Surgical Versus Nonsurgical Management of Pancreatic Pseudocysts

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Goals: Compare patient characteristics and outcome and also physician referral patterns between surgically and nonsurgically managed patients with pancreatic pseudocysts.

Background: Treatment of pancreatic pseudocysts can be accomplished by surgical, endoscopic, or percutaneous procedures. The ideal treatment method has not yet been defined.

Patients: All patients treated for pancreatic pseudocyst between 1999 and 2005 were identified in our health services database. Patients were treated with surgical, endoscopic, and percutaneous drainage procedures at the discretion of the treating physician. Main outcome measures included complications, pseudocyst resolution, and treatment modality as a function of the treating physician's specialty.

Results: Thirty patients (49%) were treated surgically, 24 endoscopically (39%), and 7 (11%) with percutaneous drainage. The most common indications for treatment were symptoms of pain, and biliary or gastric outlet obstruction (81%). Patients treated surgically and endoscopically were similar in terms of age (49 vs. 52 y), mean cyst diameter (9.1 vs. 9.5 cm, $P = 0.74$), incidence of chronic pancreatitis (50% vs. 32%, $P = 0.26$) and complicated pancreaticobiliary disease (69% vs. 60%). There were no differences in complications (20% vs. 21%) or pseudocyst resolution (93.3% vs. 87.5%, $P = 0.39$) between the surgical and endoscopic groups. There was no significant difference in the rate of surgical versus nonsurgical treatment in patients initially evaluated by surgeons versus nonsurgeons.

Conclusions: Surgical and endoscopic interventions for pancreatic pseudocysts are equally safe and effective with percutaneous drainage playing a less important role. Endoscopic drainage should be considered for initial therapy in appropriate patients.

Key Words: pseudocyst, pancreatitis

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P ancreatic pseudocysts are collections of pancreatic fluid contained by a wall of fibrous tissue, which result from acute or chronic pancreatitis, and represent the most common cystic lesions of the pancreas.[1] Treatment is generally reserved for those pseudocysts, which are symptomatic, enlarging, or complicated by infection or hemorrhage.[2] Open surgical internal drainage into the stomach, duodenum, or small bowel has been the traditional intervention of choice. Recently, percutaneous and endoscopic drainage have gained popularity owing to their less invasive nature. The first successful endoscopic drainage procedures were reported in 1983.[3,4] Early experience with endoscopic drainage was largely unfavorable, with low success rates, and unacceptably high morbidity. This was partly owing to inexperience and the fact that this new technique was reserved for patients with comorbid conditions deemed unfit to undergo surgery, or for those who had already failed multiple attempts at surgical drainage. With more recent technical advances and experience, endoscopic drainage is now considered an alternative to surgical drainage and is replacing it as first line therapy in many centers. Although both endoscopic and surgical methods of drainage have demonstrated comparable success rates in the retrospective studies, there is a scarcity of data in the literature regarding which intervention is optimal in a given patient. We sought to compare the outcomes and patient characteristics as they related to the method of pseudocyst drainage at our institution, with emphasis on selection of patients for one treatment over another.

MATERIALS AND METHODS

This retrospective review was approved by the Cleveland Clinic Institutional Review Board. We queried the Cleveland Clinic Health Data Services database for ICD codes 577.2 (cyst-pseudocyst of pancreas), 577.0 (acute pancreatitis), and 577.1 (chronic pancreatitis). We studied only those patients undergoing an intervention for a diagnosed pancreatic pseudocyst. This included patients treated between December 1998 and October 2005 at the Cleveland Clinic.

Patient characteristics included age, sex, nature of pancreatic disease, and symptoms attributable to the pseudocyst. Pancreatitis was defined as acute in the setting of new onset of typical symptoms (abdominal/back pain, nausea, etc) accompanied by elevated serum amylase and lipase greater than 3 times the upper limit of normal, or typical findings on imaging. Chronic pancreatitis was diagnosed in the setting of recurrent episodes of documented pancreatitis supplemented by evidence of exocrine and/or endocrine insufficiency when appropriate. Symptomatic pseudocysts included patients with pain, biliary or gastric outlet obstruction. Findings on imaging studies that supported the diagnosis of chronic pancreatitis included pancreatic duct dilatation or irregularity, calcifications, and pancreatic atrophy.

Computerized tomography, magnetic resonance imaging, endoscopic retrograde cholangiopancreatography (ERCP), and ultrasound were performed selectively at the discretion of the treating physician. The results of these studies were reviewed for the following: pseudocyst number, size, and location; presence of pancreatic necrosis, common bile duct dilatation or stricture; pancreatic duct dilatation or stricture; and pancreatic duct disruption. The size of the pseudocyst was determined by the maximum diameter appreciated by any imaging modality before intervention. The primary physician admitting the patient or the initial consultant was classified as either medical (gastroenterology, internal medicine), or surgical.

Interventions consisted of percutaneous, endoscopic, and surgical methods as dictated by the treating physician or consultant. There was no treatment bias toward any modality based on any institutional clinical pathway. This allowed for studying our hypothesis that any treatment bias was a consequence of who first treated the patient. Surgical treatment consisted of pseudocyst drainage and also additional pancreaticobiliary procedures in certain cases as deemed necessary by the surgeon at the time of operation. Cholecystectomy was performed when there was a question of gallstones either contributing to, or potentially complicating pancreatitis. Longitudinal pancreaticojejunostomy was performed when feasible in the presence of chronic pancreatitis. Splenectomy and gastric drainage procedures (eg, pyloroplasty, gastrojejunostomy) were selectively performed by the operating surgeon in the presence of splenic vein thrombosis and gastric outlet obstruction, respectively. A biopsy of the pseudocyst wall was performed in all instances and reviewed by a staff pathologist to confirm the diagnosis of pseudocyst.

Endoscopic drainage was performed using monitored sedation and consisted of transmural drainage through the gastric wall with or without transpapillary drainage. Transmural drainage was performed only if a visible bulge was appreciated by the endoscopist. Endoscopic ultrasound (EUS) was not routinely used. A needle-knife catheter was used to puncture the cyst wall and location was confirmed with contrast injection. Using Seldinger technique, the tract was balloon-dilated and stented with either 1 or 2 double pigtail stents at the discretion of the endoscopist. Imaging the pancreatic duct and improving native pancreatic duct drainage were considered important interventions in the endoscopic approach. Transpapillary drainage was performed if the pancreatogram revealed a stricture downstream from the pseudocyst or contrast material filled the pseudocyst. A pancreatic duct sphincterotomy was performed and pancreatic duct stent was placed unless technical reasons prevented access to the pancreatic duct. Biliary sphincterotomy and common bile duct stenting were performed concurrently if there was evidence of biliary stricture.

Percutaneous drainage was performed by a staff radiologist under computed tomographic guidance using local anesthetic. After needle localization of the pseudocyst, the Seldinger technique was used to dilate the tract and place a pigtail drainage catheter. Only patients expected to be definitively treated with drainage were considered; diagnostic aspirations were excluded.

Patient follow-up was conducted by chart review for clinic and hospital visits following intervention, and follow-up imaging studies. The primary outcomes studied were procedure-related complications, pseudocyst recurrence, and mode of intervention as it related to the primary physician taking care of the patient. Examples of procedure-related complications included short-term outcomes such as technical failure, bleeding (requiring reoperation or angiographic intervention), and wound infection, and also long-term outcomes such as incisional hernia. A patient was considered to have a *recurrence* in the setting of a new pseudocyst detected by imaging after prior resolution. *Persistence* was defined as the continued presence of a pseudocyst on follow-up imaging after treatment.

Statistical analysis was performed using InStat version 3.0 (GraphPad Software Inc, San Diego, CA). A 2-tailed Student t test was used for normally distributed data. Contingency table analysis was performed with either the χ^2 or Fisher exact tests. A P value < 0.05 was considered significant. The number of patients treated with percutaneous drainage precluded comparative analysis with surgical or endoscopic therapies.

RESULTS

A total of 61 patients had an intervention for a pseudocyst over the period from December 1998 to October 2005. Thirty patients (49%) were treated surgically, 24 (39%) endoscopically, and 7 (11%) percutaneously. In 17 patients (29%), pseudocysts were the result of idiopathic pancreatitis. Sixteen patients (27%) developed pseudocysts after alcohol-induced pancreatitis, whereas biliary pancreatitis was the cause in 13 patients (22%). In the remaining cases, the presumed etiology for pseudocyst formation was postsurgical pancreatic leak (4), post-ERCP pancreatitis (2), sphincter of Oddi dysfunction (1), corticosteroids (1), hyperlipidemia (1), hypercalcemia (1), pancreatic cancer (1), and duodenal polyposis (1).

Surgical procedures performed included cystogastrostomy in 14 patients (47%), Roux-en-Y cystojejunostomy (5), and cystoduodenostomy (4). Twenty additional pancreaticobiliary procedures were performed in 15 patients including cholecystectomy (11), Puestow procedure (longitudinal pancreaticojejunostomy) (2), splenectomy (2), pancreatic debridement (1), hepaticojejunostomy (1), gastrojejunostomy (1), pyloroplasty (1), and Duval procedure (distal pancreatectomy with end-to-end pancreaticojejunostomy) (1). Endoscopic therapy consisted of cystogastrostomy alone in 12 patients (50%), transpapillary drainage alone in 6, and combined transmural and transpapillary drainage in 6. Endoscopic stents were left in place for 13 to 104 days (median 43 d). Duration of stenting was not known in 8 patients. In 3 of these patients, the stent had migrated on repeat ERCP whereas in another 5 there was no documented stent extraction.

The most common indications for therapy were abdominal pain or symptoms of an obstructed bile or pancreatic duct, present in 48 patients (81%), followed by increasing size in 6 (10%). Mean follow-up was 10 months (0 to 43 mo) in the endoscopic group versus 15 months (1 to 74 mo) in the surgical group ($P = 0.36$). Patient age (49 vs. 52 y), size of the dominant pseudocyst (9.1 vs. 9.5 cm), prevalence of chronic pancreatitis (50% vs. 32%), and multiple pseudocysts (41% vs. 25%) were all similar in the surgical and endoscopic group, respectively (Table 1). Likewise, patients with imaging characteristics of complex pancreaticobiliary disease (eg, common bile duct or pancreatic duct obstruction, major pancreatic duct disruption, pancreatic necrosis) were equally prevalent in both groups at 60%.

TABLE 1. Patient Characteristics and Outcomes in Surgical Versus Endoscopic Treatment Groups

	Surgery (n = 30)	Endoscopy (n = 24)	P
Demographics			
Mean age (y)	49	52	0.59
Pseudocyst diameter (cm)	9.1	9.5	0.74
Follow-up (mo)	15	10	0.36
Indication for intervention			
Symptoms	23	17	
Size	5	3	
Other	2	4	
Etiology of pancreatitis			
Alcohol	8	8	
Biliary	8	5	
Postoperative/ postprocedural	1	5	
Idiopathic	11	5	
Other	2	1	
Multiple pseudocysts (%)	12 (41)	5 (25)	0.36
Complicated pancreatic/biliary disease (%)	18 (64)	12 (60)	1.0
Chronic pancreatitis	15 (50)	7 (32)	0.26
Outcomes			
Complications	6 (20)	5 (21)	1.0
Pseudocyst resolution	28/30 (93.3)	21/24 (87.5)	0.39

Outcomes in the surgical and endoscopic treatment groups are also depicted in Table 1. Procedure-related complications occurred in 6 (20%) surgical patients versus 5 patients (21%) treated endoscopically. Complications in the surgical group included 3 incisional hernias, 1 postoperative deep vein thrombosis, and 1 patient with hemorrhage into a pseudocyst from a splenic artery pseudoaneurysm after laparoscopic cystogastrostomy. One patient in the surgical group developed a pancreatic fistula after external drainage. Five of the 6 complications developed in the 15 patients undergoing only surgical pseudocyst drainage procedures for a complication rate of 33% in this cohort. Complications in the endoscopic group consisted of 2 technical failures and 2 episodes of postprocedure hemorrhage. One of these resulted from a gastroduodenal artery pseudoaneurysm and was treated successfully with angiographic coil embolization. The other required surgical intervention, which was performed at an outside facility. The remaining complication in the endoscopic group related to stent malfunction leading to pseudocyst infection. The patient was readmitted for intravenous antibiotics and the pseudocyst eventually resolved without further intervention. There were no pseudocyst recurrences in either the endoscopic or surgical groups on follow-up imaging. However, there were 2 cases of symptomatic, persistent pseudocysts in the surgical group (6.7%), and 1 in the endoscopic group (4.2%). Taking into account the 2 technical failures in the endoscopic group, pseudocyst resolution rates in the surgical and endoscopic groups were 93.3% and 87.5%, respectively. One of the surgical patients initially presented with acute necrotizing alcoholic pancreatitis and required surgery for pancreatic debridement, cholecystectomy, and Roux-en-Y cystojejunostomy. He went on to develop multiple infected peripancreatic collections after which these were percutaneously drained. The other surgical patient had chronic pancreatitis with a 5.8-cm pseudocyst

in the pancreatic neck, which was drained via open cystogastrostomy. A follow-up magnetic resonance imaging 2 years after his surgery, showed a residual 2-cm pseudocyst. There were no persistent or recurrent pseudocysts among the 15 surgical patients who underwent pseudocyst drainage alone. One patient in the endoscopic group underwent transpapillary drainage with failure of pseudocyst resolution and eventually required open cystogastrostomy. In patients with chronic pancreatitis, resolution occurred in 13 of the 15 patients treated surgically. All 7 patients with a background of chronic pancreatitis managed endoscopically underwent complete resolution. There were no deaths in either the surgical or endoscopic groups.

Percutaneous drainage was performed in 7 patients with a mean follow-up of 12 months. Pseudocysts treated percutaneously tended to either be postoperative or were suspected of being infected based on imaging characteristics. Furthermore, this group consisted of hospitalized, acutely ill patients. Recurrent pseudocysts developed in 2 patients, 1 of whom underwent subsequent open cystogastrostomy. Two patients experienced procedure-related complications. In one of these patients, the drainage catheter eroded into neighboring bowel resulting in an enterocutaneous fistula, which resolved with conservative treatment. Another patient developed a pancreatic fistula requiring pancreatic duct stent placement. Two patients died as a result of multisystem organ failure.

Patients who were initially evaluated by a surgeon underwent surgical procedures in 63% versus endoscopic or percutaneous drainage in 37%. Those initially referred to an internist or gastroenterologist underwent surgical treatment 42% of the time, versus endoscopic or percutaneous drainage in 58%. Therefore initial consultant was not predictive of ultimate treatment (P = 0.19).

DISCUSSION

In this retrospective study, we demonstrate that relatively similar groups of patients undergoing surgical and endoscopic interventions for complicated pancreatic pseudocysts had similar results in terms of procedural complications and pseudocyst resolution.

Our complication rates from endoscopic drainage procedures were comparable to those reported in the literature, which range from 0% to 70% for transmural and 0% to 28% for transpapillary drainage.[5–15] These same studies report recurrence rates of 9% and 20% for transpapillary and transmural drainage procedures, respectively. We reported no recurrences in our study population, however there were 2 surgical patients and 1 treated endoscopically who had persistent symptoms and were found to have persistent pseudocysts on imaging. The discrepancy in terms of recurrences between our data and those reported elsewhere may be explained by our relatively limited follow-up and how we defined *recurrence*. Alternatively, the high success rate and low incidence of recurrence could be attributed to more aggressive endoscopic interventions as experience with the procedure grows. There was no statistical difference between surgical and endoscopic groups in terms of complicated pancreaticobiliary disease. However, 15 patients (47%) managed surgically underwent 20 additional operative procedures, which clearly could not have been performed by nonsurgical means. Walt et al[16] demonstrated a similar pattern in their series of 257 surgical

procedures for pseudocysts, 33% of which involved resection or ductal drainage procedures. The treatment of pseudocysts in the setting of chronic pancreatitis can be particularly challenging with some authors highlighting the need to study ductal pathology before intervention to maximize clinical outcome. In our study group, there was a similar prevalence of patients with chronic pancreatitis among both the endoscopic and surgical groups. Although no patient with chronic pancreatitis developed a persistent or recurrent pseudocyst after endoscopic treatment, both patients in the surgical group with persistent pseudocysts had chronic pancreatitis. Our relatively low number of patients with chronic pancreatitis does not allow a clear conclusion, but there is no obvious disadvantage of endoscopic drainage in all patients with chronic pancreatitis.

Given the relative equivalency of surgical and endo-scopic drainage methods, we hypothesized that specialty of the initial treating physician might correlate with ultimate treatment modality. Patients therefore seem to have been referred for the most appropriate therapy without perceived outcome bias. Thus, patients requiring multiple simulta-neous interventions were treated surgically. This lack of referral bias may partly be a reflection of our multispecialty group practice and patient care multidisciplinary treatment conferences.

In a review of 238 patients treated with endoscopic drainage, Beckingham et al[17] reported a combined long-term success rate of 74% with complication and recurrence rates of 18% and 11%, respectively. This compares favorably with the results reported in several surgical series.[18] Several anatomic criteria must be met in order for endoscopic drainage to be safe and effective. The pseudo-cyst must be contiguous with the stomach or duodenum for transmural drainage. The wall of the pseudocyst should be less than 1 cm in thickness or an alternative etiology, such as a cystic neoplasm should be considered. In addition, the pseudocyst should create a clear indentation in the wall of the stomach or duodenum unless EUS is used. Roughly, 27% to 55% of pseudocysts meet these specifications, which is consistent with our application of the procedure.[19] Cahen et al identified 4 factors in multivariate analysis, which predicted successful endoscopic drainage: location of the pseudocyst in the pancreatic head, placement of more than 1 stent, and duration of drainage longer than 6 weeks.[20] Other studies have suggested transduodenal drainage to be superior to transgastric drainage.[5,9] The endoscopic approach has the advantage of promoting native ductal drainage compared with surgical approaches. At times, endoscopic transmural drainage was required to gain access to the papilla at a later session.

EUS may expand the number of pseudocysts amen-able to endoscopic drainage while making the procedure safer. Kruger et al[21] reported a 94% initial success rate with the regular use of EUS with no bleeding complications. Moreover, only 17% of the pseudocysts drained created a visible mural bulge. Others advocate the routine use of EUS during transmural drainage. In a series reported by Norton et al,[22] 3 out of 17 planned transgastric drainage procedures were aborted even in the presence of a visible bulge because of unfavorable findings on EUS. EUS-guided pancreatico-gastrostomy has been described as a means of ductal decompression in patients with chronic strictures not amenable to stenting.[23] This approach may also be ideal in the management of pseudocysts where transpapillary drainage is desirable but not technically possible.

In conclusion, there is insufficient evidence to suggest that either surgical or endoscopic management of pancrea-tic pseudocysts is superior. The major limitations of our study include the small sample size, retrospective design, and short follow-up.

Pseudocysts with favorable anatomy currently have good results with endoscopic treatment and this should be the preferred route of drainage when feasible. Surgical drainage should be considered in patients with complex pancreaticobiliary disease requiring additional procedures besides cyst drainage. Surgeons may need to consider endoscopic drainage more frequently, especially as tech-nologies such as endoscopic ultrasound expand the applic-ability of this modality.

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