0.88	0.72	0.55	0.96	0.025
	Other	1.20	1.01	1.43	0.036	1.28	1.07	1.53	0.006
Type of Whipple	Classic w PJ	**REF**				**REF**			
	Classic w/o PJ	1.10	0.71	1.71	0.668	0.89	0.51	1.56	0.692
	PP w PJ	0.97	0.87	1.08	0.688	1.29	1.12	1.48	<0.001
	PP w/o PJ	1.14	0.71	1.83	0.586	0.66	0.31	1.39	0.283
Approach	Open	**REF**				**REF**			
	Laparoscopic	0.79	0.62	1	0.059	0.77	0.55	1.09	0.146
	Robotic	0.90	0.73	1.83	0.586	0.87	0.66	1.15	0.352
Age-BMI Category	Young-Normal	**REF**				**REF**			
	Young-Obese Class I	1.1	0.91	1.33	0.322	1.33	1.04	1.69	0.019
	Young-Obese Class II	1.36	1.02	1.8	0.032	1.64	1.18	2.29	0.003
	Young-Obese Class III	1.58	1.11	2.25	0.01	2.43	1.65	3.58	<0.001
	Young-Underweight	1.26	0.75	2.11	0.378	0.97	0.47	2	0.944
	Elderly-Normal	1.13	1	1.28	0.046	0.86	0.73	1.01	0.076
	Elderly-Obese Class I	1.48	1.22	1.78	<0.001	1.49	1.19	1.87	0.001
	Elderly-Obese Class II	1.92	1.43	2.58	<0.001	1.57	1.09	2.19	0.014
	Elderly-Obese Class III	1.70	1.03	2.78	0.035	2	1.17	3.44	0.011
	Elderly-Underweight	0.80	0.51	1.29	0.371	0.633	0.3	1.32	0.227

P 30. PANCREATIC CANCER INCIDENCE AND MORTALITY: 27-YEAR TRENDS FROM THE PENNSYLVANIA CANCER REGISTRY

J Pham, W Wong, V Walter, C Vining, M Dixon, J Peng
Presenter: Jonathan Pham BS | Penn State College of Medicine, United States

Background: Pancreatic cancer (PC) is one of the deadliest malignancies, with an estimated 331,000 deaths annually worldwide. In the United States, there were an estimated 60,430 new cases and 48,220 deaths in 2021, an increase of 37.2% and 28.0%, respectively, over 10 years. This study aims to examine incidence and mortality from pancreatic cancer using a state-wide cancer registry, focusing on disparities in race, gender, and urban/rural residency.

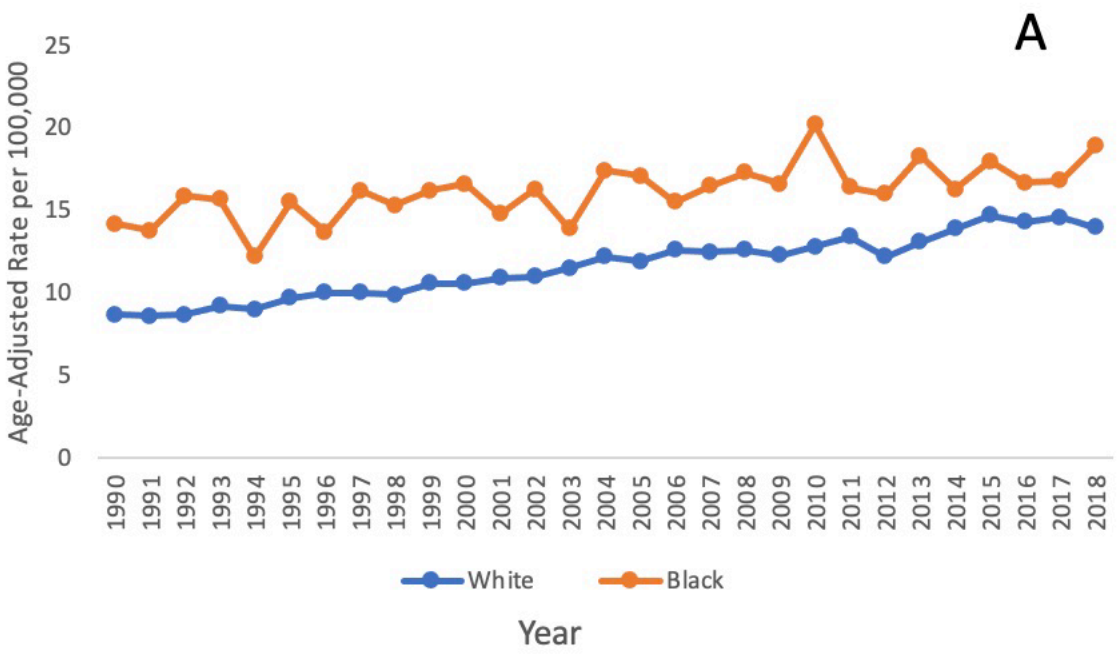
Methods: The Pennsylvania Cancer Registry (PCR) captures all cancer cases diagnosed or treated in the state. The age-adjusted incidence, stage at diagnosis, and mortality from pancreatic cancer from 1990-2018 were examined. The JoinPoint Trend Analysis software was used to model annual precent changes (APC) based on age-adjusted rates.

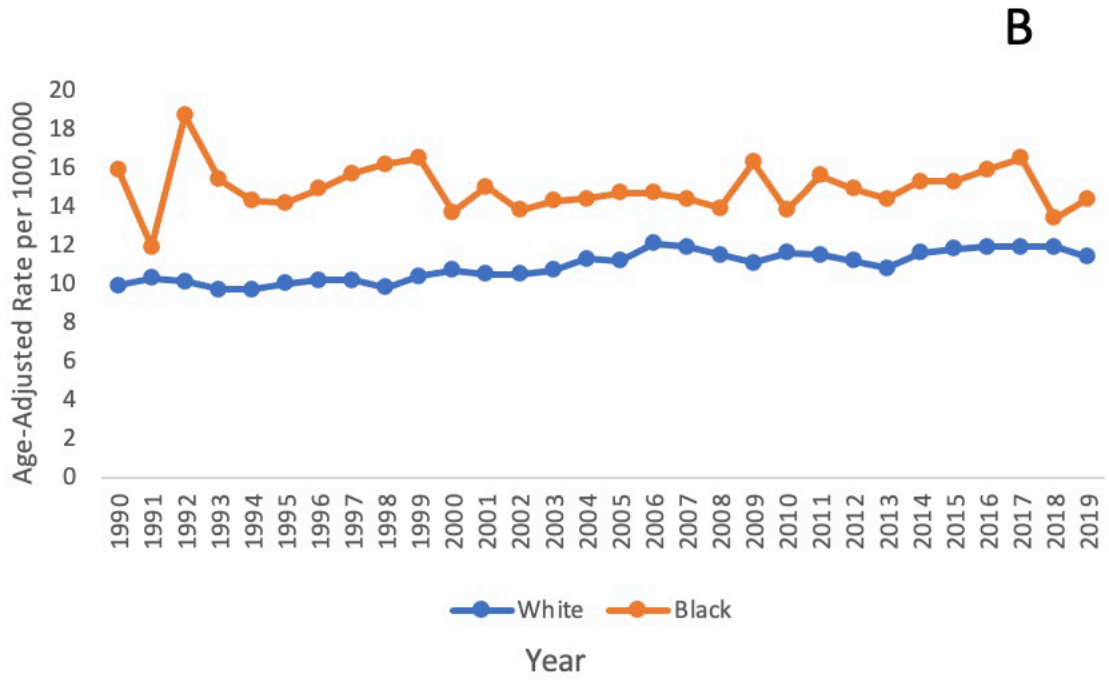
Results: In total, 53,148 cases of PC were recorded in Pennsylvania. Overall, 94.9% were over the age of 50, 50.5% were male, 88.6% were white, and 27.5% resided in a rural county. For all years, the stage at diagnosis was local in 10.1%, regional in 32.3%, and metastatic in 45.7%. From 1990 to 2018, the proportion of local disease decreased from 16.7% to 15%, while regional disease increased from 27.5% to 28.9%, and distant disease increased from 44.5% to 45.6%.

Over the study interval, the overall age-adjusted incidence rates increased from 9.1 to 14.4 cases per 100,000 (58.2% increase, APC 1.8, 95% CI 1.60-2.00). Age-adjusted incidence rate of localized disease remained stable (APC 1.5, 95% CI -0.07-3.80). Age-adjusted incidence of regional disease increased from 2.5 to 4.1 cases per 100,000 (64.0% increase, APC 1.9, 95% CI 0.0-3.9). Age-adjusted incidence of distant disease increased from 4.0 to 6.6 cases per 100,000 (65.0% increase, APC 2.0, 95% CI 0.2-3.9). In terms of race, the age-adjusted incidence for white patients increased from 8.7 to 14.0 (60.9% increase, APC 2.0, 95% CI 1.6-2.3) while the incidence for black patients increased from 14.2 to 18.9 (33.1% increase, APC 0.8, 95% CI 0.4-1.2).

Over the study interval, the overall age-adjusted pancreatic cancer mortality rate increased from 10.2 to 11.7 cases per 100,000 (14.7% increase, APC 0.7, 95% CI 0.50-0.80). The age-adjusted mortality rate for white patients increased from 9.9 to 11.4 (15.2% increase, APC 0.7, 95% CI 0.5-0.8) while mortality rate for black patients remained stable (APC -0.1, 95% CI -0.4-0.3). While there were increases in both PC incidence and death rates, there was no difference between rural counties and urban counties.

Conclusion: Both the incidence and mortality rates of PC across Pennsylvania have increased over the past three decades, in line with trends nationally and globally. Between 1990 and 2018, the overall incidence increased by 58.2% while the mortality increased by 14.7%. Future studies are warranted to determine the cause of increased mortality rate of white patients compared to black patients.





[A] Pancreatic Cancer Incidence in Pennsylvania over time by race. (White: APC 2.0 95% CI 1.6-2.3) (Black: APC 0.8, 95% CI 0.4-1.2) [B] Pancreatic Cancer Mortality in Pennsylvania over time by race. (White: APC 0.7. 95% CI 0.5-0.8) (Black: APC -0.1, 95% CI -0.4-0.3)

P 33. PANCREATECTOMY FOR INTRADUCTAL PAPILLARY MUCINOUS NEOPLASM: HAS ANYTHING CHANGED IN NORTH AMERICA?

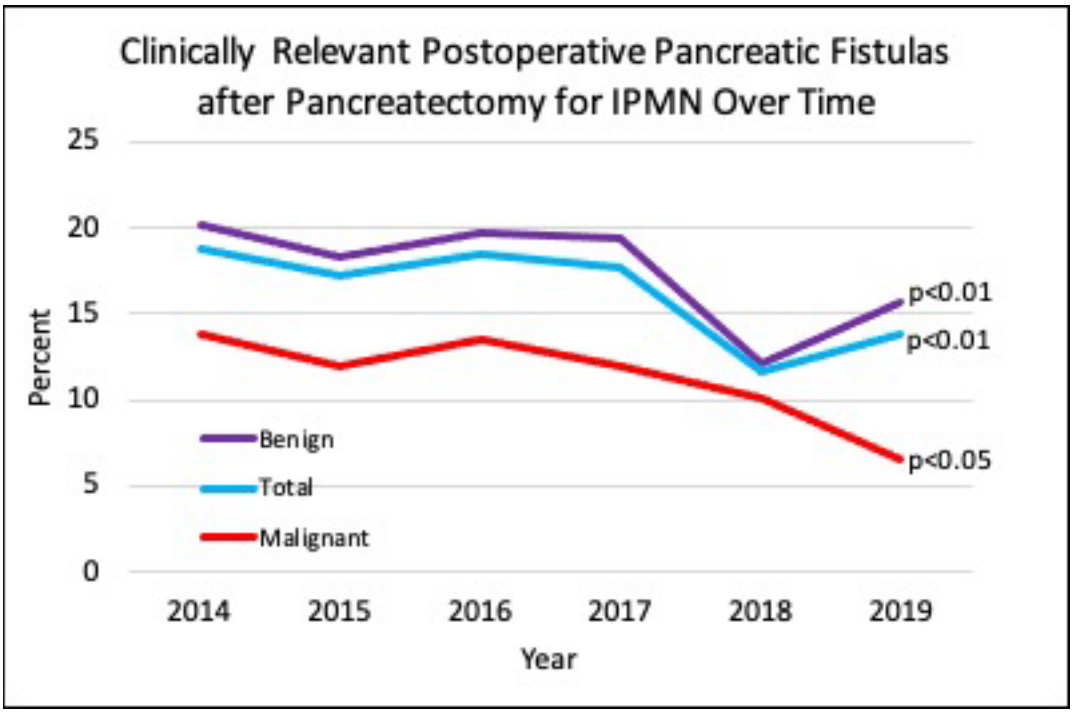
CH Davis, RC Langan, MS Grandhi, TJ Kennedy, DA August, HR Alexander, HA Pitt
Presenter: Catherine H. Davis MD, MPH | Rutgers Cancer Institute of New Jersey, United States

Background: Over the past decade, multiple guidelines and institutional reports have been published for the management of intraductal papillary mucinous neoplasm (IPMN). However, continental data on management are lacking. The aim of this study was to determine whether pancreatectomy procedures, IPMN pathology, or outcomes have changed.

Methods: The ACS-NSQIP Procedure Targeted Pancreatectomy database was queried for patients with IPMN from 2014-2019. Cases were stratified by surgical pathology and tumor stage/cyst size as well as surgical procedure. The proportion of pancreatectomies performed for IPMN was characterized by year. 30-day morbidity, including clinically relevant postoperative pancreatic fistula (CR-POPF) was measured. Mann-Kendall trend tests were performed to assess surgical trends and associated outcomes over time.

Results: A total of 3,912 patients with IPMN were identified. Procedures performed included pancreatoduodenectomy (54%), distal pancreatectomy (36%), total pancreatectomy (6%), and enucleation (1%). Operative approach was open in 71%, laparoscopic in 17%, and robotic in 11%. 21% of cases demonstrated malignancy (T0: 11%; T1: 33%; T2: 22%; T3: 33%; T4: 2%). 79% of cases were benign (cyst size 5cm:13%). Serious morbidity and mortality occurred in 30% and 1.5% of cases, respectively. Over time, no change was observed in use of pancreatectomy for IPMN (average 10%) or in pathology, stage, or cyst size. Robotic approach increased from 9% to 17% with a decrease in laparoscopic (20% to 15%) and open approaches (72% to 68%, p=0.016). While no change was observed over time in morbidity or mortality, the rate of CR-POPF decreased significantly (19% to 14%, p< 0.001, Figure).

Conclusion: Despite changing guidelines, no change was observed over a six-year period in North America in the percentage of pancreatectomies performed for IPMN or in IPMN characteristics. However, significantly more IPMN patients are undergoing robotic pancreatectomy, and postoperative pancreatic fistula rates are improving. Pancreatectomy for IPMN is safe and can be performed with acceptable morbidity and mortality.


Clinically Relevant Postoperative Pancreatic Fistulas after Pancreatectomy for IPMN Over Time
25
20
15
10
5
0
Percent
Benign
Total
Malignant
p<0.01
p<0.01
p<0.05
2014
2015
2016
2017
2018
2019
Year

P 34. ENDOSCOPIC ULTRASOUND VERSUS COMPUTED TOMOGRAPHY EVALUATION OF VEIN INVOLVEMENT FOR PANCREATIC DUCTAL ADENOCARCINOMA

N Syed, CC Vining, ME Dixon, MT Moyer, JS Peng
Presenter: June S. Peng MD | Penn State College of Medicine, United States

Background: The concordance between endoscopic ultrasound (EUS) and computed tomography (CT) for vein involvement in pancreatic ductal adenocarcinoma (PDAC) is relatively unknown. The current literature provides conflicting results regarding the sensitivity of EUS compared to CT for detecting vein involvement. This study aims to evaluate the accuracy and concordance of EUS and CT in the modern era of surgical management and high quality CTs.

Methods: This retrospective analysis included patients who underwent upfront Whipple for PDAC and had EUS evaluation including vascular involvement between January 2010 and November 2021 at a single academic center. Patients who underwent neoadjuvant treatment or whose EUS report did not comment on vessel involvement were excluded. Patients at our center routinely undergo neoadjuvant therapy unless a tissue diagnosis cannot be obtained or the primary lesion is resectable per National Comprehensive Cancer Network (NCCN) guidelines. CT images were over-read by a surgical oncologist to ascertain vascular involvement. EUS and CT results were compared to vascular resection at surgery. Concordance was calculated using Cohen's kappa.

Results: A total of 34 patients were included with an average age of 68 years (SD 9.3) and body mass index of 28.9 kg/m2 (SD 6.2). Nineteen patients were female (54%). Preoperative CTs were performed as triphasic pancreatic protocol scans in 25 patients (73.5%). Six patients (17.6%) required vein resection at surgery, including 3 superior mesenteric vein (50%), 2 portal vein (33.3%), and one vein confluence (16.7%). One portal vein resection required an interposition graft and the rest of the vein resections were closed primarily. Pathology showed T4 disease in one patient (3%), T3 in 7 (20.6%), and T2 in 21 (61.8%). Node positive disease was found in 26 patients (76.5%) and margin positive disease in 11 patients (32.4%). The sensitivity and specificity of EUS for vein resection was 66.7% and 67.9%, respectively. The sensitivity and specificity of CT for vessel involvement was 50.0% and 35.7%. The positive predictive value (PPV) and negative predictive value (NPV) for EUS was 28.6% and 90.4%. The PPV and NPV for CT was 14.3% and 76.9%. The observed proportionate agreement is 68.7% (24/35), while the probability of random agreement is 47.2%. Cohen's kappa was 0.4.

Conclusion: In this study, EUS was more sensitive than CT in detecting vein involvement in PDAC, although neither test was perfect. The level of concordance between EUS and CT was moderate, indicating their complementary value in assessing vein involvement in patients with PDAC. Templated reporting of EUS by gastroenterologists and CT by radiologists with specific focus on vascular involvement may improve the performance of these modalities for vascular involvement and could better guide treatment for patients.

P 36. COST-EFFECTIVENESS OF STAGING LAPAROSCOPY AND PERITONEAL CYTOLOGY IN PANCREATIC ADENOCARCINOMA

N Panse, R Trivedi, V Prasath, S Arjani, RJ Chokshi
Presenter: Neal Panse | Rutgers New Jersey Medical School - Newark, United States

Background: Pancreatic adenocarcinoma (PDAC) is associated with poor survival and high treatment cost. Initial staging is commonly performed with computed tomography (CT). While it is a fairly sensitive imaging modality, CT imaging is unable to capture very small regions of disease or micro-metastases. Performing a laparoscopy and peritoneal cytology at the time of diagnosis may improve accuracy of diagnostic staging and allow for optimization of treatment regimens. This has the potential to better target high-morbidity treatments to those who are most likely to benefit from them, and to prioritize quality of life in others by avoiding ineffectual interventions. In this study, we performed a decision tree analysis comparing cost-effectiveness of staging techniques: CT alone vs CT with diagnostic laparoscopy and cytology in biopsy-proven PDAC.

Methods: A decision tree was constructed comparing CT alone vs CT with laparoscopy and cytology. Branch-point probabilities, survival, and utility weights were obtained from the published literature. Costs were determined using 2021 Medicare payment rates. Effectiveness was measured in quality-adjusted life years (QALYs) and calculated using the declining exponential approximation of life expectancy (DEALE) method. Results were verified by performing one-way, two-way, and probabilistic sensitivity analyses for each branch-point probability around its 95% confidence interval.

Results: The CT with laparoscopy and cytology arm had a higher percentage of patients with metastases at initial staging (48.0%) than CT alone (20.3%). CT alone yielded 1.75 QALYs at $35,770.80 and had an ICER of $2,105.31/QALY over CT with laparoscopy and cytology, which produced 1.49 QALYs at $35,236.32 (Figure 1). Thus, CT alone was more cost-effective. All sensitivity analyses using 95% confidence intervals for each branch-point did not show any benefit in performing CT with laparoscopy and cytology.

Conclusion: Diagnostic laparoscopy and cytology results, in addition to standard CT results, upstaged some patients and revealed a greater proportion of patients to have metastatic disease. These patients did not receive high-cost, high-morbidity neoadjuvant therapy and possible surgery, thereby improving their quality of life. Even so, our analysis shows CT alone to be the more cost-effective strategy. This suggests that in patients with metastatic disease which is not conventionally detectable, there may be some therapeutic role of treatment with curative intent. Limitations include an inability to account for potentially higher rates of R0 resection in surgical candidates who have undergone laparoscopy and cytology at staging. The model also did not account for possible increased survival in patients with R0 resection following invasive staging. Further research evaluating changes in survival time and success rate of R0 resection in patients who underwent diagnostic laparoscopy and cytology is warranted.

Base Case	Cost ($)	QALYs	Cost ($)/QALY	ICER
CT with laparoscopy and cytology	35,236.32	1.49	23,648.54	-
CT alone	35,770.80	1.75	20,440.46	2,105.31

Figure 1. Cost-effectiveness of CT alone and CT with laparoscopy and cytology. Abbreviations: QALY, quality-adjusted life-year. ICER, incremental cost-effectiveness ratio (change in cost($)/change in QALYs).

P 37. PREVALENCE AND PROGRESSION OF INTRADUCTAL PAPILLARY MUCINOUS NEOPLASMS OF THE PANCREAS IN SOLID ORGAN TRANSPLANT RECIPIENTS: A SYSTEMATIC REVIEW

T Sugawara, FS Rodriguez, A Kalra, J Ishida, S Grandi, MH Al-Musawi, RD Schulick, M Del Chiaro
Presenter: Toshitaka Sugawara MD, PhD | University of Colorado, United States

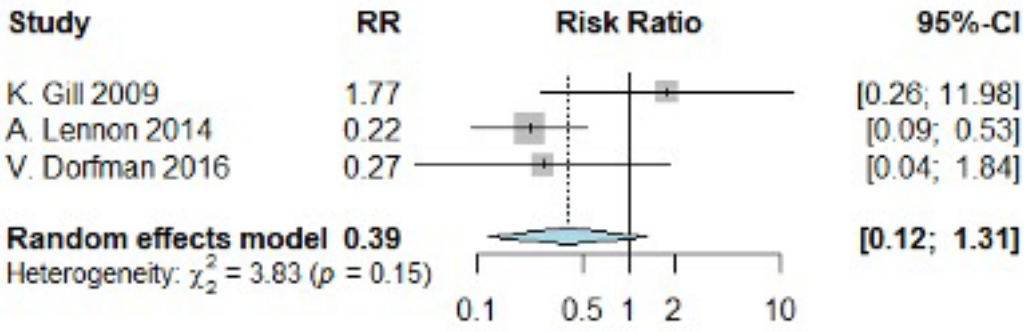
Background: It has been reported that there is an increased risk of cancer in the transplanted population related to the chronic use of immunosuppressive drugs. Intraductal papillary mucinous neoplasm (IPMN) is considered a neoplasm with malignant potential. Overall, malignancy has been reported in up to 62.2% of resected main duct and 24.4% of branch duct IPMN lesions. This study aimed to determine the prevalence of IPMN in all solid organ transplant recipients and addresses the impact of chronic immunosuppressive therapy on their clinical courses.

Methods: This study follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline. The PubMed, Embase, Scopus, and Google Scholar were searched, and data were extracted from relevant studies. As the primary outcome, the relative risk ratios of progression of IPMN on imaging studies in case-control studies were pooled using the random-effects model. In addition, the prevalence of IPMN in each study was extracted.

Results: Two authors identified 93 potentially relevant studies. Among these publications, 12 studies met the inclusion criteria. Eight studies included liver transplant recipients, three studies included all solid organ transplant recipients, and 1 study included pancreas transplant patients. Seven studies included only branch duct IPMN. In total, 291 IPMN patients were included from 8220 immunosuppressed patients. The median follow-up time was 37.5 months (range: 13-64 months). There were 9 studies that reported the prevalence of IPMN; the median percentage was 3.2%, ranging from 0.3% to 25%. The mean progression rate, any progression, from 11 studies was 17% (range: 0-88%).

We used case-control studies (n=3), comparing IPMN in transplant patients and IPMN in immunocompetent patients, for sub-analysis. The immunosuppressed group was younger (61y [57-64] vs 68y [64-70], P = 0.05), more male (53.5% vs 36.4%, P = 0.002), and more diabetes (37.7% vs 18.8%, P = 0.003) patients than the other group. Overall, the pooled relative risk ratio for progression risk associated with transplantations was 0.39 (CI 95% 0.12-1.31)] (Fig).

Conclusion: The present study showed that the prevalence and progression of IPMN in immunosuppressed patients might be the same as for immunocompetent patients. However, the number of evidence about this topic is limited, and the results are highly heterogeneous. Furthermore, the median follow-up time of included studies is short. Therefore, our findings encourage further studies to assess the management of IPMN in immunosuppressed patients, especially addressing the new incidence of IPMN in all solid organ transplant recipients and the impact of chronic immunosuppressive therapy on their clinical courses. Additionally, we propose that future studies should also assess whether the degree of immunosuppression (as measured by the dose and type of medication used) influences IPMN incidence/progression.


Study
RR
Risk Ratio
95%-CI
K. Gill 2009
1.77
[0.26; 11.98]
A. Lennon 2014
0.22
[0.09; 0.53]
V. Dorfman 2016
0.27
[0.04; 1.84]
Random effects model
0.39
[0.12; 1.31]
Heterogeneity: χ^2_2 = 3.83 (p = 0.15)
0.1
0.5
1
2
10

P 38. BILE VOLATILE ORGANIC COMPOUNDS IN THE DIAGNOSTICS OF BILIARY OBSTRUCTION AND PANCREATIC CANCER

V Teränen, S Nissinen, A Roine, A Antila, A Siiki, Y Vaalavuo, P Kumpulainen, N Oksala, J Laukkarinen
Presenter: Ville Teränen MD | Tampere University Hospital, Finland

Background: Detection of volatile organic compounds (VOCs) from bodily fluids with field asymmetric waveform ion mobility spectrometry (FAIMS) and related methods has been studied earlier in various settings. Preliminary results have been discovered for example in the detection of prostate, colorectal and ovarian cancer from urine samples. In this study, our primary aim was to differentiate pancreatic cancer from benign tumors of the pancreas by using bile samples obtained during endoscopic retrograde cholangiopancreatography (ERCP). Secondarily we aimed to differentiate all pancreatic region malignancies from all kinds of benign causes of biliary obstruction.

Methods: Bile sample was successfully aspirated from 93 patients during ERCP in Tampere University Hospital and patient records were prospectively followed up for at least two years after ERCP. Bile samples were analyzed using Lonestar chemical analyser (Owlstone, UK) employing an ATLAS sampling system and a split flow box. Conclusive diagnoses and data from analysis were matched and divided into two subcategories to be compared. Statistical analysis was performed using linear discriminant analysis (LDA) and support vector machines (SVM).

Results: Benign pancreatic lesions (n=9) were differentiated from pancreatic cancers (n=8) with correct rate of 88 % by LDA classification model. All kinds of benign causes of biliary obstruction (n=75) were differentiated from all pancreatic region cancers (n=19) with correct rate of 76 % by SVM model.

Conclusion: Analysing bile VOCs with FAIMS shows promising capability in the detection of pancreatic cancer and other malignant tumors causing biliary obstruction.

P 39. A NEW POTENTIAL PROGNOSTIC BIOMARKER AND TARGET IN HEPATO-PANCREATO-BILIARY CANCERS: THE GLUCOSE TRANSPORTER-1

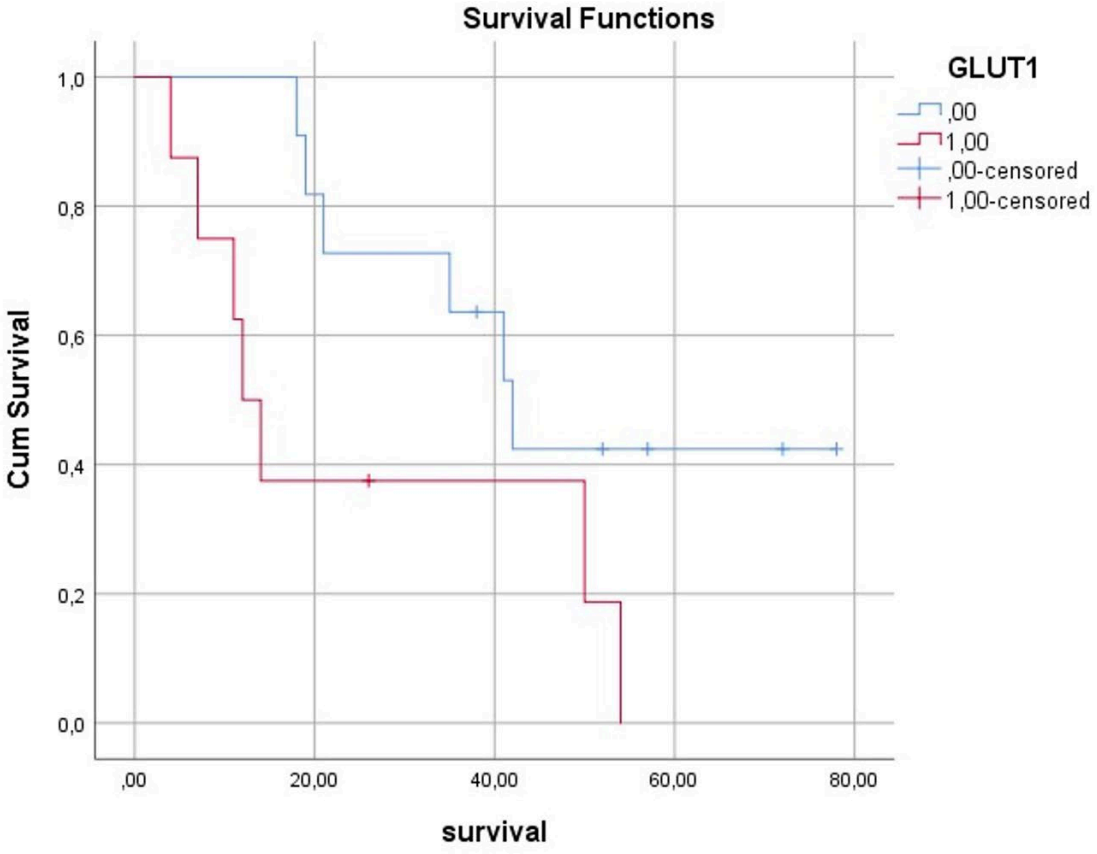
A Comandatore, R Balsano, C Carpenito, LNC Boyd, R Gaeta, M Capula, M Palmeri, G. Di Franco, N Furbetta, G Kazemier, E Giovannetti, L Morelli
Presenter: Annalisa Comandatore MD | University of Pisa, Italy

Background: The increased expression of the glucose transporter-1 (GLUT-1) in tumor tissue is related to the formation of hypoxic areas that result in metabolic alterations and ultimately lead to its overexpression. Although in pancreatic ductal carcinoma (PDAC) many studies have already established a correlation between GLUT-1 overexpression and a reduced Overall Survival (OS),changes in metabolism in extrahepatic cholangiocarcinoma (EC) are not yet investigated. The aim of our study was to determine the level of GLUT-1 expression in tissues of patients diagnosed with extrahepatic cholangiocarcinoma and then correlate this data with clinical outcome. In addition, we also evaluated the activity of new drugs inhibiting GLUT-1 in EC cell lines.

Methods: Tissues from n=23 radically-resected patients (n=16 Male, n=7 Female) were used to assess GLUT-1 expression by immunohistochemistry of tissue microarrays (TMAs). Staining for GLUT-1 was scored in accordance with both the intensity and the percentage of cells expressing this transporter. SPSS-IBM-26 software was used for statistical analysis. The activity of new anti-GLUT-1 compounds was assessed by Sulforhodamine-B assay using EGI1 and TFK1 cells.

Results: OS was ssignificantly shorter in patients with high GLUT-1 expression when compared to that of patients with low GLUT-1 expression (25.5 vs.50.3 months, p=0.045 Fig.1). The GLUT-1 inhibitor PGL14 showed antiproliferative activity in EC cells comparable to the promising activity shown in PDAC cells.

Conclusion: These results demonstrate the prognostic role of GLUT-1 in patients with EC and pave the way to new studies on of the efficacy of GLUT-1 inhibitors.



Fgiure 1. Kaplan-Meyer curves of EC patients grouped according to low (legend-0-blue) vs. high expression (legend-1-red) of GLUT-1

P 41. PROGNOSTIC FACTORS FOR ISOLATED LOCAL RECURRENCE AFTER RESECTION OF PANCREATIC DUCTAL ADENOCARCINOMA: A NATIONWIDE ANALYSIS

IWJM van Goor, PCM Andel, FS Buijs, MG Besselink, BA Bonsing, K Bosscha, LAA Brosens, OR Busch, GA Cirkel, RM van Dam, S Festen, B Groot Koerkamp, E van der Harst, IHJT de Hingh, G Kazemier, M Los, GJ Meijer, VE de Meijer, VB Nieuwenhuijs, D Roos, JMJ Schreinemakers, MWJ Stommel, RC Verdonk, HC van Santvoort, IQ Molenaar, LA Daamen, MPW Intven
Presenter: Lois Daamen MD, PhD | Regional Academic Cancer Center Utrecht, Netherlands

Background: Disease recurrence after resection of pancreatic ductal adenocarcinoma (PDAC) remains one of the biggest challenges in PDAC management. Almost all patients develop PDAC recurrence at a certain moment during postoperative follow-up. Of these patients, about 20% develops isolated local recurrence (ILR) within a median disease-free interval of 12 months. The prognosis of this specific subgroup is favorable compared to patients with systemic disease recurrence. Therefore, these patients might specifically benefit from additional (local) treatment, possibly improving survival and quality of life. To enable early treatment of ILR, early detection of disease recurrence is of great importance. Patients at risk for developing ILR, therefore might particularly benefit from standardized post-operative surveillance. To identify patients at risk for developing ILR after PDAC resection, we aimed to identify factors predictive for ILR in this study.

Methods: This national cohort study was conducted among all patients who underwent PDAC resection in the Netherlands (2014-2019). Patients were excluded in case of complication-related mortality within 90 days after resection, and macroscopic irradical resection. Furthermore, patients were excluded if the recurrence site was unknown. Baseline and perioperative data were collected from the mandatory, prospective Dutch Pancreatic Cancer Audit. Additional data on follow-up and survival was collected from the patients' records.

Patients were divided into two groups based on their initial recurrence location: ILR or distant metastases (whether or not combined with synchronous local recurrence). Patients without disease recurrence were censored at date of last follow-up. Missing data was considered missing at random and handled using multiple imputation. Survival rates were estimated and compared using Kaplan-Meier curves and the log-rank test, respectively. Multivariable cause-specific competing risk analysis was performed to identify prognostic factors for ILR. Akaike's information criterion was used to select the best predictive model. The discriminative ability was determined by the concordance index (C-index) and calibration by calibration plots, both corrected for overfitting by interval validation in 1000 bootstrap samples. The optimal cut-off value of the final predictive model was determined by the Youden index.

Results: In total, 1729 patients with a median follow-up of 35 (95% CI 34-36) months were analyzed. 1164 patients (67%) developed disease recurrence. Among these, 248 patients (21%) presented with ILR within a median disease-free interval of 15 (95% CI 14-16) months. Their median overall survival (OS) was 26 (95% CI 26-27) months, compared to a median OS of 16 (95% CI 16-17) months in patients who had distant metastases at initial presentation.

Factors independently associated with ILR were vascular resection, perineural invasion, lymph node status, resection margin status, and adjuvant chemotherapy (Table 1). After correcting for optimism, the best predictive model had a C-index of 0.66 and the slope of the calibration plots was 0.981.

Based on the optimal cut-off value determined by the Youden index, patients were stratified in two groups.

Conclusion: The developed predictive model for ILR, based on the prognostic factors identified in this study, can be used to identify patients at risk for developing ILR and guiding clinicians in their surveillance-related decisions.

Table 1. Significant factors predictive of isolated local recurrence based on Akaike's Information Criterion in 1729 patients who underwent PDAC resection

	HR*	95% CI	P-value
Vascular resection (yes vs. no)	1.85	1.41 – 2.43	< 0.001
Perineural invasion (yes vs. no)	1.47	1.00 – 2.16	< 0.05
Lymph node status			
- N0 (no positive lymph nodes)	Ref	Ref	Ref
- N1 (≥ 1 but < 4 positive lymph nodes)	1.64	1.18 – 2.27	< 0.01
- N2 (≥ 4 positive lymph nodes)	2.16	1.48 – 3.15	< 0.001
Resection margin status (R1 < 1 mm vs. R0 ≥ 1 mm)	1.50	1.15 – 1.95	< 0.01
Adjuvant chemotherapy (yes vs. no)	0.65	0.49 – 0.86	< 0.01

PDAC: pancreatic ductal adenocarcinoma; ILR: isolated local recurrence; HR: hazard ratio; CI: confidence interval. * Hazard ratios of ILR at initial presentation.

P 43. "COLD TRIANGLE ROBOTIC PANCREATODUODENECTOMY": TECHNIQUE, POSTOPERATIVE COMPLICATIONS AND PATHOLOGICAL RESULTS.

EF Kauffmann, N Napoli, M Ginesini, C Gianfaldoni, F Asta, A Salamone, F Vistoli, U Boggi
Presenter: Emanuele Federico Kauffmann MD | University of Pisa, Italy

Background: In pancreatoduodenectomy (PD) for pancreatic cancer the triangle procedure improves the rate of negative margin resections. The R0 resection is crucial to improve the prognosis. The clearance of the perineural tissue along the peripancreatic arteries could be challenging and performed with sharp dissection or with the help of energy devices. Sharp clearance of all soft tissue included in the space lined by the common hepatic artery/celiac trunk, the superior mesenteric artery (SMA), and the superior mesenteric/portal vein (triangle operation) may improve the rate of negative margin resection in pancreatoduodenectomy for pancreatic cancer. We herein present the technique of "cold" triangle robotic pancreaticoduodenectomy

Methods: Basically, a radical and en-bloc clearance of the mesopancreas should be performed by a four-step procedure. Dissection is carried out using only robotic scissors. During the first step perivascular triangle dissection begins with division of the gastroduodenal artery and lateral-to-medial dissection along the hepatic artery, then along the right side of the celiac trunk until the diaphragmatic crus. In the second step, after a wide Kocher maneuver, the origin of the SMA and the celiac trunk are identified, cranial to the left renal vein. The lymphatic tissue above the left renal vein and the right ganglion are removed en-bloc with the specimen. In the third step the peritoneum behind the third duodenal portion is opened. The first jejunal loop is mobilized to the right side of the mesenteric vessels and finally divided. During the fourth step, the divestment of the SMA proceeds until the inferior pancreato-duodenal artery is visualized and ligated. The divestment is performed without energy devices to reduce the risk of diathermic injury and late bleeding. Usually, a right approach is employed with a bottom-to-up dissection. The Clavien-Dindo classification was used to grade the severity of post-operative complications. Post-pancreatectomy hemorrhage (PPH) delayed gastric emptying (DGE), chylous fistula were classified accordingly to ISGPS criteria and collected as ideally associated with the surgical technique. In this analysis we considered patients from August 2009 to September 2021 underwent robot-assisted PD for pancreatic cancer.

Results: This technique was developed in 252 procedures and was employed in 127 RPDs for pancreatic cancer. The median operative time was 540 (470-585) minutes. No conversion occurred due to troublesome dissection or bleeding. Reoperation was needed in 14 patients (9.4%), out of these 11 (8.6%) were for bleeding, one (0.8%) for intestinal volvulus, 2 (1.6%) for fluid collections not amenable of percutaneous drainage. No pseudoaneurysm of the gastroduodenal artery was observed, one patient was reoperated for bleeding and only one case (0.8%) of erosive bleeding from the superior mesenteric artery probably due to thermal injury was reported. The chyle leak rate was 3.2%. The mortality, excluding the first 33 patients of the population to complete the learning curve, was 5/219 (2.3%). The rate of R1 resection (circumferential margins at 1mm) was 44.1%. The median number of examined lymph nodes was 42 (33-51).

Conclusion: Cold" Triangle RPD allows to achieve satisfactory pathology parameters with a acceptable risk of post-pancreatectomy surgical complication.

Length of staying, median (IQR)	17 (12-24)
90 days mortality, N° (%)	9 (7.1)
90 days mortality in the whole experience, N° (%)	10 (3.9)
90 days mortality in the whole experience after completion of the learning curve, N° (%)	5(2.3)
Extraluminal PPH, N° (%)	11 (8.6)
Chylous fistula, N° (%)	4 (3.2)
Delayed gastric emptying (DGE), N° (%) - **Grade A** - **Grade B** - **Grade C**	52 (40.9) 18 (14.2) 21 (16.5) 13 (10.2)
Post-operative complication, N° (%) - **Clavien 0** - **Clavien I** - **Clavien II** - **Clavien III** - **Clavien IIIa** - **Clavien IIIb** - **Clavien IVa**	 33 (26) 19 (15) 47 (37) 15 (11.8) 8 (6.3) 7 (5.5) 4 (3.2)
CCI, median (IQR)	20.9 (0-36.2)
Reoperations, N° (%)	14 (11%)

P 45. EFFECT OF INSURANCE STATUS ON PERIOPERATIVE OUTCOMES AND TIME TO INITIATE ADJUVANT THERAPY AFTER ROBOTIC PANCREATICODUODENECTOMY: A PROPENSITY-SCORE MATCHED ANALYSIS

S Ross, H Jacoby, I Sucandy, K Crespo, C Syblis, P Vasanthakumar, A Rosemurgy
Presenter: Harel Jacoby MD | Digestive Health Institute Tampa, United States

Background: Socioeconomic factors are known to impact oncological outcomes in patients undergoing hepaticopancreaticobiliary operations for cancer and may delay initiation of adjuvant therapy. The effect of having Medicaid/Uninsured, and to a lesser extent Medicare, is thought to negatively impact patients 'postoperative course, but this is unestablished, especially for patients undergoing robotic cancer operations. This study was undertaken to determine the impact of insurance status on perioperative outcomes and time to initiate adjuvant therapy in patients undergoing robotic pancreaticoduodenectomy.

Methods: With IRB approval, we prospectively followed 212 patients who underwent robotic pancreaticoduodenectomy for pancreatic adenocarcinoma. Patients were stratified by their health insurance status (i.e., Private, Medicare, and Medicaid/Uninsured). Patients were 2:2:1 propensity-score matched by age, BMI, ASA class, tumor size, and 8th edition AJCC staging. Perioperative variables were compared utilizing 3x2 contingency tables and an ANOVA of independent measures. Statistical significance was accepted at a p-value≤0.05 and the data are presented as median(mean±SD).

Results: 25% patients had private insurance, 70% had Medicare, and 5% had Medicaid or were uninsured (Table). Previous intra-abdominal operations were frequent and conversions to 'open' pancreaticoduodenectomy, intra-operative complications, and R1 resections were infrequent (Table). Before the propensity-score matching, patients with Medicare were oldest (p< 0.0001) (Table). Following propensity-score matching, no differences were found in the pre-, intra-, and short-term postoperative variables among patients, including time to initiation of adjuvant treatment (Table).

Conclusion: In our hepatopancreaticobiliary program, health insurance status does not predict perioperative outcomes or time to initiation of adjuvant therapy after robotic pancreaticoduodenectomy. Differences in outcome for patients stratified by insurance status purported by many with 'open' pancreaticoduodenectomy is abrogated by the robotic approach.

	Before Matching				After Matching			
	Private	Medicare	Medicaid/Uninsured	Total | P-Value	Private	Medicare	Medicaid/Uninsured	Total | P-Value
Number of Patients	54	148	10	212	20	20	10	50
Age (years)	62 (62±10.2)	72 (73±8.7)	62 (60±10.0)	**p<0.0001**	61 (62±7.9)	65 (67±9.0)	62 (60±10.0)	p=0.13
Sex (M/W)	28/26	85/63	5/5	p=0.73	11/9	9/11	5/5	p=0.82
BMI (kg/m2)	27 (27±6.1)	27 (27±3.8)	25 (25±5.1)	p=0.40	26 (26±4.6)	27 (26±4.3)	25 (25±5.1)	p=0.91
Previous Abdominal Operations (n)	26 (48%)	87 (59%)	3 (30%)	p=0.11	9 (45%)	11 (55%)	3 (30%)	p=0.43
ASA	3(3±0.6)	3 (3±0.7)	3 (3±0.5)	p=0.29	3 (3±0.5)	3 (3±0.5)	3 (3±0.5)	p=0.96
Intraoperative Variables								
Operative Duration (min)	404 (418±95.5)	416 (426±91.7)	421 (437±130.4)	p=0.81	398 (422±100.3)	403 (398±348.1)	421 (437±130.4)	p=0.57
Estimated Blood Loss (mL)	200 (278±342)	200 (319±365.6)	175 (266±240.9)	p=0.71	200 (219±163.1)	250 (346±348.1)	175 (266±240.9)	p=0.32
Conversions to Open (n)	3 (6%)	24 (16%)	1 (10%)	p=0.13	3 (15%)	3 (15%)	1 (10%)	p=0.92
Intraoperative Complications (n)	1 (2%)	9 (6%)	0	-	0	0	0	p=1.00
Lymph Nodes Harvested (n)	14 (15±6.0)	14 (15±4.6)	15 (16±6.5)	p=0.55	14 (16±7.3)	11 (13±3.5)	15 (16±6.5)	p=0.21
Margin Status (R0/R1)	53/1	140/8	10/0	-	20/0	18/2	10/0	-
AJCC Staging (%)	I (17%), II (66%), III (17%), IV (0%)	I (21%), II (64%), III (12%), IV (3%)	I (20%), II (60%), III (20%), IV (0%)	-	I (20%), II (60%), III (20%), IV (0%)	I (20%), II (60%), III (20%), IV (0%)	I (20%), II (60%), III (20%), IV (0%)	p=1.00
Tumor Size (cm)	3 (3±1.5)	3 (3±1.0)	2 (3±1.0)	p=0.60	3 (3±1.2)	3 (3±0.9)	2 (3±1.0)	p=0.31
Postoperative Variables								
Postoperative Complications (n)	5 (9%)	26 (18%)	1 (10%)	p=0.31	0	4 (20%)	1 (10%)	-
Clavien-Dindo Score (≥III)	III (2), IV (1), V (2)	III (7), IV (9), V (10)	III (1)	-	0	III (2), IV (1), V(1)	III (1)	-
In-Hospital Mortality (n)	2 (4%)	9 (6%)	0	-	0	1 (5%)	0	-
Length of Stay (days)	5(7±5.3)	5 (8±12.3)	7 (10±8.3)	p=0.48	5 (6±3.8)	5 (8±6.1)	7 (10±8.3)	p=0.21
Readmissions within 30 days (n)	5 (9%)	14 (9%)	3 (30%)	p=0.11	2 (10%)	0	3 (30%)	-
Time to Adjuvant Therapy (weeks)	7 (8±3.9)	7 (8±3.6)	7 (8±4.2)	p=0.96	6 (7±3.2)	5 (7±3.1)	7 (8±4.2)	p=0.83

P 46. COMPARISON OF ONCOLOGIC OUTCOMES BETWEEN OPEN AND LAPAROSCOPIC DISTAL PANCREATECTOMY FOR PANCREATIC DUCTAL ADENOCARCINOMA USING DATA FROM THE KOTUS-BP NATIONAL DATABASE

H Kim
Presenter: Hongbeom Kim | Seoul National University College of Medicine, Korea

Background: Despite the lack of high-level evidence, laparoscopic distal pancreatectomy (LDP) is frequently performed in patients with pancreatic ductal adenocarcinoma (PDAC) owing to advancements in surgical techniques. The aim of this study was to investigate the long-term oncologic outcomes of LDP in patients with PDAC via propensity score matching (PSM) analysis using data from a large-scale national database.

Methods: A total of 1202 patients who were treated for PDAC via distal pancreatectomy across 16 hospitals were included in the Korean Tumor Registry System-Biliary Pancreas. The 5-year overall (5YOSR) and disease-free (5YDFSR) survival rates were compared between LDP and open DP (ODP).

Results: ODP and LDP were performed in 846 and 356 patients, respectively. The ODP group included more aggressive surgeries with higher pathologic stage, R0 resection rate, and number of retrieved lymph nodes. After PSM, the 5YOSRs for ODP and LDP were 37.3% and 41.4% ($p = 0.150$), while the 5YDFSRs were 23.4% and 27.2% ($p = 0.332$), respectively. Prognostic factors for 5YOSR included R status, T stage, N stage, differentiation, and lymphovascular invasion.

Conclusion: LDP was performed in a selected group of patients with PDAC. Within this group, long-term oncologic outcomes were comparable to those observed following ODP.

P 48. ASSESSING THE IMPACT OF PREOPERATIVE CORTICOSTEROID THERAPY IN PATIENTS UNDERGOING PANCREATICODUODENECTOMY USING THE NATIONAL SURGICAL QUALITY IMPROVEMENT PROGRAM (NSQIP)

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Presenter: Saba Alvi MD | Tufts University School of Medicine, United States

Background: The purpose of this study is to evaluate the effectiveness of preoperative glucocorticoid use on reducing postoperative complications of pancreaticoduodenectomy.

Methods: A retrospective analysis of patients undergoing pancreaticoduodenectomy was performed using the NSQIP database (2014-2019). In addition, we utilized propensity score matching to compare patients on preoperative steroids to those who were not. Outcomes measured include 30-day complications and mortality, need for readmission, a prolonged hospital length of stay, delayed gastric emptying, and pancreatic fistula.

Results: After Propensity score matching, there were 438 patients in the steroid group and 876patients in the no steroid group. There was no difference in pancreatic fistula (23.8% vs. 21.7%; p-0.3), delayed gastric emptying (21.1% vs.20.1%; p-0.06), major complications (31.8% vs. 30.1%; p-0.1), and mortality (3.5% vs. 3.2%; p-0.6) between the two groups.

Conclusion: Glucocorticoids did not reduce the incidence of overall complications, postoperative fistula, and delayed gastric emptying following pancreaticoduodenectomy.

Pancreas specific complications			
	Steroids	No Steroids	p-value
Complications			
Mortality	3.5%	3.2%	0.6
Readmission	15.8%	14.7%	0.3
prolonged LOS	11.5%	10.5%	0.5
Pancreatic Fistula	23.8%	21.7%	0.3
Reoperation	6.3%	5.9%	0.5
Delayed Gastric Emptying	21.1%	20.1%	0.6

LOS- Length of Stay

P 49. OPTIMAL PAIN MANAGEMENT AFTER OPEN WHIPPLE: COMPARISON OF EPIDURAL VERSUS INTRATHECAL (IT) MORPHINE PLUS TRANSVERSUS ABDOMINIS PLANE (TAP) BLOCK VERSUS TAP BLOCK ALONE

JM Collins, A Hu, ME Dixon, JS Peng
Presenter: June S. Peng MD | Penn State College of Medicine, United States

Background: There has been significant interest in opioid-sparing analgesia after surgery with use of epidural analgesia (EA), spinal or intrathecal (IT) blocks, and regional blocks. The optimal approach for pain control after open pancreatectomy is not known and the current study aims to evaluate our single-institution experience.

Methods: We examined institutional outcomes using three pain management approaches after open pancreatoduodenectomy: 1) EA, 2) IT morphine plus TAP (IT+TAP), and 3) TAP alone. Sequential patients who underwent pancreatoduodenectomy via upper midline incision for neoplastic or pre-neoplastic disease between July 2020 and November 2021 were included. EA utilized bupivacaine and hydromorphone infusion, IT morphine was administered at 150-200 mcg, and TAP blocks utilized liposomal bupivacaine. Postoperatively, all patients were managed according to a standardized pathway which included intravenous and oral acetaminophen. Demographics and outcome variables were compared using non-parametric Kruskal-Wallis and Fisher's exact tests.

Results: A total of 30 patients were identified for inclusion, with demographics and outcomes summarized in Table 1. There were no statistically significant differences in baseline characteristics. Postoperative pain scores were comparable, and median morphine milligram equivalent (MME) use during hospitalization was 20.0 for EA, 24.3 for IT+TAP, and 170.0 for TAP (p= 0.257). There was a non-significant trend in postoperative fluid bolus requirement, which was given in 33.3% in EA, 10.0% in IT+TAP, and 60.0% in TAP (p=0.131). Foley removal was earlier in the IT+TAP group (p=0.001).

Conclusion: In this analysis, the use of EA versus IT+TAP resulted in similar pain scores and narcotic usage during admission. IT+TAP was associated with earlier Foley removal. Further studies including larger, randomized studies are needed to determine optimal approach to pain management after open Whipple.

Table 1

	Total n=30	Epidural n=15	IT+TAP n=10	TAP n=5	p-value
Age	66.0 (58.0, 70.0)	67.0 (54.0, 69.0)	64.0 (59.0, 70.0)	68.0 (61.0, 73.0)	0.810
Body mass index (kg/m^2)	28.3 (23.6, 31.9)	28.5 (23.6, 32.1)	26.7 (22.6, 30.5)	29.0 (26.6, 39.9)	0.474
Gender					0.885
Female	11 (36.7)	6 (40.0)	3 (30.0)	2 (40.0)	
Male	19 (63.3)	9 (60.0)	7 (70.0)	3 (60.0)	
POD 1 mean pain score	2.8 (1.0, 4.3)	1.2 (0.4, 4.5)	2.8 (1.8, 3.1)	3.4 (3.4, 6.0)	0.209
POD 3 highest pain score	5 (3, 7)	6 (1, 7)	5 (2, 8)	5 (5, 5)	0.982
POD 3 lowest pain score	0 (0, 3)	2 (0, 4)	0 (0, 3)	0 (0, 0)	0.260
Any oral narcotics[a]	23 (76.7)	10 (66.7)	9 (90.0)	4 (80.0)	0.534
Any IV narcotics[a]	15 (50.0)	5 (33.3)	6 (60.0)	4 (80.0)	0.139
MME[a]	24.3 (13.0, 54.0)	20.0 (0.0, 45.0)	24.3 (14.0, 54.0)	170.0 (20.0, 341.5)	0.257
MME per day[a]	4.1 (1.9, 9.0)	4.0 (0.0, 9.0)	4.1 (2.6, 6.3)	34.0 (4.0, 48.8)	0.219
POD Foley removal	2 (1, 2)	2 (2, 4)	1 (1, 2)	2 (2, 2)	**0.001**
Length of stay (days)	5 (5, 7)	6 (5, 7)	5 (5, 6)	6 (5, 7)	0.585
POD 0-1 bolus[b]	9 (30.0)	5 (33.3)	1 (10.0)	3 (60.0)	0.131

Reported as median (IQR) or number (%) with significant p-values reported in **bold**. IT, intrathecal morphine; TAP, transversus abdominis plane block; POD, postoperative day; IV, intravenous; MME, oral morphine milligram equivalents.
a During admission.
b Any crystalloid or colloid bolus administered postoperatively prior to 11:59 PM on POD 1.

P 50. PLASMA SOLUBLE UROKINASE-TYPE PLASMINOGEN ACTIVATOR RECEPTOR (P-SUPAR) REFLECTS THE INFLAMMATORY RESPONSE AFTER PANCREATIC SURGERY.

A Aronen, J Aittoniemi, R Huttunen, A Siiki, A Antila, J Sand, J Laukkarinen
Presenter: Anu Aronen MD | Sigrid Jusélius Foundation, Finland

Background: Surgical trauma depress cell mediated immunity and may increase the risk of postoperative complications. Plasma soluble urokinase-type plasminogen activator receptor (P-suPAR) is a novel biomarker which is affected by several systemic inflammatory conditions. It is elevated in pancreatic cancer (Loosen et al., Carcinogenesis 2019) and in acute alcohol-induced pancreatitis (Nikkola et al. Pancreas 2017). Postoperatively, P-suPAR remains unchanged in patients with perioperatively diagnosed positive blood culture (Rabensteiner et al. GMS Inf Dis 2016) and in patients undergoing coronary bypass (Gozdzik et al. Plos One 2014). Our aim of this study was to investigate P-suPAR levels before and after pancreatic surgery.

Methods: One hundred seventy-six patients planned to undergo pancreatic surgery for suspected malignant or premalignant lesion were recruited to this study. Patient-related comorbidities, preoperative laboratory values, surgical parameters, postoperative complications and final histopathology were registered. P-suPAR values were analyzed preoperatively, and on postoperative day (POD) one and three. One hundred fifty patients [median age 67 (range 33-84) years, 50% male] underwent a surgical procedure. The operation was pancreaticoduodenectomy in 83, distal pancreatectomy in 27 and total pancreatectomy in 23 patients. 17 patients did not undergo pancreatic resection due to a metastasized or advanced disease.

Results: P-suPAR values were significantly decreased on postoperative days 1 [median 3.2 (IQR 2.5-3.9) ng/mL; p< 0.001] and 3 [3.2 (2.7-4.1) ng/mL; p< 0.001] when comparing to preoperative values [3.7 (3.1-4.7) ng/mL], unlike CRP or white blood cell count (WBC). Furthermore, P-suPAR values were significantly lower in patients who developed a postoperative pancreatic fistula [2.6 (2.1-3.4) ng/mL] compared to patients with no fistula [3.2 (2.6-3.8) ng/mL; p=0.007]. There was no difference in other complications.

Conclusion: Unlike many inflammatory cytokines, P-suPAR is decreased after pancreatic resection. This differs from the previous findings after non-pancreatic surgery. In this study group, P-suPAR level decreases significantly after pancreatic surgery. Furthermore, P-suPAR level in the first postoperative day after pancreatic surgery is significantly lower in patients who develop postoperative pancreatic fistula. These findings differ from the kinetics of other inflammatory markers and are entitled to further investigation and interest. In addition, different pancreas-specific inflammatory and immunological mechanisms behind various postoperative complications remain as the subject of future studies.

P 51. VASCULAR PANCREATIC SURGERY WITH VENOUS AND ARTERIAL CONDUITS: REFLECTIONS ON TECHNIQUE, POSTOPERATIVE AND ONCOLOGIC OUTCOMES

B Kinny-Köster, JR Habib, MA Al Efishat, AF van Oosten, S Shoucair, AA Javed, JL Cameron, CR Shubert, RA Burkhart, KJ Lafaro, WR Burns, J He, CL Wolfgang
Presenter: Benedict Kinny-Köster MD | NYU Langone Health, United States

Background: Improved systemic control from new neoadjuvant chemotherapy in pancreatic cancer has increased the importance of margin-negative resections. To achieve this in patients with locally advanced pancreatic cancer, it is sometimes necessary to resect substantial segments of arteries and veins. That creates the need to provide extensive vascular conduits with often greater than 6 cm of length to bridge defects for revascularization.

Methods: We identified 63 implanted conduits (41% autologous vessels) in 56 pancreatic surgeries for underlying malignancies (89% adenocarcinoma) between October 2013 and July 2020 in our prospectively maintained database. Analyzed outcomes with R0 resections were postoperative complications and oncologic survival.

Results: For vascular reconstruction, 25 arterial and 38 venous conduits have been used during 39 pancreatoduodenectomies, 15 distal pancreatectomies and 3 total pancreatectomies. The arterial hepatic inflow and venous mesenteric drainage reconnecting the distal superior mesenteric vein were the primarily bridged systems (96% and 95% of conduits). Of the 50 patients with adenocarcinoma, 92% underwent neoadjuvant chemotherapy and 86% received neoadjuvant radiation. An R0 rate (>1 mm margin) of 78% was achieved. A Clavien-Dindo grade ≥IIIb complication was apparent in 29% of the patients, while the median Comprehensive Complication Index was 29.6. While the 90-day mortality rate was 9%, the median postoperative oncologic survival reached 40 months.

Conclusion: Vascular pancreatic surgery is increasingly required due to improved preoperative systemic control to resect the primary tumor burden. Optimization of surgical techniques for segmental vascular reconstruction with conduits is becoming critically important in carefully selected patients to achieve favorable oncologic outcomes.

P 52. THE INFLUENCE OF SARCOPENIA AND SYSTEMIC INFLAMMATION ON SURVIVAL IN RESECTED PANCREATIC CANCER

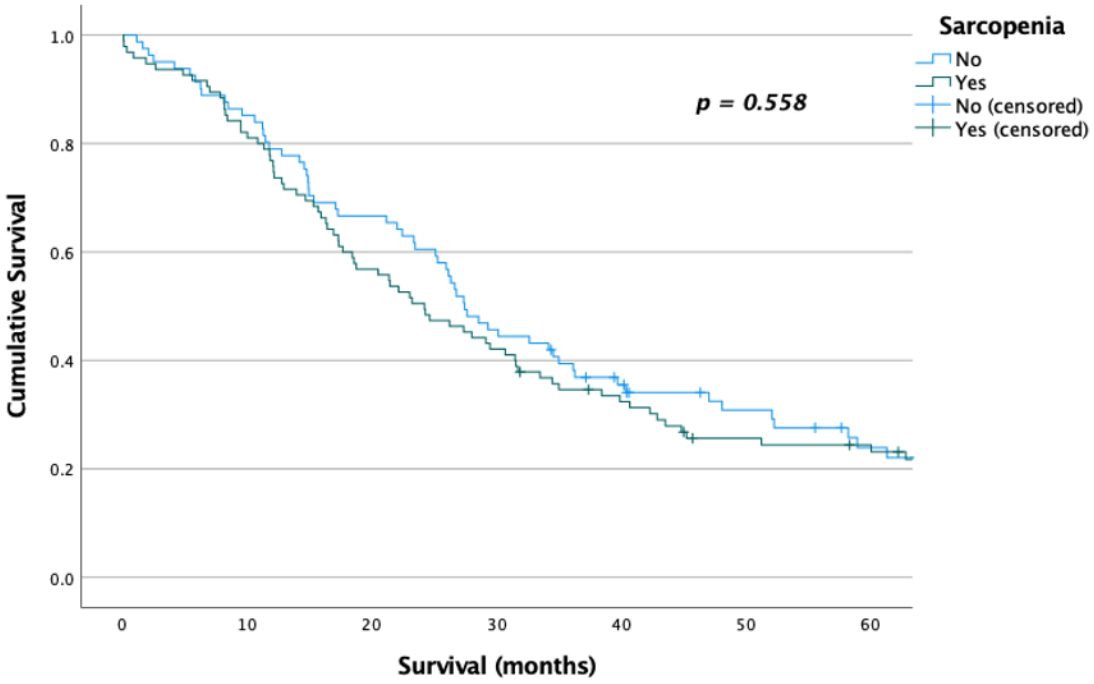
A Bryce, S Dreyer, DK Chang
Presenter: Nigel Jamieson MD, PhD | University of Glasgow, United Kingdom

Background: Sarcopenia, cachexia and systemic inflammation are early hallmarks of pancreatic cancer which hamper systemic therapy and accelerate the terminal stages of the disease. These conditions are more prevalent in pancreatic cancer than other cancer types, and ultimately cause patients' demise. The relationship between sarcopenia (cachexia associated loss of skeletal muscle mass) and the systemic inflammatory response has been demonstrated in other cancer types using image-based body composition analysis, along with the significant impact of this relationship on outcomes and survival. We sought to determine the impact of sarcopenia and systemic inflammation on survival as part of a wider study assessing the contribution of tumour molecular features to tumour-host interaction in pancreatic cancer.

Methods: Retrospective analysis of a prospectively maintained database of patients with pancreatic cancer undergoing resection with curative intent within the West of Scotland Pancreatic Unit was undertaken. Body composition analysis was performed with single slice cross-sectional skeletal muscle index measurement at the L3 lumbar vertebra from pre-operative computed tomography using Slice-o-Matic software. This was compared to validated thresholds for defining sarcopenia. Validated pre-operative systemic inflammatory response measures were curated (modified Glasgow Prognostic Score [mGPS] and neutrophil-lymphocyte ratio [NLR]) along with survival data. Patients undergoing palliative bypass, those with metastatic disease at resection or those with tumours other than pancreatic ductal adenocarcinoma were excluded.

Results: 176 patients were identified who underwent resection between 2008 and 2019. Mean age was 64 years and 49% were male. 71 patients (40%) underwent neoadjuvant treatment and 105 patients (60%) had up-front resection. Median post-operative survival of the entire cohort was 26.3 months and 95 patients were defined as sarcopenic (54%). Sarcopenia was not associated with worse survival versus non-sarcopenia (median survival 24.2 months vs 27.4 months, $p = 0.558$). mGPS was raised in 52 patients (30%) however this was also not associated with overall survival versus patients with normal mGPS (median survival 26.2 months vs 26.6 months, $p = 0.193$). There was also no significant difference in survival in patients with raised NLR, or in patients with sarcopenia across both the up-front resection group and the neoadjuvant group.

Conclusion: Pancreatic cancer represents a complex biological process with survival likely influenced by tumour biology and the relationship between tumour epithelium and the tumour microenvironment. This study demonstrates no survival difference in patients with sarcopenia as defined by validated body composition measures. Systemic inflammation, as defined by mGPS and NLR, also had no impact on survival. Survival has previously been shown to be influenced by sarcopenia in all patients with pancreatic cancer, suggesting selection of "fitter" patients for resection in our cohort. Further understanding of tumour biology is needed to determine the relationship between tumour epithelium, tumour microenvironment, cachexia and systemic inflammation. Analysis of this relationship is ongoing and we envisage presenting results of this research in conjunction with this abstract if selected for presentation.


Sarcopenia
No
Yes
No (censored)
Yes (censored)
p = 0.558
Cumulative Survival
1.0
0.8
0.6
0.4
0.2
0.0
0
10
20
30
40
50
60
Survival (months)

P 53. SANTORINI'S DUCT IPMN: SHOULD IT BE ADDED AS A NEW HIGH-RISK CRITERION?

M Machado , M Autran
Presenter: Marcel C. Machado MD | University of São Paulo, Brazil

Background: Intraductal papillary mucinous neoplasm of the pancreas (IPMN) originates from the ductal epithelium of the pancreas and can progress to an invasive cancer. Since not every IPMN tend to be aggressive, development of guidelines to with recommendations to observe or to surgically treat those patients is needed. IPMN has been classified into two groups: main-duct (Wirsung duct) and branch-duct types. The main-duct IPMNs are considered as more aggressive while branch-type are benign or low-grade lesions, however, no mentions are made related to Santorini's duct (SD) IPMN that has been so far considered as a branch-type lesion in the literature. The main objective of this study is to present a case of Santorini's duct IPMN with high-grade dysplasia and invasive carcinoma, review of the literature and to propose the inclusion of this type of IPMN as a high risk criterion in the IPMN guidelines.

Methods: We reviewed all papers reporting IPMN in the SD. We found a total of 21 cases, including ours.

Results: Sixteen patients (76.2%) presented with malignant disease at diagnosis. In our case on histological evaluation a well-defined intraductal mucinous neoplasm originating in the Santorini's duct with minor invasive component and exuberant exudative/suppurative inflammatory process in organization, surrounded by fibrosis was found (the set of neoplasia and inflammatory and fibrous changes measures 4.3 cm). Microscopic neoplastic extension: invasive adenocarcinoma is restricted to the pancreas, the intraductal component extends to the minor duodenal papilla and the fibrous inflammatory process adheres the pancreas to the duodenum. Neoplastic involvement was not detected in the main pancreatic duct, in the greater duodenal papilla and in the choledochal duct.

Conclusion: Due to its malignant behavior, similar to the main pancreatic duct, Santorini's IPMN should be included as a high-risk criterion in the guidelines for the management of intra ductal papillary mucinous neoplasm of the pancreas .

P 56. ROLE OF INFLAMMATORY AND NUTRITIONAL MARKERS IN PREDICTING COMPLICATIONS FOLLOWING PANCREATICODUODENECTOMY

R Jotheeswaran, H Singh, J Kaur, R Nada, T D Yadav, V Gupta, S S Rana, R Gupta
Presenter: Rajeshwar Jotheeswaran MD | Postgraduate Institute of Medical Education And Research, India

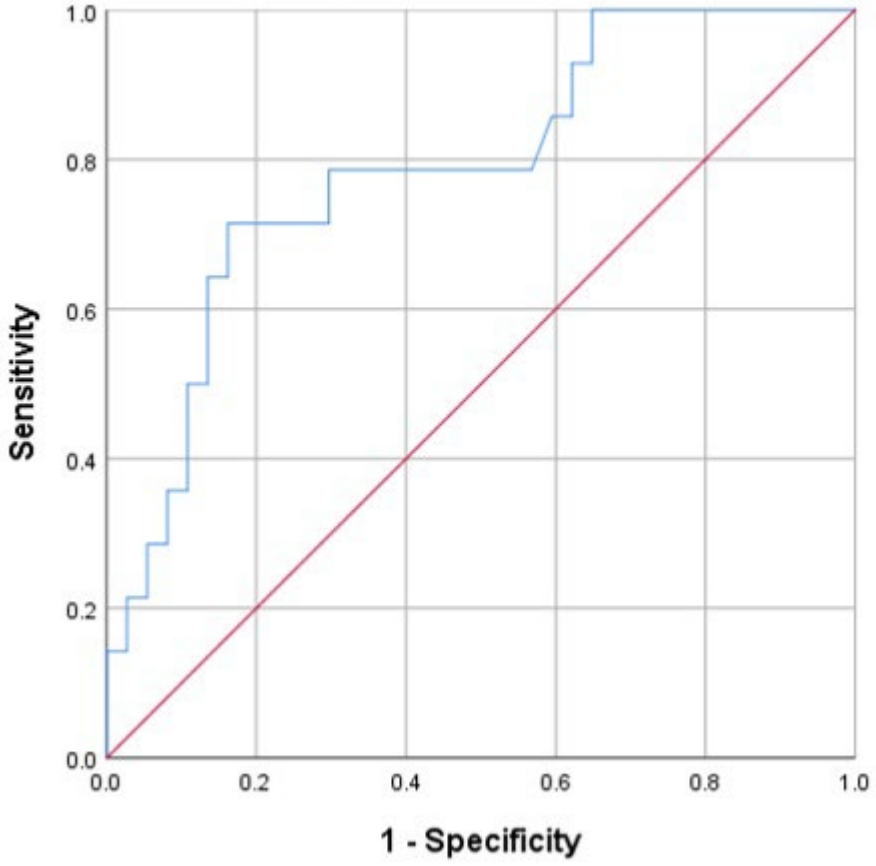
Background: Pancreaticoduodenectomy (PD) is attended with considerable morbidity and mortality. Early recognition of patients likely to develop severe postoperative complications will allow timely institution of tailored approach. Present study was planned to predict post-operative complications using inflammatory and nutritional markers measured early in the post-operative period.

Methods: Patients undergoing PD between June 2019 and November 2020 were included. Postoperative pancreatic fistula (POPF), delayed gastric emptying (DGE), and post-operative pancreatic hemorrhage (POPH) were graded according to the International Study Group of Pancreatic Fistula and the International Study Group of Pancreatic Surgery. We also documented other complications like wound infection, intraabdominal collection and non-surgical complications. Nutritional and inflammatory markers were analyzed on postoperative day (POD) 1 and 3 Patients were followed up for a period of 30 days or till discharge whichever was longer.

Results: Patients undergoing PD between June 2019 and November 2020 were included. Postoperative pancreatic fistula (POPF), delayed gastric emptying (DGE), and post-operative pancreatic hemorrhage (POPH) were graded according to the International Study Group of Pancreatic Fistula and the International Study Group of Pancreatic Surgery. We also documented other complications like wound infection, intraabdominal collection and non-surgical complications. Nutritional and inflammatory markers were analyzed on postoperative day (POD) 1 and 3 which included albumin and Prognostic Nutritional Index (PNI), procalcitonin, C-Reactive Protein (CRP), Systemic Immune Inflammation Index (SIII), Neutrophil Lymphocyte Ratio (NLR), Platelet Lymphocyte Ratio (PLR), serum and drain fluid Interleukin- 6 (IL6), serum and drain fluid Tumor Necrosis Factor alpha (TNF α), drain fluid lactate, pyruvate, glucose, lactate/pyruvate, urine trypsinogen-2 and modified Glasgow Prognostic Score (mGPS). Patients were followed up for a period of 30 days or till discharge whichever was longer.

Conclusion: Drain fluid IL6 and Urine trypsinogen-2 on POD3 can rule out occurrence of CR-POPF.

Fig.1: ROC curve for Drain Fluid IL 6 on POD3:



P 57. COMPARING POST- OPERATIVE OUTCOMES FOR PANCREATIC DUCTAL ADENOCARCINOMA: NEOADJUVANT THERAPY VERSUS UPFRONT SURGERY

T Almerey, D Hyman, A Mujkanovic, J Stauffer
Presenter: Tariq Almerey MD | Mayo Clinic, Jacksonville, United States

Background: Optimal outcomes regarding upfront surgery versus neoadjuvant therapy (chemotherapy and radiation) for pancreatic ductal adenocarcinoma (PDAC) is debated. There is concern that neoadjuvant therapy may result in worsened postoperative outcomes. Our study objectives were to show the impact of neoadjuvant chemotherapy on post-operative morbidity and mortality.

Methods: Pancreatic resections for PDAC between 1/1/2010-12/31/2020 were included in this retrospective review. Data pertaining to 90-day complications were obtained and graded according to international consensus guidelines. Clavien-Dindo scores were retroactively assigned to each subject with an associated 90-day complication. Categorical variables were compared by Fisher's Exact Test.

Results: 370 subjects who underwent pancreatic resection for PDAC were included in this review. There was no significant difference in the rate of major morbidity between subjects who received upfront surgery and neoadjuvant therapy (15.5% vs 20.3%). Similarly, there were no significant differences in the rates of mortality (3.4% vs 2.9%), post-operative pancreatic fistula (9.5% vs 10.9%), or postpancreatectomy hemorrhage (6.9% vs 6.5%) respectively.

Conclusion: The role of neoadjuvant therapy for resectable disease in the management of PDAC is controversial. We show that postoperative outcomes are not worsened by the use of neoadjuvant therapy prior to pancreatic resection for PDAC. Further research is needed to reveal which patient subgroups may benefit from the use of neoadjuvant therapy.

P 58. ANALYZING HOW PERIOPERATIVE VARIABLES PREDICT SURVIVAL IN ROBOTIC DISTAL PANCREATECTOMY AND SPLENECTOMY FOR PATIENTS WITH ADENOCARCINOMA OR NEUROENDOCRINE PATHOLOGY

S Ross, I Sucandy, H Jacoby, J Primus, K Crespo, C Syblis, A Rosemurgy
Presenter: Harel Jacoby MD | Digestive Health Institute Tampa, United States

Background: This study was undertaken in patients with adenocarcinomas and neuroendocrine tumors to determine whether perioperative variables predict survival following a robotic distal pancreatectomy and splenectomy.

Methods: We prospectively followed 67 patients who underwent robotic distal pancreatectomy and splenectomy for adenocarcinoma or neuroendocrine tumor. Employing a correlation matrix, we established associations between perioperative variables. Utilizing the Cox-model of Proportional Hazards, we eliminated covariance in determining the significance and influence of perioperative variables on survival. Data are presented as median(mean±SD).

Results: Of the 38 patients with adenocarcinoma, a correlation matrix denoted significance between tumor size and mortality (p=0.01) and significance between operative duration and LOS (p=0.003) and operative duration and complications with Clavien-Dindo score≥III (p=0.006). Sex, age, BMI, ASA class, operative duration, EBL, occurrence of serious complications [Clavien-Dindo score≥III], length of stay (LOS), and readmission within 30 days did not influence patient survival. By Cox Model, only tumor size was a predictor of duration of survival (p=0.03). (Table)

Utilizing the correlation matrix for the 29 patients with neuroendocrine tumors, we determined that men (p=0.04) and positive margins (p=0.002) correlated with higher mortality; men also had a greater BMI (p=0.01), ASA class (p=0.009), and operative duration (p=0.01) while positive margin status increased LOS (p=0.003). By Cox Model, there were no significant associations or influences between perioperative variables and duration of survival.

Conclusion: For patients with adenocarcinoma who underwent robotic distal pancreatectomy and splenectomy, only tumor size had a significant association with duration of survival. For patients with neuroendocrine tumors, male patients and patients with positive margins correlated with higher mortality, but none of the perioperative variables tested influenced duration of survival. Tumor size can be used to predict duration of survival for patients with adenocarcinoma, while there are no perioperative variables that predict duration of survival for patients with neuroendocrine tumors.

	Adenocarcinoma	Neuroendocrine Tumor
Number of Patients (n)	38	29
Age (years)	73(70±10.2)	57(57±9.4)
Sex (M/W)	22/16	13/16
BMI (kg/m^2)	27(27±5.2)	30(30±6.4)
Previous Abdominal Operations (n)	16	15
ASA Class	3(3±0.5)	3(3±0.6)
Intraoperative Variables		
Operative Duration (min)	306(301±93.7)	221(246±94.7)
Estimated Blood Loss (mL)	120(181±160.4)	100(154±172.6)
Positive Margin Status (n)	4	1
Intraoperative Complications (n)	1	0
Tumor Size (cm)	4(4±2.0)	2(3±2.3)
Postoperative Variables		
Postoperative Complications (n)	6	0
Clavien-Dindo Score (≥III)	3	0
In-Hospital Mortality (n)	0	0
Length of Stay (days)	4(6±4.2)	4(5±2.2)
Readmissions within 30 days (n)	2	3

P 59. SURGICAL RESECTION OF SPORADIC PANCREATIC NEUROENDOCRINE TUMORS: A TWO-DECADE EXPERIENCE AT A LARGE VOLUME CANCER CENTER

BJ Kim, N Ikoma, MP Kim, CD Tzeng, JE Lee, MHG Katz, J Maxwell
Presenter: Bradford J. Kim MD, MHS | University of Texas MD Anderson Cancer Center, United States

Background: Neuroendocrine tumors (NET) are indolent, although an estimated 50% of patients present with metastatic disease. Surgical resection may be reasonable in well-selected patients at every disease stage; but for patients with pancreatic NETs (PNETs), operative risk must be carefully balanced with the risk of progression or recurrence. The objective of this study was to determine post-pancreatectomy long-term outcomes in PNET patients undergoing resection.

Methods: From 2000-2020, clinicopathologic information was collected for patients undergoing resection for sporadic PNETs (inherited PNETs excluded) at a large volume cancer center. Surgical complications were prospectively tracked (from 2011) using the Modified Accordion Grading System (MAGS; Major Complication:Grade≥3).

Results: Among 392 resected PNET patients, 52.6% were male with a median age of 57 years (IQR:48-66). Twenty percent of patients presented with metastatic disease. Operations performed included enucleation (7.7%), distal pancreatectomy (56.9%), central pancreatectomy (4.3%), pancreaticoduodenectomy (30.1%), and total pancreatectomy (1.0%). Median tumor size was 3 cm (IQR:1.9-5.0), with an R0 resection rate of 90.8%. Twenty-nine percent of all patients had a major complication. Rates of delayed gastric emptying, pancreatic fistula, and postoperative transfusion were 12.8%, 46.8%, 7.7%, respectively. Median length of stay was 8 days (IQR 6-11). Concurrent hepatic metastatectomy was performed in 12% of patients with a major complication rate of 7.1%. Median overall survival (OS) of all patients was 171 months. Nonmetastatic PNET patients had improved OS compared to metastatic patients (179 months vs.103 months, $p < 0.001$, Figure).

Conclusion: PNET resection is safe and can be associated with prolonged survival. Further, resection of the primary PNET and associated metastatic disease is not associated with increased morbidity in selected patients and may achieve long-term survival.

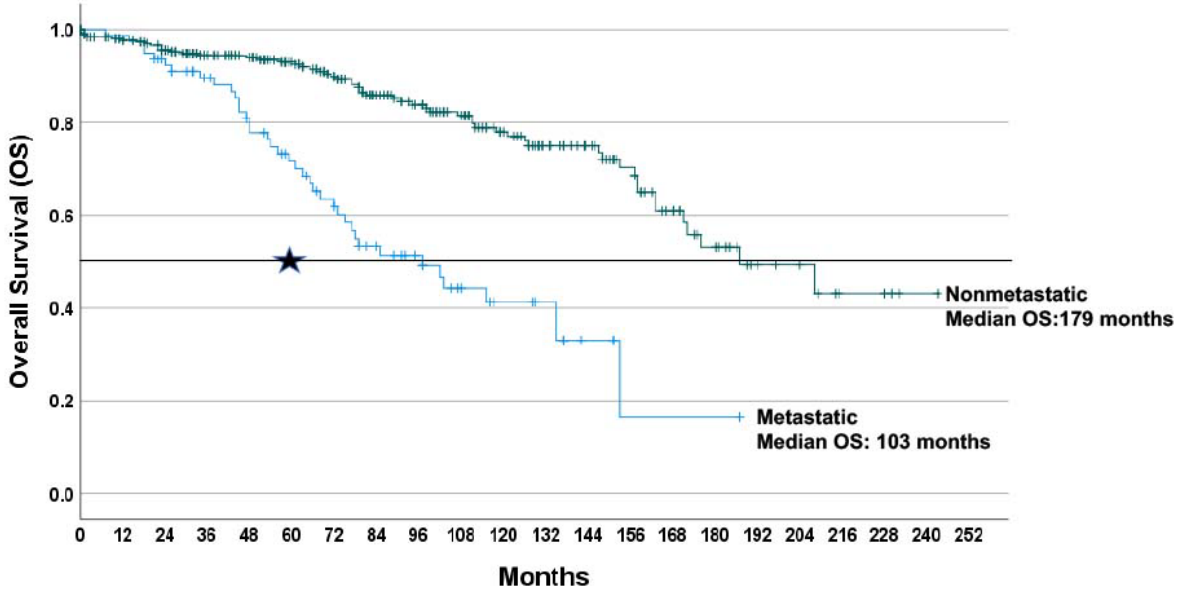


Figure Legend: Median survival for resected metastatic and nonmetastatic PNETs at MD Anderson Cancer Center compared to median OS of all advanced PNET according to SEER analysis (2000-2012).

P 60. THE FIRST 40 CONSECUTIVE FULLY ROBOTIC PANCREATODUODENECTOMY PERFORMED BY A SINGLE SURGEON WITHOUT CONVERSION TO OPEN SURGERY: A CASE-SERIES

C Carpenito, N Furbetta, M Palmeri, G Di Franco, S Guadagni, D Gianardi, M Bianchini, A Comandatore, C Gianfaldoni, M Mastrangelo, M Cammarata, G Di Candio, L Morelli
Presenter: Annalisa Comandatore MD | University of Pisa, Italy

Background: Several studies have compared robotic pancreatoduodenectomy (RPD) and open pancreatoduodenectomy (OPD), showing that robotic RPD is a feasible and safe procedure for both benign and malignant pathologies. Technical challenges of minimally invasive surgery limited the diffusion of the RPD despite some studies have demonstrated that RPD reduces estimated blood loss and length of post-operative stay in comparison to OPD and that RPD is associated with better oncological outcomes respect to OPD. Furthermore, the reported learning curve for RPD performed by a single surgeon ranges from 20 to 100 cases, and a rate of conversion to open surgery ranges from 1.1% to 5.1%. We report our experience, with the first 40 consecutive fully RPD with the use of the da Vinci Xi, performed between 2018 and 2021 by a single surgeon with previous experience in pancreatic surgery and in robotic surgery for other indications.

Methods: The first 40 consecutive RPD performed between May 2018 to December 2021 by the same operator with the da Vinci Xi were retrospective analyzed. At the beginning of the series, the surgeon was already highly experienced in pancreatic surgery (> 400 procedures) and in minimally invasive surgery (both laparoscopic and robotic surgery, > 800 procedures). The only surgical exclusion criterion for RPD was the presence of vascular involvement (borderline resectable or locally advanced tumors). Intraoperative and perioperative outcomes were evaluated, including previous abdominal surgery and BMI.

Results: No conversion to open surgery was reported. Eighteen out of 40 patients (45%) had undergone previous abdominal surgery, 14 of 40 (35%) had a BMI between 25 kg/m2 and 30 kg/m2 and 3 of 40 (7,5%) had a BMI greater than or equal to 30 kg/m2. Mean operative time was 434,9 $\pm$ 112,1 mins while mean console time was 282,7 $\pm$ 39,5 minutes. Thirty-two out of 40 (80%) were pylorus preserving PD while the remaining 8 (20%) were Whipple procedures. All the procedures were performed with a fully robotic technique, both for the resective phase and for the reconstructive phase, including all anastomoses (pancreatojejunostomy, hepaticojejunostomy and duodenojejunostomy or gastrojejunostomy). The median postoperative stay was 10 days [8-21,75], 15 out of 40 patients were discharged within POD 8.. Five patients (12,5%) had major complications (grade 3 Clavien-Dindo or above), while only 2 (5%) clinically relevant (both grade B) POPFs were encountered. There was no 30-day mortality.

Conclusion: In our experience, RPD is a technically feasible and safe procedure for pancreatic and periampullary tumours. Previous experience in pancreatic and minimally invasive surgery, both laparoscopic and robotic surgery, together with the use of the da Vinci Xi, seem to play a significant role to flatten the specific learning curve for RPD, and to reduce the risk for conversion to open surgery.

P 61. COMPLETE PANCREATIC DUPLICATION: CASE REPORT AND REVIEW OF THE LITERATURE

N Lluis, Y Curbelo, P Inampudi, D Asbun
Presenter: Nuria Lluis MD | Miami Cancer Institute, United States

Background: Complete pancreatic duplication is an extremely rare anatomic variant. We describe a case report of an incidentally found complete pancreatic duplication with an inverted orientation and separate ductal system, as well as a review of the literature.

Methods: The patient's medical chart and imaging were reviewed. A literature search was performed in PubMed of English-written articles describing pancreatic anatomic variants.

Results: A 24-year-old female with a past medical history of nephrolithiasis and Crohn's disease on biological treatment underwent a follow-up MR enterography after experiencing mild abdominal pain during the past four months. Imaging revealed the presence of a complete pancreatic duplication. The accessory pancreas was located in the left hemiabdomen, slightly more inferiorly than the dominant pancreas. The head was oriented laterally, and associated with the first jejunal loops. Neither the dominant pancreas or the accessory pancreas were associated with peripancreatic inflammatory stranding. No pancreatic ductal dilatation or glandular calcifications were noted.

Fusion or duplication variants may arise from the pancreatic ductal system. Head/body or tail bifurcations, looped or N-shaped head, ring configuration of the head, and anomalous origin of the uncinate process are amongst rare variants of duplication described in the literature. The complete duplication of pancreatic parenchyma is much less commonly described. The incidence of pancreatitis in patients with duplication anomalies does not appear to be higher than that of the general population.

Conclusion: The identification of asymptomatic congenital pancreatic variants is rarely reported. To the best of our knowledge, this is the first report of a large heterotopic pancreatic duplication lodged between jejunal loops with inverse orientation and a separate ductal system.

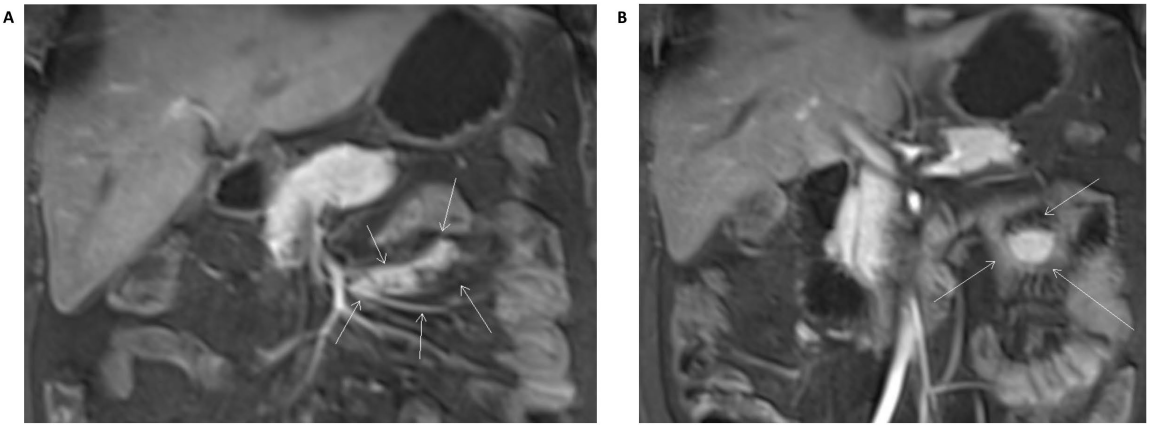


Figure 1. Complete pancreatic duplication. A) Coronal post-contrast T1-weighted images at the arterial phase show the accessory complete pancreas situated in the left hemi-abdomen, slightly more inferiorly than the dominant pancreas. B) The head is associated with the first jejunal loops. Neither the dominant or the accessory pancreas show peripancreatic inflammatory stranding.

P 62. BUTYRYLCHOLINESTERASE CONTROLS THE CANINE PANCREAS DIGESTIVE ENZYMES SYNTHESIS RATE BY CONTROLLING THE NUMBER OF ACH RECEPTORS OCCUPIED. THIS EXPLAINS HOW TOXIC ACINAR CELL DAMAGE CAUSES PANCREATITIS

T Dressel
Presenter: Thomas D. Dressel BME MS MD | University of Minnesota, United States

Background: We developed a canine model for acute pancreatitis, induced by intravenous injection of the anticholinesterase, (O,O-Diethyl-O-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate), Diazinon, 75 mg/ kg. Butyrylcholinesterase (BCHE) is synthesized, stored, and secreted by the canine acinar cells in an active form.

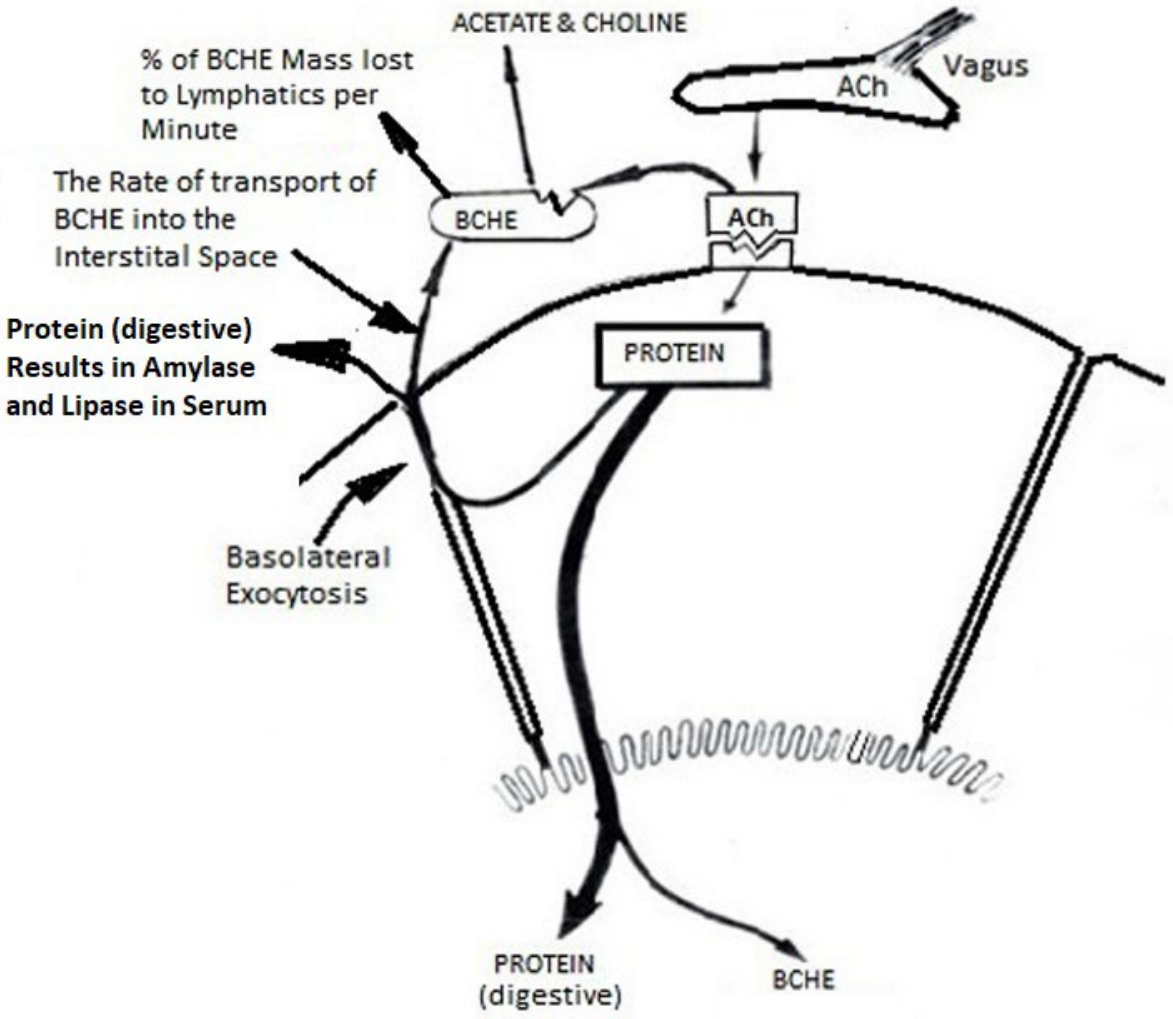
Methods: The principals control theory are applied to a model of the pancreatic lobule that incorporates the low level, dose dependent basolateral transport of pancreatic enzymes and BCHE into the interstitial space. This basolateral transport mechanism is responsible for the nonzero amounts of serum amylase and lipase seen under physiologic levels of pancreatic stimulation. Unlike the neuromuscular junction, where there is a fixed amount of membrane bound acetylcholinesterase, in the canine pancreas interstitial space, there is a variable amount of water soluble butyrylcholinesterase.

Results: The mass of BCHE present in the interstitial space is a dynamic balance between the rate of basolateral transport of BCHE into, and the diffusion out of, the interstitial space. In the steady state, (constant rate of ACh released by the Vagus nerve), the mass of BCHE in the interstitial space = the rate of basolateral transport of BCHE into the interstitial space, divided by the percentage rate of loss of BCHE into the lymphatics. For example, if the transport rate of BCHE into the interstitial space is one mg/ minute, and the percentage rate of loss of BCHE to the lymphatics is 10 % of the mass per minute, then the mass of BCHE in the interstitial space is (one mg/min)/(0.1/min) = 10 mg.

Conclusion: This negative feedback model gives insight into the pathogenesis of pancreatitis. In a steady state, the rate of Vagal ACh released into the interstital space is constant. And there is a perfect balance between the rate of release of ACh into the interstital space and the rate of hydrolysis of ACh by the BCHE activity. The ACh receptor occupancy is constant. Any toxic insult to the acinar cells that reduces the rate of digestive enzyme output, initially results in a decrease in the rate of transport of BCHE into the interstitial space, and a reduction of the amount of BCHE in the interstital space, which causes ACh receptor occupancy to increase, which then increases the rate of enzyme synthesis. The amount of BCHE in the interstital space increases until there is again just enough BCHE to hydrolyze all of the ACh entering the interstital space. This control mechanism acts like “cruise control” for the rate of digestive enzymes synthesis, in that it restores the rate of protein synthesis present before the toxic insult, but it requires a greater number of ACh receptors occupied to do so. If the toxic damage is severe enough to cause the increase in receptor occupancy to result in hyperstimulation, then it predisposes the pancreas to pancreatitis.

The human pancreas doesn’t synthesize BCHE, but Diazinon causes pancreatitis in humans. The human pancreas must synthesize a different secretagogue specific inhibitory enzyme. It's an unknown, water soluble, serine protease enzyme, synthesized, stored, and secreted in an active form.

Closed Loop Model of Canine Pancreatic Lobule With BCHE as the Secretagogue Specific Inhibitory Enzyme



P 63. CAN WE COMPARE THE RESULTS OF THE TREATMENT OF RESECTABLE AND BORDERLINE PANCREATIC CANCER.

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Background: Surgical treatment of pancreatic cancer (PC) is one of the most difficult problem of surgery. Currently, there is a large range of surgical procedures on the pancreas and methods of combined treatment, but the problem remains relevant to this day.

Methods: We analyzed the results of surgical treatment of 191 patients with PC. St.I-16 (8.4%), St.II – 108 (56.5%), and St.III – 62 (32.4%), St.IV-5 (2.6%). Men-132 (69,1%), women – 59 (30.9%), age - 61.1±6.7 years. Localization of tumor: head of pancreas – 170, distal tumors - 19, total lesion - 2. Pancreatoduodenectomy (PD) was performed in 170 patients, 18 patients undergone distal pancreatic resection: RAMPS – 13, Kimura's procedure – 1, Warshaw – 1, Applbey – 3; total pancreatectomy - 2. In cases of vascular invasions was performed: portal vein (PV) resection – 2, resection superior mesenteric vein (SMV) – 6, resection of the porto-mesenteric junction - 8, resection of the side wall of PV/SMV – 4, graft implantation – 3, plastic of the SMA – 1, celiac trunk resection – 3. Patients are divided into 2 groups: 1st - standard PD - 164, 2nd - operations with blood vessels resection - 27.

Results: Morbidity and mortality rates were evaluated within 30 days after surgery. Pancreatic fistula (PF) - 14.7% (28): gr. A-14, gr. B-10, gr. C-4. Bile lekage – 6.3% (12), pancreatitis – 2.6% (5), delayed gastric emptying – 4.2% (8), bleeding – 8,4% (gr. A-6, gr. B-6, gr. C-4), abscess - 3.7% (7), wound infection – 3.7% (7), others – 7,9% (15). Morbidity -51.3% (98), and mortality - 4.7% (9). In 1st gr. Morbidity and mortality rate is 50,6% (83) and 4,3% (7), in 2nd gr. – 55.5% (15) and 7.4% (2) respectively. PF in 1st gr. – 14.6% (24), 2nd gr. – 14.8% (4). R1 resections in the 1st group - 4 (2.4%), 2nd gr. – 2 (7,4%). Long-term results: overall survival – 23.5 months, relapse-free survival – 17.1 months. In the 1st gr. - 26.8 and 18.9 months accordingly, in the 2nd – 20.2 and 16.4 months. One year survival – 54.3%, 3-years-17.1%, 5-years - 11.4%.

Conclusion:. Surgical treatment patients with borderline resectable PC is more difficult and is accompanied by slightly worse immediate results. Performing vascular resection during tumor invasion with the achievement of marginR0 allows for comparable rates of overall and relapse-free survival.

Patients from the 2nd group had at least the 3 stage of the tumor at the time of surgery, that's why the morbidity and mortality rate was higher. But all these patients undergone radical surgical treatment, which allowed almost equalize the long-term survival in both groups.

P 64. CYTOREDUCTION WITH HIPEC FOR ADENOCARCINOMA FOLLOWING COMPLETION PANCREATECTOMY FOR RECURRENT IPMN

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Background: We present a unique case of recurrent IPMN which after complete resection presented with mucinous adenocarcinoma in the resection bed which was treated with HIPEC with Mitomycin C, and cystoreduction. The patient initially presented at the age of 37years with pancreatic head IPMN for which he underwent pancreatoduodenectomy in 2017. Intraoperative frozen section of neck margin was negative. Postoperative recovery was uneventful. Final pathology revealed IPMN with extensive high grade dysplasia at neck margin, intrapancreatic rupture with mucin extrusion, PanIN3 , 0/24 LN, pTisN0. He was lost to follow up and presented 1.5yr later with SBO which resolved with conservative management. Surveillance MRI in 2019 showed increased cystic dilation of pancreatic duct at pancreticojejunostomy and an additional cyst concerning for recurrent disease which was confirmed on EUS which revealed acellular mucin but no dysplastic cells. The patient underwent completion pancreatectomy, final pathology showed extensive high grade dysplasia, no invasive malignancy, 0/17LN, an implant at anastomotic site with mucin and high grade dysplasia. Surveillance imaging 10 months after completion pancreatectomy revealed 2.4cm lesion in the area of pancreatic with an adjacent smaller lesion, mildly PET avid. After discussion at tumor board regarding local therapy, on follow up image 3 months later, the lesion increased in size to 3.8cm superior to portal vein in the resection bed. Patient underwent exploratory laparotomy, resection of periportal mass, peritoneal cystic lesion, and HIPEC in Feb 2021. Pathology was consistent with abundant mucin fragment with minute focus of adenocarcinoma, mucinous epithelium with high grade dysplasia. He received 12 cycles of gemcitabine and Xeloda which was well tolerated. Currently remains no evidence of disease on most recent follow up 12 months after cytoreduction and HIPEC.

P 65. SURVIVAL ASSOCIATED WITH STAGING CT AND DIAGNOSTIC LAPAROSCOPY AND CYTOLOGY IN PANCREATIC ADENOCARCINOMA: A CASE SERIES

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Background: Pancreatic cancer has a 5-year survival rate of approximately 10% and incidence has been trending upwards for the past 20 years. Patients with localized disease are treated with curative intent using a combination of surgical resection and systemic therapy. Diagnostic staging is performed with computed tomography (CT). While CT imaging effectively identifies extent of gross disease, micro-metastases cannot be captured. Performing laparoscopy and peritoneal cytology at the time of diagnosis can uncover disease in peritoneal fluid that is not perceptible by CT. However, additional staging may delay neoadjuvant therapy and its benefits are unclear. Laparoscopy and cytology may improve accuracy of cancer staging and avoid futile surgery in patients with metastatic disease.

Methods: This is a single-center retrospective review of eight patients with non-metastatic pancreatic cancer diagnosed from 2017-2020. Patients were staged using CT and subsequently underwent diagnostic laparoscopy and cytology. Patient demographics, clinicopathologic status, treatment course, and survival was also obtained.

Results: Eight patients met study criteria. One patient had resectable disease by CT while seven had locoregional disease (Table 1). All patients had negative laparoscopies. The patient with resectable disease and four with locoregional disease had negative cytologies as well. Of the remaining three patients with locoregional disease, two cytologies showed atypical cells, and one was positive for micro-metastases. Among five total patients with a negative laparoscopy and negative cytology, two underwent surgical resection. No surgical resections were aborted due to disease spread. None of the three patients with atypical or positive cytology underwent resection. The two patients who underwent resection received neoadjuvant chemotherapy and remain alive, with an average of 22.0 months since diagnosis. The patient with negative laparoscopy and positive cytology received chemotherapy and remains alive, with 21.8 months since diagnosis.

Conclusion: This study found similar average survival in two patients with R0 resection following negative laparoscopy and cytology, and a patient with systemic therapy following negative laparoscopy and positive cytology. Laparoscopy and cytology may have spared the cytology-positive patient a non-therapeutic surgery, thereby maximizing quality of life. Evidence in published literature also suggests that cytology-positive patients do not show significant survival benefit with resection. Despite potential benefits associated with more accurate staging, universal laparoscopy and cytology may increase risk of disease progression due to delayed initiation of neoadjuvant therapy, particularly in patients with resectable lesions. Further research to determine which patients would most benefit from invasive staging is warranted.

Table 1. Patient demographics

Category	Variable	n=8
Age at Diagnosis (years)		65.6 (range 56 - 77)
Race		
	White	2 (25%)
	Non-White	6 (75%)
Comorbidities		
	HTN	6 (75%)
	DM	6 (75%)
Smoking History		
	Yes	4 (50%)
	No	4 (50%)
Alcohol Use		
	Yes	4 (50%)
	No	4 (50%)
Tumor Location		
	Head	6 (75%)
	Body/Tail	2 (25%)
Resectability by CT		
	Resectable	1 (12.5%)
	Locoregional	7 (87.5%)
	Metastatic	0 (0%)

P 66. RECURRENT METASTATIC SOLID PSEUDOPAPILLARY NEOPLASM OF THE PANCREAS FOLLOWING ABDOMINAL TRAUMA TREATED BY CYTOREDUCTIVE SURGERY

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Background: Solid pseudopapillary neoplasm (SPN) is a rare pancreatic tumor that most commonly arises in young women with non-specific clinical symptoms. Although SPNs typically display indolent behavior with a favorable natural history, pancreatic trauma leading to tumor disruption may result in occult peritoneal seeding providing a mechanism for development of metastatic disease.

In this report, we present the case of a patient with SPN metastasizing throughout the abdomen and pelvis nearly 16 years after resection of a SPN discovered incidentally following blunt pancreatic trauma sustained during an acrobatic cheerleading accident. In September of 2004 the patient, age 16, underwent an exploratory laparotomy, distal pancreatectomy and splenectomy for a transection of the body of the pancreas with a large left retroperitoneal hematoma. Pathology revealed a 1 x 4 cm laceration in the spleen; an 8 cm hemorrhagic portion of adipose tissue and 5 x 3 x 0.5 cm mass lesion with an area of surface disruption in the distal portion of the pancreas. The resection margin showed no evidence of involvement and 3 resected lymph nodes that were negative for tumor. The sections obtained from the capsular margin of the neoplasm showed the neoplasm to be present at the margin, however, there was no evidence of adherent soft tissue or vascular structures that would imply invasion of these structures. Since 2004, the patient has been followed by serial imaging which revealed peritoneal nodularity slowly growing (Figure 1A and 1B). In 2020, at age 30, 13 ova were harvested and banked. Following confirmatory diagnostic studies for metastatic SPN, complete resection of macroscopic tumor was recommended and thereafter performed by complete cytoreductive surgery (CCRS): exploratory laparotomy, lysis of adhesions, cholecystectomy, omentectomy, resection of the splenic flexure of the colon with en bloc tumor nodules and colocolostomy, limited distal pancreatectomy, and pelvic peritonectomy with resection of tumor nodules (from the right paracecal area, the posterior cul-de-sac area, the anterior cul-de-sac bladder flap region, and the right broad ligament). The peritoneal cancer index (PCI) was 11. Histopathology revealed a characteristic pseudopapillary growth pattern and positive nuclear beta-catenin staining consistent with recurrent SPN. A Pan Cancer 42 gene panel identified only a CTNNB1 mutation for beta catenin whose molecular pathway has been reported as aberrant during SPN tumorigenesis. The patient currently remains without evidence of disease progression 2 years after CCRS.

Conclusion: Although rarely reported, metastatic disease does occur with SPNs. Blunt trauma is a means for tumor rupture and disease dissemination. CCRS offers a treatment option for SPN with peritoneal metastasis that may provide durable oncologic benefit.

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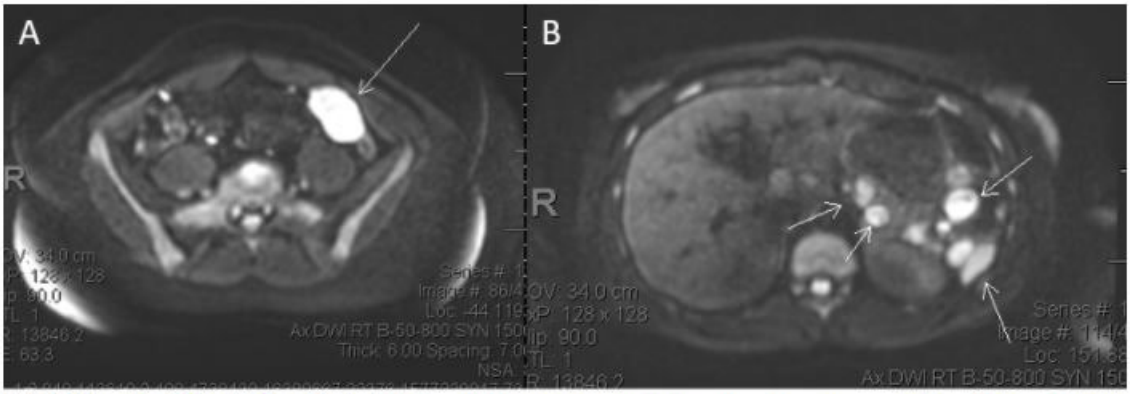
Figure 1



MRI MRCP 1/10/2020. Axial diffusion weighted images with b value = 800. White arrows show peritoneal metastasis.