

Endoscopic management of pancreatic fluid collections

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Abstract

Pancreatitis, both acute and chronic, can lead on to various types of fluid collections that include pseudocysts, organized or walled off pancreatic necrosis (WOPN), and pancreatic abscess and these have been traditionally treated by surgery. The advancement in the endoscopic technology and instruments including the availability of therapeutic endoscopic ultrasound (EUS) has opened up an era of minimally invasive, safe and effective endoscopic drainage of pancreatic fluid collections (PFC). Endoscopic drainage is to be done only in symptomatic patients and it can be accomplished either through the transpapillary, transmural, or using a combination of these two routes. The decision to use one approach over the other depends on the size of the PFC, its proximity to the stomach or duodenum, presence of solid necrotic debris and the ability to enter the pancreatic duct and/or reach the area of disruption. EUS guided drainage should be considered in patients with non-bulging fluid collections, high pretest probability of bleeding, prior failed transmural entry using non-EUS guided technique and, collections inaccessible by standard technique like those located at the tail end of the pancreas.

Key words

Pancreatic fluid collections, Walled off pancreatic necrosis, Endoscopic ultrasound, Endoscopic drainage

Background

Pancreatitis, both acute and chronic, can lead on to various types of fluid collections that include pseudocysts, organized or walled off pancreatic necrosis (WOPN), and pancreatic abscess.^[1,2] These local complications have been traditionally treated surgically.^[3,4] However, surgery is often associated with higher morbidity with more long term complications. Percutaneous drainage is also effective in managing all types of pancreatic fluid collections (PFC's) but it leads on to patient discomfort as well as disadvantages of need for external catheters and the potential for development of a pancreatico-cutaneous fistula when a pancreatic fluid collection communicates with the main pancreatic duct. The

advancement in the endoscopic technology and instruments has opened up an era of minimally invasive and effective endoscopic drainage of pancreatic fluid collections.^[4-21] Since the first reports of endoscopic management of pseudocyst, technology and expertise have progressed to include drainage of abscesses, drainage and now debridement of organized necrosis, not only of bulging but also non-bulging and distant collections by using endoscopic ultrasound (EUS).^[22-24]

Indications for Drainage of Pancreatic Fluid Collections

Mere presence of PFC on imaging studies is not an indication for intervention. Earlier, a size cut-off of approximately 6 cm was used as a criterion for drainage of a PFC. However, studies have shown that patients may remain asymptomatic with pseudocysts of more than 6 cm with little risk of complications.^[11] Therefore patients with asymptomatic PFC's are usually followed up and intervention is preferred only in symptomatic patients. The symptoms related to PFC's include abdominal pain, weight loss, gastric outlet obstruction, obstructive jaundice, and pancreatic duct leakage leading on

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to ascites or effusion. Presence of Infected PFC is an absolute indication for drainage.^[9,11]

Evaluation before endoscopic drainage

Once the decision has been made to drain the PFC endoscopically, the endoscopist should answer these questions before proceeding for intervention. i) Exclude the possibility of cystic neoplasm, pseudoaneurysm and other masquerader of PFC such as duplication cyst, lymphocoele and rarely gall bladder can also be interpreted as a PFC. ii) Is there any contraindication to puncturing the stomach wall (e.g., fixed coagulopathy, cyst wall >1 cm thick, gastric varices or a complex cyst)? iii) Is endoscopic ultrasound (EUS) available? iv) Is surgical and/or radiological backup available? Moreover, endoscopic drainage of pancreatic necrosis is a highly complex procedure with limited experience and there are no randomized studies comparing it with different techniques and therefore should be undertaken only by an experienced endoscopist at a centre with a good surgical and radiological back up. In patients with pancreatic necrosis we need to identify whether the pancreatic necrosis is organized or early necrosis. The presence of solid debris should be quantified by EUS or magnetic resonance imaging (MRI). Also we should determine whether the pancreatic necrosis is central or peripheral necrosis. Central pancreatic necrosis is confined almost entirely to the pancreatic parenchyma and immediately adjacent peripancreatic tissue.^[9] As the body of the pancreas is close to the stomach and duodenum, patients with central pancreatic necrosis are suitable candidates for transmural drainage. Peripheral pancreatic necrosis is not in the immediate vicinity of the pancreas and is less amenable to endoscopic therapy alone.^[9]

Technique of endoscopic drainage

PFC may be drained either through the transpapillary, transmural, or using a combination of the two routes.^[11-15] The decision to use one approach over the other depends on the size of the pseudocyst, its proximity to the stomach or duodenum, and the ability to enter the pancreatic duct and/or reach the area of disruption and the comfort level of the endoscopist with a given procedure. The transpapillary drainage is effective if the PFC communicates with the main pancreatic duct, and is less than 6 cm in size.^[11] Transpapillary drainage is usually avoided in larger PFC's because of risk of infection although we have shown that transpapillary drainage with a nasopancreatic drain (NPD) is safe and effective in patients with multiple and large pseudocysts. Also transpapillary drainage alone is not advocated in patients with pancreatic necrosis because of high risk of secondary infection.^[11,25] The advantage of the transpapillary approach over the transmural drainage is the avoidance of bleeding or perforation that may occur with the transmural drainage. However, risk of infection and stent induced ductal changes mimicking chronic pancreatitis are significant adverse effects of transpapillary drainage.^[11,14]

Transmural drainage

Intravenous contrast enhanced computed tomography (CECT) should be obtained before attempted transmural drainage to identify major vascular structures or pseudoaneurysms between the gastric or duodenal wall and the PFC. EUS can help in better delineating the vascular structures between the cyst wall and the stomach. Endoscopy is performed with a therapeutic, side viewing video duodenoscope. Extrinsic compression of the gastric or duodenal lumen by the PFC is determined endoscopically. A pancreatogram can be obtained when possible at the index endoscopy either before or after drainage to assess the integrity of the pancreatic duct. Entry into the collection is achieved by several methods. For non-EUS-guided drainage, either needle-knife electrocautery or needle aspiration is used. In patients undergoing EUS, PFC puncture is performed under direct EUS guidance, with use of color-flow Doppler to help avoid disruption of mural blood vessels at the time of wall puncture. Aspiration of contents and/or injection of contrast allow confirmation of entry into the collection. When a "dry" aspiration is obtained, contrast should be injected to confirm position of the needle tip. A guide wire is then advanced through the needle, coiled within the collection under fluoroscopic guidance. The puncture tract is dilated with a wire-guided hydrostatic balloon via direct endoscopic and fluoroscopic guidance until the waist of the balloon is obliterated. After dilatation, a 5 or 7 Fr nasocystic drain (NCD) and/or 7/10 Fr pigtail stent/stents are placed into the cyst cavity by advancing it over guide wire. In patients with walled off pancreatic necrosis (WOPN) along with this drainage, endoscopic debridement can also be performed under direct endoscopic vision by entering into the necrotic cavity with a standard or therapeutic channel, forward-viewing gastroscope.^[7-10] Devitalized pancreatic tissue can be removed with the combination of several different accessories, including 15-mm biliary stone retrieval balloons, Roth retrieval net baskets, lithotripsy stone retrieval baskets, tripod retrieval forceps, rat-toothed and pelican forceps and 10-Fr irrigation probes.^[7-10] The removal of necrotic debris depends upon the size of gastro-retroperitoneal track. Wider diameter track enable the debridement of large pieces of necrotic retroperitoneal tissue. Transmural placement of a fully covered self-expanding metallic stent has been described in a patient not responding to frequent sessions of endoscopic necrosectomy.^[26] However, such treatment is associated with risk of stent migration and bleeding and therefore has not been routinely recommended.

Role of endoscopic ultrasound in transmural drainage

Endoscopic ultrasound guided puncture has been found to be safe for non-bulging collections. It has the advantage of excellent visualization of pancreas and peripancreatic areas and provides direct passage of the needle into the cavity avoiding inadvertent puncture of intervening blood vessels. EUS guided drainage should be considered in patients with non-bulging fluid collections, high pretest probability

of bleeding, prior failed transmural entry using non-EUS guided technique and, collections inaccessible by standard gastroduodenoscopy technique like those located at the tail end of the pancreas.^[22-24] EUS is however, less useful for monitoring the resolution of necrotic tissue because the resultant cavity does not provide good EUS images because of presence of excessive air.

Transpapillary drainage

The transpapillary drainage involves cannulation of the pancreatic duct through the major or minor papilla. Once cannulated, minimal contrast is injected to confirm pancreatic duct (PD) disruption, defined by free extravasation of contrast outside the pancreatic ductal system as seen on fluoroscopy. PD disruption is defined as complete when the main duct upstream to the disruption is not opacified and as partial when the main duct is visualized upstream from the site of disruption. On endoscopic retrograde cholangiopancreatography (ERCP), it should also be noted that whether the disruption is involving the main pancreatic duct or the side branch.^[15-18] After confirming the ductal disruption, a stent or nasopancreatic drain (NPD) is placed across the papilla in to the PD by advancing it over a hydrophilic guide wire. An attempt should be made to place the endoprosthesis across the area of the disruption (bridging the disruption) and if that is not possible it should be placed as close as possible to the PD disruption. Pancreatic sphincterotomy, if required, can be done. Extracorporeal shock wave lithotripsy (ESWL) can be done in patients with ductal calculi. The ductal strictures should be dilated with bougie dilators or balloon dilators and this should be followed by insertion of endoprosthesis. We as well as other authors have shown that endoscopic transpapillary drainage has best results when the pancreatic duct disruption is partial and it can be bridged.^[13-20]

Complications

Endoscopic therapy of PFC's is associated with complications in 5 to 16% of the patients and the complications are higher in patients with solid necrotic debris in the PFC's.^[11-13] Fortunately, most of these are local and easily manageable. Bleeding is the most dreaded complication of the transmural drainage and is seen in 8 to 10% of the patients. Other complications include perforation, fistula formation, air embolism, transient aggravation of sepsis, and perforation of the adjacent organs. The transpapillary drainage is associated with complications like retroperitoneal perforation, guide wire/stent induced ductal damage/disruption, infection, stent migration and stent induced ductal changes.

Results of endoscopic drainage

There are no prospective randomized studies comparing endoscopic drainage with other drainage techniques like percutaneous or surgical drainage and most of the experience with endoscopic drainage is from retrospective analysis emanating from highly specialized pancreatic endotherapy centers. The success rates, recurrence rates, and complication rates following endoscopic drainage of PFC's are variable

because of the heterogeneous patient population and varying endoscopic drainage methods. A review of published trials of endoscopic treatment of pancreatic pseudocysts in 1997 reported success rates of 86% after transmural drainage and 84% with transpapillary drainage alone and long-term success was reported in 75% of these patients.^[21] Baron *et al.* (2002) reported that with endoscopic therapy complete endoscopic resolution was achieved in 113 of 138 patients (82%) with pancreatic fluid collections and resolution was significantly more frequent in patients with chronic pseudocysts (59/64, 92%) than acute pseudocysts (23/31, 74%, $P=0.02$) or necrosis (31/43, 72%, $P=0.006$).^[12] There have been considerable improvement in the endoscopic techniques and instruments and also the availability of endoscopic ultrasound (EUS) has made the transmural procedures more safer as well as by accurately evaluating the extent of necrotic debris has helped in choosing the best technique of treatment in an individual patient. The transpapillary drainage has best results when there is lack of significant necrotic debris, communication with the main pancreatic duct, and partial duct disruption that can be bridged with endoprosthesis. Recent studies have reported immediate technical success in 90-95% of patients undergoing endoscopic drainage with long term success in 85-90% patients.^[18-20,22-24]

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