

Laparoscopic management of pancreatic pseudocysts.

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Abstract

Laparoscopic management of pancreatic pseudocysts offers the benefits of minimal access surgery to patients. Its role in the management of pancreatic pseudocyst is gaining momentum in this era of minimal access surgery as the scope of laparoscopy widens with advancement of medical technology.

Some surgeons now seem to advocate this approach towards management of pancreatic pseudocysts in selected patients. It is however an advanced laparoscopic procedure that demands skills and expertise for safety.

Aim.

To review laparoscopic internal drainage of pancreatic pseudocysts and evaluate its benefits and safety based on the following parameters;

- Patient selection
- Operating time
- Operating technique
- Operative complications
- Post operative pain and narcotic use
- Recovery rate
- Hospital stay
- Cost effectiveness
- Quality of life.

Key words.

Pseudocyst – pancreatic pseudocyst – cystogastrostomy – cystojejunostomy – laparoscopic internal drainage.

Introduction.

Pancreatic pseudocyst was first described by Morgan [1]. It is a collection of fluid rich in pancreatic enzymes, necrotic tissue and blood usually located at the lesser sac as a result of a pancreatic inflammatory process. Its lining is made of non-epithelialised granulation tissue and therefore the name pseudocyst (*pseudo - false*) [1]. Contrary to this, a true cyst should have an epithelial lining. It mainly occurs as a complication of acute pancreatitis but may also occur after abdominal trauma, as a complication of an acute exacerbation or progressive ductal obstruction in chronic pancreatitis and rarely due to gallbladder disease [2]. About 75% of all pancreatic masses are pancreatic pseudocysts [1, 2].

Pancreatic pseudocysts may occur within or outside the pancreas, solitary or multiple and may be small or large. Most patients may be asymptomatic [1, 3]. The disease may mimic other medical conditions and therefore needs a careful clinical evaluation. Symptoms may include abdominal pain, nausea and vomiting, fever, abdominal mass/distension and weight loss among others.

Diagnosis can be achieved through a careful clinical and radiological evaluation especially abdominal ultrasonography and/or CT scan.

A pancreatic pseudocyst (PP) takes about 4-6 weeks for the wall to mature and most of them resolve by 6 weeks [1, 2, 3]. Asymptomatic patients are managed conservatively by observation and radiological follow-up using serial ultrasonography or CT scans [4]. PPs persisting for >6 weeks and greater than 5 cm are unlikely to resolve spontaneously and have an increased incidence of complications that include infection, bleeding, perforation, obstruction, pseudo aneurysm among others and therefore warrant the need for decompression to prevent complications [3].

Interventional therapy is achieved by external drainage or internal drainage into the GI tract. Modalities of drainage available include percutaneous drainage, endoscopic, laparoscopic and open surgical internal drainage.

Materials and methods.

Articles of relevant studies were searched from the internet using search engine Google, Yahoo, Highpower Press, SpringerLink, PubMed and the library facility available at Laparoscopy Hospital, New Delhi and analyzed.

Pathogenesis.

The pancreas produces fluid rich in digestive enzymes. Acute pancreatitis leads to extravasation of pancreatic secretions rich in enzymes that result to digestion of adjoining tissues [3]. This leads to disruption of pancreatic parenchyma and surrounding tissues. Collection of fluid containing pancreatic enzymes, hemolysed blood and necrotic debris occurs around the pancreas mainly in the lesser sac since it is a potential space [1]. The collection/s may resolve spontaneously as the patient recovers from the acute phase but others may become organized and become walled-off by a thick wall of granulation tissue and fibrosis over several weeks forming a pancreatic pseudocyst [4].

Aetiology.

1. Acute pancreatitis from a wide varied of causes especially alcohol and gallstones.
2. Abdominal trauma blunt or penetrating.
3. Chronic pancreatitis as a result of an acute exacerbation or due to progressive ductal obstruction.
4. Gallbladder disease.

Acute pancreatitis resulting from alcohol and gallstones accounts for about 75%-80% in terms of aetiology of pancreatic pseudocysts [1, 2]. In children the main cause is abdominal trauma [2]. The other listed causes are rare.

Clinical presentation.

Majority of the patients are asymptomatic [1, 3]. The clinical presentation may vary with individual patients and may mimic other medical conditions therefore presenting a

diagnostic challenge especially where the clinical course is not clear. Symptoms may occur due to;

- Sudden expansion.
- Intra abdominal or/and Gastrointestinal hemorrhage.
- Fistula formation.
- Intestinal obstruction.
- Formation of pseudo aneurysm.
- Vascular occlusion.
- Pleural effusion or ascites due to fistula formation or rupture, etc.

Symptoms may include;

- Abdominal pain
- Vomiting
- Nausea
- Poor appetite
- Diarrhea
- Fever
- Weight loss
- Jaundice
- Painful detectable abdominal mass
- Abdominal distension
- Ascites or even pleural effusion
- Fistula, etc

Diagnosis.

It is important to exclude all other differential diagnosis before subjecting the patient to surgery. A complete medical history and physical exam is mandatory. Diagnostic procedures for pancreatic pseudocyst may include;

1. Blood tests. Laboratory studies may be limited.
2. Abdominal Ultrasonography. Repeated ultrasonography can be used to monitor the progression of pancreatitis at various stages.
3. Computed Tomography Scan (CT scan). CT scan has been the standard test with 90%-100% sensitivity [4]. It gives information regarding fluid collection as well as presence or absence of necrosis.
4. Magnetic Resonance Imaging (MRI). MRI helps to differentiate between organized necrotic tissue and pseudocyst as well as accessing both the biliary and pancreatic ductal systems in selected patients.
5. Endoscopic Ultrasonography (EUS). Useful in endoscopic drainage.
6. Endoscopic Retrograde Cholangiopancreatography(ERCP). This can be performed selectively on patients suspected to have ampullary obstruction, all recurrent pseudocysts and patients who develop pseudocysts long after acute recovery of acute episode of pancreatitis.

Management.

Small asymptomatic pseudocysts can be managed conservatively [5]. Persistence of a pseudocyst may be an indication of a persistent communication with the pancreatic ductal system [1]. Pseudocysts persisting for more than 4 weeks and greater than 5cm are unlikely to resolve spontaneously increasing the incidence of complications and therefore decompression is recommended in order to prevent them [1, 3, 4, 5].

Symptomatic pancreatic pseudocysts and those which do not shrink conservatively need interventional drainage either by external or internal drainage into the stomach or jejunum. It is recommended that mature pseudocysts of >6cm in size and >6weeks old should be drained [1, 2, 3, 4, 5].

There are various modalities of pancreatic pseudocyst management including;

- Conservative
- Percutaneous drainage
- Endoscopic drainage
- Open surgery internal drainage
- Laparoscopic internal drainage

Conservative management.

This can be safe in asymptomatic patients with ultrasonography or CT scan follow-up. It involves observation and monitoring by serial imaging. A pancreatic pseudocyst takes 4–6 weeks for the wall to mature. Most pseudocysts resolve by 6 weeks [3]. The rate of complications increases by 50% after 6 weeks that include infection, bleeding, perforation, obstruction and pseudoaneurysm formation [3, 4, 5]. Therapeutic measures are warranted in patients with enlarging, infected, bleeding or symptomatic pseudocysts.

Percutaneous drainage.

This involves simple aspiration by use of a catheter size 8-16 Fr introduced using ultrasound or CT scan guidance. It is contraindicated in poor compliant patients, ductal stenosis and hemorrhagic cysts. The recurrence rate is quite high approximately 70% due to reaccumulation [6].

Endoscopic drainage.

Endoscopic drainage can be performed via cyctoenterostomy or transpapillary. Good success rate results have been documented and research is ongoing regarding its effectiveness [7, 8].

Open internal drainage.

Open surgery has been the conventional method of management of symptomatic pancreatic pseudocysts [9]. Internal drainage can be performed into any part of the GI tract; namely stomach, duodenum or jejunum depending on the location of the pseudocyst. Most of the pseudocysts are formed retrogastric in the lesser sac and therefore cystogastrostomy is most commonly performed [1, 9].

Open drainage procedures for pancreatic pseudocysts include;

- Cystogastrostomy
- Cystoduodenostomy
- Roux-en-Y cystojejunostomy

- Distal pancreatectomy.

Indications for open management include;

- Infected pseudocysts
- Necrosis
- Pseudoaneurysm
- Need for concomitant operative treatment like obstruction, ductal stricture, etc.

Laparoscopic internal drainage.

Laparoscopic cystogastrostomy was first performed in 1994 by J. Petelin; Kansas; USA [1, 10]. Laparoscopic intraluminal cystogastrostomy was first described by Gagner and Way et al [1, 10, 11]. Different techniques have been described for laparoscopic pseudocyst drainage. Like in open management, internal drainage can be performed into the stomach, duodenum or jejunum depending on the location of the pseudocyst. Pancreatic pseudocyst typically forms in the lesser sac which anatomically is a potential space and therefore cystogastrostomy is more commonly performed which is easier compared to cystojejunostomy [1].

Operative technique.

The first intraluminal laparoscopic cystogastrostomy (LCG) was described by Gagner and Way et al that involved the insertion of radially expanding 5 mm trocars into the stomach allowing the introduction of 5 mm laparoscopic instruments [1, 10, 11,]. Laparoscopic anterior cystogastrostomy (CG) was initially described by Meltzer and Amaral and later reported by Holeczy and Danis and is the preferred method of laparoscopic pancreatic pseudocyst (LPP) management in mature pseudocysts [1, 12, 13]. Morino et al and later Park et al described posterior CG using endoscopic linear stapler through the lesser sac [1, 14, 15, 16]. Laparoscopic anterior transgastric cystogastrostomy is the easier approach in the available options of laparoscopic treatment of retrogastric PP as mentioned earlier and will be described here [1].

Patient position and team;

The patient is positioned in modified lithotomy position and the surgeon stands between the legs with the 1st assistant (camera surgeon) and scrub nurse on the right and 2nd assistant to the left of the patient.

Technique,

Pneumoperitoneum is achieved via closed or open technique and a subumbilical 10mm primary port for camera preferably a 30 degree scope made. A right 5mm and a left 10mm midclavicular ports are used as working ports. In some selected cases a subxiphoid 5mm port may be used to retract the left lobe.

An anterior longitudinal gastrostomy opening is then done using electrosurgery with L shaped hook or harmonic scapel or endolinear cutter over the most prominent part of the cyst. Both edges of stomach wall are anchored to the anterior wall of the greater and less curvatures using self retracting sutures to allow access to the posterior wall of the stomach. The stomach is irrigated and washed well before opening the cyst and

then percutaneous aspiration of the fluid is done with a long Veress needle or a lumbar puncture needle to ascertain the exact nature of the fluid.

A circumferential incision is made using electrocautery or harmonic scapel by the help of a stay silk suture placed at the summit of the cyst and a circumferential full thickness wall of the stomach together with the cyst wall excised. Most recurrences result from inadequate stomas and therefore adequate sized stomas should be performed measuring at least 4cm.

The fluid is then aspirated and haemostatic interrupted or continuous sutures placed to approximate the stomach and the cyst wall. Endoliner cutter and endostapling may be used instead making the procedure simpler but more costly. The scope is introduced into the cavity and debridement of the necrotic tissue performed with a fenestrated bowel holding forceps and the cavity thoroughly cleaned and rinsed with normal saline and sacked. A nasogastric tube in place facilitates suction of the fluid from the stomach.

Haemostasis is checked and the anterior stomach wall closed by either continuous intracorporeal suturing or stapling technique. The peritoneal cavity is then irrigated and washed thoroughly then trocars are removed and the large ports closed.

Review of citations.

Hauters P, et al of Belgium, in 2004, evaluated 12 patients with pancreatic pseudocyst and operated on by laparoscopic cystogastrostomy (LCG) between 1997 and 2002[17]. The median operating time was 90min (range: 60-140) and a median postoperative hospital stay of 6 days (range: 4-24). One patient developed a postoperative port haematoma and no mortality was recorded. One other patient was readmitted on the 20th postoperative day with cyst infection due to partial closure of the cystogastrostomy and was treated by endoscopic stenting. No recurrence of pseudocyst was reported.

In a study by Andrian E. Park and Todd Heniford B, of North Carolina, in 2002, out of 29 patient selected for laparoscopic pancreatic pseudocyst(LPP) surgery, LPP was completely successful in 28 while the procedure aborted in one patient due to extensive gastric varices that were encountered [18]. Laparoscopic distal pancreatectomy (LDP) was attempted in 25 patients and was successfully performed in 23 patients. The mean operating time was 2.8 hours and the mean postoperative hospital stay was 4.4 days. No major complications were reported in this study.

Ramachandran; C, S. et al performed 5 LCGs for PPs between 1998 and 2001[19]. The mean operating time was 110 minutes (range: 92-128) and the mean hospital stay was 4 days. There were no postoperative complications and a postoperative follow-up with ultrasound for over 1 year revealed complete resolution of the cysts in all the patients.

A case note review of all 15 patients who had undergone stapled LCG in Norwich, UK was performed by Hindmarsh, A. et al in 2004[20]. Three procedures were converted to open due to technical problems. Early complications recorded included systemic sepsis in one patient, bleeding gastric ulcer in 2 patients and a pseudocyst recurrence due to

partial closure of the CG in two patients. No late recurrences or other complications were noted after a median follow-up of 37 months.

In another series of 17 patients with PP and managed laparoscopically between 1996 and 2001 by Hauters P et al, he observed that 15 patients developed PP after acute pancreatitis and 2 patients had an associated chronic pancreatitis [21]. LCG was performed in 10 patients while LCJ was performed in the rest. LPP surgery was successful in 16 patients with a median operative time of 100 minutes (range: 80-300) with no mortality or immediate morbidity recorded and a median postoperative hospital stay of 6 days. There were two patients readmitted within the first 3 weeks with secondary PP infection the first one due to an early closure of the CG who was managed with a stent inserted endoscopically while the second patient who had a large right retrocolic abscess after LCJ was treated by percutaneous drainage. After a median of 12 months (range: 6-36), no recurrence of PP was observed in 16 patients since 1 patient was lost for follow-up.

At GEM Hospital, India, in 2007, Chinnusamy Palanivelu et al evaluated 108 cases with PP managed laparoscopically [22]. LCG was performed in 90 cases (83.4%), LCJ in 8 cases (7.4%), open CG in 2 cases (1.8%), and laparoscopic external drainage in 8 cases (7.4%). The mean operating time was 95 minutes and mean hospital stay was 5.6 days. All operations were successful without any significant intraoperative complications. Two patients were re-operated for bleeding and gastric outlet obstruction while another patient had a late recurrence due to inadequate stoma size and was managed by open CG later. No mortality was reported in the postoperative period.

Teixeira, J. et al of New York, USA, reported their experience with 8 Roux-en-Y LCJs in 2003 where 6 patients had alcoholic pancreatitis and two had gallstone pancreatitis [23]. The mean operating time was 150 minutes (range: 100-215 minutes), mean EBL of 78cc and a minor complication rate of 20%. No major complications or mortality was reported.

In the UK, Aljarabar, M and Ammori; B, J. in 2007, reviewed a total of 118 and 569 patients in 19 and 25 reports respectively, who underwent 118 and 583 laparoscopic and endoscopic drainage procedures, respectively and compared the two groups [24]. Success rates of achieving resolution of PPs in the laparoscopic and endoscopic series were 98.3% and 80.8% respectively, with morbidity rates of 4.2% and 12%, and mortality rates of 0% and 0.4%, respectively. During follow-up period with a mean of 13 and 24 months, respectively, recurrence rates of 2.5% in the laparoscopic group and 14.4% in the endoscopic group were observed with reintervention rates of 0.9% and 11.8%, respectively.

Alejandro Oria et al of a tertiary referral center in Argentina evaluated 10 consecutive patients with giant pancreatic pseudocysts measuring 10 cm or more in diameter in the year 2000[25]. Video-assisted pancreatic necrosectomy was performed and a Roux-en-Y jejunostomy performed. Complete necrosectomy was successful in all the cases

with no postoperative retroperitoneal complications or mortality. The mean hospital stay was 8.2 days and no recurrence at a mean follow-up period of 6.9 months.

Discussion.

Pancreatic pseudocyst remains a problem occasionally encountered by surgeons world over. Its clinical course has already been described and the management has been mainly by open surgery. This trend has however been changing with advancement of medical engineering and improvement of surgical techniques.

In the last few decades, minimum access technique has gained momentum and the scope is widening day by day. It offers the benefits of minimal invasive surgery and has been found to be safe in qualified and experienced hands. Laparoscopy is widely used today for various procedures and is the method of choice in some procedures like cholecystectomy. It is however controversial in some fields and a lot of research is ongoing on its safety in many other areas. It requires training of skills because it has its own shortcomings in terms of access as opposed to open surgery.

Laparoscopic internal drainage of PPs has been done in various centers through one of the available options with good results and many surgeons are now advocating it considering its benefits. Many articles have been written regarding LPP treatment and most of the surgeons seem to consider this to be a safe and beneficial approach to management of PPs.

In the literature obtained in this review, patients with diagnosed PPs were managed through various methods of LPP management depending on their locality. Most surgeons preferred LCG since it is easier and safer to perform. Other performed LPP procedures were LCJ and rarely LCD in a few patients where the PP locality demanded so. LCJ and LCD are technically more difficult to perform and therefore less commonly performed.

The average operative times for LCG in most articles ranged between 90-110 minutes. In one series of 8 patients managed through LCJ, the average operative time was 150 minutes while in another series of 29 patients in whom 25 were managed through laparoscopic distal pancreatectomy (LDP), the average operative time was 2.8 hours. LCG is technically easier of the available LPP management options and this may explain the difference in the average operative time findings in the various articles.

Individual patients present differently and the ease of access may vary depending on locality of the PP.

Intraoperative complications were minimal and so was the conversion rate. In one series of 29 patients, one patient required conversion to open surgery due to extensive varices. In two other studies of 17 and 15 patients, there was one conversion for unspecified reasons and three patients due to technical problems respectively.

Overall, few insignificant complications have been reported either intraoperatively or in the immediate postoperative period including, bleeding, port hematoma, sepsis,

recurrence due to inadequate drainage stoma size among other minor complications. The authors of various studies did not find any significant morbidity rates and no mortalities were reported in LPP management.

In one study comparing laparoscopic and endoscopic PP drainage, laparoscopy was found to be superior with a higher success rate, lower morbidity, no mortality, and negligible recurrence and reintervention rates.

The average duration of hospital stay ranged between 4 days to 8.2 days for LPP management procedures. In most of the articles evaluated, the average duration of hospital stay was about 4-5 days and therefore one can probably conclude that the recovery rate was quick overall and cost effective. One may also deduce that postoperative pain and narcotic use was minimal given that pain can be used as a good measure of recovery since there was no direct way of getting that information.

Follow-up results reported only isolated cases of recurrences otherwise no major adverse outcome was recorded which in essence may indicate a good quality of life. Most of the literature reviewed shows that patients were followed up for an average ranging from 6.9 months up to 37 months. In the few cases where recurrences were reported, the cause was due to an inadequate stoma which underlines the importance of making an adequate drainage stoma size at the time of surgery.

Conclusion.

Laparoscopic internal drainage of pancreatic pseudocyst is a safe procedure in experienced hands and offers the benefits of minimal access surgery to patients. It is gaining momentum in this era of minimal access surgery. However, there is need for further evaluation since this is an advanced laparoscopic technique that calls for careful patient selection and the necessary expertise.

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