

Management of Pancreatic Fistulas

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KEYWORDS

• Pancreatic fistula • Management • Therapy

KEY POINTS

- A pancreatic fistula is defined as the leakage of pancreatic fluid as a result of pancreatic duct disruption; such ductal disruptions may be either iatrogenic or noniatrogenic.
- The management of pancreatic fistulas can be complex and mandates a multidisciplinary approach.
- Basic principles of fistula control/patient stabilization, delineation of ductal anatomy, and definitive therapy remain of paramount importance.

INTRODUCTION AND DEFINITION

Pancreatic fistula is a well-recognized complication of pancreatic surgery and pancreatitis. Successful management of this potentially complex problem often requires a multidisciplinary approach. A pancreatic fistula is defined as the leakage of pancreatic fluid as a result of pancreatic duct disruption. Such ductal disruptions may be either iatrogenic or noniatrogenic. Noniatrogenic fistulas typically result from either acute or chronic pancreatitis, caused most frequently by gallstones or alcohol.

Iatrogenic pancreatic fistulas usually result from operative trauma, which typically occurs in the tail of the pancreas during splenic surgery, during left renal/adrenal surgery, or during mobilization of the splenic flexure of the colon. More frequently, pancreatic fistulas occur following resection of a portion of the pancreas. For postoperative pancreatic fistulas, a consensus definition and grading scale were developed to aide in their classification.¹ The definition of a postoperative pancreatic fistula is drain output of any volume on or after postoperative day 3 with an amylase greater than 3 times the serum level. Iatrogenic fistulas may also result from complications of endoscopic interventions during endoscopic retrograde cholangiopancreatography (ERCP).

A pancreatic fistula can drain to either an internal or an external location. An internal pancreatic fistula is usually seen in patients with a history of pancreatitis, in which the

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leakage is not controlled by the inflammatory response. Such fistulas may manifest as pancreatic ascites or a pancreaticopleural fistula. An external pancreatic fistula can also be called a pancreaticocutaneous fistula. These fistulas often occur after percutaneous drainage of a pancreatic fluid collection/pseudocyst, following pancreatic debridement, or after a pancreatic resection.

Regardless of the cause or location of the pancreatic fistula, the steps required for treatment are similar. First, stabilization of patients and medical optimization are crucial. Controlling the fistula, controlling sepsis, and providing adequate nutrition typically accomplish this. Second, the area of pancreatic duct injury must be identified. Finally, definitive management of the fistula should be addressed.

INITIAL MANAGEMENT

The first step in the management of patients with a pancreatic fistula is control of the pancreatic secretions. This step is accomplished with percutaneous drains placed under computed tomography (CT) or ultrasound guidance. Drainage of fluid collections along with antibiotics when appropriate help control the inflammation and potential source of infection. Following control of the fluid, the next step is to medically optimize patients. Patients with a pancreatic fistula are at risk for having significant nutritional and electrolyte imbalances. Particularly, patients have significant loss of sodium and bicarbonate caused by pancreatic exocrine secretions. Nutritionally, patients with pancreatic fistulas often present with significant nausea, anorexia, and the inability to tolerate oral intake. In addition, pending the severity of the pancreatic fistula, these patients often have poor nutritional absorption, particularly of protein and fat. Given this, patients may require total parenteral nutrition (TPN) in an effort to overcome their catabolic state. TPN provides the benefit of minimizing protein loss while ideally minimizing pancreatic enzyme secretion. TPN, however, is not without risks to patients, including potential line sepsis and cholestatic injury to the liver. With this in mind, enteral feeding should be initiated when possible because it is relatively simple to administer, less costly than TPN, and has the ability to maintain mucosal barrier function. Ideally, this would be postpyloric in nature via a nasojejunal feeding tube. However, the benefits of postpyloric feeding over gastric feeding are debatable.²

EVALUATING THE PANCREATIC DUCT

Following stabilization of patients, the next step in management is to identify the location and extent of pancreatic duct injury. This information can help dictate the need for additional interventional procedures and will be vital in creating operative plans should patients require surgical intervention. At this point in the management of patients with a pancreatic fistula, a CT has surely been done to assess for and drain any fluid collections. To evaluate the pancreatic duct magnetic resonance cholangiopancreatography (MRCP) and ERCP are used. MRCP is noninvasive and delineates the sites of ductal disruption as well as other findings, such as stones or strictures. A supplement to standard MRCP includes secretin stimulation MRCP, which is useful in the diagnosis of chronic pancreatitis by stressing the pancreas to produce exocrine secretions while performing the imaging. Regardless of the type of MRCP, it remains only a diagnostic modality. In contrast, ERCP has the benefit of visualizing the pancreatic duct while at the same time providing potentially therapeutic interventions, including sphincterotomy, stenting, and nasobiliary drainage. ERCP, however, requires conscious sedation and carries the risk of duodenal perforation (<1.0%) or pancreatitis (3.5%).³ Finally, in patients who have already undergone percutaneous drainage, a fistulogram can be

performed through the drain as a simple method to visualize the area of pancreatic ductal injury.

DEFINITIVE MANAGEMENT OF THE PANCREATIC FISTULA

After the anatomy of the pancreatic duct and the location of the injury have been identified, attention can be turned toward definitive management of the fistula. It should be noted, that 70% to 82% of pancreatic fistulas will close spontaneously without the need for operative intervention.^{4,5} Often, simply making patients nil per os (NPO) and reducing pancreatic stimulation will, over time, result in resolution of the pancreatic fistula. However, there are certain pancreatic fistulas that will eventually require intervention.

Octreotide

Octreotide, a synthetic somatostatin analogue inhibits pancreatic exocrine secretion. It is commonly thought that octreotide facilitates spontaneous fistula closure. However, a meta-analysis evaluating octreotide failed to show any improvement in the rate of fistula closure.⁶ Despite the lack of effect on fistula closure rate, octreotide may help lower fistula output and make fistula control easier.

Fibrin Glue

Fibrin glue has been used to obliterate the fistula tract. This technique involves injection of fibrin glue either under radiographic guidance or through a previously placed drainage tract. Studies of this technique are limited; but in small case series, it has been shown to be a successful treatment option for patients with low-output pancreatic fistulas.^{4,7}

Endoscopic Therapy

The use of ERCP in the evaluation of a pancreatic fistula is beneficial in that it has both diagnostic and therapeutic utility. In patients with a persistent pancreatic fistula despite percutaneous drainage and medical optimization, an ERCP with sphincterotomy or stenting can be performed. This practice serves to reduce the pressure within the pancreatic duct, ideally facilitating the closure of the pancreatic fistula. In the literature, closure rates as high as 82% have been reported.⁵ However, a recent multicenter series comparing endoscopic transpapillary stenting versus conservative treatment failed to show a significant improvement in the fistula closure rate (84% vs 75%) or in the time to closure (71 days vs 120 days).⁸ Despite these findings, endoscopic stenting may be useful in the management of select pancreatic fistulas.

Patients who present with pancreatic ductal disruption (either complete or partial) can often be managed with an endoscopic stent to bridge the disruption with a success rate of more than 50%. Predictors of success include the ability to bridge the disruption and patients with a partial disruption.⁹

Operative Management

The operative management of pancreatic fistulas remains an important component of their treatment but is generally reserved for patients in which efforts at conservative or endoscopic procedures have failed. Surgery is often needed in patients who are unable to have endoscopic therapies secondary to postsurgical anatomy or who have an inability to cannulate the pancreatic duct, a significant ductal stricture, or a very large defect. The type of surgical intervention proposed for patients varies greatly on the location of the ductal injuries.

Patients who present with a large pancreatic duct (7 mm or greater) are generally best managed with duct decompression, usually via a lateral pancreaticojejunostomy. If a pancreatic pseudocyst is present, this area should be incorporated into the anastomosis, although frequently duct decompression alone is sufficient enough to allow resolution of the cyst.¹⁰

For those patients without a dilated pancreatic duct, knowing the location of the ductal injury becomes vital in preoperative planning. For example, patients with an injury isolated to the body or tail of the pancreas are often best served by a distal pancreatectomy, resecting only the area of the pancreas beyond the disruption.

Disconnected duct syndrome is a phenomenon often seen in patients following acute pancreatic necrosis in which a portion of the pancreas has undergone autolysis. Initial management is similar with supportive care and management with percutaneous drainage. Definitive management will depend on the location of the ductal disruption. If the injury is located near the tail of the pancreas, it can frequently be managed with distal pancreatectomy. If the ductal disruption is near the neck of the pancreas, then these patients are best served by draining the fistula for a period of time until a fibrous fistula tract can develop. At that time, a fistula enterostomy can be performed using a Roux-en-y jejunal limb. The success rate has been reported to be as high as 100% in certain series, with minimal comorbidities.¹¹ However, long-term failure may occur because of obliteration of the fistula tract over time. Another surgical option for a disconnected duct at the neck of the gland is distal pancreatectomy, but that sacrifices a notable amount of otherwise functional pancreatic parenchyma. Finally, recent studies have investigated the role of endoscopic therapies for the management of disconnected duct syndrome. Some have found that patients temporarily improved with endoscopic therapy but will often go on to require surgical intervention.¹² In patients who may not be considered a surgical candidate, or who refuse surgery, a rendezvous technique using endoscopic and percutaneous techniques may provide an alternative treatment method.¹³

TREATMENT OF POSTPROCEDURE PANCREATIC FISTULA

Postprocedural pancreatic fistulas often follow percutaneous drainage of a pancreatic pseudocyst, operative debridement of acute pancreatitis, operative pancreatic injury, or planned pancreatic resection. The management of the fistula is variable pending the cause of the fistula.

Pancreatic Fistula Associated with Pseudocyst Drainage

A pancreatic fistula following percutaneous drainage of a pseudocyst occurs approximately 15% of the time. Persistent drainage is often the result of a stricture within the main pancreatic duct, which is causing the pressure within the duct to be abnormally high. In this setting, early ERCP evaluation should be sought because the addition of a sphincterotomy or stent to reduce the pressure within the pancreatic duct will often result in spontaneous closure of the fistula. If after 6 weeks patients continue to have active drainage, then the need for operative intervention should be discussed with patients.

Pancreatic Fistula After Debridement of Pancreatic Necrosis

Patients with pancreatic necrosis secondary to acute pancreatitis often present with pancreatic duct disruption. At the time of the initial surgery, the goal is to debride all necrotic tissue and perform wide drainage. Surprisingly, many duct disruptions will go on to seal with time and drainage. However, should patients continue to have

ongoing fistula drainage, then the next step will be to study the pancreatic duct anatomy. If patients can tolerate ERCP, then it should be used for decompression of the pancreatic duct. If despite ductal decompression patients still have a persistent pancreatic fistula, then operative intervention should be considered.

Pancreatic Fistula After Operative Trauma

Pancreatic fistula after operative trauma is usually isolated to the tail of the pancreas following splenectomy, left nephrectomy/adrenalectomy, and mobilization of the splenic flexure. Without an underlying pancreatic duct stricture, these fistulas will typically resolve with conservative management. However, if patients do go on to require surgery, then distal pancreatectomy is typically sufficient.

Pancreatic Fistula After Pancreatic Resection

Following pancreatic resection, a leak from either the divided edge of the pancreas or the pancreatic anastomosis is considered a postoperative pancreatic fistula. Rates of postoperative pancreatic fistula vary widely in series but approximate 20% for both distal pancreatectomy and pancreaticoduodenectomy and can have significant morbidity.^{1,14,15} Numerous preoperative risk factors for pancreatic fistula have been identified, including male gender, jaundice, cardiovascular disease, operative time, intraoperative blood loss, type of pancreatico-digestive anastomosis, hospital volume, and the surgeon's experience.^{16,17} Perhaps the most significant risk factors are pancreatic duct size and pancreatic texture. The management of a postoperative pancreatic fistula is generally supportive with drainage of any collections. Rarely are endoscopic or surgical therapies needed. To facilitate more accurate reporting of such fistulas, a uniform grading system has been developed (see **Table 1**).

Prevention of Fistula After Pancreatic Resection

Given the frequency of pancreatic fistulas following pancreatic resection, extensive research has looked at methods for prevention. In the setting of pancreaticoduodenectomy, the method of reconstruction (pancreaticojejunostomy vs pancreaticogastrostomy), the use of octreotide, the application of fibrin glue, and the type of anastomosis (invaginating, duct to mucosa, stented) have all been studied.^{6,18-20}

Table 1
Grade of postoperative pancreatic fistula

Grade	A	B	C
Clinical conditions	Well	Often well	Ill appearing/bad
Specific treatment	No	Yes/no	Yes
US/CT (if obtained)	Negative	Negative/positive	Positive
Persistent drainage (after 3 wk)	No	Usually yes	Yes
Reoperation	No	No	Yes
Death related to fistula	No	No	Possibly yes
Signs of infections	No	Yes/no	Yes
Sepsis	No	No	Yes
Readmission	No	Yes/no	Yes/no

Drain output of any measurable volume of fluid on or after postoperative day 3 with an amylase content greater than 3 times the serum amylase activity.

Abbreviation: US, ultrasound.

Data from Bassi C, Dervenis C, Butturini G, et al. Postoperative pancreatic fistula: an international study group (ISGPF) definition. *Surgery* 2005;138(1):8-13.

No single method has been shown to be consistently better than the others. In the setting of distal pancreatectomy, numerous methods for transecting the pancreas and controlling the remnant have been investigated. They include stapled closure, sutured closure, transection and control with various energy devices, the application of fibrin glue, and coverage with autologous tissue.^{21–23} The level of evidence varies dramatically among the studies; as in the case of pancreaticoduodenectomy, no method is reliably better than the others at lowering the fistula rate. Minimizing postoperative pancreatic fistulas remains a topic of intense investigation.

SUMMARY

The management of pancreatic fistulas can be complex and mandates a multidisciplinary approach. Basic principles of fistula control/patient stabilization, delineation of ductal anatomy, and definitive therapy remain of paramount importance.

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