Original article

Pancreatic debridement in a district general hospital – viable or vulnerable?

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Little is known about the outcome after pancreatic debridement in the district general hospital (DGH) setting and the debate about centralisation of pancreatic surgical services continues. We retrospectively reviewed our experience over 2 years, looking particularly at mortality, morbidity and cost. Of 12 cases treated during this period, 8 were women and 7 were gallstone induced. The mean pre-operative age was 56.5 years and pre-operative Apache II score was 15. The rates for postoperative morbidity and mortality were 67% and 25%, respectively. In half, digital necrosectomy was performed and in half a regional pancreatic resection. These figures are similar to others found in the literature (comparison with 15 contemporary series). The median cost per patient was £21,487, mainly due to ITU accommodation (57.4% of total costs). This is similar to other previously published rates and the rate from our local tertiary centre. It is concluded that acceptable results for pancreatic debridement are producible in the DGH at economically viable levels.

Key words: Pancreatic debridement – Economics of surgery – District general hospitals

Acute pancreatitis is a common disease which runs a variable course. Severe, life-threatening, acute pancreatitis occurs in about 15% of cases with mortality around 6–10%.^{1–5} Whilst patients with fulminant pancreatitis consume large amounts of healthcare resources, it is a benign disease often affecting young patients. Should the patient survive, they can expect a good quality of life with normal expectancy.⁶ In the year up to 1 January 1998, 106 cases of acute pancreatitis were admitted to York District Hospital (serving a population of 300,000).

Relatively little is known about the district general hospital (DGH) experience of surgery for acute pancreatitis, despite most cases being treated in these hospitals. Most of the published literature comes from university hospitals, whose patient populations and hospital structures are different from those of the average DGH. In turn, these contribute heavily to the on-going debate about the

centralisation of pancreatic surgery.^{7–13} Therefore, we undertook a retrospective case-note review of our experience in a DGH. Whilst primarily looking at the morbidity and mortality of the surgery, we also estimated the cost per patient. This was compared with previously published results and the charge from our regional referral centre.

A systematic review was undertaken using Medline (different search arms used relating to pancreatitis, surgery and economics) and the abstracts of recent relevant conferences.

Patients and Methods

Between 1 May 1996 and 31 April 1998, there were 12 patients in whom surgery was performed for pancreatic necrosis. These were all under the care of one consultant (DJA), who within our unit of six consultants performs most

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of the pancreatic surgery. All were primary admissions to York District Hospital and none were transferred at a later stage. Eight were admitted under the care of surgeons, whilst four were initially under the care of physicians.

The diagnosis of acute pancreatitis was made from clinical examination and serum amylase. Each patient was

routinely scored by the Apache II scoring system. The need for surgery was judged by objective clinical deterioration based on daily simplified acute physiology scores and contrast-enhanced computer tomography (CT). Daily haematological and biochemical parameters were assessed for evidence of sepsis and organ dysfunction. Fine needle aspiration of the necrotic pancreas for infective organisms was not performed routinely.

A roof-top incision was used to enter the abdomen as previously described.¹⁴ A typical finding at surgery was of gross induration in the left upper quadrant with the spleen, tail of pancreas and the colonic splenic flexure plastered down to the retroperitoneum. The retroperitoneum was accessed by reflecting the spleen medially to reach the back of the pancreas. We aimed to perform a radical debridement of all necrotic tissue/collection leaving the left upper quadrant entirely clean and subsequently irrigating the whole retroperitoneum via two wide-bore drains inserted to drain dependently on each side (0.9% saline at a rate of 1 l/h, until clinical improvement occurred).

The cost of each patient was calculated from their case notes. The costs were divided into those of hotel, investigation, and therapy (Table 1). Hotel costs included those of staffing, catering, and housekeeping. Surgical costs were calculated from the frequency and duration of surgery.

Statistical analysis was performed on the data using a chi-squared test, a *P* value of less than 0.05 was taken to be significant (the data were not normally distributed).

Results

There were 8 women (67%) present in the population. The mean and median ages were 56.5 years and 63 years, respectively (range, 19–77 years). The aetiology of each case is shown in Table 2. All case notes were obtained for analysis. Each patient's length of stay is shown in Figure 1.

Table 1 The cost of each variable measured

Hotel costs			
	Ward	24 h stay	£217.00
	Theatre	4 h list	£1740.00
Investigative costs			
	Radiology	Chest	£7.13
		Other	£7.13
		Ultrasound	£17.80
		ERCP	£213.90
		CT abdomen	£42.78
	Biochemistry	U&E	£1.56
		LFT	£1.17
		Amylase	£1.63
		Albumin	£0.98
	Haematology	FBC	£2.77
		Clotting	£2.93
Therapeutic costs			
	Transfusion	G&S	£4.81
		Cross-match	£10.20
		Blood/unit	£38.52
		FFP	£27.75
		Platelets	£39.74
	Antibiotics	Cef & Met	£16.59
		Co-amoxiclav	£7.57
		Tazocin	£34.80
		Penicillin	£3.71
	Enteral feed	per day	£4.98
	TPN	per day	£90.00

U&E, urea and electrolytes; LFT, liver function tests; ERCP, endoscopic retrograde pancreatography; TPN, total parenteral nutrition; G&S, group and save serum; FFP, fresh frozen plasma; Cef & Met, cefotaxime (1 g tds) and metronidazole (500 mg qds); Co-amoxiclav (1.2 g tds); Tazocin (4.5 g tds); and benzyl penicillin (1.2 g tds).

Table 2. Patient details

Patient	Age (years)	Sex	Aetiology	Pre-operative Apache II	Blood tests	X-ray tests	Microbiology tests	Antibiotic therapy (days)	TPN (days)
1	73	F	Postoperative*	19	69	8	5	8	0
2	68	M	Gall stones	24	113	4	30	25	3
3	61	M	Alcohol	21	154	5	34	22	0
4	77	F	Gall stones	15	81	7	5	11	0
5	65	F	Gall stones	9	68	10	4	45	0
6	19	F	Trauma	7	100	10	22	12	0
7	53	F	Gall stones	6	85	17	18	24	10
8	27	F	Drug	17	60	16	23	6	0
9	38	M	Idiopathic	17	99	9	14	35	0
10	66	M	Gall stones	14	129	10	26	24	16
11	61	F	Gall stones	9	374	25	35	224	45
12	71	F	Gall stones	19	96	22	29	117	50

*Developed pancreatitis on first day following a parathyroidectomy.

TPN, total parenteral nutrition.

The mean time to surgery after presentation was 23 days (range, 2–45 days). However, in 3 patients (patients 4, 5, and 9) there was evidence of an initial attack of pancreatitis prior to admission. The time to operation from presentation in the three deaths was 2, 8 and 26 days. This is compared with a mean of 20 days (range, 5–45 days) after presentation, for the time to surgery in those patients surviving. The time to operation was not significant when related to mortality. The mean Apache II score prior to surgery was 15 (range, 9–24) (Table 2). Pre-operative CT scans showed peripancreatic collections associated with pancreatic necrosis in 50% of cases and solely pancreatic necrosis in 25%. In half of the patients, a pancreatic resection was performed (Table 3), with one having a total pancreatectomy. The other six patients had a blunt digital necrosectomy performed. Four patients required more than one laparotomy (mean 1.8 operations per patient). Most patients had surgery in addition to the pancreas (splenectomy in 9, cholecystectomy in 4, and

Figure 1 Duration of stay for each patient (white bars = ward; black bars = ITU).

bowel resection in 5). All had confirmatory histological analysis of the specimen, and microbiological culture confirmed infected necrosis in 10 patients (83%).

Table 3 Operations and outcome details

Patient	Operation(s)	Microbiology	Complications	Outcome
1	Total pancreatectomy, splenectomy, defunctioning colostomy	Mixed coliforms		Died
2	(1) Subtotal pancreatectomy, splenectomy, subtotal colectomy (2) Laparotomy for bleeding SMA	Gram-negative bacilli	Sepsis, bleeding	Died
3	(1) Subtotal pancreatectomy (2) Subtotal colectomy	None	Renal failure, sepsis Empyema, ischaemic colon	Died
4	Subtotal pancreatectomy, Sb resection, cholecystectomy and splenectomy	Enterococci	Pleural effusion, pneumonia	Lived
5	Pancreatic debridement	Mixed coliforms		Lived
6	Distal pancreatectomy	Enterococci		Lived
7	Necrosectomy, cholecystectomy, splenectomy	Gram-negative bacilli	Fistula	Lived
8	(1) Subtotal pancreatectomy, splenectomy, cholecystectomy (2) Extended right hemicolectomy (3–5) Lavage	Mixed coliforms	Deaf, sepsis, Renal failure Fungal septicaemia	Lived
9	(1) Necrosectomy, splenectomy (2) Laparotomy and drainage of collection (3) Whipples resection (4) Subtotal colectomy (5) Gastroenterostomy, cholecystoenterostomy and lavage	Gram-negative bacilli	MRSA bronchopneumonia Renal failure Biliary fistula Septicaemia Abdominal collections	Lived
10	Necrosectomy, splenectomy	Mixed coliforms	PE, incisional hernia	Lived
11	Necrosectomy, splenectomy	None		Lived
12	Necrosectomy, splenectomy, cholecystectomy	Gram-negative bacilli	Fistula	Lived

Patients with multiple operations are indicated by the presence of the operation number in parentheses before the details.

Morbidity and mortality

Eight patients (67%) had significant postoperative complications with renal failure and sepsis. Two pancreatic fistulae were present on discharge. One patient became deaf, probably as a result of antibiotics, while she was ventilated. Three underwent haemofiltration for renal failure. The mean length of stay of those surviving was 65 days (47 days post-surgery).

The overall postoperative mortality was 25%. The mean ages of those dying and surviving the operation were 67 years (range, 61–73 years) and 53 years (range, 19–77 years), respectively ($P = 0.05$). The mean pre-operative Apache II scores of those dying and surviving were 21.3 (range, 15–24) and 12.8 (range, 6–21), respectively ($P = 0.05$). Only one patient with an Apache II score over 18 survived. Patients 1 and 3 were ventilated and in established multi-organ failure at the time of referral. Patient 3 already had an empyema at referral. Patient 2 survived the first 10 postoperative days before undergoing massive haemorrhage from the superior mesenteric artery. All of those dying had formal pancreatic resections at laparotomy, indicating the severity of their macroscopic necrosis. In all three dying postoperatively, the cause of death was reported as multi-organ failure with septicaemia. The average time to die was 10 days (range, 1–16 days) postoperatively.

Cost

The mean cost of those dying was £25,729 (range £7612 to £44,865). The median cost of those surviving was £18,264 (IQ range, £14,362 to £26,292, not normally distributed; see Fig. 2). Hotel costs accounted for the majority of the overall cost (84%; see Table 2). The duration of ITU stay was the most important variable in cost, ranging between £3600 and £70,800. The median ITU stay was 5 days with only 4 patients staying longer than 9 days, two of these

Figure 2 Total cost for each patient.

died. Investigations accounted for 2% of the overall costs. Therapeutic costs accounted for 13.7% of the total of which theatre time accounted for 37%. Antibiotics, nutritional support and blood transfusion accounted for the rest of the costs, equally.

Discussion

Population and surgery

This represents our experience over two years and compares with other DGHs.^{8,9} Two-thirds of our series were female and gallstone induced, thought to have a worse prognosis than alcohol-induced pancreatitis.¹⁶ Our age and Apache II scores are equivalent to other series.^{2,15–31}

We believe surgery is indicated in the presence of infection (suspected or confirmed), rather than just severe acute pancreatitis. In ten cases, subsequent microbiological culture confirmed infection of the pancreas. We aimed to be radical in our initial debridement to avoid further surgery (8/12 had only one laparotomy). Recent articles¹⁷ have advocated avoiding extensive resection of the pancreas to preserve any viable tissue, and avoid later morbidity with diabetes, *etc.* Whilst we managed digital necrosectomy in 50% of cases, we always aimed to clear the left upper abdominal quadrant of debris. We preserved all viable-looking pancreas. Our splenectomy rate (75%) is higher than other series. This may reflect our approach to the retroperitoneum. However, we believe an anterior approach to the retroperitoneum is less likely to allow thorough clearance of the pancreatic debris, therefore increasing the risk for further surgery and complications.

Morbidity, mortality and cost

We had similar morbidity and mortality rates to other series,^{2,15,16,18–31} which are thought to be acceptable.⁵ The median overall cost for each patient was £21,487 (IQ range £14,078 to £30,935). The cost of dying or surviving was not significantly different ($P = 0.3$). The ITU stay cost the vast majority of the total. Three patients (patients 2, 8, and 9) with multiple postoperative problems accounted for 60% of the total ITU costs. Both those surviving were young, one with a dependant family. Delays in discharge can be very expensive (patient 8 staying several weeks awaiting social services). Investigative costs were surprisingly low (2%), reflecting the ease of diagnosis and the reliance upon CT to stage the disease.

Financial comparisons

One previous article looked in detail at the cost of pancreatic debridement.³ In 1993, their overall cost was

£18,441 (equal to £22,212 in 1998³²). A second cost estimate has been produced of £250,000 per patient.²⁵ This is a tertiary referral centre and they cite their selected population the cause for high expense, a claim supported by their high mortality rate of 70%. If we compare the main drivers of cost (hospital stay and number of laparotomies) with the recent literature, we find similar rates to our own. We contacted our regional centre to find the charges for our average patient (1.8 operations, 54.5 days in hospital, of which 5 were on ITU). We were quoted a figure of £25,662, similar to our own.

Conclusions

During the last 4 years, we have performed at least 10 major pancreatic resections per year. Our 30-day mortality rate for carcinoma and chronic pancreatitis is 2.5%. Whilst we are aware of the arguments for centralisation of services, including pancreatic resection, good results are available in the DGH at competitive economic rates. The skills to manage acute pancreatitis come as a result of training and continuing elective experience. We believe it is the interested surgeon and support services that produce good results not just the volume of workload. This view is also held by others.^{8,9,12}

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