Surgery for chronic pancreatitis: a review of 12 years experience

R L Byrne BM BS FRCS
Senior House Officer

C W Venables FRCS
Consultant General Surgeon

R H K Gompertz FRCS*
Lecturer in Surgery

Department of Surgery, Freeman Hospital, Newcastle upon Tyne

The surgical management of chronic pancreatitis remains controversial. We have practised a selective approach to surgery using symptoms and endoscopic retrograde cholangiopancreatography (ERCP) as the indications for operation and the procedure performed. A total of 76 patients who underwent surgery for chronic pancreatitis over a 12 year period were reviewed. Of the patients, 24 (32%) had a Whipple's resection (WR), 41 (54%) distal pancreatectomy (DP) with drainage, and 11 (14%) had other procedures. Eleven patients had died. Hospital records were reviewed and of the 65 patients alive at follow-up, 51 (79%) were interviewed. Twenty-three patients (74%) who underwent DP reported either excellent or good general health compared with 7 (44%) who had WR (P = 0.04). However, there was no difference in general health between operative groups using visual analogue scales. There was no difference in pain at follow-up between DP and WR. Of patients interviewed, 88% felt that their pain was better than before operation and 25 (49%) had no pain at all. Diabetes developed more frequently after DP (P = 0.005) than after WR. Good results can be achieved by pancreatic resection when careful selection is exercised.

The principal aim of surgical management of chronic pancreatitis (CP) is to achieve pain relief. However, the surgical procedure that is chosen remains the subject of debate. Pathological changes within the pancreas vary; from dilatation of the pancreatic duct, with or without

* Present appointment: Consultant Surgeon, Burton District General Hospital, Burton-on-Trent

Present appointment and correspondence to: Miss R L Byrne, Specialist Registrar, Department of Urology, Freeman Hospital, Newcastle upon Tyne NE7 7DN

calcification, to severe fibrosis leading to ductular stenosis without dilatation (1). Pathological changes may be localised or spread diffusely throughout the gland. The introduction and generalised use of endoscopic retrograde cholangiopancreatography (ERCP), in conjunction with computed tomography (CT), in the late 1970s allowed the preoperative identification of the extent and localisation of pancreatic pathology in the majority of patients. Although the precise relationship between structural pancreatic changes and pain in chronic pancreatitis has not been clearly established, ERCP and CT allowed a more appropriate and selective surgical strategy to be employed. Distal pancreatectomy (DP) or lateral pancreaticojejunostomy had been used in the majority of patients requiring surgical treatment for pain before the availability of this modality (2).

Many others recommend formal pancreatic drainage with pancreaticojejunostomy in the presence of a dilated pancreatic duct (3–6). In our centre, early experiences with lateral pancreaticojejunostomy gave poor results, with pain control being a particular problem. In view of this we have adopted a policy of pancreatic resection for the majority of our patients, the resection being guided by preoperative investigations, in particular ERCP. Our only indication for pancreaticojejunostomy is a 'chain of lakes' appearance on ERCP where both duct dilatation and multiple duct strictures are present simultaneously. We have reviewed the outcome of patients who underwent surgery for chronic pancreatitis over a 12-year period when a policy of pancreatic resection in the majority was employed.

Patients and methods

In all, 163 patients with chronic pancreatitis were identified from hospital records. Of these patients, 85

with CP underwent surgery between 1981 and 1993. Seventy-six sets of patient records were identified; nine could not be traced. These 76 sets of notes were reviewed. Eleven patients were dead. Fifty-one were interviewed by one independent person (RLB) who had not been involved in the operations performed. A standard questionnaire and 100 mm visual analogue scales were used. The scales were used as measures of pain and general health and patients were assigned a numerical score depending on the position they marked on these scales.

Operative procedures

A Whipple's resection (pancreaticoduodenectomy) was performed in a standard manner with the common bile duct, distal pancreas and stomach anastomosed into the jejunum in this order. A routine cholecystectomy was performed to prevent late cholecystitis. Distal pancreatectomy included resections from 30% to 70% of the pancreas depending on findings at exploration of the pancreas. In over 80% of patients, between 40% and 50% of the distal pancreas was excised. The distal end of the pancreas was drained in all cases. This was usually into the jejunum at the duodenojejunal flexure or into a Roux-en-Y jejunal loop or stomach where the former was not feasible.

Statistics

All statistical analysis was performed using Minitab for Windows® program. Data were assessed using χ^2 for comparison of operative groups. The Mann–Whitney U test was used for non-parametric continuous data. A P value < 0.05 was taken as statistically significant.

Results

There were 52 male patients (68%) with a mean age of 47 years (range 24–72 years) and 24 (32%) were female with a mean age of 47 years (range 18–76 years). The median duration of symptoms for all patients was 3 years (interquartile range 1–5 years). The aetiology of CP was alcohol in 50 (66%), gallstones in 2 (3%), familial in 4 (5%), trauma in 1 (1%) and was idiopathic in 19 (25%). Of patients in whom alcohol was identified as the cause of CP, 48% admitted to drinking more than 100 units/week (range 40–480 units). All patients had pain preoperatively and this was the indication for surgery in 95%. Three patients presented with a major gastrointestinal haemorrhage and one had duodenal stenosis as the principal indication for operation. Forty-one patients (54%) underwent distal pancreatectomy and 24 (32%) had a Whipple's procedure. Of the remaining 11 (14%) patients, six underwent cystgastrostomy, two lateral pancreaticojejunostomy and two had a non-resectional bypass of the pancreatic head. All resected specimens showed typical histopathological changes of chronic pancreatitis.
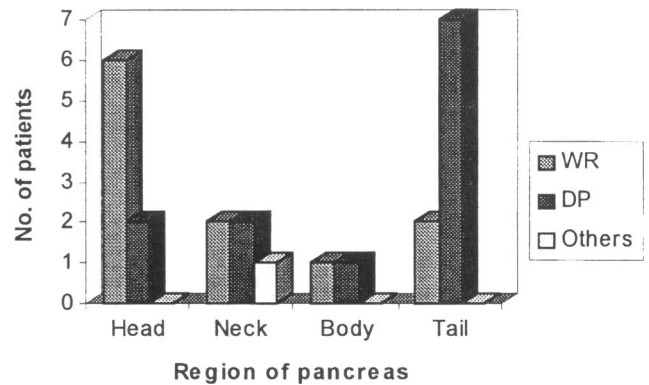

Figure 1. ERCP results: presence of duct dilatation on ERCP.

Preoperative investigations

In all, 71 (93%) patients underwent preoperative ERCP. Seven of the ERCPs failed, six because of inability to identify or cannulate the pancreatic duct and one owing to the presence of duodenal stenosis. Six pathological features within the pancreas at ERCP were recorded; these were duct strictures, blocked duct, duct dilatation, the presence of calculi, cysts and extravasation of contrast outside the gland. There was a significant difference between operative groups in the incidence of strictures ($P = 0.02$) and duct dilatation ($P < 0.05$) in the proximal (head and neck) compared with the distal (body and tail) pancreas (Fig. 1 and Fig. 2). Eighteen patients (24%) underwent CT scan preoperatively. A CT scanner was not available at the Freeman Hospital until 1992; although access to a CT scanner at another hospital was possible this facility was not always readily available. A total of 25 patients (33%) had abdominal ultrasound scans preoperatively.

Postoperative complications

Fifty (66%) patients had no postoperative complications. Four (5%) patients died within 30 days of surgery. Of those that died, one had a WR during which the portal vein was injured and repair was followed by portal vein thrombosis, liver necrosis and multiorgan failure. One had DP and sustained an asystolic cardiac arrest 6 days
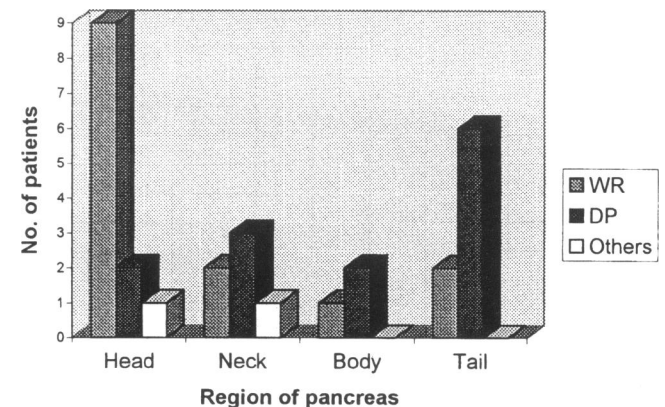

Figure 2. Presence of duct strictures on ERCP.

postoperatively. This patient had preoperative evidence of a previous infarct, but had been assessed as fit for operation by a consultant cardiologist and consultant anaesthetist. A further patient had undergone only gastric and biliary bypass because of extensive peripancreatic inflammation and died 20 days postoperatively. The exact cause of death was not available. The remaining patient underwent transgastric drainage of a pancreatic abscess and died 24 days postoperatively of adult respiratory distress syndrome and septicaemia. Post-mortem showed evidence of alcoholic liver disease and chronic pancreatitis. Of the remaining 21 patients, four had chest infections, five had septicaemias, three owing to candidal infection (from intravenous feeding, elminated as a problem in later patients by the routine use of jejunostomy feeding), two had a haemorrhage postoperatively requiring laparotomy, two developed subphrenic abscesses also requiring laparotomy, two had DVT, three had cardiovascular complications, one had problems with analgesic withdrawal, one had a drain which required removal by laparotomy and the final patient had incomplete records of the postoperative period. The median length of postoperative stay for all patients was 21 days (interquartile range 16–24 days). There was no significant difference between the different operative groups ($P = 0.23$).

Long-term follow up

There were seven late deaths, four from unrelated causes, two from an unknown cause, and one after an alcoholic binge. Seven patients have required more than three hospital admissions for symptoms relating to CP, but none was admitted more than five times. No patients required readmission for further surgery.

Of the 65 patients still alive at follow-up, 51 were interviewed. Of the 14 patients who were not interviewed, five had moved from the region and were being followed up elsewhere. Two of these patients continued to drink and had continuing abdominal pain. The remaining three patients were well. Of the 11 patients still in the region who declined the invitation to interview, five had been seen in the outpatient clinic within the previous 12 months. Of these patients, two had no abdominal pain but one had undergone radical neck dissection for pharyngeal carcinoma. The remaining three patients had pain; two controlled with co-codamol and one patient was on oral morphine sulphate. Four patients repeatedly did not attend outpatients; three were recorded as continuing to drink alcohol on their last clinic visit.

Four (17%) of the patients who had WR were diabetic preoperatively compared with 8 (33%) postoperatively ($P = 0.18$). Of these patients, seven required insulin therapy and one oral hypoglycaemic drugs. Of those undergoing DP, 6 (14%) were diabetic preoperatively compared with 21 (49%) postoperatively ($P = 0.005$). All but one of these patients required insulin therapy, the remaining patient was controlled with diet. One of the two patients who underwent a lateral pancreaticojejunostomy developed diabetes postoperatively and required insulin.

Questionnaire results

Fifty-one patients (79% of those alive at follow-up) were interviewed. Mean follow-up time of these patients was 6.8 years (range 1–12 years). Nineteen (29%) were in full- or part-time employment. Eighteen (28%) felt able to work but did not because of unemployment or retirement. Six (9%) stated that they did not work owing to symptoms relating to their operation or continued CP. The work records of the remaining 22 (34%) patients are unknown. Nine patients (18%) admitted continuing to drink alcohol; of these, three were drinking more than 21 units/week.

Bowel function was recorded by symptoms of frequent and/or loose stool. Patients recorded their symptoms as mild, moderate or severe. There was no significant difference between operative groups for these symptoms ($P = 0.14$). The postoperative use of enzyme supplements was significantly ($P = 0.0046$) greater in those patients who had WR (15 patients (63%)) compared with those undergoing DP (11 patients (27%)).

Patients were asked how they would rate their current health when given the options excellent, good, fair or poor. These results (Table I) showed a significant ($P = 0.04$) number (23 (74%)) who had DP had either excellent or good general health at follow-up compared with 7 (44%) who had WR. Of the two patients who had WR and stated their general health was poor, one was owing to the fact the patient was receiving chemotherapy for breast cancer and the other stated that severe rheumatoid arthritis was the cause. Patients were also questioned on the presence of abdominal pain. They were asked to describe their pain as either mild, moderate or severe (Table II). There was no significant difference between operative groups ($P = 0.09$). The patient with severe pain in the 'others' group had undergone pancreaticojejunostomy. Twenty-eight (78%) patients who had DP stated their pain was better than preoperatively. None of the 13 patients who had undergone WR who were interviewed felt their pain was worse than preoperatively.

In contrast to results on general health obtained by direct questioning, the results from visual analogue scales (Table III) showed no significant difference between groups ($P = 0.12$). Visual analogue scales for pain (Table III) also showed no difference between operative groups ($P = 0.49$).

Table I. Questionnaire responses to patient assessment of their general health ('Unknown' figures refer to patients alive but not interviewed)

	WR	DP	Others
Excellent	1 (6%)	5 (16%)	1 (25%)
Good	6 (38%)	18 (58%)	2 (50%)
Fair	7 (44%)	7 (23%)	1 (25%)
Poor	2 (12%)	1 (3%)	0
Unknown	4	5	5

Table II. Questionnaire responses to presence of abdominal pain ('Unknown' figures refer to patients alive but not interviewed)

	WR	DP	Others
None	5 (31%)	18 (64%)	2 (50%)
Mild	3 (19%)	5 (16%)	0
Moderate	7 (44%)	8 (20%)	1 (25%)
Severe	1 (6%)	0	1 (25%)
Unknown	4	5	5

Table III. Visual analogue scales

	WR	DP	Others
Pain scale			
(0 = none, 100 = severe)			
Median	33	24	0
Interquartile range	21–51	0–50	0–18
General health scale			
(0 = poor, 100 = excellent)			
Median	54	73	82
Interquartile range	43–80	40–95	44–100

Discussion

The aetiology of pain of chronic pancreatitis appears to be multifactorial. A proportion of patients with dilated pancreatic ducts have increased interstitial and intraduct pressures and correlation between tissue pressures and pain has been reported (7,8). However, 30–60% of patients with pain and chronic pancreatitis do not have dilated ducts (9,10). Perineural inflammation has been suggested as a cause of pain in chronic pancreatitis (11) and neuropathological examination of pancreatic tissue from patients with chronic pancreatitis has demonstrated disintegration of the perineurium of nerves in areas of pancreatic inflammation (12).

Although there are a variety of non-surgical treatment options for chronic pancreatitis including oral analgesics, oral pancreatic enzyme supplements (13), nerve blockage and, more recently, endoscopic therapy (14) and extracorporeal shock wave lithotripsy (ESWL) (15), surgery remains the treatment of choice for patients with advanced disease where other options have failed or in the presence of complications. The aims of surgery are to allow decompression of the pancreatic duct with removal of any inflammatory mass, ie pancreatic drainage and resection.

We have used ERCP to identify pancreatic abnormalities and to determine the location and extent of pancreatic resection. This is reflected by the correlation of pathological features identified by ERCP and the surgery that was undertaken. All patients who underwent distal pancreatectomy in this series also had drainage of the cut end of the pancreatic duct. We know from postoperative ERCP findings in a few cases (where an ERCP has been repeated because of pain) that these anastomoses remain patent for many months, although the exact proportion that do and for how long has not been determined. Association of

distal pancreatectomy with duct drainage has been shown to increase the rate of good results in previous studies (16,17) compared with distal resection alone.

Patients who had undergone DP reported significantly better general health than those who had WR. However, this difference was not present when using visual analogue scales. Why this discrepancy occurred cannot be concluded from our data; however, it does suggest that the use of more than one method of assessing such a subjective variable can be helpful. Detailed quality of life assessments after pancreatic resection have been shown to be a useful method of assessing this group of patients (18).

In this study, patients who had undergone DP appeared to have less pain compared with those who underwent WR, although all those who underwent WR stated their pain had improved postoperatively. Our results compare with other studies which report an improvement or absence of pain in 50% to 90% of patients who had undergone DP (19–23), 53% to 88% in those who had WR (22,24,25) and 56% to 86% (4,6,16,26–30) in those who had drainage procedures only. Some authors have had disappointing experience with DP (4,31). It has been suggested that this may be because of diffuse pancreatic disease in patients with alcohol-induced and idiopathic chronic pancreatitis or poor correlation between ERCP demonstration of distal disease and laparotomy findings (31).

The mortality in this study compares with that reported for either pancreatic resection or duct drainage by other authors (4,6,21,22,25,27–29,32). We demonstrated a significant increase in the number of diabetic patients after DP but not after WR. This is consistent with the presence of a greater proportion of islets in the distal pancreas. The incidence of postoperative diabetes after either DP or WR is similar to other series (4,21,22,24,25) as were the postoperative requirements for enzyme supplements (21,24).

The long-term outcome of patients undergoing WR in this series may be improved further by adopting the newer organ-preserving procedures. The pylorus-preserving partial pancreaticoduodenectomy (33) and the more conservative duodenum-preserving pancreatic head resection (34) have been shown to provide good postoperative pain relief with low mortality and morbidity (35).

In conclusion, we have found preoperative ERCP to be useful in identifying areas of maximal pathology within the pancreas and hence to determine the resection to be undertaken. We have demonstrated that a good postoperative outcome can be achieved in patients undergoing either WR or DP for chronic pancreatitis. Although the surgical management of chronic pancreatitis remains difficult, a selective policy can provide good results.

References

1 Sarles H, Sahel J. Pathology of chronic calcifying pancreatitis. *Am J Gastroenterol* 1976; **66**: 117–39.

2 Frey C. Role of subtotal pancreatectomy and pancreatico-

jejunostomy in chronic pancreatitis. *J Surg Res* 1981; **31**: 361–70.

3 Berens JJ, Baggenstoss AH, Gray HK. Ductal changes in chronic pancreatitis. *Arch Surg* 1954; **68**: 723–30.

4 Taylor RH, Bagley FH, Braasch JW, Warren KW. Ductal drainage or resection for chronic pancreatitis. *Am J Surg* 1981; **141**: 28–33.

5 Prinz R, Greenlee H. Pancreatic duct drainage in 100 patients with chronic pancreatitis. *Ann Surg* 1981; **194**: 313–20.

6 Proctor HJ, Mendes OC, Thomas CG, Herbst CA. Surgery for chronic pancreatitis: drainage versus resection. *Am J Surg* 1985; **148**: 754–9.

7 Ebbehøj N, Borly L, Bülow J, Rasmussen SG, Madsen P. Evaluation of pancreatic tissue fluid pressure and pain in chronic pancreatitis. A longitudinal study. *J Gastroenterol* 1990; **35**: 462–6.

8 Jalleh RP, Aslam M, Williamson RCN. Pancreatic tissue and ductal pressures in chronic pancreatitis. *Br J Surg* 1991; **78**: 1235–7.

9 Frey CF, Bodai BJ. Surgery in chronic pancreatitis. *Clin Gastroenterol* 1984; **13**: 913–40.

10 Grodsinsky C. Surgical treatment of chronic pancreatitis: a review after a 10 year experience. *Arch Surg* 1980; **115**: 545–51.

11 Frey CF. 95% pancreatectomy. In: *The Pancreas*. St Louis: CV Mosby, 1973: 96.

12 Bockman DE, Büchler M, Malfertheiner P, Beger HG. Analysis of nerves in chronic pancreatitis. *Gastroenterology* 1988; **94**: 1459–69.

13 Isaksson G, Ihse I. Pain reduction by oral pancreatic enzyme preparation in chronic pancreatitis. *Dig Dis Sci* 1983; **28**: 97–102.

14 Geenen JE, Rolny P. Endoscopic therapy of acute and chronic pancreatitis. *Gastroenterol Endosc* 1991; **37**: 377–82.

15 Sauerbruch T, Holl J, Sackman M et al. Extracorporeal lithotripsy of pancreatic stones in patients with chronic pancreatitis and pain: a prospective follow-up study. *Gut* 1992; **33**: 969–72.

16 Leger L, Lenriot JP, Lemaigre G. Five to twenty-five year follow-up after surgery for chronic pancreatitis in 148 patients. *Ann Surg* 1974; **180**: 185–91.

17 Gauthier-Benoit C, Perissat J. Le traitment des pancréatites chroniques. Rapport au 89 ème Congrès de L'Association Françiase de Chirurgie. Paris: Masson, 1987.

18 Broome AH, Eisen GM, Harland RC, Collins BH, Meyers WC, Pappas TN. Quality of life after treatment for pancreatitis. *Ann Surg* 1996; **223**: 665–72.

19 Sato T, Miyashita E, Yamauchi H, Matsuno S. The role of surgical treatment for chronic pancreatitis. *Ann Surg* 1986; **203**: 266–71.

20 Brinton MH, Pellegrini CA, Stein SF, Way LW. Surgical treatment of chronic pancreatitis. *Am J Surg* 1984; **148**: 754–9.

21 Rossi RL, Rothschild J, Braasch JW, Munson JL, ReMine SG. Pancreatoduodenectomy in the management of chronic pancreatitis. *Arch Surg* 1987; **122**: 416–20.

22 Keith R, Saibil F, Sheppard R. Treatment of chronic alcoholic pancreatitis by pancreatic resection. *Am J Surg* 1989; **157**: 156–62.

23 Sawyer R, Frey CF. Is there still a role for distal pancreatectomy in surgery for chronic pancreatitis? *Am J Surg* 1994; **168**: 6–9.

24 Stone WM, Sarr MG, Nagorney DM, McIlrath DC. Chronic pancreatitis: results of Whipple's resection and total pancreatectomy. *Arch Surg* 1988; **123**: 815–19.

25 Traverso LW, Kozarek RA. The Whipple procedure for severe complications of chronic pancreatitis. *Arch Surg* 1993; **128**: 1047–50.

26 Adams DB, Ford MC, Anderson MC. Outcome after lateral pancreaticojejunostomy for chronic pancreatitis. *Ann Surg* 1994; **219**: 481–9.

27 Bradley EL. Long-term results of pancreatojejunostomy in patients with chronic pancreatitis. *Am J Surg* 1987; **153**: 207–13.

28 Mannell A, Adson MA, McIlrath DC, Ilstrup DM. Surgical management of chronic pancreatitis: long-term results in 141 patients. *Br J Surg* 1988; **75**: 467–72.

29 Greenlee HB, Prinz RA, Aranha GV. Long-term results of side-to-side pancreaticojejunostomy. *World J Surg* 1990; **14**: 70–76.

30 Delcore R, Rodriguez J, Thomas JN, Forster J, Hermreck AS. The role of pancreaticojejunostomy in patients without dilated pancreatic ducts. *Am J Surg* 1994; **168**: 598–602.

31 Rattner DW, Fernandez-del Castill C, Warshaw AL. Pitfalls of distal pancreatectomy for relief of pain in chronic pancreatitis. *Am J Surg* 1996; **171**: 142–6.

32 Williamson RCN, Cooper MJ. Resection in chronic pancreatitis. *Br J Surg* 1987; **74**: 807–12.

33 Traverso LW, Longmire WP. Preserving of the pylorus in pancreaticoduodenectomy. *Surg Gynecol Obstet* 1978; **146**: 959–62.

34 Beger HG, Krautzberger W, Bittner R et al. Duodenum preserving resection of the head of the pancreas in patients with severe chronic pancreatitis. *Surgery* 1985; **97**: 467–73.

35 Büchler MW, Friess H, Muller MW, Wheatley AM, Berger HG. Randomized trial of duodenum-preserving pancreatic head resection versus pylorus-preserving Whipple in chronic pancreatitis. *Am J Surg* 1995; **169**: 65–69.