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Percutaneous Pancreatography for Treatment of Complicated Pancreatic Duct Strictures

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Key Words
Endoscopic retrograde pancreatography · Interventional radiology · Pancreatic duct stricture · Percutaneous therapy

Abstract
Background: Percutaneous transhepatic cholangiography was developed over 30 years ago for the diagnosis of biliary disorders. It has become an accepted interventional technique for management of biliary tract diseases, especially in patients who have failed attempted endoscopic retrograde pancreatography or have altered anatomy that makes the biliary tree endoscopically inaccessible. The correlative procedure, which we term 'percutaneous pancreatography' (PP), has only been described once in the literature. ***Case Presentations:*** We report the outcome of 4 patients undergoing PP for management of difficult pancreatic duct strictures. In all patients, PP was used to provide access and therapy of otherwise endoscopically impassable pancreatic duct strictures. PP-guided pancreatic stent duct placement was performed and allowed for subsequent successful endoscopic management of complex, benign pancreatic duct obstructions. ***Conclusions:*** PP is a useful modality for management of otherwise endoscopically impassable pancreatic duct strictures.

Introduction

Disruption of the main pancreatic duct can occur following an episode of severe acute pancreatitis as well as surgical or accidental trauma. Healing of the disruption may result in pancreatic duct stricture and resultant upstream fistula or pseudocyst formation.

Endoscopic therapy has become an accepted method of intervention for a variety of pancreatic duct complications that occur as a result of acute and chronic pancreatitis or pancreatic trauma. Transpapillary balloon dilation and stenting is used to restore and maintain duct patency. Endoscopic therapy may fail if severe ductal obstruction prevents traversing of the pancreatic duct stricture or cannulation of the main pancreatic duct. Such cases are usually referred for surgical management. We describe a new technique which we term 'percutaneous pancreatography' (PP) to provide access to the main pancreatic duct in cases where pancreatic duct therapy was required but was technically not feasible using endoscopic retrograde pancreatography (ERP) techniques. This facilitated subsequent endoscopic interventions.

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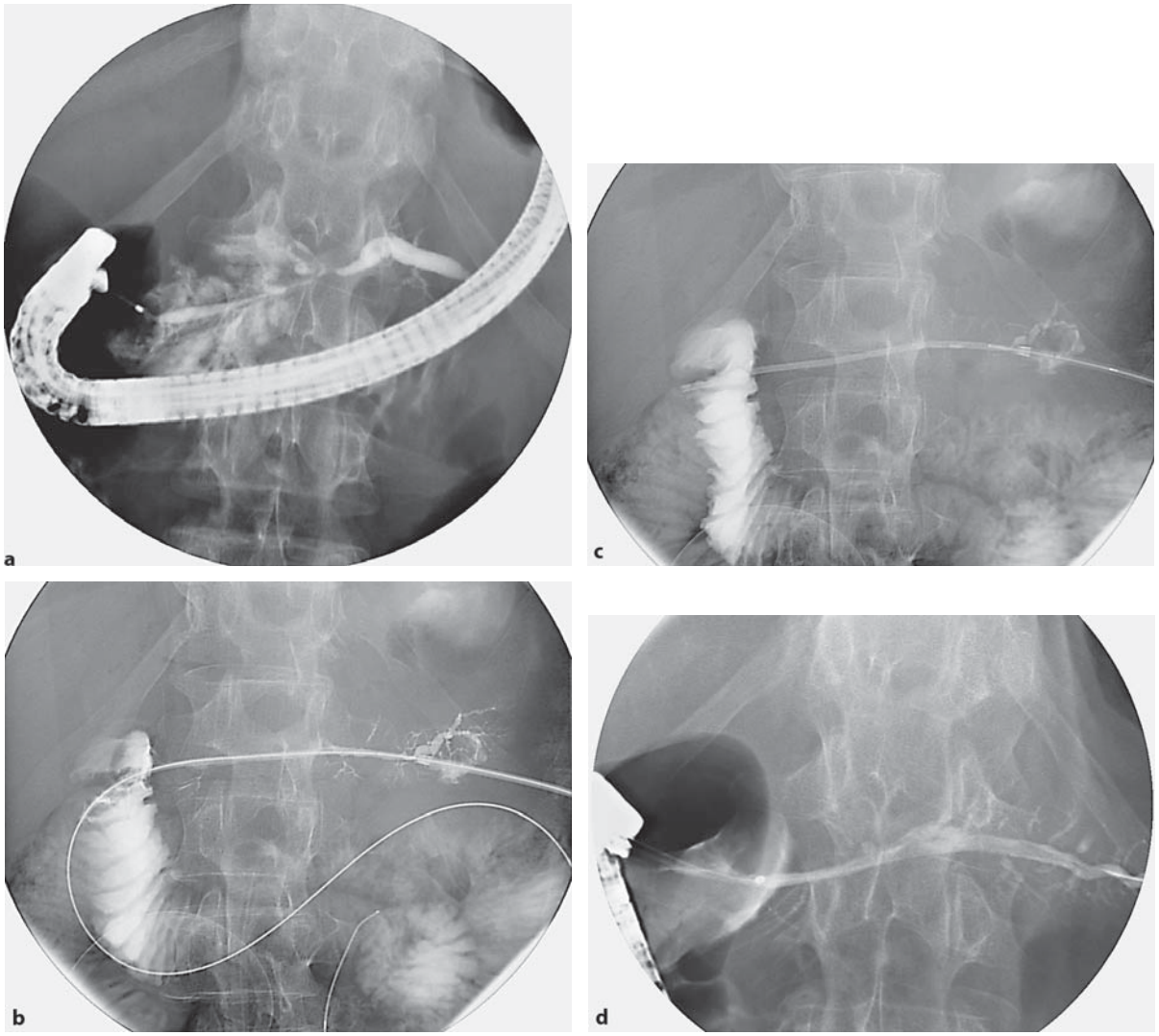

Fig. 1. a ERP demonstrating pancreatic duct stricture. **b** CT-guided needle puncture and injection of the pancreatic duct under fluoroscopy. **c** A 7-French, 12-cm plastic stent is positioned in the pancreatic duct traversing the stricture and well into the duodenum. **d** Follow-up ERP after several endoscopic sessions.

Cases and Methods

PP is performed with deep IV sedation by the anesthesiology team. If possible, the main pancreatic duct is accessed; if not, a small peripheral branch of the pancreatic duct is punctured under CT guidance upstream to the stricture. Patients are then transported from the CT suite to the fluoroscopy suite. Injection through the needle opacifies the main duct. Guide wires are advanced down the length of the pancreatic duct across the stricture. If possible, the wire is advanced into the duodenum or jejunum, as appropriate. If it is not possible to traverse the stricture or enter the bowel, an external drain is left in the pancreatic duct externally. After 1–2 days additional attempts are made to connect into the duodenum. When this is accomplished, the stricture is balloon dilated and commercially available endoscopic pancreatic stents are used along with corresponding pushing catheters. One end of the stent is left in the bowel and the other end is left in the main pancreatic duct across the stricture. The procedure requires the use of small, specialized catheters and guide wires.

Case 1

A 50-year-old man was referred for complications of idiopathic acute necrotizing pancreatitis. Three months prior to transfer he was hospitalized with severe acute pancreatitis. Abdominal CT then revealed a large peripancreatic fluid collection. Over the following months he was hospitalized repeatedly because of recurrent pancreatitis. He had been treated with total parenteral nutrition and eventually nasojejunal feeding.

The initial ERP revealed pancreas divisum. A pancreatogram via the minor papilla showed filling of approximately 3 cm of the

normal main duct, which communicated with a large multicystic cavity. Over the next 8 weeks, the patient underwent endoscopic transduodenal drainage of 2 necrotic peri-pancreatic fluid collections. At follow-up ERP, the patient was found to have developed a stricture of the main pancreatic duct at the site of the previous pancreatic duct disruption with a dilated upstream pancreatic duct. Multiple attempts to access the pancreatic duct across the stricture using a variety of guide wires failed.

Because of recurrent pancreatitis, percutaneous intervention was initiated.

A percutaneous CT-guided puncture of the dilated pancreatic duct in the tail region was performed (fig. 1a). Next a guide wire was advanced in an antegrade fashion through the pancreas duct to the level of the mid-duct stricture. A guide wire was passed through antegrade across the stricture through the minor papilla and into the duodenum and jejunum. The stricture was balloon dilated (fig. 1b) and a 7-French, 12-cm Geenen pancreatic stent was placed antegrade extending from the pancreatic duct into the duodenum (fig. 1c).

Eight and 16 weeks after the radiologically placed stent the patient returned for endoscopic stricture dilation and stent exchange. On both occasions, there was visible improvement in the stricture (fig. 1d). The patient remained asymptomatic with indwelling pancreatic stents and continued endoscopic therapy with stricture dilation and stent exchanges for 4 months, at which time all stents were removed. No further stenting has been required as of a 16-month follow-up period.

Case 2

A 47-year-old male was referred for management of severe idiopathic acute pancreatitis. Two months after initial presentation he underwent percutaneous drainage of a necrotic pancreatic collection. After the collection resolved, a pancreatic-cutaneous fistula developed. At ERP a tight pancreatic duct stricture was identified at the genu. With forceful contrast injection a dilated segment of PD in the tail filled. The tail segment of the main pancreatic duct could not be accessed.

A CT-guided puncture was performed to access the main pancreatic duct in the tail. A guide wire was passed across the stricture and into the duodenal lumen. A 5-mm dilating balloon was inflated across the pancreatic duct stricture. Finally, a 7-French stent was inserted over the guide wire across the stricture, with the distal end of the stent exiting the ampulla.

Three weeks later, the patient returned for ERP and stent exchange. The pancreatic fistula had resolved. The pancreatic stricture was re-dilated with a 6-mm balloon, and a 10-French, 10-cm stent was placed across the stricture, with excellent drainage. Serial ERPs with stricture dilation and stent exchange were performed every 2–3 months for a 10-month period with stricture resolution. No further stenting has been required as of a 27-month follow-up period.

Case 3

A 49-year-old male with familial adenomatous polyposis syndrome underwent a pylorus-preserving Whipple operation for extensive ampullary adenomata. Fourteen months later he presented with pancreatitis. A CT scan showed a 7-cm pseudocyst with dilation of the main pancreatic duct. He was thought to have developed recurrent pancreatitis due to obstruction at the pancreatico-jejunal anastomosis. An ERP was performed because of persistent abdominal pain and enlarging pseudocyst. Although the proximal end of the afferent limb could be reached, the pancreatico-jejunostomy could not be identified. Endoscopic transgastric pseudocyst drainage was performed.

To prevent recurrent pancreatitis and pseudocyst formation, ductal therapy was undertaken. Two days after resolution of the pseudocyst, CT-guided percutaneous puncture of the dilated pancreatic duct was performed (fig. 2a). A guide wire was advanced into the pancreatic duct and advanced across the anastomotic stricture. The stricture was balloon dilated up to 8 mm (fig. 2b) and 2 parallel 7-French, 5-cm Geenen pancreatic stents were placed antegrade across the stricture (fig. 2c). The patient returned 3 weeks later for endoscopic stent exchange and stricture dilation (fig. 2d–f). A tattoo was placed near the pancreatic opening. Five weeks later the stents were endoscopically removed. The visualized pancreatico-jejunal anastomosis was widely patent. He has remained without symptoms for over 2.5 years.

Case 4

A 64-year-old female had undergone Roux-en-Y hepatico-jejunostomy for management of biliary complications from a Billroth 1 procedure. Twenty-three years later she was referred for evaluation of subacute diarrhea associated with abdominal pain and weight loss. MRCP showed findings suggestive of chronic pancreatitis, including an atrophic pancreas with a dilated main pancreatic duct measuring 7 mm in greatest diameter. ERP was unsuccessful due to failure to identify the pancreatic ductal opening at the level of the expected major papilla. Radiologic percutaneous access to the pancreatic duct was undertaken. Under CT guidance, a 21-gauge needle was used to puncture the anterior abdominal wall into the main pancreatic duct. A guide wire was passed and a 6-mm balloon was used to dilate the ampulla. Two 5-French pancreatic stents were placed over the guide wire into the main pancreatic duct and positioned in parallel. Six weeks later ERP was successfully performed, including identification of the internal pancreatic stents. Cannulation was achieved alongside the radiologically placed stent. Contrast injection revealed a dilated pancreatic duct to the level of the ampulla. After stent removal a sphincterotomy was performed and a 7-French, 7-cm pancreatic duct stent was placed. This stent was removed endoscopically after an additional 6 weeks. She reports significant reduction in diarrhea, resolution of abdominal pain and she has gained weight.

Discussion

Pancreatic duct strictures and disconnections can result in undrained segments of pancreas upstream to the disconnection and lead to isolated pancreatitis in the tail of the gland, pancreatic atrophy, and/or persistent leaks. The management of pancreatic disease related to severely strictured pancreatic ducts can prove challenging. Endoscopic management, when feasible, can eliminate the need for surgical intervention. The goal of this intervention is to alleviate symptoms due to pancreatic duct obstruction, re-establish pancreatic drainage and prevent

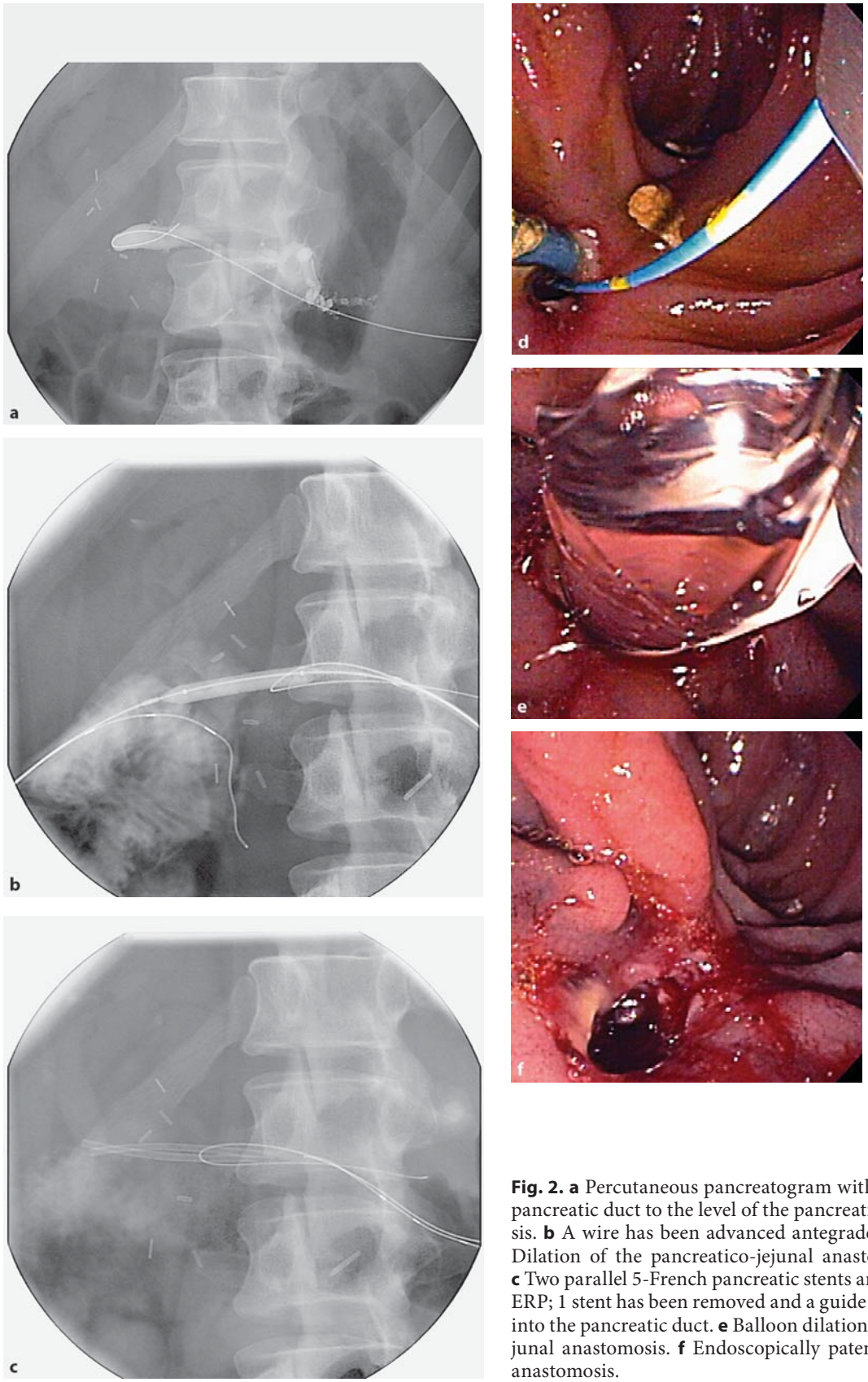

Fig. 2. a Percutaneous pancreatogram with filling of the dilated pancreatic duct to the level of the pancreatico-jejunal anastomosis. **b** A wire has been advanced antegrade into the duodenum. Dilation of the pancreatico-jejunal anastomosis is performed. **c** Two parallel 5-French pancreatic stents are placed. **d** Follow-up ERP; 1 stent has been removed and a guide wire passed alongside into the pancreatic duct. **e** Balloon dilation of the pancreatico-jejunal anastomosis. **f** Endoscopically patent pancreatico-jejunal anastomosis.

atrophy of the upstream pancreas. In situations where continuity of the main pancreatic duct cannot be reestablished endoscopically, surgical intervention usually with pancreatic tail resection is performed. As an alternative to surgical therapy, PP may be useful. PP is analogous to the performance of percutaneous transhepatic cholangiography, a well-established method for accessing biliary strictures when endoscopic methods fail.

Cope et al. [1] described a single case using a similar percutaneous method in a patient with a proximal pancreatic duct stricture. After needle puncture to access the pancreas duct, an external drain was placed over a wire through the duct into the small bowel. In that case the primary treatment modality was percutaneous intervention. Some have proposed interventional radiological methods as the preferred primary management of main pancreatic duct strictures and fistulas [2]. However, in our cases, the initial approach to endoscopic therapy was endoscopic.

We utilized an intermediary percutaneous approach, which enabled antegrade traversal of the ductal stricture allowing for further endoscopic therapy. It must also be mentioned that with our technique, we drained any pancreatic leaks associated with the duct disruption prior to stricture management. By resuming endoscopic methods after percutaneous intervention, internal drainage can be achieved, liberating the patient from external hardware.

Postsurgical anatomy can also complicate endoscopy. In some cases, a stenosed pancreatic anastomosis can be difficult to identify endoscopically, despite reaching the terminus of an afferent limb. In this setting, a rendezvous interventional procedure allows antegrade access to the pancreatic duct. Catheters or guide wire placed radiologically can be readily identified endoscopically in the small intestine, enabling endoscopists to effectively treat pancreatic ductal disease.

PP requires a skilled interventional radiologist. Some community practices may not have immediate access to a radiologist who can perform this technique. Our institution is a quaternary care center staffed with interventionalists who are adept at wire-guided pancreatico-biliary ductal manipulation. An alternative to PP is EUS-guided rendezvous [3–5]. PP and EUS-guided pancreatic therapy could be considered complementary, and PP is especially useful when EUS expertise is not available. Potential complications of PP include infection, pancreatic duct perforation with leak, bleeding, or pancreatico-cutaneous fistula, though by endoscopically internalizing the pancreatic stents, the risk of percutaneous fistulization is diminished. No complications resulted from PP in this series.

This case series includes a highly selected group of patients. PP was pursued after detailed discussion between the therapeutic endoscopist and the interventional radiologist. Patients who were not surgical candidates or declined surgery for symptomatic complicated pancreatic duct strictures were considered for PP. All patients had failed endoscopic attempt at traversing the pancreatic stricture. All attempts at PP in this series were successful, though patients generally required more than 1 percutaneous procedure.

Conclusion

These cases demonstrate that when the endoscopic transpapillary approach to treat pancreas duct disruption initially fails, surgical intervention may not necessarily be required. Rather, a percutaneous pancreatic approach can be used to a control the disruption, after which endoscopic therapy can be accomplished.

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