Surgical treatment of pancreatic pseudocysts in the 2000’s - laparoscopic approach

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A pseudocyst present as a cystic cavity bound to the pancreas by inflammatory tissue. Typically the wall of a pancreatic pseudocyst lacks an epithelial lining, and the cyst contains pancreatic juice or amylase-rich fluid. Today the mostly used definitions make a difference between peripancreatic fluid collections, pseudocysts after acute and chronic pancreatitis and pancreatic abscess as in the Atlanta classification system for acute pancreatitis. Distinction between pseudocyst and acute fluid collection leads to a better understanding of the natural history of peripancreatic fluid collections and facilitates the progress of the treatment of these two separate entities even though they are a part of a continuous pathological process. The presence of a well-defined wall composed of granulation or fibrous tissue is what distinguishes a pseudocyst from an acute fluid collection. A pseudocyst is usually rich in pancreatic enzymes and is most often sterile. Formation of a pseudocyst requires usually 4 or more weeks (many clinicians state six) from the onset of acute pancreatitis. The differentiation in the Atlanta classification between acute and chronic pseudocyst is important, but it invite to confusion. It is important to note that in the classification the terms "acute" and "chronic" refers to the pancreatitis behind the pseudocyst and not to the mode of symptomatology of the pseudocyst itself. This means that an acute pseudocyst may have been known for months, whereas a chronic pseudocyst in the next patient has been documented only a week or two.

Key words: pseudocyst, laparoscopic

DEFINITIONS

A pseudocyst present as a cystic cavity bound to the pancreas by inflammatory tissue. Typically the wall of a pancreatic pseudocyst lacks an epithelial lining, and the cyst contains pancreatic juice or amylase-rich fluid. Today the mostly used definitions make a difference between peripancreatic fluid collections, pseudocysts after acute and chronic pancreatitis and pancreatic abscess as in the Atlanta classification system for acute pancreatitis.

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Surgery as an option for treatment of pseudocysts

The role of surgery on pancreatic pseudocysts has changed for several reasons. First of all, endoscopic and percutaneous drainage techniques have become refined and universally available. Also, the natural history of pseudocysts has disclosed that a large part of asymptomatic pseudocysts need no treatment, and the results of enteropseudocystic anastomoses have shown the need for function for the short term only. No doubt there is a diminished role for surgery and an increased role of nonoperative interventional therapy for pancreatic pseudocysts.
The natural history also supports prolonged observation for most asymptomatic pseudocysts—contrary to what was recommended 20 years ago. In general, the operative management of pancreatic pseudocyst aims to evacuate the pseudocyst contents and prevent the serious complications of cyst rupture leading to fistulas and pancreatic ascites or pleural amylase-containing fluid, hemorrhage, infection and intestinal obstruction. If the pseudocyst cavity is decompressed, it is likely to become obliterated with the passage of time. For acute pancreatitis there is a choice between external and internal drainage, but in chronic pancreatitis there is also a possibility of cyst resection or lateral pancreaticojejunostomy. Pancreatic resection is appropriate in nondilated pancreatic ducts with strictures in the left part of the head, and body and tail region.

The specific type of pancreatic surgery depends on the exact location of the pseudocyst and the possible stricture. The pseudocyst is often only one feature of underlying disease—especially in chronic pancreatitis—and the decision between resection and drainage is influenced by the extent of surrounding inflammation, vascular involvement and duct ectasia.

The indications for surgery in patients with pancreatic pseudocysts are with time more controversial. Some authors prefer surgery to other forms of management for symptomatic patients with persistent pseudocysts larger than 5 cm. However, with percutaneous and endoscopic drainage available, agreement is not uniform. Nevertheless, most surgeons would agree that a surgical approach is usually chosen for the patients with recurrent pseudocysts, pseudocysts combined with common bile duct or duodenal stenosis, symptomatic pseudocysts associated with a dilated pancreatic duct, and those "pseudocysts" for which a diagnosis of cystic neoplasm cannot be excluded.

**Indications for laparoscopy in pancreatic pseudocysts**

There are today three main indications for laparoscopy in pancreatic pseudocysts:

- diagnosis
- enteropseudocystostomy
- distal pancreatectomy

**Laparoscopy as a diagnostic aid for pseudocysts**

Laparoscopic ultrasonography, biopsy of the cystic wall, and analysis of the cystic aspirate, although expensive and rather invasive procedures, may contribute to the differential diagnosis of pancreatic cystic lesions. However, these cases are rare, as most cases of pancreatic pseudocysts may be diagnosed by a simple ultrasonography or a computed tomography.

**Laparoscopic treatment**

Laparoscopic surgery has been recommended as a safe, reliable, and minimally invasive treatment for managing pancreatic pseudocyst as advances in laparoscopic surgical technique and instrumentation have furthered our ability to perform more complex laparoscopic procedures. The minimally invasive approach to gastropseudocystostomy allows for wide drainage of the pancreatic pseudocysts and avoids the greater morbidity and longer recovery from an open surgical procedure. Reports to date have consisted of case series, often with limited follow-up.

Moreover, some authors suggest that patients with pancreatic pseudocysts that are large or not amenable (anatomically or technically) to endoscopic drainage should be considered candidates for a laparoscopic internal drainage procedure.

**Technique**

A variety of techniques have been used for the drainage of the pancreatic pseudocyst, all achieving wide drainage comparable with the open procedure. In 1993, the use of both an endoscope and laparoscopic instrumentation for gastropseudocystostomy was reported. An upper endoscope served as a camera and a percutaneous endoscopic gastrostomy tube was placed and served as a working port for the passage of laparoscopic instruments. The formation of a 1.5 cm gastropseudocystostomy was described. This pseudocyst recurred, requiring a repeat minimally invasive gastropseudocystostomy.

Most reports describe an intragastric approach. Three or 4 trocars are passed through the abdominal wall into the lumen of the stomach using both intragastric and intraperitoneal visualisation. A radially dilating trocar may be used, that allows for a very small gastrostomy, which is easy to close and minimises slippage of the trocar from the gastric wall. Alternatively, trocars with balloons or flanges at their tips are used so that the gastric wall may be pulled up against the interior abdominal wall, minimising leakage of the gas from the stomach. Throughout the procedure vision is maintained either with an endoscope or a laparoscope. Conventional laparoscopic working instruments are used through the ports. An opening of 4-5 cm is made through the posterior gastric wall with either electrocautery or ultrasonic shears. The pseudocyst wall may be biopsed and sent for frozen section. Some surgeons extend the opening and provide hemostasis with the linear stapler. Although suturing of the gastropseudocystostomy is routinely used in open surgery, there are reports that cite using cauterity alone, with few reports of complications.

There is also a report of laparoscopic intragastric stapled gastropseudocystostomy for pancreatic pseudocyst using five ports. The Harmonic Scalpel was used to create two ports in the anterior stomach wall through which two balloon trocars were placed into the gastric lumen. Following balloon inflation, the trocars were used to lift up the anterior gastric wall. This created the space for the gastropseudocystostomy to be fashioned laparoscopically through the balloon trocar. The ball probe of the Harmonic Scalpel was used to puncture the cyst through the posterior gastric wall. The gastropseudocystostomy was completed by firing an Endo-GIA30 stapler across the fused posterior gastric wall and anterior wall of the cyst. The mean operative
time was 90 minutes (range 80-125 minutes) and the mean postoperative stay in hospital 3 days\textsuperscript{22}. It has also been described the use of the surgical disposable circular stapler for the operative drainage of a large symptomatic pancreatic pseudocyst\textsuperscript{31}. Also other laparoscopic gastropseudocystostomy via the cyst are described\textsuperscript{32}.

Another described laparoscopic technique used opening in the gastrocolic omentum through which the lesser sac was entered. A pseudocystostomy and a small gastrotomy were made, and the anastomosis was performed with a laparoscopic linear stapler. The remaining small opening was sutured conventionally\textsuperscript{33}. This technique would require the pseudocyst to be in the appropriate anatomic location and may be performed with a single gastric opening\textsuperscript{34}. The advantages of this approach include the avoidance of anterior gastrotomy, as well as assurance of a fairly robust anastomosis that is not dependent on the adherence of the cyst to the posterior gastric wall. As the entire anastomosis is stapled, hemostasis is ensured\textsuperscript{35}.

Laparoscopic jejunojunostomy is performed in similar manner as described for laparoscopic gastropseudocystostomy. The omentum and transverse colon are rolled upward. Most of the pseudocysts can be visualised through the transverse mesocolon. If there is any doubt, laparoscopic ultrasound is of value to localise the pseudocyst. Approximately 30 cm distal to the ligament of Treitz jejunum is transected. The pseudocyst is opened through mesocolon, fluid aspirated and cavity explored for necrotic debris, which is removed if present. A small enterotomy is made in a Roux limb and a stapled jejunojunojunosotomystomy is performed. The remaining opening is sutured and a jejunojejunostomy is performed at least 30 cm distal to the jejunojunosotomystomy\textsuperscript{36}.

Results of laparoscopic enteropseudocystostomy

Mori and colleagues\textsuperscript{28} successfully performed intraluminal laparoscopic in all 14 patients, and gastropseudocystostomy in 13. Two conversions to open surgery were necessary; one due to pulsatile uncontrollable bleeding from the cyst wall and the other because of lack of the adherence between the stomach and the pseudocyst walls. One more patient developed pseudocyst infection after several days, which required open surgery. In follow-up ranging from 6 to 32 months, there were no recurrent cysts after the initial success.

In 1997 and 1998, three consecutive patients underwent laparoscopic gastropseudocystostomy for persistent giant retrogastric pancreatic pseudocyst complicating an attack of acute pancreatitis. The mean cyst diameter was 15 cm (range 14-16). The procedure was performed with four trocars. The anterior wall of the stomach was opened longitudinally. The pseudocyst was entered through the posterior wall of the stomach. A gastropseudocystostomy was created by suturing the margins of the communication by interrupted nonabsorbable sutures. The mean operative time was 123 min, and there were no postoperative complications. The mean postoperative hospital stay was 4 days. Computed tomography demonstrated complete resolution of the pseudocyst\textsuperscript{47}.

The advantage of laparoscopic gastropseudocystostomy as compared with endoscopic gastropseudocystostomy is possibility to debride necrotic material that may be present in acute post-necrotic pseudocyst\textsuperscript{18} which reduce the risk of pseudocyst infection. Debridement of necrotic material was the most difficult part of the operation as reported by Mori and colleagues\textsuperscript{28} and it took about 30 min on average. At first the debris was removed through the trocar, but it proved to be time-consuming. In later cases authors pushed material down into the duodenum, which appeared to cause no clinical difficulties postoperatively\textsuperscript{28}.

Another group of six patients with symptomatic pancreatic pseudocysts (alcoholic origin in four cases and idiopathic in two cases) underwent laparoscopic transgastric drainage. For distal pancreatectomy and spleen salvage, the patient's positioning was half-lateral decubitus with the left side up. Four ports were used. Laparoscopic pseudocyst drainage was performed in four patients via laparoscopic anterior gastrotomy and two patients via laparoscopic intraluminal gastropseudocystostomy. The mean operative time was 100 min (range 60-160). There was no morbidity. The mean hospital stay was 5 days, and the mean time to resume normal daily activities was 2 weeks\textsuperscript{39}.

Park and Heniford\textsuperscript{27} reported results of laparoscopic treatment of pancreatic pseudocyst in 29 patients. Different techniques were employed. Twenty-eight procedures were successfully performed but in one case extensive gastric varices were encountered and the procedure was aborted. There were no postoperative deaths in this series and morbidity was limited to two cases of postoperative bleeding, which stopped by conservative therapy.

Collected material

A computerized search was made of the Medline, Premedline, and Embase databases using the search words pancreatic and pseudocysts and all relevant articles in English Language or with English abstracts were retrieved in 2003. Laparoscopic pseudocyst gastrotomy or pseudocyst jejunostomy were advocated to achieve adequate internal drainage, facilitates concomitant debriement of necrotic tissue within acute pseudocysts, and achieves good results with minimal morbidity. A randomized controlled trial that compares laparoscopic and endoscopic drainage techniques of retrogastric pseudocysts of chronic pancreatitis is much wanted. There is also a report of the use of the use of flexible endoscopy in pancreatic pseudocyst operations. This example of the utility of flexible endoscopy during laparoscopy show the marriage of these two disciplines\textsuperscript{41}.

Distal pancreatectomy

Left-sided resection, or distal pancreatectomy, are terms applied to resection of the portion of the pancreas extending to the left of the midline and not including the duodenum and distal bile duct. One of the first pancreatic left resections was described by Trendelenburg in 1882. A
sarcoma was removed by distal pancreatectomy and spleenectomy but unfortunately the patient did not survive. As far back as 1884 Billroth removed the distal pancreas for an adenocarcinoma with recovery of the pancreas. A number of different operations can today be used to resect pancreatic pseudocysts in the body and tail, but they are generally treated by distal pancreatectomy with splenectomy. Although conservative (spleen-preserving) pancreatectomy is sometimes performed in chronic pancreatitis, it is rarely recommended in patients with pseudocyst because the splenic vessels are generally incised in inflammatory scar tissue and may be compressed or even thrombosed. When the remaining ducts appear normal, a caudal end-to-end pancreaticojejunostomy Roux-en-Y can be used. More frequently the duct system appears dilated with calculi. In such cases the major duct should be opened and lateral pancreaticojejunostomy Roux-en-Y should be performed incorporating the site of pancreatic transection.

Management of the pancreatic stump is still a matter of discussion. Routine drainage into a Roux-en-Y loop of jejunum has been recommended by some surgeons, but not others. Stapling of the pancreatic remnant has been attempted, but so far neither method has proved to be superior. However, from a laparoscopic point of view it is obvious that stapling is sufficient. A closed suction drain is routinely left near the closed end of the pancreas, regardless of the handling of the cut surface, and is not removed before the patient can at least drink sufficiently to stimulate the exocrine pancreatic remnant.

Since Warshaw first proposed his method of conservation of the spleen with distal pancreatectomy (1050), in which the splenic artery and vein were divided, this method has gained acceptance in the treatment also regarding pancreatic pseudocysts.

Laparoscopic approach

Distal pancreatectomy can nowadays also be performed laparoscopically. The first description of a laparoscopic distal pancreatectomy was published by Soper et al in a porcine model. The technique can be facilitated by hand-assisted laparoscopy. In a series of 13 patients — 12 with splenic vessels preservation and one with preservation of the short gastric vessels — 3 developed pancreatic fistula. The mean hospital stay was 5 days. In another series of 13 patients there was no mortality. Two patients required conversion for bleeding from splenic vein injuries leading to a spleenectomy in one case. The spleen was preserved in 10 cases. Four patients experienced postoperative complications: one pancreatic fistula, two liquid cysts on the pancreatic margin, and one reoperation for bleeding from a trocar port. Length of stay ranged from 5 to 22 days.

In a series of 23 patients treated with laparoscopic resections of pancreatic tumors laparoscopic resections with spleen salvage was performed in 14 cases and en-block laparoscopic pancreatic resection with the spleen in 3 cases (the rest was enucleation of endocrine tumors). The average operative time was 4.5 h for distal pancreatectomy, but pancreatic fistula developed in three of these patients. Average hospital stay was 5 days.

In urological surgery, direct extraperitoneal surgery has become the preferred approach to laparoscopic adrenalectomy and nephrectomy since the introduction of the balloon dilatation method. As pancreas is also an organ located in the retroperitoneal cavity, laparoscopic distal pancreatectomy has also been tried by a retroperitoneal approach in pigs (30-35 kg). First a 12 mm port was inserted beside the umbilicus. After carbon dioxide insufflation, the abdominal viscera were inspected with a laparoscope. Below the left costal convexity, the balloon dissector was introduced and the second port was inserted in the retroperitoneal cavity. The scope was inserted using that port and additional two ports were inserted into the retroperitoneal cavity. The tail and body of the pancreas were easily mobilized from the retroperitoneum. The splenic artery and vein were identified, and carefully isolated from the pancreas. After a "flap disk" being applied to 4 cm incision, the tail of the pancreas was pulling out to resect using various devices (electrocautery, electrothermal bipolar vessel sealer, ultrasonic dissector, etc). Comparison of the cut surface showed less damaged but completely sealed with electrothermal bipolar vessel sealer and ultrasonic dissector.

SUMMARY

Laparoscopic surgery on pancreatic pseudocysts will remain an exception rather than a rule as easier techniques, such as endoscopic and percutaneous drainage techniques have become refined and universally available, and as the natural history of pseudocysts has disclosed that a large part of asymptomatic pseudocysts need no treatment. Despite that, laparoscopic surgery can be recommended as a safe, reliable, and minimally invasive treatment for managing pancreatic pseudocyst in selected cases. A variety of techniques have been used for the drainage of the pancreatic pseudocyst, but most reports describe an intragastric approach. Laparoscopic jejunopectoduodenostomy Roux-en-Y is performed in similar manner as described for laparoscopic gastropseudocystostomy. Moreover, distal pancreatectomy for pseudocysts can nowadays also be performed laparoscopically.

REZIME

Pseudocistast predstavlja cističnu šupljinu koja je za pankreas vezana inflamatornim tkivom. Tipično, zid pankreastne pseudociste ne sadrži epitelni sloj a pseudocista sadrži pankreasni sok ili amilozu bogatu tečnost. Danas korišćene definicije prema Atlanta klasifikacionom sistemu za akutni pankreatitis, razlikuju peripankreastičnu tečnu kolekciju, pseudocistu nakon akutnog i hroničnog pankreatitisa i pankreastičnu apses. Razlikovanje pseudociste od akutne tečne kolekcije vodi boljem razumevanju nastanka peripankreastične tečne kolekcije i izbravlja tok lečenja ova dva odvojena entiteta iako su deo kontinuiranog patološkog procesa. Prisustvo jasno definisanog zida
sastavljenog od granulacionog ili fibroznog tkiva je ono što razlikuje pseudocistu od akutne tečne kolekcije.

Pseudocista je uobičajenog bogata pankreasmnih enzimi ma i najčešće je sterilna. Formiranje pseudocist zahteva 4 ili više nedelja (mnogi kliničari smatraju 6 nedelja) od pojava akutnog pankreatitisa. Prima Atlantsa klasifikaciji razlikovanje akutne od hronične pseudocist se u potpunosti može voditi i konfirmirati. Vazduh je imati u vidu da se u klasifikaciji termini "akutni" i "hronični" odnose na pankreatit u kojemu nastaje pseudocista a ne na modalitet pojavljivanja pseudocist kao takve. To znači da se za akutnu pseudocistu može znati i mesecima, dok se za hroničnu pseudocistu kod drugog bolesnika može znati tek nedelju ili dve.

Ključne reči: pseudocista, laparoskopija

BIBLIOTEHNIKA


