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Original Research Article

Endoscopic management of pancreatic pseudocyst

Wormi Sharon*

Department of of General Surgery, Jawaharlal Nehru Institute of Medical Sciences, Porompat, Imphal, Manipur, India

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***Correspondence:**
Dr. Wormi Sharon,
E-mail: wormi2008@gmail.com

ABSTRACT

Background: Pancreatic pseudocyst is a well-known complication of acute or chronic pancreatitis, with a higher incidence in the latter. It represents 80-90% of cystic lesions of the pancreas. Benign and malignant cystic neoplasms constitute 10-13%, congenital and retention cysts comprising the remainder. Diagnosis is accomplished most often by computed tomographic scanning, by endoscopic retrograde cholangiopancreatography, or by ultrasound, and a rapid progress in the improvement of diagnostic tools enables detection with high sensitivity and specificity. Endoscopic drainage provides a good alternative or supplement to a surgical treatment of pancreatic pseudocysts.
Methods: This is a prospective study of 26 patients diagnosed to have Pancreatic Pseudocyst and treated by endoscopic drainage from 1st June 2008 to 30th September 2010 in St. John's Medical College and Hospital, Bangalore. Transabdominal and endoscopic ultrasound, CT scan were used to determine the number, size, volume, wall thickness, location of pancreatic pseudocysts, the extent of pancreatic parenchymal disease, the nature of the main pancreatic duct and its relationship to the cyst, the presence of portal hypertension, venous occlusion, arterial anomalies and pseudoaneurysm. The indications for endoscopic drainage were symptomatic and/or bigger than 6 cm in major diameter pancreatic pseudocysts with a close opposition to the gastric or duodenal wall.
Results: There were 26 patients with pancreatic pseudocyst and all of them are located in lesser sac. It mainly affects the middle-aged males with alcohol as the main etiology. Out of 26 patients 24 underwent endoscopic drainage and 2 patients were abandoned in view of vessel between the cyst wall and stomach which was picked up by EUS. Out of 26 patients, 5 developed infection which was proven by culture. Endoscopic cystogastrostomy was performed in 21 patients (80.8%), endoscopic cystogastrostomy with nasocystic drainage performed in 3 patients (11.5%), and abandoned in 2 patients. 2 patients developed bleeding, and managed conservatively. No intervention done. 5 patients underwent re-procedure (3 underwent nasocystic drainage, 1 aspiration, and the other cystogastrostomy), in view of recollection.
Conclusions: Endoscopic drainage is safe and effective in experienced hand, less morbidity, cost effective, short hospital stay, can be repeated.

Keywords: Computed tomography, Chronic liver disease, Diabetes mellitus, Endoscopic ultrasound, Endoscopic retrograde cholangiopancreatography, Hypertension, Milligram, Pancreatic pseudocyst, Portal hypertension, Ultrasound

INTRODUCTION

Pancreatic pseudocyst is a well-known complication of acute or chronic pancreatitis. Management of pancreatic pseudocyst has changed from traditional surgical management to less invasive techniques and conservative management. Pancreatic pseudocysts are collections of pancreatic fluid contained by a wall of fibrous tissue,

which result from acute or chronic pancreatitis, and represent the most common cystic lesions of the pancreas.[1] Typically, the wall of a pancreatic pseudocyst lacks an epithelial lining, and the cyst contains pancreatic juice or amylase-rich fluid. This is the histopathological definition of a pancreatic pseudocyst. The most common site of accumulation of the leaking pancreatic juice is the potential space of the lesser omentum (lesser sac) limited anteriorly by the stomach, inferiorly by the transverse mesocolon, laterally by the spleen, and by splenic flexure on the left and the duodenum on the right.[2] Today, the most used definitions differentiate between peripancreatic fluid collections, pseudocysts and pancreatic abscesses as in the Atlanta classification system for acute pancreatitis.[1] In the study by Bourliere and Sarles, most pseudocysts were located in or near the tail of the pancreas.[3] In another study, most extra-pancreatic pseudocysts were located in the body and tail region, whereas most intrapancreatic pseudocysts were in the head of the pancreas.[4] Pancreatic pseudocysts are most often retrogastric. Blood-stained ascites and abdominal fat necrosis have been explained by fluid escaping via the foramen of Winslow into the greater sac, and blockage of the foramen may cause the fluid to become "encysted" in the lesser sac6. There are also reports of pancreatic pseudocysts in the heterotopic pancreas, usually a silent gastrointestinal malformation, such as a case of pancreatitis and extensive pseudocyst formation in the gastric antrum, which caused gastric outlet obstruction7. Although the pancreas does not have a firm capsule, collections of pancreatic juice may remain as focal masses in the region of the duct disruption. If secretions breech the thin layer of connective tissue that surrounds the gland, the anterior pararenal space and the lesser sac are immediately involved8. The most common site of accumulation of the leaking pancreatic juice is the potential space of the lesser omentum (lesser sac). Most of the peripancreatic fluid collections that follow an attack of acute pancreatitis will probably resolve themselves.[5] unless they become infected or contain large quantities of necrotic tissue.[9] Blockage of a major branch of a pancreatic duct by a protein plug, calculus or localized fibrosis could lead to pancreatic cysts or pseudocyst formation.[10,11] A ductal disruption ventrally results in fluid accumulation in the lesser sac or in the peritoneum cavity, i.e. pancreatic ascites. Therefore, the location of the fluid collection is a key to the location of the pancreatic duct disruption.[12] There are also cases with extension of the pancreatic juice located far from the pancreatic gland, e.g. to the neck.[13]

For pancreatic pseudocysts, today it is usually based on findings at CT, MR imaging or ultrasonography, but also combined with information from surgery and autopsy. On gross inspection of the pseudocyst wall, it is usually not possible to identify the connection with the main pancreatic duct although, by injection study or endoscopic pancreatography, a connection can be demonstrated in many cases.[14] A pseudocyst of the pancreas may, on occasion, have a blue appearance on external inspection, hence the appellation "blue-dome" pseudocyst.[15]

The pseudocyst is characteristically fluctuant. The contents may vary widely from an almost colorless or turbid fluid to brownish thick fluid containing debris of pancreatic digestion.[16] The fluid can also be blood-tinged or frankly hemorrhagic. Pseudocysts may also develop in the aftermath of pancreatic trauma, and are then a direct sign of a rupture or at least a breach in the pancreatic duct. Although adult series of pseudocysts report trauma as the etiological factor in only 3-8% of patients, most pancreatic pseudocysts in children are post-traumatic[17-21]

Traumatic cyst fluid has high amylase content. However, it is also possible that a hematoma following a contusion of the gland turns into a collection of pancreatic juice as the blood is reabsorbed and replaced by seepage from a capsular tear.[11] A direct traumatic disruption of the pancreas as a result of extracorporeal shock wave lithotripsy for left-sided renal calculi has also been reported.[22] The presence of a well-defined wall composed of granulation or fibrous tissue is what distinguishes a pseudocyst from an acute fluid collection.

Acute fluid collection

- In moderate to severe pancreatitis
- Nearly 65% spontaneous resolution
- Lack a well-defined wall
- Irregular shape, can be multiple
- No communication with pancreatic duct
- May go on to form pseudocyst.

Pseudocyst

- As a result of pancreatitis, trauma, or ductal obstruction
- Localized collection of fluid
- Well defined cyst wall; no epithelial lining
- Rounded or oval in imaging studies
- Location adjacent to the pancreas in the lesser sac
- Communication often with the duct
- Spontaneous resolution in 30%.

Indications for therapeutic intervention of pancreatic pseudocysts

- Complicated pancreatic pseudocysts
- Compression of large vessels (clinical symptoms or seen on CT scan)
- Gastric or duodenal outlet obstruction
- Stenosis of the common bile duct due to compression
- Infected pancreatic pseudocysts
- Hemorrhage into pancreatic pseudocyst
- Pancreaticopleural fistula
- Symptomatic pancreatic pseudocyst
- Satiety
- Nausea and vomiting

- Pain
- Upper gastrointestinal bleeding (10%-20%)
- Asymptomatic pancreatic pseudocyst
- Pseudocysts unchanged in size and morphology for more than 6 week[2]
- Extra-pancreatic complications in patients with chronic
- Alcoholic pancreatitis[23]
- Suspected malignancy: median 5-year survival rate after resection, 56%.[24]

Endoscopic drainage

The aim of endoscopic treatment is to create a connection between the pseudocyst cavity and the gastrointestinal lumen. There are various methods for an endoscopic drainage, and it can be accomplished by either a transpapillary or a transmural approach; the latter requires access through the stomach (cystogastrostomy) or the duodenum (cystoduodenostomy).[25,26]

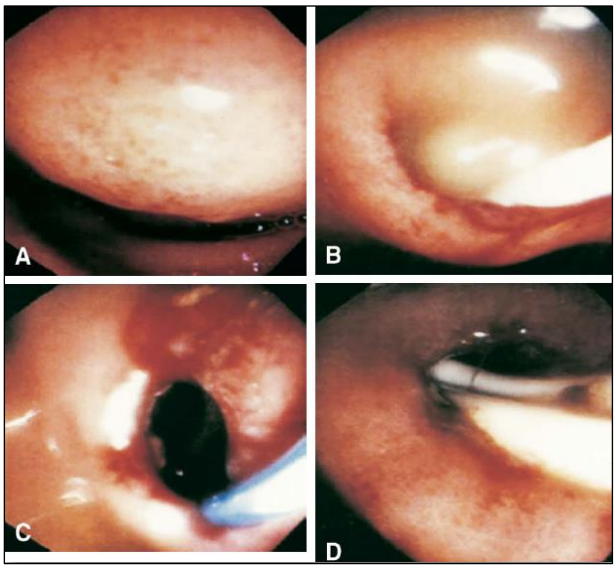

Figure 1: (A) The pseudocyst bulges into the lumen of the stomach; (B) A needle-knife catheter is used to puncture the opposed gastric and pseudocyst walls; (C) After balloon dilation, the fistula created by the needle-knife is enlarged (8-10 mm); (D) Through the enlarged opening, two 10F, double-pigtail stents are placed for drainage.

METHODS

It is a prospective study of 26 adult patients admitted in St. John's Medical College and Hospital, Bangalore from 1st June 2008 to 30th September 2010. Diagnosis is confirmed by history, clinical findings and radiological investigations- USG/CT-abdomen/EUS

Inclusion criteria

- Symptomatic pseudocyst
- Size more than 6 cm in major diameter with a close opposition to the gastric or duodenal wall
- Non- resolving pancreatic pseudocyst
- Patients above 18 years of age.

Exclusion criteria

- Grossly infected cyst or abscess
- Acute fluid collection
- Patients who were initially treated for a pseudocyst but later proved to have a cystic neoplasm or pancreatic cancer.

Intervention

- Preparation: NPO for 4-6 hours, single dose antibiotics
- Anaesthesia: Midazolam + Fortwin (Pentazocin)
- Position: left lateral
- Endoscope: 130 series side view endoscope
- Stent details: 7F double pigtail
- Immediate post procedure: NPO for 4-6 hours.

Follow up

- Clinical examination
- USG abdomen
- Stent removal at 4-6 weeks

Statistical methods

Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean±SD (Min-Max) and results on categorical measurements are presented in number (%). Significance is assessed at 5% level of significance. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

Chi-square test

$$\chi^2 = \frac{\sum (Oi - Ei)^2}{Ei}$$, where Oi is observed frequency and Ei is expected frequency.

Fisher Exact test

Table 1: Fischer Exact test.

	Class 1	Class 2	Total
Sample1	a	b	a+b
Sample 2	c	d	c+d
Total	a+c	b+d	n

Fisher Exact test statistic =

$$\sum p = \frac{(a+b)!(c+d)!(a+c)!(b+d)!}{n!} \frac{1}{\sum a!b!c!d!}$$

Significant figures

+ Suggestive significance (P value: 0.05<P<0.10)
* Moderately significant (P value: 0.01<P≤0.05)
** Strongly significant (P value: P≤0.01)

Statistical software

The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS

Pancreatic pseudocyst mainly affects middle age group. In this study, 38.5% of patients belong to age group between 21-30 and 34.6% between 31-40 age group. Age group least affected is less than 20 years and more than 50 years (3.8%).

Table 2: Age distribution of patients studied.

Age in years	Number of patients	%
21-30	10	38.5
31-40	9	34.6
41-50	6	23.1
>50	1	3.8
Total	26	100.0

Mean ± SD: 35.23±10.42

Table 3: Gender distribution.

Gender	Number of patients	%
Male	23	88.5
Female	3	11.5
Total	26	100.0

Mostly males are affected. In this study, too males are predominantly affected. The percentage of male is 88.5% compared to female of 11.5%.

Table 4: Etiology

Etiology	Number of patients	%
Alcohol	18	69.2
Drug	1	3.8
Gall stone	3	11.5
Idiopathic	4	15.4
Total	26	100.0

Most common etiology is alcohol (69.2%).

Table 5: Co-morbid conditions.

Co-morbid conditions	Number of patients (n=26)	Percentage
Absent	13	50.0
Present	13	50.0
ALD	2	7.7
CLD	2	7.7
DM	3	11.5
Seizure	1	3.8
HTN	2	7.7
HIV	2	7.7
Ca cervix	1	3.8

50% of the patients have co-morbid conditions and this contribute to longer stay in hospital. 2 patients have also been diagnosed to have HIV positive.

Table 6: Clinical features.

Clinical features	Number of patients (n=26)	Percentage
Pain abdomen	25	96.2
Vomiting	14	53.8
Fever	2	7.7
Jaundice	3	11.5
Mass abd	8	30.8

Predominant symptoms are pain abdomen (96.2%) and vomiting (53.8%). Others are mass in epigastric region, fever jaundice etc.

Table 7: Incidence of infection.

Incidence of infection	Number of patients (n=26)	Percentage
Yes	5	19.2
No	21	80.8

Majority of the patients do not show any signs of infection. Only 19.2% had infection.

Table 8: Incidence of chronic pancreatitis.

Chronic pancreatitis	Number of patients (n=26)	Percentage
Yes	11	42.3
No	15	57.7

Here in this study, the incidence of pancreatic pseudocyst does not show any significant difference between acute and chronic pancreatitis.

Majority of the patients underwent endoscopic cystogastrostomy (80.8%). 2 cases were abandoned in

view of vessels between the stomach wall and cyst which was detected by EUS.

Table 9: Procedure performed.

Procedure	Number of patients (n=26)	Percentage
Endoscopic cystogastrostomy	21	80.8
endoscopic cystogastrostomy with Nasocystic drainage	3	11.5
Abandoned	2	7.7

Out of 26 patients, 8 developed complications (30.8%). Patients have mainly recollection/infection/ bleeding. 2 patients (7.7%) developed bleeding, 1 patient was given 1unit of blood transfusion and the other was treated conservatively. Both the patients did not require any major intervention

Table 10: Complications.

Complications	Number of patients (n=26)	Percentage
Nil	18	69.2
Present	8	30.8
Recollection	3	11.5
Infection	3	11.5
Bleeding	2	7.7

5 patients underwent re-procedure, out of which 3 patients were put on nasocystic drain, 1 underwent percutaneous aspiration in view of thick fluid and infected and 1 underwent cystogastrostomy. All the patients did not have any more major complications.

Table 11: Re-procedure done.

Re-procedure	Number of patients (n=26)	Percentage
Nil	21	80.8
Done	5	19.2
Nasocystic drain	3	11.5
Aspiration	1	3.8
Cystogastrostomy	1	3.8

Here the average stay in hospital is about a week time (65.4%). Most of the patients stay longer due to other medical problems.

All the patients were followed up for a period of 4-8 weeks and all 25 patients settled and do not require any other modes of treatment. 1 patient died one week after the procedure. The same patient has also lots of co-morbid conditions- CLD with PTH with ascitis and also a diabetic with chronic renal failure.

Table 12: Duration of hospital stay after procedure.

Hospital stay after procedure in days	Number of patient (n=26)	Percentage
1 week	17	65.4
1 weeks-2 weeks	4	15.4
2 weeks-3 weeks	4	15.4
3 weeks-4 weeks	1	3.8

Mean ± SD: 8.08±6.01

Table 13: Final outcome.

Final outcome	Number of patients (n=26)	Percentage
Survived	25	96.2
Death	1	3.8

Figure 2: Before endoscopic drainage

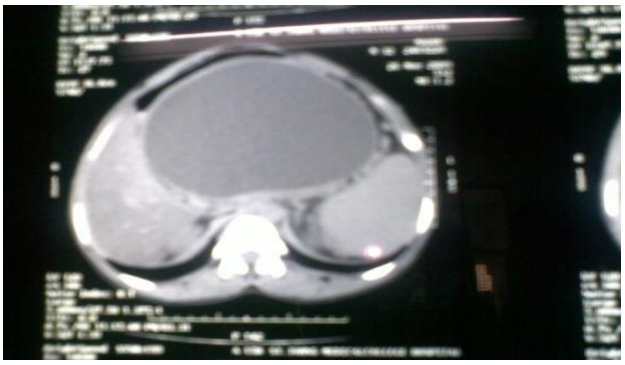

Figure 3: CT-scan picture of the same patient.

Figure 3: After endoscopic drainage.

Out of 26 patients, 24 underwent endoscopic procedure and in 2 cases the procedure was abandoned in view of visible vessels. Pancreatic pseudocyst mainly affects the middle age group. In this study, too the most affected group is middle aged men in between 21-40 years.

The most common cause is alcohol (69.2%) in this study.

Most common symptoms are pain abdomen (96.2%). Others are vomiting, fever, jaundice etc.

All the patients with PP are evaluated using USG, CT-abdomen and EUS before deciding on the type of intervention. In the present study done here 21 patients underwent endoscopic cystogastrotomy alone, 3 patients underwent cystogastrostomy along with nasocystic drainage and in 2 patients, the procedure was abandoned. 2 patients developed bleeding, 1 patient require blood transfusion. Both the patients settled with conservative management and did not require any major intervention. 2 patient's procedure was abandoned in view of vessels coming in between the stomach wall and cyst. This was picked up by EUS, so major complication was avoided.

EUS was performed in only 13 patients because facility was not available during the initial phase of the study. Had it been done in all the patients, the bleeding which occurred in two patients could have been avoided. In this study re-procedure was done for 5 patients, 3 underwent nasocystic drainage in view of recollection, 1 had cystogastrostomy and the other underwent percutaneous aspiration in view of developing an abscess.

All the patients treated for PP, none of them had any major morbidity related to the endoscopic procedure. 1 patient died one week after the procedure which is not related to the procedure as such. Patient had other co-morbid conditions like CLD with PTH with chronic renal failure and diabetes. All the patients were followed up for a period of 4-8 weeks after the procedure with USG-abdomen.

DISCUSSION

There have been several studies in the literature warning of serious, life-threatening complications related to conservative non-interventional treatment of pancreatic pseudocysts. We acknowledge the possibility of real life-threatening complications with pancreatic pseudocysts. Large pancreatic pseudocysts in particular were related with complications such as bleeding, rupture, abscess, or fistula. These large cysts over 5 cm and every cyst causing symptoms require treatment. Traditionally, pseudocysts requiring drainage have been managed surgically, either externally or internally.

Percutaneous catheter drainage under radiologic guidance is reported to be a valuable adjunct or alternative to operative pseudocyst management. It has been used with increased frequency over the past decade, but fistulous tract formation, infection, increased morbidity and mortality have been reported by the critics.

We prefer different modalities of internal pseudocyst drainage. Results of endoscopic drainage are generally good, with a technical success rate between 80 and 90% for trasmural pseudocystogastrostomy and pseudocystoduodenostomy and almost 85% for trans papillary methods.

Although drainage of pancreatic pseudocyst can be performed by endoscopic, surgical, and/or percutaneous means, only by using endoscopy do we have the potential to perform an effective internal drainage with a rapid recovery time and, in addition, provide the option of pancreatic duct drainage. While several reports have suggested similar success rates with open surgical drainage, it seems to be at the cost of higher mortality and morbidity rates.[27,28]

The exception to this may be patients with chronic pancreatitis and largely dilated ducts and communicating collections.[29] Success with laparoscopic pseudocyst drainage also has been described, but data still are limited because of a relatively small number of patients.[30] As mentioned earlier, excellent success rates have been reported with percutaneous drainage but these usually involve an extended period of external drainage and significant rates of pancreatic-cutaneous fistulas.[31,32] The success rate of endoscopic drainage of the necrosis was significantly lower when compared with other types of collections (25% versus 92.6%). Although Baron et al1 reported a higher complication rate with drainage of organized necrosis, they did not note such a dramatic difference in success rates.[33] This is perhaps a reflection of differences in timing, patient population, technique, or differences in definitions of necrosis and abscess. Baron et al describe drainage of collections that contain liquid and necrotic material that have matured at least 4 weeks, with a mean drainage time of 7weeks after the onset of acute pancreatitis.

We continue to believe that EUS enhances endoscopic pancreatic-fluid collection drainages by allowing visualization of vessels, improving localization of collections, and increasing the ability to puncture nonbulging or even distant collections.[7] On the other hand, therapeutic EUS endoscopes remain a little more difficult to use for large-stent insertion, because of slightly smaller therapeutic channels compared with therapeutic duodenoscopes.

CONCLUSION

In conclusion, endoscopic drainage of PFCs is an effective therapy with an acceptable complication rate. The choice of endoscopic therapeutic technique should be guided by characteristics of the collections and the patients. Given the disparity of results between drainage of other fluid collections and necrosis, drainage of the

latter should be performed in conjunction with surgical support and requires further evaluation to identify patients and techniques that will lead to optimal patient outcomes. Endoscopic drainage is safe and effective in experienced hand, less morbitidy, cost effective, short hospital stay, can be repeated.

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