Revision of anastomotic stenosis after pancreatic head resection for chronic pancreatitis: is it futile?

Katherine A. Morgan, Bennett B. Fontenot, Norman R. Harvey & David B. Adams

Section of Gastrointestinal Surgery, Digestive Disease Center, Medical University of South Carolina, Charleston, SC, USA

Abstract

Background: Because survival after pancreaticoduodenectomy for cancer is limited, it is difficult to assess longterm pancreaticojejunal anastomotic patency. However, in patients with benign disease, pancreaticojejunal anastomotic stenosis may become problematic. What happens when pancreaticojejunal anastomosis revision is undertaken?

Methods: Patients undergoing pancreatic anastomotic revision after pancreatic head resection for benign disease between 1997 and 2007 at the Medical University of South Carolina were identified. A retrospective chart review and analysis were undertaken with the approval of the Institutional Review Board for the Evaluation of Human Subjects. Longterm follow-up was obtained by patient survey at a clinic visit or by telephone.

Results: During the study period, 237 patients underwent pancreatic head resection. Of these, 27 patients (17 women; median age 42 years) underwent revision of pancreaticojejunal anastomosis. Six patients (22%) had a pancreatic leak or abscess at the time of the index pancreatic head resection. The indication for revision of anastomosis was intractable pain. All patients underwent preoperative magnetic resonance cholangiopancreatography (MRCP), which indicated anastomotic stricture in 18 patients (63%). Nine other patients underwent exploration based on clinical suspicion caused by recurrent pancreatitis and stenosis was confirmed at the time of surgery. Six patients (22%) had perioperative complications after revision. The median length of stay was 12 days. There were no perioperative deaths; however, late mortality occurred in four patients (15%). Six of 23 survivors (26%) at the time of follow-up (median 56 months) reported longterm pain relief.

Conclusions: Stricture of the pancreaticojejunal anastomosis after pancreatic head resection presents with recurrent pancreatitis and pancreatic pain. MRCP has good specificity in the diagnosis of anastomotic obstruction, but lacks sensitivity. Pancreaticojejunal revision is safe, but rarely effective, as a means of pain relief in patients with the pain syndrome associated with chronic pancreatitis.

Keywords pancreaticojejunostomy, reoperative surgery, anastomotic stenosis, chronic pancreatitis

Received 17 March 2009; accepted 3 December 2009

Correspondence

Katherine A. Morgan, Section of Gastrointestinal Surgery, Digestive Disease Center, Medical University of South Carolina, Charleston, SC 29425, USA. Tel: + 1 843 876 4268. Fax: + 1 843 876 4878. E-mail: morganka@musc.edu

Introduction

The Achilles heel of pancreateoduodenectomy is the pancreaticojejunal anastomosis. Early anastomotic failure is measured by the development of postoperative pancreatic fistula and consequent complications of abscess or haemorrhage. Late failure of the pancreaticojejunostomy is measured by the development of anastomotic stenosis and the complication of exocrine and endocrine insufficiency.

Longterm outcomes for most gastrointestinal anastomoses have been evaluated and defined. Gastrojejunostomy after Roux-en-Y...
gastric bypass for weight loss becomes stenotic in 4.9–6.0% of cases and is almost always successfully managed with endoscopic balloon dilation.\textsuperscript{1,2} Hepaticojejunostomy for reconstruction after a common bile duct injury is complicated by anastomotic stenosis in 9% of cases and is amenable to successful endoscopic or radiographic dilation in 69% of these.\textsuperscript{3} The low rectal anastomosis develops a symptomatic stricture in 0–6.6% of cases and is managed endoscopically in the majority of these.\textsuperscript{4} By contrast, long-term outcomes and management strategies for pancreaticojejunostomy after pancreatic head resection have not been well examined. One of the issues involved in assessing the scope of the problem and the incidence of pancreaticojejunal anastomotic stricture formation is that most pancreatic head resections are performed for malignant disease with poor survival and thus few patients are available for long-term follow-up. Long-term pancreaticojejunal anastomotic durability has not been well examined; similarly the management of pancreaticojejunal anastomotic stenosis has not been assessed.

Therefore, we performed a retrospective review and analysis of patients who underwent pancreatic head resection for benign disorders of the pancreas with subsequent operative revision for pancreaticojejunal stenosis in order to evaluate patient outcomes after the surgical management of anastomotic failure.

**Materials and methods**

All patients undergoing pancreatic head resection for benign disease in the Section of Gastrointestinal Surgery at the Medical University of South Carolina Digestive Diseases Center between 1997 and 2007 were identified from an institutional database. Those patients who underwent a second, revisional pancreatic procedure during the time period were selected. A retrospective chart review and analysis from the inpatient and outpatient electronic medical record systems were undertaken. Patient data, including demographics, presenting diagnosis, perioperative course and details of outpatient follow-up, were noted.

Long-term follow-up was obtained by patient survey at a patient clinic visit or by telephone assessment. A good long-term clinical outcome was determined by the patient’s report of improvement or resolution of pancreatic pain as a result of the revisional pancreatic operation. A poor outcome was defined by a patient’s report of pain as unchanged or worsened after surgery. This study was approved by the Institutional Review Board for the Evaluation of Human Subjects.

**Results**

During the study time period, 237 patients (123 women; median age 45 years, range 15–74 years) underwent pancreatic head resection for benign disease in the Section of Gastrointestinal Surgery, Medical University of South Carolina. Of these, 161 procedures were performed for chronic pancreatitis (68%). Other diagnoses included intraductal papillary mucinous neoplasm (IPMN), cystic neoplasm and autoimmune pancreatitis. Of the 237 patients, 27 (11.3%; 17 women; median age 42 years, range 15–72 years; median body mass index 25 kg/m², range 17–51 kg/m²) underwent subsequent revision of pancreaticojejunal anastomosis.

In 24 patients the indication for the index pancreatic head resection was intractable pain secondary to chronic pancreatitis (89% vs. 68% in the overall group; \( P < 0.04 \)) (Table 1). The aetiology of chronic pancreatitis was sphincter of Oddi dysfunction (12 patients, 50%), pancreas divisum (five patients, 21%), ethanol (three patients, 13%) and idiopathic (four patients, 17%). Two patients underwent pancreatic head resection for IPMN and one for autoimmune pancreatitis (Table 2). Twenty-two patients underwent pancreaticoduodenectomy and five underwent duodenal preserving pancreatic head resection (Beger procedure).\textsuperscript{5} All underwent pancreaticojejunal anastomosis with a duct-to-mucosa technique, using interrupted absorbable monofilament sutures. Three involved a second outer layer of interrupted silk sutures including the pancreatic capsule and small bowel seromuscular layer. In 24 patients a 5F paediatric feeding tube was inserted as a temporary anastomotic stent. Four patients (14.8%) had a pancreatic leak and two (7.4%) had a perianastomotic abscess in the postoperative period after this index operation.

The 27 patients identified in this series presented at a median of 12 months (range 2–99 months) after pancreatic head resection with abdominal pain and pancreatitis. All underwent magnetic resonance cholangiopancreatography (MRCP), which indicated anastomotic stricture in 18 patients (67%). Pancreaticojejunal stricture was evidenced by narrowing at the anastomosis accompanied by upstream dilation (Fig. 1). In four patients, the
pancreatic duct was only mildly prominent (2.5 mm), but showed persistent dilation >1 mm from baseline at 15 min after secretin administration. The median main pancreatic duct diameter was 3.5 mm (range 2.5–7.0 mm) overall and 4.0 mm (range 2.5–7.0 mm) in the abnormal studies; four patients had pseudocysts. Nine other patients were identified based on strong clinical suspicion of anastomotic stricture arising from episodes of recurrent pancreatitis (Table 3).

Three patients underwent endoscopic management of the anastomotic stenosis attempted prior to operative revision. In one, the pancreaticojejunal orifice was unable to be located. In another, the anastomosis was located but therapeutic intervention was unsuccessful as a result of positioning. The third patient suffered endoscopic perforation during attempted navigation of the afferent gastrojejunal loop.

The technique of anastomotic revision varied depending on the underlying disorder, the size of the pancreatic duct and the degree of pancreatic fibrosis. The pancreaticojejunalostomy was taken down and examined. In most cases it was obliterated and not patent. Anastomotic stenosis was confirmed in all patients at the time of surgery. The pancreas was then opened along the pancreatic duct for a variable distance. A pancreaticojejunosotomy with interrupted permanent suturing was performed using the same limb of small bowel in 24 cases and a separate Roux-en-Y limb in three. Most patients had a duct-to-mucosa anastomosis. In one patient, a dunking technique was employed. In two patients the anastomosis included an existing pseudocyst.

Six patients (22%) had a complication after the reoperative procedure. Two patients suffered a pancreatic anastomotic leak; in one patient this required percutaneous transhepatic cholangio-

Figure 1 Secretin stimulated magnetic resonance cholangiopancreatogram image demonstrating pancreaticojejunal anastomotic stenosis, evidenced by signal void at the obliterated anastomosis (A), accompanied by upstream main pancreatic duct dilation (B). Also visualized are the jejunal limb (C) and the choledochojejunosotomy (D).

Table 3 Magnetic resonance cholangiopancreatography findings in the 27 patients who presented at a median of 12 months after pancreatic head resection with abdominal pain and pancreatitis

<table>
<thead>
<tr>
<th>Result</th>
<th>Finding</th>
<th>Patients, n</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abnormal</td>
<td>Stenosis with dilated upstream pancreatic duct</td>
<td>14</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Persistent pancreatic duct dilation after secretin stimulation</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td></td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>
gram catheter placement to divert bile and in the other the leak resolved without intervention. One patient had a perianastomotic abscess requiring image-guided percutaneous drainage. Two patients suffered catheter-related sepsis. One patient required re-intubation with a 2-day ventilatory course secondary to respiratory insufficiency. The median length of stay was 12 days (range 4–24 days).

There was no perioperative mortality. However, four patients (15%) died during the follow-up period. All four patients had a diagnosis of chronic pancreatitis. Two patients died 5.5 years and 2.3 years post-revisional surgery of malnutrition. Both had undergone subsequent completion pancreatectomy with islet autotransplantation (TP/IAT). Another patient committed suicide 11 months post-surgery and one died at home of unknown causes 5 years after surgery.

Longterm follow-up was obtained from the 23 survivors at a median of 56 months post-procedure (range 23–126 months). Six of these 23 patients (26%) reported a good outcome in terms of pain relief after the revisional operation. Five of the six patients with a good outcome had an initial diagnosis of chronic pancreatitis and the sixth had autoimmune pancreatitis. Two of the six patients continue to take narcotic analgesic medication daily or several times a week despite reporting a good outcome.

**Discussion**

Pancreatic head resection is performed increasingly for benign disease. Hence, longterm outcomes, particularly of the pancreaticojejunal anastomosis, have become notable.

Recently, Reid-Lombardo and colleagues at the Mayo Clinic reviewed their experience with pancreaticoduodenectomy for benign disease (122 patients, 40% chronic pancreatitis) and found four (3.3%) with pancreaticojejunal stenosis. Patients presented with abdominal pain, diarrhoea and recurrent pancreatitis evidenced by pseudocyst on imaging. Management included an endoscopic approach in two and surgical revision in two cases. The authors reported a good outcome in all four patients.

The current series has a higher incidence of symptomatic anastomotic stenosis (11.3% vs. 3.3%) than the Mayo series. This discrepancy may reflect the larger proportion of patients overall in this series with chronic pancreatitis (68% vs. 40%). Chronic pancreatitis was found to be a risk factor for pancreaticojejunal stenosis in this series (68% overall vs. 89% in the stenotic group; \( P < 0.04 \)). Thus, one might speculate that the inflammatory and fibrosing process inherent in pancreatitis might lend itself to pancreaticojejunal anastomotic stricture. In addition, this series had a worse outcome in terms of pain relief than the Mayo series (26% vs. 100% of patients indicated a good outcome). This difference, too, may be ascribed to a higher incidence of chronic pancreatitis because 24 of the 27 patients with anastomotic stenosis in this series suffered from chronic pancreatitis, whereas only one of the four patients in the Mayo series did. Clearly, the pain syndrome associated with chronic pancreatitis is complex and often multifactorial.

In most gastrointestinal anastomoses, ischaemia has been implicated in anastomotic failure; the pancreaticojejunal anastomosis is no exception. Strasberg and colleagues found in a prospective evaluation that 38% of patients undergoing pancreaticoduodenectomy had evidence of inadequate pancreatic blood supply to the cut edge of the pancreas at the time of anastomosis. They recommended cutting back the pancreas to the healthy bleeding gland prior to proceeding with pancreaticojejunal anastomosis to prevent early anastomotic failure (pancreatic fistula). Certainly, ischaemia may also play a role in longterm pancreatic anastomotic failure. As the current series is a retrospective study, the occurrence of pancreatic neck ischaemia and its relationship to pancreaticojejunal stenosis is not easily assessed.

Demographically, the patients in this series who underwent revision of pancreaticojejunal anastomosis stricture were similar to those who underwent pancreatic head resection for benign disease and did not undergo stricture revision. A total of 63% were women, compared with 56% of the entire group (\( P = \text{not significant [NS]} \)). The median age of the patients was 42 years, compared with 45 years in the entire group (\( P = \text{NS} \)). There were insufficient data to compare the body mass index between groups.

The patients with pancreaticojejunal anastomosis stricture identified in this series presented with abdominal pain. Steatorrhoea was not a significant clinical feature. Most patients, however, were already taking pancreatic enzyme supplementation and faecal fat studies were not performed in any patient.

Magnetic resonance cholangiopancreatography was the primary mode of evaluation for the patient presenting with abdominal pain post-pancreatic head resection with suspected pancreaticojejunal stenosis. Two-thirds of patients had an abnormal study suggestive of stenosis. Therefore, a positive test was useful. The use of secretin-stimulated MRCP to assess for pancreatic anastomotic stenosis or papillary stenosis in the patient with native anatomy has been described, although only in small series, with conflicting reported accuracy. Interestingly, Nordback and colleagues evaluated 26 consecutive asymptomatic patients after pancreatic head resection with functional MRCP and found that 48% had at least partial pancreaticojejunal anastomotic obstruction.

As a confounding factor, however, the consistent use of secretin stimulation in magnetic resonance evaluation of the pancreas in our institution was employed only during the latter portion of the time period referred to in this series. In addition, two of the studies were performed at outside centres. Therefore, as a result of the variability of study protocol and quality, we cannot draw definitive conclusions about the significance of a negative test from this experience.

The third of patients without MRCP evidence of pancreaticojejunal stenosis were subjected to exploration based on clinical, laboratory or radiographic evidence of recurrent pancreatitis, considered an indirect indicator of pancreaticojejunal stenosis. Anastomotic narrowing or obliteration was confirmed in all patients by the surgeon at surgery. It is important to note,
however, that this finding was a subjective evaluation made by the surgeon and no objective measurements were taken. The MRCP result was not predictive of outcome.

Several authors have reported on adjunctive techniques for the successful endoscopic navigation of surgically altered foregut anatomy. Endoscopic management was attempted in only three cases in this series, all of which failed. The challenges to endoscopic intervention are illustrated by these three failures: difficult navigation of altered anatomy with risk of perforation; loss of landmarks to allow identification of the pancreaticojejunostomy anastomosis, particularly when stenotic, and awkward positioning once the anastomosis is identified, potentially precluding therapeutic intervention.

The anastomotic revision in all cases entailed opening the pancreatic duct along the pancreas anteriorly for as long as it could be followed, and then performing a lateral pancreaticojejunalostomy either to the same limb of jejunum or to a new Roux-en-Y limb, as length would allow. This technique was used to allow the greatest chance of ductal and parenchymal decompression and to minimize the chance of recurrence of stenosis. Interestingly, the median pancreatic duct diameter was 3.5 mm in all patients in the series. The pancreatic duct was ≥5 mm in diameter in only seven patients and >7 mm in only two. It has previously been shown that pancreatic duct and parenchymal drainage with lateral pancreaticojejunalostomy is unsuccessful for pain relief in patients with small duct chronic pancreatitis (pancreatic duct diameter <7 mm in diameter). Therefore, the poor outcomes for pain relief in this study may not have been entirely unexpected.

The high late mortality (15%) observed in this series reflects the difficulties facing this challenging patient population, in which surgical management of chronic pancreatitis fails. Although ethanol abuse has been identified as a risk factor for increased mortality associated with chronic pancreatitis, none of the patients in the study who died had alcohol-related pancreatitis. The pain relief outcomes noted in this series are disappointing, with only six patients (26%) reporting improvement in their pain after anastomotic revision. In addition, of these six patients, two still require chronic narcotic analgesia medication. One might debate the underlying problems presented by psychosocial patient disorders, methods of diagnosis, operative technical considerations and perioperative indicators predisposing to pancreaticojejunalostomy stenosis. What is not debatable is that in this cohort of patients operative intervention with pancreaticojejunalostomy revision was of little value. Given the heterogenous and multifactorial nature of the neuropathic pain syndromes associated with chronic pancreatitis, this is not surprising. Relief of anastomotic obstruction does not address the central and splanchnic neural contributors to pancreatic pain and nor does it ameliorate the underlying disorder of exaggerated pancreatic fibrosis. The relief of pain associated with chronic pancreatitis is without doubt more complicated than the correction of pancreatic duct obstruction.

Thoracic splanchnicectomy and coeliac neurolysis have been advocated by some authors as alternative strategies for refractory pain after pancreatic surgery for chronic pancreatitis. Although they are effective, both techniques have unfortunately shown limited durability. An alternative measure in patients with continued pain after previous pancreas surgery is total (completion) pancreatectomy. This reoperative approach has been shown to be effective in relieving pain in carefully selected patients. In the past, total pancreatectomy was avoided because of resultant severe diabetes marked by potentially life-threatening hypoglycaemic episodes. With the advent of islet autotransplantation, however, this brittle diabetes can be ameliorated. As a result, reoperative surgery with extensive resection is a viable option for select patients and may be preferable to anastomotic revision.

Conclusions

Stricture of the pancreaticojejunalostomy anastomosis after pancreatic head resection for benign disease can present with recurrent pancreatitis and pancreatic pain, and is probably not a rare event, particularly in patients with chronic pancreatitis. Secretin-stimulated MRCP has good specificity in the diagnosis of anastomotic obstruction, but lacks sensitivity. Operative pancreaticojejunal revision is safe, but rarely effective as a means of pain relief in patients with the pain syndrome associated with chronic pancreatitis.

Conflicts of interest

None declared.

References


