

Laparoscopic Cystogastrostomy for the Management of Pancreatic Pseudocysts*

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Aims: To assess the value of laparoscopic cystogastrostomy in the treatment of pancreatic pseudocysts.

Materials and Methods: Patients who underwent laparoscopic surgery for pancreatic pseudocysts were included in the study. All the cysts were non-resolving, symptomatic and large, as a result of acute pancreatitis. Laparoscopic cystogastrostomies were performed by either anterior transgastric or posterior techniques.

Results: From February 2001 to November 2006, seven patients were included into the study. The etiology of pancreatitis was gallstone disease in six cases and hyperlipidemia in one. The mean age was 58.7 years (52-69) and the mean pseudocyst size was 15.1 cm (7-20). Transgastric cystogastrostomy and posterior cystogastrostomy were carried out in three and four patients, respectively, with no conversion. Mean hospital stay was 13.4 days (6-30). Neither mortality nor procedure-related major complication was encountered. Follow-up computerized tomography studies confirmed complete resolution of the cyst in all cases, in the first month.

Conclusions: Laparoscopic cystogastrostomy is an effective and safe treatment of pancreatic pseudocysts.

Key Words: Pseudocyst, laparoscopy, cystogastrostomy, pancreatitis

Pankreas Psödokistlerinin Tedavisinde Laparoskopik Kistogastrostomi

Amaç: Pankreas psödokistlerinin tedavisinde laparoskopik kistogastrostominin yerini değerlendirmek.

Gereç ve Yöntem: Pankreas psödokistleri nedeniyle laparoskopik cerrahi uygulanmış hastalar çalışmaya alındı. Kistlerin tümünün özellikleri akut pankreatit sonrası gelişmeleri, klinik takipte gerilememeleri ve semptomatik ve büyük olmalarıydı. Laparoskopik kistogastrostomiler, anterior transgastrik veya posterior tekniklerden biriyle uygulandı.

Bulgular: Şubat 2001 ile Kasım 2006 arasındaki dönemde ameliyat edilmiş yedi hasta çalışmaya alındı. Pankreatit nedeni altı hastada safra taşı hastalığı, bir hastada ise hiperlipidemi idi. Ortalama yaş 58,7 (52 – 69), ortalama psödokist çapı ise 15,1 cm (7-20) olarak saptandı. Transgastrik kistogastrostomi ve posterior kistogastrostomi sırasıyla üç ve dört hastada uygulandı; hiçbir hastada açık ameliyata geçiş olmadı. Ortalama hastanede yatış süresi 13,4 gün (6-30) olarak gerçekleşti. Mortalite veya işlem ile ilgili morbidite görülmedi. Ameliyat sonrası birinci ayda yapılan kontrol bilgisayarlı tomografi incelemesinde, tüm hastalarda kistlerin tamamen yok olduğu saptandı.

Sonuç: Laparoskopik kistogastrostomi pankreas psödokistlerinin tedavisinde etkili ve güvenli bir yöntemdir.

Anahtar Sözcükler: psödokist, laparoskopi, kistogastrostomi, pankreatit.

Introduction

Pancreatic pseudocyst (PP) has been defined as a collection of pancreatic juice, enclosed by a wall of fibrous or granulation tissue, which arises as a consequence of acute pancreatitis, pancreatic trauma or chronic pancreatitis (1). Although the indication and timing of the intervention in PP related to acute pancreatitis are still controversial, there is an agreement that large, persistent and symptomatic cysts should be drained since they are usually associated with complications (2,3). The internal drainage of PP, which is the method of choice, can be achieved by surgical or endoscopic interventions (4,5). Endoscopic therapy is a promising modality but requires experienced endoscopists

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and might be associated with stent-related complications, inadequate drainage, repeated interventions and risk of perforation (4,6,7). Surgery continues to be the chief method in PP drainage.

Laparoscopic PP surgery is minimally invasive, provides detailed information about PP location and the relationship with adjacent organs, and enables effective drainage. The morbidity is low, PP wall biopsy is achievable and cholecystectomy can be added to the procedure in the presence of biliary pancreatitis. Numerous techniques have been reported for laparoscopic PP surgery thus far, including anterior and posterior cystogastrostomies, endoscopy-assisted surgery and cystojejunostomy (8-18). However, there is no consensus on the appropriate technique of laparoscopic surgery and the conclusions were usually built upon individual preferences. We present our experience in the laparoscopic management of PP. We considered the adherence between the posterior gastric wall and PP, as it is the surgical landmark in deciding on the appropriate technique.

Materials and Methods

Seven patients underwent laparoscopic surgery for PP between February 2001 – November 2006 in the Department of Surgery, Cerrahpaşa Medical Faculty, Istanbul University. All of the patients had non-resolving, symptomatic and large cysts complicating acute pancreatitis. The etiologies of the acute pancreatitis were gallstones and hyperlipidemia. No endoscopic or percutaneous intervention was attempted before surgery and the minimal time from the onset of acute pancreatitis to surgery was six weeks. The diagnosis and follow-up were made by computerized tomography (CT) and ultrasound (US) in all cases. The patients were followed periodically before and after surgery.

Surgical Procedure

Two different surgical techniques were carried out to create cystogastrostomies. The decision was made according to the operative findings after the dissection of the gastrocolic ligament and examination of the adherence between the posterior gastric wall and cyst cavity. If the PP was tightly adhered to the posterior gastric wall, a transgastric anterior cystogastrostomy was performed; otherwise, a posterior cystogastrostomy was

done. The procedures were performed under general anesthesia. The patient was positioned in slight reverse-Trendelenburg position and the legs were slightly opened wherein the operating surgeon mostly stood; the left arm was fixed in adduction in order to ease surgical team rotation around the patient for occasional maneuvers. A 10-12 mmHg pneumoperitoneum and 30° angled camera were used during the operations. The first camera port was inserted at the umbilicus and the operation was carried out by an additional three or four ports: two at right and one at left subcostal regions and one at epigastrium. All the ports were 10 mm in diameter with the purpose of using each laparoscopic device freely; however, the port of medial right subcostal area was changed to a 12 mm port to insert endo-stapling device when required. Laparoscopic US was used in all cases except the first, in order to evidence the cyst location and its relationship with adjacent organs. Bleeding control was achieved by electrocautery and Ligasure™ (Valleylab, Tyco, USA). A laparoscopic roticulating linear stapler (Endo-GIA Reticulator™, 45 mm vascular type, Auto Suture, USSC, Tyco, USA) was used for creating anastomosis. Laparoscopic cystogastrostomy was performed in all cases and no additional assistance (endoscopy, hand-assisted technique, etc.) was applied during the procedures. Since all the patients were followed from the beginning of the acute pancreatitis episode, no biopsy was taken from the cystic wall.

Transgastric Approach

After exploring the PP at the lesser sac and verifying tight adherence between PP and posterior gastric wall, a gastrotomy was made on the anterior gastric wall. The incision site was chosen upon US findings and the location of the cyst's bulge at the posterior gastric wall. The PP was confirmed by Veress needle aspiration. A hole wide enough to insert an arm of the stapler was then created on the posterior gastric wall. The cyst fluid was aspirated and one arm of the stapler was inserted into the cyst and fired (Figure 1). After checking the anastomosis, the initial incision site was sutured intracorporeally by an endo-needle holder since the stapler line did not include this part of the anastomosis. Then a nasogastric catheter was placed through the stomach into the cyst and the anterior gastric wall was closed in two layers by hand-sewn intracorporeal sutures. Finally, a suction drain was placed near the anastomosis.

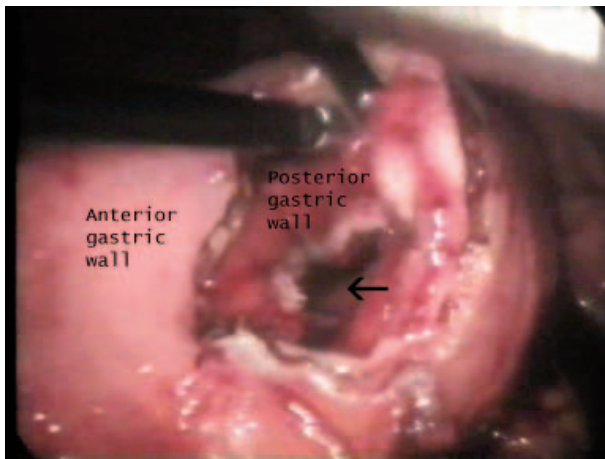


Figure 1. Transgastric anterior cystogastrostomy. The anastomosis is shown by arrow before the closure of anterior gastrotomy (case no. 3 in the Table).

Posterior Approach

If the cyst was not found to be adhered to the posterior gastric wall on lesser sac examination, posterior approach (or lesser sac technique) was performed. The cyst fluid was aspirated by Veress needle and incisions were made on the posterior gastric wall and the cyst. These two holes were united with a suture in order to ease stapling. Then the arms of the stapler were inserted into the gastric lumen and cyst and the stapler was fired (Figure 2). Thereafter a nasogastric catheter was placed through the stomach into the cyst and the holes were closed with intracorporeal sutures. Finally, a suction drain was placed near the anastomosis.

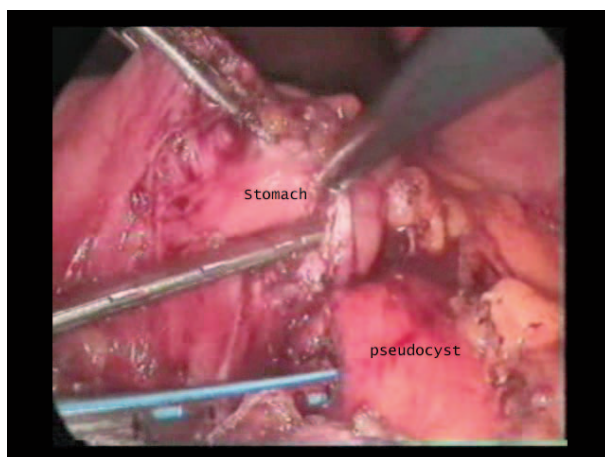


Figure 2. Posterior cystogastrostomy. The stapler arms are inserted through the openings of posterior gastric wall and pseudocyst (case no. 4 in the Table).

Results

Seven patients (6 female, 1 male) underwent laparoscopic surgery for PP. The mean age was 58.7 (52–69). Pseudocysts were related to acute hyperlipidemia in one and acute biliary pancreatitis in six cases. The mean pseudocyst size in the longest axis was 15.1 cm (7–20). The summary of the results are shown in Table. Transgastric cystogastrostomy and posterior cystogastrostomy were performed in three and four patients, respectively, with no conversion to open surgery. Neither technical trouble nor intraoperative complication was encountered and there was no intraoperative bleeding on anastomotic lines. Transcystic posterior cystogastrostomy was performed in one patient (case no. 5 in the Table). This variation of the posterior technique was preferred since no true anterior PP wall was observed within the cavity and the anterior part of the PP was formed by the posterior gastric wall. Thus, an incision of 5 cm was made by Ligasure on the posterior gastric wall and the opening of the cyst wall was closed by intracorporeal sutures.

A standard laparoscopic cholecystectomy was added to the procedure in six patients who had a history of acute biliary pancreatitis; no additional port was required.

The patients were permitted liquid diet on postoperative day three and the abdominal drains were removed thereafter. The mean hospital stay was 13.4 days (6–30). There was neither mortality nor procedure-related major complication. As for the morbidity, a moderate-severe ascites was diagnosed in one patient (case no. 4 in the Table) in the postoperative course but no relation with surgery could be shown as the amylase level of the ascites was normal; the patient was successfully managed with diuretics. A mild fever not exceeding 37.6 °C (axillary) was irregularly observed in five patients in the first three postoperative days and controlled with antipyretics. No anastomotic leak was evidenced.

Postoperative follow-up CT studies revealed complete resolution of the PP in all cases after one month (Figure 3a, b). All the patients are still symptom- and PP-free in their follow-up.

Discussion

Even though the number of the patients is limited, these results demonstrated that laparoscopic

Table. Patients with pseudocysts who were managed by laparoscopic surgery (* the operation was performed by transcystic approach).

	PATIENTS						
	1	2	3	4	5	6	7
Age / Gender	52 / F	62 / M	52 / F	69 / F	65 / F	55 / F	56 / F
Etiology	ABP	ABP	AHP	ABP	ABP	ABP	ABP
Pseudocyst size (cm)	13 × 11	19 × 9	17 × 10	20 × 15	7 × 5	13 × 14	11 × 16
Interval to surgery (weeks)	8	7	8	6	24	8	12
Operation	TCG	PCG	TCG	PCG	PCCG*	PCG	TCG
Hospital stay (days)	6	9	18	30	7	10	14

ABP: acute biliary pancreatitis; AHP: acute hyperlipidemic pancreatitis; TCG: transgastric cystogastrostomy; PCG: posterior cystogastrostomy.

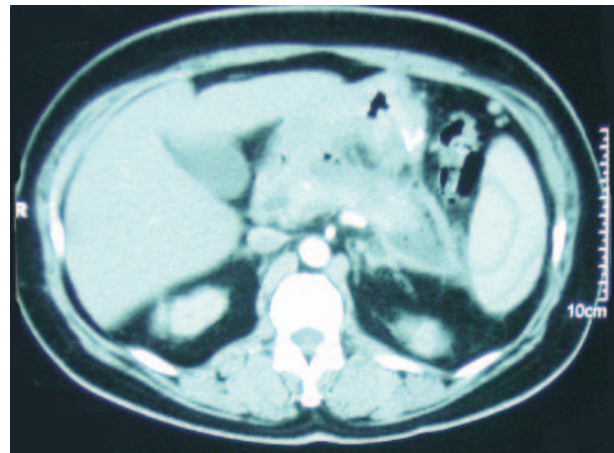


Figure 3. a- CT image of a pancreatic pseudocyst; b- In the same patient, no evidence of pseudocyst on follow-up CT, one month post-surgery (case no. 3 in the Table).

cystogastrostomy was a safe and useful tool in the management of PP.

The indications for the drainage of PP have been the subject of several studies to date. In a prospective study, Bradley et al. (3) suggested drainage of the PP if the cyst regression did not take place within four to seven weeks. The authors stressed the importance of interventional management in such circumstances, since the morbidity and mortality had been as high as 41% and 12%, respectively, in untreated cases. According to common agreement, large (>6 cm in diameter), non-resolving, symptomatic and complicated (bleeding, infection, etc.) cysts are indications for drainage in acute pancreatitis (19). All of the cases in our study presented the first three criteria; it seems that these criteria are -not unexpectedly- related with each other. With the PP

diagnosis, a six-week waiting period is commonly applied before an intervention; a PP diagnosis cannot be made earlier than four weeks, since a regression may occur and the maturation of the cyst wall, which is obligatory for a safe anastomosis, takes place after six weeks (1,2). We applied the same waiting period in this series and encountered no problem regarding the structure of the PP.

The drainage of the PP may be performed by three methods, including percutaneous external drainage (PED) and endoscopic or surgical internal drainages. PED is a relatively simpler procedure but bears higher rates of recurrence and morbidity. Criado et al. (20) reported that even though PED was effective in some cases of PP (21%), the initial failure and recurrence rates (62% and 17%, respectively) were high. Moreover, PED was found

to be associated with higher morbidity and longer hospital stay in retrospective and population-based studies (21,22). Thus, PED should not be considered as a routine method for the management of PP. A novel and innovative minimally invasive approach is endoscopic internal drainage (EID). This is more suitable than PED since the PP is drained to the gastrointestinal tract. The technique includes PP drainage through the gastric or duodenal wall and placement of a stent, with or without transpapillary stent applications. The introduction of EID and laparoscopic PP surgery have taken place almost synchronously and encouraging results of EID have been reported so far (4,6,7). However there are drawbacks to the EID. First, this technique requires advanced skills and sophisticated endoscopy armamentarium, which are not commonly available. Moreover, the anastomosis (or gap) between PP and gastrointestinal lumen is usually about 1.5 cm; therefore, not as wide as a surgical anastomosis (9). The presence of pancreatic debris is not uncommon in PP and inadequate width of anastomosis may lead to PP infection, sepsis and drainage failures in EID. Furthermore, stent-related complications (kinking, migration, etc.), gastrointestinal perforation and bleeding may be associated with EID (4,6,7). Despite the positive results with the approach, the studies on EID have not reported the details about the outcome in patients who had drainage failures. Regarding this issue, Nealon and Walser (23) recently reported a series of 79 patients who initially underwent PED or EID and later experienced complications requiring surgery. The commonest complication was sepsis in 91% of patients, which reflected the severity of complications related to the failure of the initial attempt of non-operative drainage. Thus, the authors underlined the magnitude of the complications and suggested careful selection of the patients for nonoperative management. Considering the initial experience of EID, a "*surgery should be performed whenever EID fails*" approach was previously suggested (24). However, this opinion must be revised regarding the importance of an effective first attempt for PP drainage. We experienced neither drainage failure nor PP infection or sepsis in our series of patients.

Laparoscopic surgery is gradually being performed more frequently in the treatment of PP (8-18). This is a better alternative to PED and EID than open surgery, since the latter was associated with 10-21% morbidity in elective cases (5,25). It is minimally invasive and has well-known advantages with respect to postoperative pain,

cosmetics, hospital stay and postoperative recovery period. Furthermore, it provides definitive information on the location of PP and the relationships with the adjacent organs. This is particularly important since the adherence between the posterior gastric wall and PP is assessed by indirect findings in EID (4,6,7). According to our experience, the imaging studies can misinform about the adhesions in the lesser sac, and although most of the PP in our series were relatively large and exhibited bulges to the stomach on CT, only three of them presented adequate adherence for transgastric technique on laparoscopic exploration. Laparoscopy eliminates the risk of an iatrogenic perforation in such circumstances. In addition, the debris within PP may lead to recurrences or complications; thus, a minimum anastomotic width of 3 cm was suggested especially in large cysts (12). The laparoscopic PP surgery (LPS) series reported an anastomotic width between 30 – 60 mm (9-11,16-18). We preferred an endo-linear stapler of 45 mm for the anastomosis and this resulted in effective drainage in all cases. The surgeon can of course tailor the anastomotic length on a case by case basis, but we agree that there should be a minimum width of 3 cm, based on our experience in draining the concentrated debris within PP. Another advantage of LPS is performing cyst wall biopsy if the diagnosis is questionable, even though this is not mandatory if the patients have been closely followed since the onset of acute pancreatitis and no PP was present on initial imaging studies. Finally, an important but seldom-mentioned advantage of LPS is that a laparoscopic cholecystectomy is necessary in acute biliary pancreatitis, and LPS can be performed in the same session. In this present series, etiology primarily (in 6 of 7 patients) included acute biliary pancreatitis and a laparoscopic cholecystectomy was performed in the same operation along with LPS. In these circumstances, the patients would already undergo surgery. We thus believe that the indication for PED or EID must be further questioned in PP related to acute biliary pancreatitis.

LPS is a relatively novel operation and its technical details have been developed in the last decade. Laparoscopic anterior (or transgastric extraluminal) (9,11-14,16) and posterior (or lesser sac) (9,15,16) cystogastrostomies, endoscopy-assisted (or intragastric intraluminal) cystogastrostomy (8,10,12,18) and cyst-jejunostomy (9,17) have been reported in the literature to date. Since there were various techniques, questions arose about the choice of the appropriate surgical method

in LPS. It seems that many statements were unfortunately based on individual preferences rather than objective observations, and we still have no evidence-based conclusions. This may be due to the lack of larger series, an inevitable dilemma regarding the incidence of PP, and recent introduction of this advanced surgery. Although there is no evidence-based study so far, current knowledge and experience might still be analyzed to enlighten this issue.

Diverse techniques have different advantages and drawbacks. Transgastric cystogastrostomy is performed on the posterior gastric wall, through an anterior gastrotomy, and is easier to perform than posterior cystogastrostomy. However, Barragan et al. (16) concluded that posterior cystogastrostomy was superior to anterior technique since the latter has two incisions on gastric walls; it was further mentioned that wider anastomosis and safer operation were possible with posterior technique. The authors also reported a conversion from posterior technique to anterior technique because of intensive adhesions at the lesser sac. First of all, the cystogastrostomy made on the posterior gastric wall during anterior approach should not be considered as a gastrotomy open to the peritoneal cavity, since some authors reported safe anastomoses made only by incising the posterior gastric wall with electrocautery or harmonic scalpel (8,12). Moreover, anastomotic size does not depend on the technique since they are performed by either the same staplers or surgeons. Needless to say, the first step with the anterior technique should be the exploration of the lesser sac in order to check the adherence between stomach and PP. Therefore, no approach can be deemed safer than the other, provided this step is not skipped. We do believe that in the presence of tight adherence between the posterior gastric wall and PP, the anterior cystogastrostomy should be preferred because it is quicker and easier to perform with similar morbidity to the posterior approach. To date, no technical failure or complication was reported regarding transgastric cystogastrostomy (9,11-14,16). Under the circumstances, there is no clear evidence justifying a more difficult surgical technique. Nevertheless, if the posterior gastric wall is not adhered to PP and a cystogastrostomy is planned, there remains no other choice than the posterior technique. This strategy, based on lesser sac exploration, should be stressed, and this seems to be the most logical algorithm whenever a cystogastrostomy is planned.

An alternative is intragastric intraluminal (or endoscopy-assisted) LPS. The results of this technique were reported to be favorable (8,10,12,18). Mori et al. (8) performed intragastric LPS in 14 patients and the authors experienced drainage failure and inadequate anastomosis in one patient each. The only noticeable advantage of intragastric intraluminal LPS is the PP drainage without a risk of peritoneal contamination. However, to date, no peritoneal complication has been reported in all of the series of LPS. On the other hand, intragastric intraluminal technique has several disadvantages. It is performed in a limited area by relatively more stable ports and the surgeon cannot freely choose the drainage site (14). Hauters et al. (12) performed LPS using both the intragastric intraluminal and transgastric extraluminal techniques. The authors mentioned that transgastric extraluminal technique was easier to perform since the axis of the endo-stapler was vertical in the intraluminal approach, compared with tangential stapling during extraluminal technique. The intragastric intraluminal approach still has more drawbacks than positive aspects in the treatment of PP.

Laparoscopic cyst-jejunostomy (LC) is another alternative in LPS. Although there is no alternative to LC for PP drainage if the cyst is not adjacent to the stomach or duodenum, the role for mandatory LC is questionable. Teixeira et al. (17) reported their experience in routine LC. There was one prolonged postoperative ileus in their series. The authors suggested routine LC while arguing that lack of adherence to the posterior gastric wall can be a contraindication for cystogastrostomy and cyst-jejunostomy was the procedure of choice in open surgery. It is now evident that non-adherence to the posterior gastric wall can easily be managed by a posterior cystogastrostomy, and there is no significant difference between open and laparoscopic PP surgery. However, the LC, which is a more complicated technique than cystogastrostomy, includes two anastomoses and a Roux limb, so the need for such a technique is still uncertain.

In summary, LPS is a safe and feasible method and provides efficient drainage of PP. The exploration of the PP at the lesser sac and determining its adherence to the posterior gastric wall is the most important step in making the choice between anterior and posterior LPS techniques. Larger series and comparisons with endoscopic PP drainage are indisputably needed to elucidate the value of LPS.

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