The Role of Surgery in Pancreatic Pseudocyst

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ABSTRACT

Background/Aims: Surgery has been the only option available for many years for treating pseudocyst of the pancreas. Recently, new methods, such as percutaneous drainage, endoscopic transenteric drainage and transpapillary drainage, began to be used for treatment of the pseudocyst. But we have to agree that no single technique offers the desired combination of 100% success and no complications. We'd like to present our surgical experience in the past 14 years.

Methodology: A total of 22 patients were treated for pancreatic pseudocyst (PP) in our departments in Dalin and Hualien Tzu-Chi General Hospital within the last 14 years. They were retrospectively reviewed and followed up until recently.

Results: There were 14 (63.6%) males and 8 (36.4%) females aged between 15 and 79 years old (mean age 38.2 years). Dominating symptoms in most patients were epigastric pain, palpable mass, nausea, vomiting, fever and leukocytosis, and persistent elevation of serum amylase. Imaging studies, such as ultrasound, computed tomography (CT) scan, and endoscopic retrograde cholangiopancreatography (ERCP), were helpful in establishing diagnosis. In addition to symptomatic persistent large (>6cm) pseudocyst, various types of complication including infection, gastrointestinal (GI) obstruction, rupture into GI tract, peritonitis, GI bleeding, internal bleeding, and pancreatic ascites were indications for surgery in our cases. Operative procedures composed of external drainage (ED, 9 cases), internal drainage using cystogastrostomy (CJ, 4 cases) and cystogastrostomy (CG, 8 cases), and distal pancreatectomy (1 case). Ten complications (45.5%) included recurrence of cyst (1 in ED and 1 in CJ), recurrence with pancreaticopleural fistula (1 in ED), colon perforation (1 in ED), delayed massive bleeding (1 in CG), pancreatic fistula (3 in ED), pancreatic abscess (1 in CJ) and persistent pain (1 in CG). Reoperation was needed for check bleeding (1 in CG) and proximal colostomy for colon injury (1 in ED). A case received CJ for recurrence of pseudocyst 9 years later (1 in CJ). Percutaneous drainage with wide bore tube was effective for pancreatic abscess (1 in CJ) and transpapillary drainage with stent was used to relieve pleural effusion with respiratory failure (1 in ED). No mortality occurred in this series.

Conclusions: We believe that surgery, though without flaws, still plays an important role in the management of selected cases of pseudocyst of the pancreas. Surgical intervention, endoscopic drainage, and percutaneous drainage were complementary rather than conflicting alternatives both for the simple and complicated pseudocysts.

INTRODUCTION

In 1862, Le Dentu (1) proclaimed that cysts of the pancreas "should be relegated to the list of affectations for which the healing aid is impotent". Fortunately, for the patient in whom a pseudocyst develops as a complication of pancreatitis, this prediction has been proved incorrect. Despite more than 100 years of surgical experience with this disease entity, controversy continues to surround the timing of operative intervention as well as indications for specific procedures.

Surgery was the only option available for many years. In the opinions of most surgeons and many senior gastroenterologists, surgical drainage is still the treatment of choice. It has been a mainstay for the management of the pseudocyst because of recurrent or persistent pseudocyst, presenting as complications such as rupture of cyst, combination with common bile duct (CBD) or duodenal stenosis, association with dilated pancreatic duct, and suspicion of neoplasm. Recently, new methods, such as percutaneous drainage, endoscopic cystogastrostomy, and endoscopic transpapillary drainage have been developed to treat the pseudocyst. However it is not widely used for its technical demand as well as inadequacy of endoscopic internal drainage (10% of mean with 23% require surgery) (2), and percutaneous drainage (50-60% of patients treated needed further treatment) (3).

But we have to agree that no single technique offers the desired combination of 100% success and no complication. We reviewed the results of surgical therapy for pancreatic pseudocysts including various complications at our institutions by the same surgical team over the last 14 consecutive years. Only a few papers in this field have been published in this fashion
during last two decades (4-7). One of the most important reasons is that such cases were not so common in our surgical practice. The aim of this paper is to share our surgical experience with this disease entity with our colleagues.

**METHODOLOGY**

A total of 22 patients treated for pancreatic pseudocyst presenting with different manifestations in surgical departments both in Hualien and Dalin Tzu Chi General hospitals in the past 14 years since 1989 through 2003, were collected retrospectively. Pancreatic pseudocysts were confirmed by their lack of epithelial lining in the cyst wall biopsy, the high concentration of pancreatic enzymes, and their formation at least 4 weeks after an episode of acute pancreatitis or pancreatic trauma. Only the patients who needed operation due to acute complication such as infection, peritonitis, ascites, or bleeding and symptomatic PP, were included in this study. The sizes of the PPs were recorded from operative findings or measurement of the PPs in CT image. Pertinent data included age, sex, associated diseases, clinical findings, operative procedures performed, and postoperative course. Duration of follow-up was 2 months to 14 years with the average of 5.91 years.

**RESULTS**

From 1989 through 2000, 17 patients with pancreatic pseudocysts in Hualien Tzuchi General Hospital, and from 2001 through 2003, 5 patients in Dalin Tzuchi General Hospital, were treated by the same General Surgical team. Male to female ratio was 14:8. The mean age was 38.2 years (range 15-79 years). The etiology is listed in Table 1 and alcoholism was the most common cause for pseudocyst. Regarding clinical manifestations, abdominal pain or fullness existed for 95.5% (n=21) and fever and leukocytosis was detected in most of the complicated cases and few uncomplicated cysts (n=10, 45.5%), and seven cases presented with palpable mass in the abdomen (31.8%). There were also some nonspecific GI symptoms such as nausea and vomiting in nearly half of the cases.

Objective documentation of a pancreatic pseudocyst was obtained by ultrasonography (n=17, 77.2%) (Figure 1a), computed axial tomography (n=18, 81.8%) (Figure 1b) or endoscopic retrograde pancreatography (n=5, 22.7%). Most of the PPs resolved and were followed by sonography (Figure 2a) and CT (Figure 2b). The indications for surgery and the procedure performed are summarized in Tables 2 and 3 respectively. The sizes of the PP could be recorded for 13 elective cases and 7 emergency cases. All of the PP measured more than 6cm in size and the average size was 8.2cm. 11 cases showed more than 10cm in size. The largest one measured 40x30x15cm in size and occupied more than half of the abdomen including the intestines.

**TABLE 1 Presumed Cause of Pancreatic Pseudocyst**

<table>
<thead>
<tr>
<th>Cause</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>10 (45.5%)</td>
</tr>
<tr>
<td>Biliary</td>
<td>2 (9.1%)</td>
</tr>
<tr>
<td>Alcoholic and trauma</td>
<td>2 (9.1%)</td>
</tr>
<tr>
<td>Trauma</td>
<td>3 (13.6%)</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>1 (4.5%)</td>
</tr>
<tr>
<td>Idiopathic</td>
<td>4 (18.2%)</td>
</tr>
<tr>
<td>Total</td>
<td>22 (100%)</td>
</tr>
</tbody>
</table>
pelvic cavity. ERCP was performed in 5 cases and four were done preoperatively. One of them was done for a patient with recurrent cyst complicated with respiratory failure from massive pleural effusion secondary to pancreaticopleural fistula. The problem was solved by transpapillary drainage by an endoscopist. The cyst was infected in a case following ERCP and urgent laparotomy with external drainage was performed. Percutaneous drainage under sonography or CT was done in 4 cases and half of them were used in postoperative pancreatic abscess and recurrent pseudocyst respectively. Preoperative usage in one case was unfortunately complicated with leakage of pancreatic juice around the catheter leading to diffuse peritonitis.

Operative procedures used in these patients are listed in Table 3. All of the complicated cysts except one infected cyst were operated by external drainage. Internal drainage was carried out in another 12 symptomatic matured pseudocysts and distal pancreatectomy was done in a patient with PP at the tail. CG was performed in more than half of the patients (66.6%, Figure 3). Suture ligation outside the cyst for bleeding pseudoaneurysm was done in two cases and partial gastrectomy was added for a case presenting with a cyst perforation into the stomach. Significant morbidity occurred in 10 of 22 patients (45.5%) and six of them (60%) happened in patients with external drainage. Three cases with pancreaticocutaneous fistula, 2 cases with recurrence of pseudocyst, and one case of colon perforation occurred in the ED group. All three fistulas closed spontaneously with conservative management including total parenteral nutrition followed by enteral feeding. One of the recurrent pseudocysts was treated first with percutaneous drainage. Endoscopic stenting at initial attempt failed.

Unfortunately, it recurred (Figure 4a-c) and was complicated with pancreaticopleural fistula associated massive pleural effusion and respiratory failure eight months later (Figure 5a-c). However, it finally responded well to the successful transpapillary stent insertion (Figure 5d). Urgent proximal colostomy was done for colon perforation and reconstruction was carried out half a year later. Two recurrences occurred in the CJ group and only one of them needed second internal enteric drainage 9 years later because of biliary obstruction. The other patient didn’t need operation after aspiration percutaneously. A delayed massive bleeding was found in the CG group. He was prompted to have an operation for cessation of anastomotic bleeding on the seventh postoperative day. A case with a giant cyst (Figure 6a) treated by CJ technique was complicated with pancreatic abscess formation and it was finally solved by percutaneous drainage with large bore drain tube (Figure 6b and c). No operative death occurred.

**DISCUSSION**

Acute destructive pancreatitis can lead to the formation and development of pseudocysts (8-10). A pancreatic pseudocyst is an extravasated collection of exocrine pancreatic juice surrounded by a fibrous membrane made of adjacent viscera and parietal wall devoid of an epithelial lining. Surgical treatment of pancreatic pseudocysts is still controversial regarding the optimal time for intervention, the choice of surgical technique and the choice of management in cases of complications. In addition to the surgical approach, appropriate usage of the diagnostic imaging studies and nonoperative techniques are the fundamentals of success in the management of the pancreatic pseudo-
Pancreatic pseudocysts are recognized in over 10% of cases of pancreatitis. They occur as a result of pancreatic inflammation, trauma, or duct obstruction. As is the case with most series, alcohol-related pancreatitis was the entity most commonly associated with pseudocysts in our series (5). Although we have two cases allocated in combined etiology of alcohol and trauma, they sustained abdominal trauma one to four years before the operation.

Pancreatic pseudocyst should be suspected in patients with acute pancreatitis whose symptoms fail to resolve within 7 to 10 days or in patients with chronic pancreatitis who complain of persistent pain, nausea, or vomiting. As in the most series in the literature, epigastric pain or fullness accounted for 95.5%. But less percentage (n=7, 31.8%) of palpable abdominal mass was noted in our series.

The most reliable way of making diagnosis is by ultrasound or CT scanning. Hessel found ultrasound to be 90% accurate and 98% specific when the pancreas could be visualized. Unfortunately gas obscures the pancreas in nearly one third of the patients. CT scan have increased sensitivity and specificity and provided additional information about retroperitoneal extension and the relationship between cyst and adjacent enteric lumen (11). Computed axial tomography (CT) and ultrasound are equally accurate for cysts in our cases as most of them were >5 cm in diameter. But they were used only in 80% of our cases for diagnosis and cases in emergency situation were immediately operated. An initial preoperative CT scan with correlated sonography followed by serial sonographic examinations was noted to be very effective for observation of the cyst condition before and after the operative treatment. We used this method in our cases and most of them could clearly demonstrate the resolution (Figure 2) or recurrence of the cyst (Figure 4).

Routine use of ERCP is still controversial. ERCP demonstrates abnormalities of the pancreatic duct in up to 90% of the patients with pseudocyst and nearly two-thirds of the pseudocysts communicate with the pancreatic duct. So ERCP may provide valuable information concerning the natural course of pseudocyst and selection of suitable candidates for nonoperative management. Several studies suggest that routine ERCP should be considered in all patients with pseudocysts to optimize treatment strategy (8,12). Nealon et al. (8) reported that routine ERCP changed the operative management in nearly 60% of their patients and improved their outcome. But it is still associated with exacerbation of acute pancreatitis, infection of pseudocyst, and other endoscopic related complications. A case in our series contracted infection of the pseudocyst with sepsis several hours following investigation. We use ERCP only in elective symptomatic cases but maturation of the wall in CT was not enough for cyst-enteric anastomosis, as the management will vary according to the findings. In such cases, percutaneous drainage may be considered if ERCP showed no communication between the cyst and pancreatic duct. Transpapillary pancreatic stenting may be planned for cases with connection. We may also arrange it in patients with suspected pancreatic cancer and reluctance for operation. Otherwise, appropriate operative procedure was chosen straight forward for mature and uncomplicated cases. Therefore, ERCP was not routinely done by us and was performed only in selected cases. If done, it should be performed within 24-48 hours before a planned drainage procedure under the umbrella of antibiotics. Angiography is generally not useful for diagnosis of pseudocyst. We believe that using these modalities only in a complementary fashion may give us the best result with aggregate specificity approaching 100%.

The advent of sonography and CT scan of the abdomen in the 1970s has clearly established that approximately 50% of pseudocysts resolve spontaneously (6,13-15). A review of the literature also reveals that up to 40% of patients with untreated pseudocyst develop complications although some previous studies were predicated on patients who were identified because of symptoms (11). Resolution of pancreatic pseudocyst and development of complications were therefore thought to be a function of time. As a matter of fact, it is a great challenge for a surgeon to decide when to operate on the patient with PP in order to avoid unnecessary consequences. However, there are few longitudinal studies of pseudocysts. The Mayo clinic experience reported by Vitas and Sarr (6) review 68 patients with asymptomatic pancreatic pseudocysts. At a mean follow-up of 51 months, 63% remained asymptomatic. In 6 patients (9%) significant

![Figure 4 Recurrence of PP.](image)
complications developed, including intracystic hemorrhage, perforation, and infection. Of the 35% who required therapy, five cases were emergent and the remaining were elective, with either pain, cyst enlargement, or gastric or biliary obstruction. The mean size of the pseudocyst was less than 6cm, and only surgical therapy was used. A similar study by Yeo et al. (15) at Johns Hopkins University included 36 patients with pancreatic pseudocysts. Spontaneous resolution occurred in 69% of the cases at 1-year follow-up. In 40% of the cases, pancreatic pseudocysts were stable or smaller. These papers encouraged expectant treatment of the pancreatic pseudocysts. However both studies were short in follow-up duration (1 to 4 years) and the PP were small in average size. In Vitas series, there were significant amount of case with the cyst age of <6 weeks (31%) and indeterminate duration (41%) in his group II who were assigned to undergo nonoperative noninterventional expectant management. In addition, only 24 of 43 patients were followed completely by radiographic surveillance and the risk of eventual operation treatment increased in parallel with increasing size of PP (28 to 57%). In the Mayo series, they still encountered a significant amount of cases with complications necessary for emergent operation. On the other hand, Bradley et al. (16) have affirmed the value of a waiting period. Their data suggested that spontaneous resolution occurred in 40% of the acute pancreatitis cases with a duration less than 6 weeks, and the complication rate was only 20%. A waiting period greater than 7 weeks, however, was associated with a 56% complication rate and spontaneous resolution was observed in only 1 of 25 patients from 7-18 weeks.

But a current review of recent studies by Pitchumoni and Agarwal (17) pointed that one absolute, an adage of surgical training that a 6-cm pseudocyst present for 6 weeks or more requires surgery, is absolutely untrue. We have 50% (11/22) of complicated cases in our series either preoperatively or postoperatively. Although there was no mortality, they were often associated with severe morbidity. As they all were diagnosed at the first visit, we could not know the age of the PP before that episode. Even in the elective cases, those with larger pseudocysts were finally involved with some complications. Two cases with huge PP (>15cm) sustained pancreatic infection following ERCP in one case and leakage of pancreatic juice around the drainage catheter with diffuse peritonitis following percutaneous drainage in the other patient. The third case contracted severe hemodynamic change and pancreatic abscess following internal drainage due to sudden massive fluid loss with inadequate replacement and poor drainage respectively. So we should keep in mind that a huge PP may be more difficult to handle than an average sized PP (6cm to 10cm) in every step of treatment. The other factor we could trace in our patients is that the complicated cases were much more related with alcoholic history (7/11). Therefore, we would like to assume that increased awareness and early intervention should be carried out in cases presenting with huge PP especially with an alcoholic history. We also have a painful experience of operation in a symptomatic patient with an immature cyst wall who ended up with recurrence.
after external drainage (Figure 4a-c) and severe pulmonary effusion due to pancreaticopulmonary fistula even after percutaneous drainage was done (Figure 5a-c). It was ultimately treated uneventfully by transpapillary drainage (Figure 5d). So we do agree that Pitchumoni's consideration is reasonable and rational but the old 6cm-6 weeks criteria for intervention should still be a relative indicator rather than an absolute one.

Surgical drainage has been the gold standard for managing PP. However, it is associated with significant morbidity and mortality as mentioned above. Despite relatively limited experience with percutaneous drainage and despite recurrence and failure rates ranging as high as 25% to 79% these methods are recommended increasingly as the first line of treatment (3,18-22). vonSonnenberg et al. reported a 94% cure rate of 51 patients with infected PP treated by percutaneous drainage. The fistula usually closed in less than 30 days (21). Adams and Anderson (22) reviewed 52 patients who underwent CT-guided drainage. All patients had pancreatic fistulas and had an average hospital stay of 40 days. The average duration of fistula drainage was 42.1 days, and in 48% of the patients it was further prolonged by a drain tract infection. Sometimes these patients failed to respond to conservative treatment and required operative intervention (23). Robert Rao in his interesting paper concluded that failed nonoperative drainage is associated with a protracted illness and carries a risk of increased morbidity after operative intervention. They also pointed out that 39% of their patients undergoing pancreatic duct drainage for chronic pancreatitis had PP. So they suggested these two coexisting problems be treated at the same time whenever possible. We used percutaneous drainage in a patient carrying a large infected PP with systemic toxemia including fever and leukocytosis. But it was complicated with leakage around the catheter with diffuse peritonitis. It, on the hand, really helped to control a postoperative pancreatic abscess with sepsis by effective drainage through a wide bore drain tube. Theoretically, endoscopic drainage of PP more closely mimics operative internal drainage. But an inherent problem with endoscopic drainage is that not all the PP are continuous with stomach or duodenum. In addition, it is technically demanding and widely known for initial success but early recurrence (24). Similarly, a case in the ED group who sustained a recurrent PP complicated with pancreaticopleural fistula even after postoperative percutaneous drainage was relieved by transpapillary drainage later and it remained stable until recent follow-up.

We therefore stick to the surgical intervention as an initial treatment of choice in general for cases with indication as well as being fit for anesthesia and operation. For selected cases such as those with infected PP and with a friable thin wall, unstable clinical condition, or suspect malignancy, we may arrange percutaneous drainage to control the acute episode. Then further imaging study will be followed before a definitive surgical treatment. For the patients, who are diagnosed incidentally, they are put on a list for regular follow-up especially for a large PP. Appearance of symptoms or increase in the size of PP will be an indicator for the intervention. Percutaneous or endoscopic transpapillary approach may also be chosen for the symptomatic cases with thin wall or reluctance to

FIGURE 6
Clinical course of a giant PP. (a) A huge PP occupying half of the abdomen including pelvis. (b) Percutaneous drainage with a pigtail catheter in pancreatic abscess. (c) Multiple drains including wide bore tube in different locations for better drainage.
undergo operative procedures at their first attempt.

Complete dependent drainage is critical in any internal drainage procedure and solid material lining a pseudocyst should be thoroughly debrided at the time of internal drainage. Cystogastrostomy was chosen when the cyst wall was adherent to the posterior gastric wall (Figure 4). If the cyst wall is adherent to the duodenal wall, cystoduodenostomy should be performed. Cystojejunostomy was used when the cyst was not closely adherent to the upper gastrointestinal tract and was located at the base of the transverse mesocolon. It is also suggested for extremely large PP (>15cm) so as to achieve dependent drainage (11,17).

An infected pseudocyst presents as secondary infection of a previously sterile pseudocyst. The chance of progression from a sterile to an infected pseudocyst increases with time and occurs in approximately 10-15% of PP (16). Infection may be due to translocation of bacteria from the GI tract, secondary infection of an intracystic hematoma or may be iatrogenic after puncture or ERCP (25). External drainage is the traditional surgical therapy for infected pseudocyst and is thought to be preferable to cystoenterostomy, since the creation of anastomosis in an infected field is thought to be unsafe with the risk of postoperative abscess formation. But development of pancreaticocutaneous fistula has been described to occur in 12-20% of patients after external drainage (26). Djamila Boerma (27) proved in his series that surgical internal drainage is safe and effective in selected cases that had a firm cyst wall and could hold anastomosis well. We used this technique only in one patient out of 5 cases with infected PP because of diffuse peritonitis or associated systemic toxemia in other 4 patients. The patient who used ID recovered uneventfully in the postoperative period. In contrast, out of the remaining 4 cases, one ended up with colon perforation in and two with prolonged hospital stay for pancreatic fistula. Unfortunately, only one case in each group needed reoperation in the same admission due to bleeding and inadvertent colon injury with perforation respectively. Endoscopic intervention (transpapillary drainage) of a patient with pancreaticocutaneous fistula in the ID group and radiologic intervention (percutaneous drainage) in a patient with postoperative pancreatic abscess in the ID group prevented both of them from undergoing reoperation. Therefore multidisciplinary approach by a well-experienced team composed of surgeon, endoscopist, and radiologist is fundamental for the best outcomes. 70-80% of the fistulas will close spontaneously within 4 months. But high output (>200cc/day) appears to extend the duration of closure (30). Three in our ED group confronted pancreatic fistula and they were managed by total parental nutrition (TPN) in the early days followed by jejunostomy feeding in all patients. Nobody needed reoperation or prolonged TPN. All fistulas closed within 1-2 months. Consequently, less intervention was needed in the ID group (33.3%) in contrast to the ID group (50%) (AUTHOR please specify which should be ID and which should be ED). If all need for reopera-

### TABLE 4 Postoperative Morbidity and Management with Different Operative Methods

<table>
<thead>
<tr>
<th>Procedures</th>
<th>Complications</th>
<th>Number (%)</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. External drainage</td>
<td>1. Recurrence</td>
<td>1</td>
<td>Aspiration</td>
</tr>
<tr>
<td></td>
<td>2. Recurrence with pancreaticopleural fistula</td>
<td>1</td>
<td>Transpapillary drainage</td>
</tr>
<tr>
<td></td>
<td>3. Colon perforation</td>
<td>1</td>
<td>Colostomy</td>
</tr>
<tr>
<td></td>
<td>4. Pancreatic fistula</td>
<td>3</td>
<td>Conservative</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td>6 (60%)</td>
<td></td>
</tr>
<tr>
<td>2. Internal drainage</td>
<td>1. Internal bleeding</td>
<td>1</td>
<td>Reopen one week later</td>
</tr>
<tr>
<td>Cystogastrostomy (CG)</td>
<td>2. Persistent pain</td>
<td>1</td>
<td>Conservative</td>
</tr>
<tr>
<td></td>
<td>1. Recurrence</td>
<td>1</td>
<td>Cystojejunostomy</td>
</tr>
<tr>
<td>Cystojejunostomy (CJ)</td>
<td>2. Pancreatic abscess</td>
<td>1</td>
<td>Percutaneous drainage</td>
</tr>
<tr>
<td></td>
<td>3. Resection</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td>4 (40%)</td>
<td></td>
</tr>
<tr>
<td>Distal pancreatectomy</td>
<td>Nil</td>
<td></td>
<td>Nil</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>10 (100%)</td>
<td></td>
</tr>
</tbody>
</table>
tion was included, a significantly lower incidence of only 16.6% (one out of 6 cases) in the ED group compared to 75% (3 out of 4) in the ID group was found. So early TPN combined with routine use of early jejunal feeding may be the most important strategy for this result. A well-organized surgical nutrition team should be granted a greater credit for this wonderful gain. We encountered a massive bleeding from anastomosis of cystogastrostomy 7 days after operation and needed emergency reoperation for hemostasis. It is quite common to find a few cases as in our studies and most series (31) with a higher incidence of up to 50% (32) though there are also a few studies without this life-threatening complication (4). This has been attributed to a reflux of digestive juices with enzymatic activation (33). Use of absorbable suture might be the cause for such tragedy. Non-absorbable sutures with interlocking suturing method may secure hemostasis better along the cyst-enteric anastomosis. No such complication occurred in our later cases. Interestingly, recurrence of pseudocyst happened in one case 9 years after initial operation with cystojejunostomy and it was associated with biliary obstruction. Abdominal discomfort and repeated jaundice prompted him to receive a second cystojejunostomy. It might be due to the stenotic change of the initial cystoenteric anastomosis and persistent ductal leakage.

Another problem we met in our patients pertaining to the operative technique was the management of a really huge and widely situated giant PP. It was universally agreed that a giant cyst should be dependently drained by ID (11,17). But it led to severe complications with sudden hemodynamic change and pancreatic abscess in the early postoperative days (Figure 6a, b). Massive fluid loss and inadequate drainage with contamination of the PP by drop of intestinal content from the dysfunctioning limb of the Roux loop into the cavity should explain this unpleasant complication. Such a sorrowful adverse outcome was reported by Johnson et al. in their four patients with giant PP (>15cm). Three of four patients had life-threatening postoperative complications as a result of incomplete emptying of the cyst, and two patients died. They concluded that CG may not be an appropriate treatment for the giant PP because it failed to provide dependent drainage (34). Actually, it is impossible to drain internally for such a widely situated giant PP. Usage of transpapillary drainage in combination with percutaneous drainage may be a good alternative in such cases if we can prove presence of a communication between the PP and pancreatic duct. It might have precluded such a severe adverse effect as mentioned above. If we choose surgery, external drainage rather than internal drainage should be placed on first priority for such particular condition.

Operative mortality was high in early times (8.6% to 16%) and reduces significantly in recent years with the range of 0% to 5% (35,36). We didn’t have any mortality in our series though complicated cases with emergency operation were included.

In summary, we treated 22 symptomatic cases of pseudocyst of the pancreas including patients with complications by surgical intervention as a primary treatment from 1989 through 2003 at our hospitals and most of them recovered uneventfully. The clinical findings are variable and most of them presented with abdominal pain or fullness. Ultrasonography and CT were equally effective for diagnosis but sonography was noninvasive, cheap and useful for follow-up. Computed tomographic scanning was also helpful for evaluation of localization, extent, correlation with surrounding structures, and an image guide to drain the cyst. External drainage of the PP was associated with higher morbidity than ID. But only one in each group needed to undergo reoperation. Percutaneous drainage or endoscopic drainage may be a good tool both in the preoperative and postoperative period. All these techniques for investigation and definitive treatment should be carried out coordinately as in an orchestra by a team approach for the best outcomes. Although there was some morbidity, there was no mortality in our whole series.

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