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Major Pancreatic Resections in Patients Aged Over 75 Years Old Experience of a Single Hepatobiliary Unit

Vivian Hei Man Li, John Isherwood, Chloe Hollobone, Cristina Pollard, Eyad Issa and Ashley Dennison*

Department of Hepatobiliary and Pancreatic Surgery, University Hospitals of Leicester, UK

Abstract

Background: Patients above the age of 65 to 70 have often been denied surgical resection or intervention for pancreatic malignancy due to associations with significantly increased perioperative morbidity and mortality. However, increasing evidence supports that age should not be the main determinant of surgical resection. This study describes the surgical outcomes for patients over the age of 75 selected for major pancreatic resection in a single tertiary hepatobiliary unit.

Methods: A single centre retrospective cohort study at a UK tertiary referral centre. Departmental records were reviewed for patients over the age of 75 who underwent a major pancreatic resection for malignancy.

Results: 64 patients (34 male, 30 female), aged 75 or over (median age 78) underwent a major pancreatic resection. Forty-two patients (65.6%) had curative resections and 22 (34.4%) had palliative procedures. The mean overall length of stay for the curative versus palliative cohorts were 12 days (range 5 to 48) and 8.5 days (range 5 to 22) respectively ($p<0.018$). The median HDU stay for the curative cohort was 3 days (range 1 to 10 days) compared to 2 days (range 0 to 5 days) for the palliative cohort ($p<0.05$). The overall complication rate was 34.4% and perioperatively, 45.2% of curative patients had a postoperative complication compared to 13.6% of palliative patients. The 30 day mortality was 2.4% (n=1) for curative patients and 9.1% (n=2) for palliative patients. Patients who underwent curative resection had a higher overall survival at 2 years (50%) compared to those undergoing palliative intervention (22.7%). Survival curves at 2 years demonstrated significantly greater survival for patients undergoing curative surgical intervention ($p=0.0016$).

Conclusion: This study suggests that major pancreatic resections in patients over the age of 75 are safe and feasible in selected patient cohorts. The survival rates following both curative and palliative surgical procedures in patients over the age of 75 are comparable with rates seen in younger cohorts undergoing similar major surgical interventions. Further research is required to establish prognostic factors associated with poor outcomes which will facilitate improving patient selection and preoperative workup which will further improve postoperative morbidity.

Keywords: Pancreatic resection; Outcome; Elderly; Survival

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Correspondence:
Vivian Hei Man Li, Department of Hepatobiliary and Pancreatic Surgery, University Hospitals of Leicester, UK, Tel: 01162588244; E-mail: v.li@doctors.org.uk

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Introduction

Pancreatic cancer is currently the fifth most common cause of cancer-related mortality in the UK and is projected to be the second leading cause of cancer related mortalities by 2030 [1]. With an incidence of approximately 9,000 new cases each year in the UK, the disease is increasingly detected in the elderly population with 60% of patients presenting over the age of 65 and 40% over the age of 75 [1,2]. The survival rate at 5 years remains the lowest of all cancers in both men and women in the UK, with a 2.1% and 2.9% survival at 5 years respectively [2].

Pancreatic cancer is an aggressive disease and despite recent advances in neoadjuvant and adjuvant therapeutic modalities, surgical resection offers the only chance for cure, improving the 5 year survival rate from 5% to more than 20% [2]. Unfortunately, the majority of patients present with inoperable metastatic disease, with only 10% to 20% of patients suitable for surgical resection. Approximately 40% of patients present with metastatic disease, 40% with locally advanced tumors, with only 20% potentially resectable or borderline resectable [2].

Palliative bypasses are performed for unresectable disease due either to locally advanced or metastatic disease found at exploration [3]. However it is believed that older patients receiving major

Table 1: Demographic data of curative and palliative cohorts.

Characteristic	Groups	
Age	Curative (n=42/64, 65.6%)	Palliative (n=22/64, 34.4%)
	Median 78 (range 75 to 83)	Median 78 (range 75 to 84)
Ethnicity		
White British	35 (83.3%)	21 (95.5%)
Asian/Asian British Indian	3 (7.1%)	0
Black British African	1 (2.4%)	0
White Irish	1 (2.4%)	0
Black British Caribbean	1 (2.4%)	0
Asian/Asian British Pakistani	1 (2.4%)	1 (4.5%)
Gender		
Male	21 (50%)	13 (59.1%)
Female	21 (50%)	9 (40.9%)
ASA Grade		
1	0	0
2	33 (78.6%)	10 (45.5%)
3	7 (16.7%)	12 (54.5%)
Missing	2 (4.8%)	0
Comorbidities		
No comorbidities	7 (16.7%)	2 (9.1%)
Diabetes Mellitus	11 (26.2%)	7 (31.8%)
Hypertension	23 (54.8%)	12 (54.5%)
Myocardial Infarction	1 (2.4%)	2 (9.1%)
Ischemic Heart Disease	1 (2.4%)	5 (22.7%)
Cerebrovascular Accident/Transient Ischemic Attack	1 (2.4%)	1 (4.5%)
Asthma	3 (7.1%)	1 (4.5%)
Chronic Obstructive Pulmonary Disease	0	3 (13.6%)
Chronic Kidney Disease	2 (4.8%)	1 (4.5%)
Immunosuppression	0	0
Other (e.g. Multiple Sclerosis, PVD, Bladder Cancer)	24 (57.1%)	14 (63.6%)
Additional Risk Factors		
No risk factors	24 (57.1%)	13 (59.1%)
Smoker	1 (2.4%)	1 (4.5%)
Ex-smoker	10 (23.8%)	5 (22.7%)
Alcohol	9 (21.4%)	2 (9.1%)
High BMI (>30)	1 (2.4%)	0
Lives alone	6 (14.3%)	2 (9.1%)
Histological Diagnosis		
Pancreatic Adenocarcinoma	30 (71.4%)	22 (100%)
Ampullary Adenocarcinoma	6 (14.3%)	0
Intraductal papillary mucinous neoplasm (IPMN)	2 (4.8%)	0
Cholangiocarcinoma	3 (7.1%)	0
Epithelioid Tumour	1 (2.4%)	0

pancreatic resections are associated with a significantly increased perioperative morbidity and mortality. As a consequence although an increasing number of single centre studies have suggested that age should not be the main determinant of surgical resection, historically patients above the age of 65 to 70 have often been denied surgical resection or intervention. This is despite the increased incidence of pancreatic cancer in the elderly and without taking into account other risk factors that have unfavorable effects on the long term survival of patients including the type and extent of resection [4-10].

With the centralization of major pancreatic resectional surgery, there has been an increasingly elderly population of resectable and borderline resectable patients presenting to the MDT (multi-disciplinary meeting) for discussions. Patients who are over 75 and are potentially suitable for a major resection often represent a clinical conundrum and various preoperative triaging methods have been developed. This study describes the surgical outcomes for patients over the age of 75 selected for major pancreatic resection in a single tertiary hepatobiliary unit.

Methods

A single centre retrospective cohort study at a UK tertiary referral centre. Departmental records were reviewed for patients over the age of 75 who underwent a major pancreatic resection for malignancy between the 1st January 2013 and the 5th August 2017.

A total of 64 patients were identified. Perioperative data collected included complications and length of stay. Additional data included follow up at 24 months postsurgical intervention.

Data were analyzed using SPSS (25.0, 2017).Student's t-test and log rank test were used with statistical significance determined as $p<0.05$. Graphical representations were designed with GraphPad Prism 8 software (8.1.1, 2019).

Results

Demographics

Sixty four patients (34 male, 30 female), aged 75 or over (median age 78) underwent a major pancreatic resection with 87.5% of patients being of white British origin. All patients were assessed for their fitness prior to surgery, where the ASA physical status classification stratifies co-morbidities. Sixty two point seven percent of patients were ASA grade II and 29.7% were ASA grade III. The patients were divided into two groups dependent on whether the procedure was curative or palliative. Forty two patients (65.6%) had curative resections and 22 (34.4%) had palliative procedures. The final histological diagnosis varied amongst patients in the curative cohort. Seventy one point four percent of patients had a pancreatic adenocarcinoma, 14.3% of patients had an ampullary adenocarcinoma, 7.1% had a cholangiocarcinoma and 4.8% had an intraductal papillary mucinous neoplasm. All patients who had a palliative procedure had a pancreatic adenocarcinoma and 79.6% of the curative cohorts were ASA grade II compared to 45.5% for the palliative cohort. For the palliative cohort 54.5% were ASA grade III compared to 16.7% for the curative cohort. The most predominant co-morbidity was hypertension, followed by diabetes mellitus and ischemic heart disease (Table 1).

Procedures

A Pancreaticoduodenectomy (PD) was the most common resection performed in the study. Of all 42 curative resections, 78.6% were PDs and 21.4% of patients had a distal pancreatectomy.

Twenty two patients underwent a palliative procedure with 54.5% undergoing a biliary bypass and 18.2% a gastrojejunostomy. Eighteen point two percent had an exploratory laparotomy with frozen section and 9.1% had a more complex biliary bypass with additional

Table 2: Procedures included for curative and palliative cohorts.

Procedures	Curative (n=42/64, 65.6%)	Palliative (n=22/64, 34.4%)
Pancreaticoduodenectomy (PD)	33 (78.6%)	-
Distal pancreatectomy and splenectomy	9 (21.4%)	-
Biliary bypass	-	12 (54.5%)
Gastrojejunostomy	-	4 (18.2%)
Laparotomy and frozen section	-	4 (18.2%)
Biliary bypass + gastrojejunostomy	-	2 (9.1%)

Table 3: Complications and re-admission rate divided by curative and palliative cohorts.

Complications	Curative (n=42/64, 65.5%)	Palliative (n=22/64, 34.4%)
Total complication rate	19 (45.2%)	3 (13.6%)
Clavien-Dindo Classification		
Grade 1	3 (7.1%)	2 (9.1%)
Grade 2	8 (19.0%)	1 (4.5%)
Grade 3a	6 (14.3%)	0
Grade 3b	1 (2.4%)	0
Grade 4a	0	0
Grade 4b	0	0
Grade 5	1 (2.4%)	0
Re-admission	13 (31.0%)	5 (21.7%)
Re-operation	1 (2.4%)	0

gastrojejunostomy (Table 2). There were 3 cases which were duodenal resections for cancer and these have been excluded from the analysis.

High Dependency Unit (HDU) admission and overall length of stay

In both cohorts, the median HDU stay was 3 days (range 0 to 10 days) and the median overall stay was 11 days (range 5 to 48 days). The mean overall length of stay for the curative *vs.* palliative cohorts were 12 days (range 5 to 48) and 8.5 days (range 5 to 22) respectively ($p<0.018$). The median HDU stay for the curative cohort was 3 days (range 1 to 10 days) compared to 2 days (range 0 to 5 days) for the palliative cohort ($p<0.05$).

Complications and re-admissions

Five patients from the curative cohort and 2 patients from the palliative cohort were readmitted within 2 weeks. The overall complication rate was 34.4% and perioperatively, 45.2% of curative patients had a postoperative complication compared to 13.6% of palliative patients.

There were 13 Postoperative Pancreatic Fistula (POPF) complications. Seven patients had a grade A POPF (drain amylase concentration more than 3 times the upper limit of normal serum value). Five patients had a grade B POPF (4 with persisting pancreatic drainage over 3 weeks and 1 with signs of infection related to a POPF without organ failure, this was a small collection than did not require drainage). There was 1 grade C POPF with a patient returned to theatre for a postoperative collection and pancreatico-jejunostomy disruption. The additional complications in curative patients were classified by the Clavien-Dindo criteria and are shown in Table 3.

Survival and chemotherapy

The 30 day mortality was 2.4% (n=1) for curative patients (patient

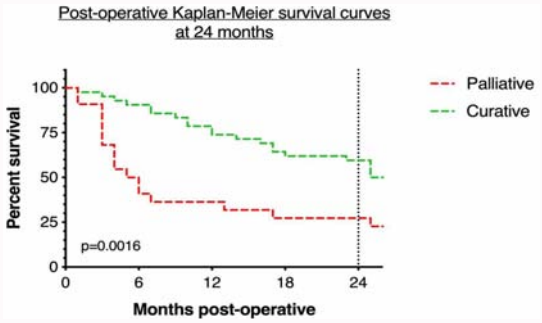

Figure 1: Kaplan-Meier Survival Curves at 24 months.

died from respiratory failure secondary to aspiration on day 5) and 9.1% (n=2) for palliative patients (metastatic disease). Patients who underwent curative resection had a higher overall survival at 2 years (50%) compared to those undergoing palliative intervention (22.7%). Survival curves at 2 years demonstrated significantly greater survival for patients undergoing curative surgical intervention (Log-rank test, $p=0.0016$) (Figure 1). In the curative cohort, 23 (54.8%) patients received adjuvant chemotherapy compared to 12 (54.5%) patients who received adjuvant chemotherapy in the palliative cohort. Only 1 patient (2.4%) in the curative cohort and no patients in the palliative cohort received neoadjuvant chemotherapy.

Discussion

Patients aged 65 and above are projected to increase to over a quarter of the UK national population by 2037. With 50% of cases of pancreatic cancer presenting over the age of 75, the surgical management of elderly patients presenting with challenging co-morbidities is becoming an increasingly common management challenge in tertiary hepatobiliary units [11]. Appropriate surgical risk stratification and preoperative work up is therefore vital when considering possible surgical intervention.

There are few reports of major pancreatic resections in patients over 75 years of age although major surgical resections in patients over 75 years old are described in other surgical specialties [4,6]. Advances in perioperative care, surgical techniques and perioperative selection tools have proven effective in triaging elderly patients with both benign and neoplastic disease. Such advance in other major HPB operations such as liver surgery has focused the attention of pancreatic surgeons onto patients over seventy five years of age with pancreatic malignancies. This is in the knowledge that with careful selection, appropriate preoperative assessment and surgery, alongside diligent postoperative care, excellent results can be achieved and the more cautious approach that has previously been adopted should be reviewed.

Short and long-term surgical outcomes in elderly patients

The immediate postoperative mortality and morbidity varies widely between surgical specialties and the nature of the intervention. Previous studies have documented the 30 day postoperative outcomes for a range of surgical interventions, including major abdominal surgery for benign and malignant disease [12]. Controversies still exist in respect of the appropriateness of surgery in patients with advanced age, their suitability for surgery and the effect of overall survival on the outcome of major surgical operations. A summary of short term survival outcomes for major resections in the elderly is shown in Table 4. The majority of studies investigating surgical outcomes

Table 4: Short term survival outcome summary in major abdominal surgical operations.

Surgical Specialty	Study	Country	Year	Surgical Intervention	Age group	Total number of resections	% ASA Grade 1 to 2	% ASA Grade 3 to 5	30 day Mortality	Complication rate	Length of Stay
Colorectal	Hamel et al. [12]	USA	2005	Open bowel resection ‡	>80	1595	14.3%	84.8%	11.9% (189/1595)	-	-
	Endreseth et al. [32]	Norway	2005	Rectal cancer resection †	75 to 79	741	-	-	3% (25/741)	-	-
	Tan et al. [15]	UK	2007	Colorectal cancer resection †	>75	17,117	53.3%	46.7%	10.6% (1762/16,664)	-	12 days (median, range 9 to 19)
	Chautard et al. [14]	France	2008	Laparoscopic bowel resection ‡	>70	178	-	-	0% (0/178)	33% (59/178)	15 days (mean)
	Rutten et al. [19]	Netherlands (Dutch TME study)	2008	Rectal cancer resection ‡	≥ 75	230	-	-	6.5% (15/230)	51.8% (118/230)	-
Upper GI	Ruol et al. [17]	Italy	2007	Oesophageal resection ‡	>70	165	58.7%	41.3%	1.9% (3/165)	49.1% (78/159)	-
	Orsenigo et al. [18]	Italy	2007	Gastrectomy †	≥ 75	249	-	-	3% (7/249)	20% (49/249)	15 days (mean)
	Cho et al. [13]	Korea	2009	Laparoscopic subtotal gastrectomy ‡	≥ 70	226	-	-	0.9% (2/226)	16.8% (38/226)	-
	Oakley et al. [20]	UK	2016	Oesophageal resection ‡	>75	147	-	-	3.4% (5/147)	62.7% (84/134)	16 days (Median, range 13 to 22)
Vascular	Hamel et al. [12]	USA	2005	Non ruptured AAA repair ‡	>80	286	14.3%	84.8%	8.0% (23/286)	-	-
	Haug et al. [33]	Norway	2005	Elective open AAA repair ‡	≥ 80	105	-	-	10.5% (11/105)	-	-
	Raval et al. [27]	USA	2012	Open AAA repair ‡	≥ 80	391	-	-	6.1% (24/391)	33.2% (130/391)	-
	Raval et al. [27]	USA	2012	Endovascular AAA repair ‡	≥ 80	1634	-	-	1.8% (29/1634)	13.6% (222/1634)	-
Hepatobiliary	Menon et al. [34]	UK	2006	Major liver resection ‡	≥ 70	127	79%	21%	7.9% (10/127)	31% (39/127)	15.2 days (mean)
	Adam et al. [31]	France	2010	Liver resection for colorectal metastases †	≥70	1624	-	-	3.8%§ (62/1624)	32.3% (418/1295)	-
	Cho et al. [21]	USA	2011	Hepatectomy ‡	70	75	17.3%	82.7%	0% (0/75)	56% (42/75)	7 days (median, range 1 to 24)
	Tzeng et al. [16]	USA	2014	Hepatectomy ‡	≥ 75	894	19.2%	80.8%	4.8% (43/894)	23.9% (214/894)	7 (median, range 1 to 138)
	Paiella et al. [28]	Italy	2017	Pancreatico-duodenectomy ‡	≥ 75	96	-	-	1.04%¶ (1/96)	65.6% (63/96)	10 days (mean, range 5 to 73)
	Shamali et al. [10]	UK	2017	Pancreatico-duodenectomy ‡	≥75	102	80.4%	19.6%	5.9% (6/102)	57.8% (59/102)	15 (median, range 10 to 22)

†Results for curative and palliative surgery
‡Results for curative surgery
§60-day mortality
¶90-day mortality

in the elderly suggest that immediate postoperative mortality is not predominantly based on age alone. Indeed, the number and severity of comorbidities appear to be the primary factor in predicting the immediate postoperative complication and mortality rate.

Thirty day mortality rates across a number of surgical interventions vary from 0% to 12%, which is equivalent to the 30 day mortality described in this study where we have demonstrated a mortality of 2.22% (n=1) for curative and 8.70% (n=2) for palliative resections [12-14].

The United Kingdom National Bowel Cancer Project reported that the 30 day mortality is three times as high in elderly patients (over 75 years old) compared to their younger cohort (10.6% *vs.* 3.8%) [15]. This picture is similar in liver resections, where mortality rates in the elderly were twice as high as younger patients (4.8% *vs.* 2.0%), despite less extensive resections. However, the number of comorbidities was significantly greater and likely explains why this cohort was more susceptible to experiencing postoperative complication [16]. Several studies however did not demonstrate a significant or large difference in mortality, and studies reviewing outcomes for oesophageal and gastric resections described only marginally higher mortality rates that were statistically insignificant when compared to their younger cohorts [17,18].

The overall frequency and severity of postoperative complications in the elderly are generally increased compared to their younger

Table 5: Long term survival outcome summary in major abdominal surgical operations.

Surgical Specialty	Study	Country	Year	Surgical Intervention	Age Group	1 year Survival	2 year survival	3 year survival	5 year survival
Colorectal	Endreseth et al. [32]	Norway	2005	Rectal cancer resection †	75 to 79	-	-	-	38% (1223/4875)
	Law et al. [30]	Hong Kong	2006	Rectal cancer resection ‡	>75	-	-	-	47.7% (64/133)
Upper GI	Saidi et al. [35]	USA	2004	Gastrectomy ‡	>70	-	41.7% (10/24)	-	16.6% (4/24)
	Ruol et al. [17]	Italy	2007	Oesophageal resection ‡	>70	-	-	-	39% (57/147)
	Orsenigo et al. [18]	Italy	2007	Gastrectomy †	≥ 75	-	-	-	47% (117/249)
	Oakley et al. [20]	UK	2016	Oesophageal resection ‡	>75	65% (96/147)	-	-	21% (31/147)
Vascular	Haug et al. [33]	Norway	2005	Elective open AAA repair ‡	≥ 80	83.3% (87/105)	-	-	47.1% (49/105)
Hepatobiliary	Menon et al. [34]	UK	2006	Major liver resection ‡	≥ 70	-	-	59% (72/127)	-
	Adam et al. [31]	France	2010	Liver resection for colorectal metastases †	≥ 70	-	-	57.1% (927/1624)	-
	Paiella et al. [28]	Italy	2017	Pancreatico-duodenectomy ‡	≥ 75	-	-	-	13.5% (13/96)
	Shamali et al. [10]	UK	2017	Pancreatico-duodenectomy‡	≥ 75	-	-	-	34.8% (35/102)

† Results for curative and palliative surgery
‡ Results for curative surgery

counterparts. In this study, postoperative complications were greater in the curative cohort (46.7%) than the palliative patients (13.0%). Although not directly comparable, these rates are similar to those seen in other interventions performed in elderly patients, including a 51.8% complication rate seen in total meso-rectal excisions for rectal cancer [19], a 49.1% to 62.7% complication rate seen following oesophagectomy and a 23.9% to 56% complication rate seen following major liver resections [16,17, 20, 21].

In some smaller studies, the frequency of complication rates was comparable between younger and older cohorts, with no statistically significant difference [18]. This was also reflected in a larger study analyzing 7261 patients undergoing elective liver resection, where minor postoperative complications such as urinary tract infections were not significantly greater in the elderly, although the rates of major complications including cardiopulmonary complications, sepsis and requirement for prolonged ITU care and intubation were increased for elderly patients [16]. The risk of mortality is increased in elderly patients after major postoperative complications and has generally been attributed to associated co-morbidities, frailty and lack of reserve in elderly patients that results a failure to recover from a significant postoperative complication.

Frailty syndrome predicts surgical outcomes and quantifiable factors are determined by measuring grip strength, exhaustion, low activity levels and slowed walking speed [22]. This has been found to be an independent predictor of perioperative morbidity in the elderly, as patients with frailty syndrome have an up to four times higher risk of developing major complications after surgery. Assessments of frailty can be used in addition to other predictive measures of preoperative physiology, such as ASA grading and P-POSSUM scoring that predominantly assess co-morbidities, pathological risk factors and biochemical abnormalities. Some authors recommend frailty assessments as part of routine work-up for elderly patients undergoing elective surgery [20]. Our cohort of curative patients was predominantly ASA grade II but formal pre and postoperative assessments of frailty were not conducted and this is an aspect that we can potentially explore to improve patient outcomes.

The Enhanced Recovery after Surgery (ERAS) protocol is specifically designed to reduce the postoperative length of stay and complication rates. Such techniques involve optimizing preoperative nutrition and fitness together with the avoidance of extended fasting and encouraging early mobilization after surgery [23]. The implementation of such protocols in tertiary specialist centers where major resections are performed has improved postoperative recovery and have yielded specific benefits in the elderly, where averting the frequency and severity of postoperative complications can prevent consequent morbidity and mortality [12,20]. Our unit has an established ERAS protocol and although they can be difficult to implement in elderly patients (particularly when applying overarching goals), adherence to the ERAS ethos is considered fundamental to patient recovery and rehabilitation postoperatively and is particularly important in this elderly group of patients.

Advances in therapeutic techniques, including laparoscopic approaches in colorectal and gastric resections and neoadjuvant radiotherapy are enabling elderly patients to withstand the physical rigors of surgery and achieve encouraging results with good long term survival rates [13,14]. Reduced lengths of hospital stay, cardiorespiratory complications, wound infections and intraoperative blood loss have all been described with laparoscopic resections in the elderly when compared to younger cohorts [24-26]. This has translated to lower postoperative mortality, with a described 30 day mortality of 0% in laparoscopic bowel resections and 0.9% in laparoscopic subtotal gastrectomy in selected elderly cohorts [13,14]. Minimally invasive techniques in vascular surgery has also demonstrated significant benefits for the elderly, with Endovascular Aneurysm Repair (EVAR) demonstrating a 30 day mortality for Abdominal Aortic Aneurysm (AAA) repair as low as 1.8% in patients over the age of 80 as compared to 6.1% of patients undergoing open AAA repairs [27].

The short term outcomes for elderly patients with pancreatic cancer undergoing major resections suggest similar outcomes to those reported in other surgical specialties. Recent research in patients over 75 undergoing curative resection and particularly PD

has described a postoperative complication rate of 65.6% with no significant differences compared to cohorts as young as 40 to 64 years of age and this was associated with similar 90 day mortality rates and overall lengths of stay [28]. Other authors have also described similar complication rates of 57.8% and 30 day mortality of 5.9% (10), outcomes which are similar to the findings in our study.

The long-term outcomes and survivals are similar between surgical specialties and are summarized in Table 5. Pancreatic cancer survival remains low as with other late presenting cancers such as oesophageal malignancy, with 5 year survival rates of 21% to 39% [17,20].

The precise histological diagnosis enables prognostic predictions in respect of long-term survival, with pancreatic adenocarcinoma demonstrating significantly worse 5 year survival rates compared to periampullary malignancies (27% *vs.* 42%) [29]. Our study reflects this and 28.6% of the curative cohort had periampullary malignancies compared to the palliative cohort that consisted entirely of patients with pancreas adenocarcinoma. Colorectal cancer resections typically have improved longer-term survival with 5 year survival as high as 47.7% and liver resection for colorectal metastases also demonstrates a 3 year survival of 57.1% [30,31].

Limitations of this study include the relatively small numbers recruited in a single tertiary centre. In addition, there is limited long-term data relating to neoadjuvant and adjuvant therapies, which are known to impact long-term survival. The long-term outcomes for pancreatic surgery do not appear to vary significantly in respect of age. For younger patients, the median survival rates for curative resection in patients with a mean age of 65 are 17 to 23 months for local/resectable disease and up to 20 months in borderline resectable pancreatic cancer [3]. This compares to our study with an overall survival rate of 53.5% at 24 months in patients with a median age of 78. This study clearly demonstrates that major pancreatic resection in patients over 75 is feasible but also that a robust selection process is important to enable appropriate identification of suitable individuals. The selection of patients must include MDT triaging and multidisciplinary pre-operative assessment and input, including a formal anesthetic assessment, and dietetic and pre-habilitation input. Findings from our study compare favorably to other studies where survival outcome is described for patients with a mean age of 65 undergoing palliative pancreatic resection, with median survival of 6 months [3]. Similarly, the median survival rate for palliative bypass in our study is also approximately 6 months demonstrating that patients over 75 who undergo palliative resection have comparable survival to those under 65.

Conclusion

This study describes a single institution experience of safe pancreatic resections in an elderly population. We have also demonstrated that mortality rates in patients over the age of 75 are significantly better for those undergoing curative surgery than palliative surgery. In addition the survival rates following both curative and palliative surgical procedures in patients over the age of 75 are comparable with rates seen in younger cohorts undergoing similar major surgical interventions. Major pancreatic resections in patients over the age of 75 are safe and feasible in selected patient cohorts. Further research is required to clearly establish prognostic factors associated with poor outcomes which will facilitate patient selection methods and pre-operative workup which will further improve post-operative morbidity.

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