Pancreatic pseudocyst in children: a single-institute experience

Mohamed Khalifa, Tarek Gobran, Khaled S. Shreef and Amira Waly

Background and objectives **Pancreatic pseudocysts are rare in children, with most series describing not more than 24 patients. At Zagazig University Hospital we have managed a range of cases of this disorder and feel this experience should add to the existing experience with children. This study aimed to analyze the causes, clinical presentation, and management of symptomatic pancreatic pseudocysts treated at our institution.**

Patients and methods **This study included 19 children. Their ages ranged from 1 month to 17 years. All cases were diagnosed as pancreatic pseudocysts and were admitted and treated in the Pediatric Surgery Unit, Zagazig University Hospital, during the period from 1996 to 2011. The collected data included age, sex, etiology, clinical presentation, radiological information, operative data, postoperative complications, and the final outcome.**

Results **Twelve patients (63.2%) had a history of abdominal trauma, whereas the remaining seven patients (36.8%) had no abdominal trauma. The pseudocysts were acute in 11 patients, chronic in seven patients, and only one patient had congenital pseudocyst. Nine patients improved with expectant treatment; however, 10 patients required surgery. The surgical intervention included cystogastrostomy for four patients, cystojejunostomy for two patients, complete excision with distal pancreatectomy in two children, and partial excision with external drainage in the remaining two patients. One patient developed postoperative wound infection, and two cases had external pancreatic fistula.**

Conclusion **Although spontaneous resolution of pancreatic pseudocysts occurred, more commonly, in acute, small-sized, and post-traumatic cysts, the surgical treatment of pancreatic pseudocyst is a valid, safe, effective, and satisfactory treatment, especially in complicated cases.** ***Ann Pediatr Surg*** **11:127–131 © 2015 Annals of Pediatric Surgery.**

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Pediatric Surgery Unit, Department of General Surgery, Faculty of Medicine, Zagazig University, Zagazig, Egypt

Correspondence to Mohamed Khalifa, Pedia Surgery Unit, Faculty of Medicine, Zagazig University, Zagazig, Egypt
Tel: +00966 507883049; e-mail: khshreef@hotmail.com

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Introduction

Pancreatic pseudocyst (PP) is the most common cystic lesion of the pancreas [1]. Unlike in adults, trauma is the most common cause of PP in children, whereas gall stones and alcohol are considered the main causes in adults [2]. When a PP exceeds 6 cm in diameter and persists over 6 weeks, it is unlikely to resolve spontaneously and usually interventional treatment is necessary [3]. An overall 30–50% of untreated persistent pseudocysts are more liable for development of complications such as abscesses formation, fistulae, spontaneous rupture, and massive hemorrhage, which may lead to death [4]. The aim of this study was to analyze the causes, clinical presentation, and management of symptomatic PPs in a series of 19 children treated in the Pediatric Surgery Unit of Zagazig University Hospitals.

Patients and methods

This retrospective study was carried out at the Pediatric Surgery Unit, Surgical Department, Zagazig University Hospital, Egypt, during the period from 1996 to 2011. The study included 19 patients with PPs. Their ages ranged from 1 month to 17 years. The data were obtained from medical records and the treating surgeons. The data included age, sex, etiology, clinical presentation, radiological information, operative data (indication, type of procedure), postoperative complications, and the final outcomes.

The diagnosis of PP was based on the history and clinical examination. Ultrasonography was performed for all cases, and computed tomographic scan (for 10 cases) was used to confirm the diagnosis and to measure the number of cysts, their size, location, and the thickness of their wall. The PPs in our study were classified into acute or chronic types. If the time interval between the occurrence of insult and appearance of cyst was less than 6 weeks, the cysts were classified as acute; however, if the time interval was 6 weeks or more, the cysts were classified as chronic cysts.

All patients of this study were hospitalized. Conservative approach was used for the treatment of acute PPs; a nasogastric tube was inserted, with administration of intravenous fluids and antibiotics. All patients subjected to conservative management were followed up clinically and radiologically to assess the response to conservative treatment. Failure of medical treatment or occurrence of complication was an indication for surgical intervention. However, chronic PPs were managed surgically from the start, and conservative approach had no role in these chronic cases. Selection of the surgical procedure depended on the intraoperative location of PP: PPs located at the base of the transverse mesocolon were drained using Roux-en-Y cystojejunostomy (Fig. 1); PPs in the lesser sac were drained using transgastric cystogastrostomy; PP at the tail of the pancreas was completely excised using distal pancreatectomy (Fig. 2); and PPs at the head of the pancreas were surgically treated

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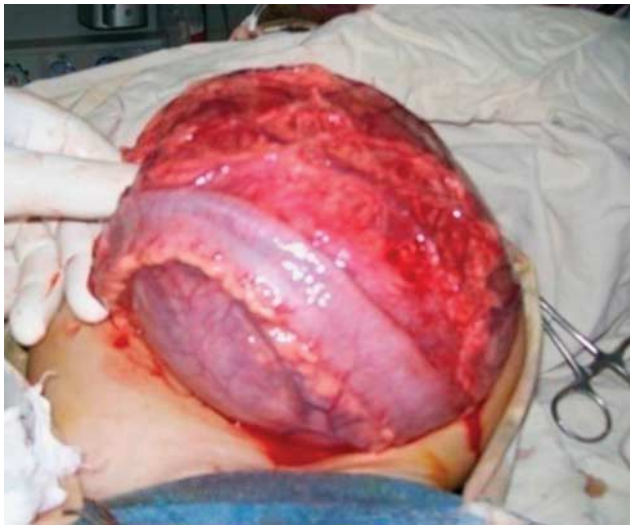
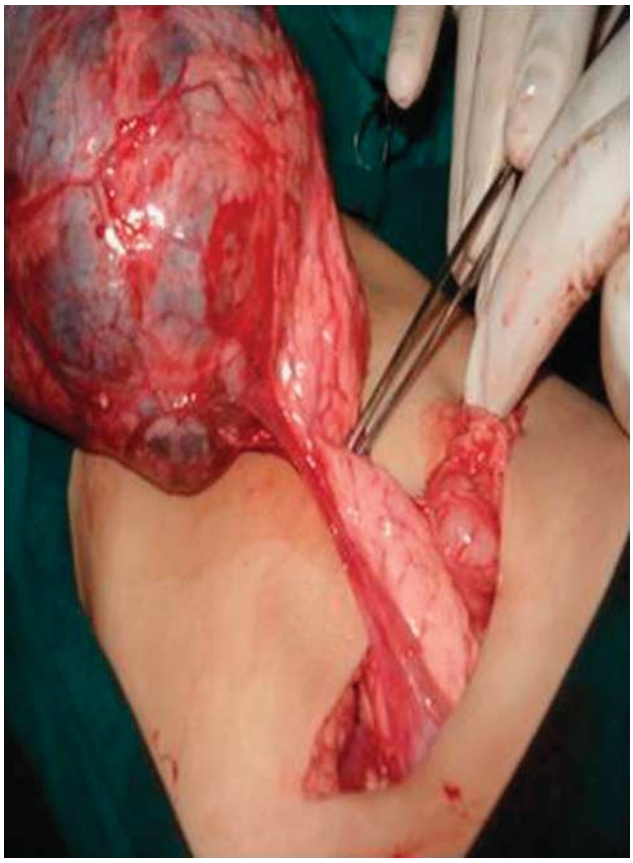
Fig. 1



Large pancreatic pseudocyst appreciated more at transverse mesocolon.

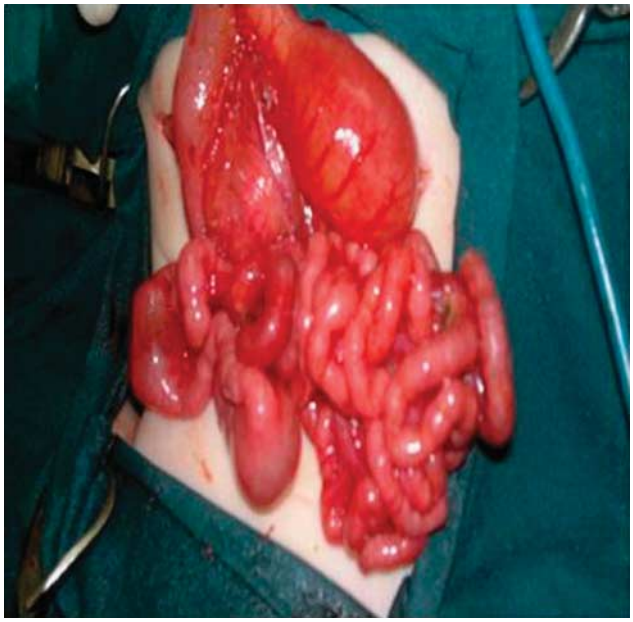
Fig. 2



Pancreatic pseudocyst originated from pancreatic tail.

with partial excision and external drainage (Fig. 3). One patient had associated gall bladder stones. Cholecystectomy was performed during surgical management of the cyst. For all operated cases a biopsy was taken from the wall of the cyst and was sent for histopathological examination to confirm the diagnosis.

Fig. 3



Pancreatic pseudocyst at the head of the pancreas in neonate.

All patients were followed up in the outpatient clinic with clinical examination and ultrasound to detect any recurrence or complications.

Data were collected, tabulated, and statistically analyzed using IBM SPSS statistics (IBM, New Orchard Road, New York). Descriptive statistics were used, such as percentage, arithmetic mean, and SD. Statistical tests of significance were used to compare the studied groups, such as Fisher's exact test and *t*-test. A *P* value of 0.05 or less was considered significant.

This study was approved by the ethical committee.

Results

Nineteen children, 11 boys (57.9%) and eight girls (42.1%), were admitted with the diagnosis of PP. The mean age was 8.3 years (range: 1 month to 17 years). Twelve patients (63.2%) had a history of trauma, whereas the remaining seven patients (36.8%) had no history of significant trauma and had different etiological causes. One of them was falsely diagnosed on prenatal ultrasound as gastric duplication; the cause of this PP was unclear and was considered as congenital PP. This case was excluded from the classification of PP as acute or chronic (Table 1).

Eleven patients with acute PPs (eight patients had history of significant trauma and three with no history of trauma) presented with constant abdominal pain with variable intensity, associated with vomiting, anorexia, and loss of appetite with or without weight loss. Four of these cases had abdominal mass. The mean interval time between the etiological insult and clinical presentation was 2.8 weeks (range: 1–4 weeks). Only one of the 11 patients presented with manifestations of generalized peritonitis due to cyst rupture.

Seven patients with chronic PPs (four patients had history of significant trauma and three with no history of

Table 1 Data collected from the study cases

Case	Age (years)	Sex	Cause	Type	Size (cm)	Clinical course	Intervention	Morbidity
1	8	Male	Traumatic (handle bar)	Acute	5.8	Resolved	–	–
2	12	Female	Idiopathic	Acute	3	Resolved	–	–
3	5	Female	Traumatic (fall)	Chronic	11	Gastrointestinal compression	Cystogastrostomy	–
4	3	Male	Idiopathic	Chronic	4		Complete excision and distal pancreatectomy	–
5	8	Male	Traumatic (epigastric blow)	Acute	6.3	Resolved	–	–
6	6	Female	Gall stone	Chronic	7		Cystogastrostomy and cholecystectomy	–
7	4	Female	Traumatic (fall)	Chronic	15	Gastrointestinal compression	Roux-en-Y cystojejunostomy	–
8	10	Male	Traumatic (RTA)	Acute	3.5	Resolved	–	–
9	8	Male	Mumps	Chronic	9		Roux-en-Y cystojejunostomy	–
10	6	Male	Traumatic (horse kick)	Acute	4.5	Resolved	–	–
11	7	Male	Idiopathic	Acute	3.5	Resolved	–	–
12	11	Female	Traumatic (horse kick)	Acute	6.7	Resolved	–	–
13	2	Female	Traumatic (fall)	Chronic	14.5		Complete excision and distal pancreatectomy	–
14	1	Male	Idiopathic	Acute	5.7	Rupture and peritonitis	Partial excision and external drainage	Wound infection and controlled external fistula
15	15	Male	Traumatic (RTA)	Acute	7.2	Resolved	–	–
16	13	Female	Traumatic (epigastric blow)	Acute	10		Cystogastrostomy	–
17	1/12	Male	Unknown	Congenital	7	–	Partial excision and external drainage	Controlled external fistula
18	17	Male	Traumatic (RTA)	Chronic	8.5		Cystogastrostomy	–
19	12	Female	Traumatic (RTA)	Acute	4	Resolved	–	–

RTA, road traffic accident.

Table 2 The relation between the size of the PPs and the method of management

Size of PP (cm)	Total number [$n=19$ (100%)]	Spontaneous resolution [$n=9$ (47.4%)]	Surgical intervention [$n=10$ (52.6%)]	*P* value
<6	8	6 (75)	2 (25)	0.07
≥ 6	11	3 (27.3)	8 (72.7)	

PP, pancreatic pseudocyst.

trauma) presented with persistent abdominal pain, abdominal mass (six patients out of seven), or manifestation of gastrointestinal compression (two cases out of seven). The mean interval time between the etiological insult and clinical presentation of chronic PP was 6.5 weeks (range: from 6 to 12 weeks).

The sizes of PPs ranged from 3 to 15 cm (average 7.2 cm). PPs with diameter less than 6 cm had higher incidence of spontaneous resolution (75%) and less incidence of surgical intervention as compared with PPs more than 6 cm in diameter; however, when these data were analyzed they were statistically insignificant (Tables 2 and 3).

All cases of acute PPs (11 patients) were treated conservatively; of them, nine (81.8%) improved completely with conservative management (seven traumatic and two nontraumatic), whereas the remaining two patients needed surgical intervention because one had ruptured PP and the other showed no signs of improvement during the follow-up period.

Seven patients classified as chronic PPs (four traumatic and three nontraumatic) required surgical intervention. The intervention was elective in six patients and emergency in one patient who had intestinal obstruction due to gastrointestinal compression. Only one of 19 patients had congenital PP and required surgical intervention. Thus, the total number of cases that required surgical intervention was 10 (52.6%).

There was no significant difference between traumatic and nontraumatic PP as regards PP type, chance of spontaneous resolution, and need for surgery (Table 3).

The follow-up period ranged from 6 to 24 months (13.6 months). One patient had wound infection, and two patients had external pancreatic fistulae, which was managed conservatively for 3–4 weeks, and closed spontaneously. No recurrence or mortality was recorded during the follow-up period (Table 1). The histopathological results of all specimens confirmed the provisional diagnosis.

Discussion

Although pancreatitis is uncommon in the pediatric population, it often has a severe clinical course. Less than 5% of patients with pancreatitis develop complications, which include PP, pancreatic necrosis, and hemorrhagic pancreatitis [5]. The cause of PP in children is somewhat different from that in adults; alcohol and gall stone are more common causes in adults, whereas trauma is the leading cause of PPs in children, especially blunt abdominal trauma (more than 60%) [6,7]. These nearly match with that reported in our

Table 3 Traumatic versus nontraumatic pseudocysts

Variables	Traumatic pseudocyst ($n=12$)	Nontraumatic pseudocyst ($n=7$)	P value
Mean age (mean ± SD) (years)	9.8 ± 3.97	5.3 ± 4.2	0.03
Acute pseudocyst [*n* (%)]	8 (66.7)	3 (50)[a]	0.63
Chronic pseudocyst [*n* (%)]	4 (33.3)	3 (50)[a]	
Spontaneous resolution [*n* (%)]	7 (58.3)	2 (28.6)	0.35
Surgical intervention [*n* (%)]	5 (41.7)	5 (71.4)	

[a]The case of congenital pancreatic pseudocyst is excluded from this classification.

study, in which the history of trauma was detected in 63.2% of cases, whereas 36.8% had no history of trauma. There was one case that was discovered during the prenatal period and confirmed after surgical exploration. This case is extremely rare and was not documented before, except in two cases in one literature [8].

According to the Atlanta classification [9], PPs are classified into acute PPs and chronic PPs on the basis of the nature of underlying diseases. Acute PP arises as a consequence of acute pancreatitis or pancreatic trauma, whereas a chronic PP arises as a consequence of chronic pancreatitis. The PP is also classified into acute and chronic on the basis of the time interval between etiological insult and presentation (usually 4–6 weeks) in an attempt to help decide the timing of surgical intervention [10]. In this work, the PP that had history less than 6 weeks was considered as acute PP, whereas PP that had a history 6 weeks or more was considered as chronic PP.

Govil and colleagues stated that, most PPs are uncomplicated with few nonspecific symptoms, except when they are large. Complicated PP may have uncommon modes of presentation, including bleeding, rupture, infection, gastric outlet obstruction, and jaundice due to obstruction of the common bile duct [11]. In our study, constant abdominal pain was the main presenting symptom: abdominal mass was palpated in 10 cases (52.6%); one patient presented with acute rupture and another two cases presented with gastrointestinal compression.

Abdominal ultrasound and computed tomographic scan were the main diagnostic modalities used in the diagnosis of PPs in this study. Other modalities can be used in the diagnosis and evaluation of PPs. Endoscopic ultrasonography can visualize the cyst and its relationship with the vascular structure, and endoscopic retrograde cholangiopancreatography can provide better images of the pancreatic ductal anatomy and detect any communication between the duct and pseudocyst. However, these investigations are difficult to be applied in children in comparison with adults and need experienced personnel [12,13].

The natural history of PPs in children differs from that in adults. The spontaneous resolution of acute PP on medical therapy is more frequent in children than in adults (about 70% in post-traumatic PPs) [14,15]. The mechanism of spontaneous resolution is unclear. It has been postulated that it may be due to spontaneous drainage into pancreatic duct or into the neighboring gut [16].

Teh *et al.* [17] treated PPs in a series of 24 children. They noted that the resolution of symptoms during expectant management occurred in 29% of patients, whereas 71% of patients required surgical intervention. In our study, 47.4% of our patients improved completely with conservative treatment and 52.6% of patients needed surgical intervention.

Many investigators recommended intervention for PP that persists longer than 6 weeks because spontaneous resolution is unlikely to happen after this time and the wall of the cyst becomes mature enough with good thickness, which allows internal drainage [7,14,18]. Parks and colleagues [19] reported in their study that spontaneous resolution occurred in 42 patients who had PPs for more than 6 weeks and in 8% of 13 pseudocysts that had been present for 7–12 weeks. The management of PP in our study depended on the time of PP presentation. PP with a history of less than 6 weeks was managed with expectant treatment, whereas PP that had a history of 6 weeks or more was managed with surgical operation.

In our study, 72.7% of PPs greater than 6 cm needed surgery, whereas 27.3% improved with conservative treatment. However, in PPs less than 6 cm in diameter, 25% needed surgery and 75% improved with conservative approach. These results are nearly in agreement with that of Yeo *et al.* [20], who reported that 67% of PPs greater than 6 cm in diameter required surgical intervention, whereas 40% of those less than 6 cm in size required operative intervention. More recent studies, however, have found that PPs greater than 10 cm in diameter may also resolve spontaneously [21]. All cases of PPs with a size of 10 cm or more encountered in our study were managed with surgical intervention.

In contrast, Teh *et al.* [17] stated that the size of PP in children was not a significant factor in determining the need for surgical intervention, instead the etiology was more important in choosing the method of management: 45% of post-traumatic PPs required intervention, whereas 92% of nontraumatic PPs improved with conservative approach. In our series, the cause of PPs was statistically insignificant in determining the method of treatment.

According to many authors, the initial conservative treatment is the treatment of choice of early cases of PPs in children because the liability of occurrence of complications, unlike in adults, is low [12,22–24]. The complication rate of conservative treatment in the study by Teh *et al.* [17] was 8.3%. In our study, the complication rate of conservative management was 15.7% (two patients out of 11).

There are three interventional approaches for the active management of PP, including percutaneous drainage, endoscopic drainage, and surgical interventions (excision, external drainage, and internal drainage) [11]. The choice of treatment modality depends on the nature of the cyst, its position, and the local experience. In our institution, surgical intervention was the only available approach.

Percutaneous drainage is the least invasive method, but it is associated with higher complications, including recurrence and pancreatic fistula and higher mortality rates [25,26]. Endoscopic drainage requires experienced surgically minded endoscopist and sophisticated endoscopy armamentarium Despite encouraging results with this therapeutic modality, direct translation of their results into the pediatric population cannot be assumed [22,27–29].

Surgical internal drainage is the mainstay of treatment. It is still a valid option with good results in children. The recurrence rate ranges from 0 to 6% [11,17,22]. In our research, three types of operations were applied, including cystgastrostomy, cystoduodenostomy, or cystjejunostomy. Selection of drainage procedure was largely determined by the anatomic location of the PP (Table 1) [30].

External drainage of PPs is associated with a mortality rate of 6%, recurrence rate of 22%, and an incidence of external fistula of 10–29% [31,32]. The persistence of fistula is usually due to communication of PP with main pancreatic duct. In our series, two patients were managed with partial excision and external drainage. They developed external fistula that fortunately responded to conservative management and closed spontaneously after 3–4 weeks.

Conclusion

Although the conservative management of PPs is a successful effective method of treatment in children with acute, small-sized, and post-traumatic cysts with low incidence of occurrence of complication, surgical treatment is a valid, safe, effective, and satisfactory treatment in complicated cases.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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