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# Treatment of pancreatic pseudocysts in line with D'Egidio's classification

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## Abstract

**AIM:** To explore the implications of underlying diseases in treatment of pancreatic pseudocysts (PPC).

**METHODS:** Clinical data of 73 cases of pancreatic pseudocyst treated in a 12-year period were reviewed comprehensively. Pancreatic pseudocysts were classified according to the etiological criteria proposed by D'Egidio. The correlation between the etiological classification, measure of treatment and clinical outcome of the patients was analyzed.

**RESULTS:** According to the etiological criteria proposed by D'Egidio, 73 patients were divided into three groups. Group I was comprised of 37 patients with type I pseudocyst, percutaneous drainage was successful in the majority (9/11, 82%) while external or internal drainage was not satisfactory with a low success rate (8/16, 50%). Group II was comprised of 24 patients with type II pseudocyst, and internal drainage was curative for most of the cases (11/12, 92%), but the success rate of percutaneous or external drainage was unacceptably low (4/9, 44%). Group III consisted of 12 patients with type III pseudocyst. Internal drainage or pancreatic resection performed in 10 of these patients produced a curative rate of 80% (8/10) with the correction of the ductal pathology as a prerequisite.

**CONCLUSION:** The classification of pancreatic pseudocyst based on its underlying diseases is meaningful for its management. Awareness of the underlying diseases of pancreatic pseudocyst and detection of the ductal pathology in type II and III pancreatic pseudocysts with endoscopic retrograde cholangiopancreatography may help make better decisions of treatment to reduce the rate of complications and recurrence.

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**Key words:** Pancreatic pseudocysts; D'Egidio's classification

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## INTRODUCTION

Pancreatic pseudocyst is the most common complication of acute or chronic pancreatitis<sup>[1]</sup>. In an attempt to help decide the timing and choice of surgical intervention, several classifications have been proposed. According to the Atlanta classification<sup>[2]</sup>, an acute pseudocyst is a collection of pancreatic juice enclosed by a wall of fibrous or granulation tissue, arising as a consequence of acute pancreatitis or pancreatic trauma, whereas a chronic pseudocyst is a collection of pancreatic juice enclosed by a wall of fibrous or granulation tissue, arising as a consequence of chronic pancreatitis and lacking of an antecedent episode of acute pancreatitis. But in clinic, some pseudocysts are usually associated with chronic pancreatitis and may develop after an episode of acute pancreatitis. There is also a classification based entirely on pancreatic duct anatomy proposed by Nealon *et al*<sup>[3]</sup>. This system defines the categories of ductal abnormalities seen in patients with pseudocyst and relates the authors' experience with different types of treatment. The classification of pseudocysts proposed by D'Egidio *et al*<sup>[4]</sup> takes into account all the aspects mentioned above. They identified three distinct types of pseudocysts: Type I or acute "post-necrotic" pseudocysts that occur after an episode of acute pancreatitis and are associated with normal duct anatomy and rarely communicate with the pancreatic duct, Type II, or post-necrotic pseudocysts which occur after an episode of acute or chronic pancreatitis (the pancreatic duct is diseased but not strictured, and there is often a duct-pseudocyst communication) and Type III, defined as "retention" pseudocysts, which occur in chronic pancreatitis and are uniformly associated with duct stricture and pseudocyst-duct communication.

Based on a review of the literature and 12-year clinical experiences with 73 patients with pancreatic pseudocyst, we analyzed the correlation between the underlying diseases of pancreatic pseudocyst, methods of treatment and the clinical outcome of the patients.

## MATERIALS AND METHODS

### Clinical data

This study included 43 male and 30 female patients with pancreatic pseudocyst, whose age ranged from 16 to 78 years with an average age of 39 years. All patients were confirmed to have fibrous encapsulation on ultrasonography, computed tomography (CT) or at operation. Patients with acute peripancreatic fluid collection or without evidence of encapsulation were excluded<sup>[2-5]</sup>. According to their underlying diseases, the patients were divided into 3 groups on the basis of etiologic criteria for classification proposed by D'Egidio<sup>[4]</sup>. Group I consisted of 37 patients with D'Egidio type I pseudocyst, which occurred following an episode of acute pancreatitis in all cases. Patients were categorized as having acute pancreatitis on the clinical basis in conform to Atlanta criteria<sup>[2]</sup>. These patients having a clinical diagnosis of acute pancreatitis lacked of any of the findings typically seen in chronic pancreatitis. Endoscopic retrograde cholangiopancreatography (ERCP) or sinography was performed in 12 of these 37 patients, and no pancreatic

duct stricture was identified, only one patient was found to have cyst-duct communication. Group II was comprised of 24 patients with D'Egidio type II pancreatic pseudocyst, 12 of them had definable acute pancreatitis and 19 had various chronic pancreatitis. The diagnosis of chronic pancreatitis was established clinically<sup>[6,7]</sup>. Fifteen of these patients received ERCP or sinography, and were confirmed to have chronic pathological changes in the pancreatic duct. Confirmatory imaging of ERCP or sinogram in this group displayed a tortuously or irregularly dilated main pancreatic duct, calcification of pancreas, and no duct stricture. Seven of them were found to have cyst-ductal communication. Group III included 12 patients with chronic pancreatitis, and 8 of them received ERCP or sinography for confirmation of the diagnosis. The evidence for a diagnosis of chronic pancreatitis included structural abnormalities in the pancreas identifiable on the images, and a main pancreatic duct stricture and ductal irregularity, areas of dilation and narrowing (the sign of "chain of lakes").

**Table 1** Size of pseudocyst and anatomy of the pancreatic duct of patients

Group	Number of Patients (n)	Average size of cyst (cm)	Duct stricture <sup>1</sup>	Cyst-duct communication <sup>1</sup>
I	37	7.2 (2-23)	0/12	1/12
II	24	4.4 (2-12)	0/15	7/15
III	12	10.5 (5-25)	8/8	7/8

<sup>1</sup> The number before the slash indicates the number of cases receiving ERCP or sonogram, and that after the slash is the positive cases identified.

### Treatment

Patients were considered to be candidates for intervention (surgical or radiological) when they were diagnosed as having a pseudocyst 5 cm or greater in diameter with no sign of spontaneous resolution over a period of evaluation varying in length based on specific clinical criteria. Sixty patients were subjected to percutaneous catheter drainage or surgical therapy. The other patients were treated conservatively for relieving their symptoms. The decision to employ percutaneous or surgical drainage was made on the basis of the circumstances. Percutaneous drainage was applied to the patients whose pseudocysts arose as a consequence of acute pancreatitis and were superficial so that there was a suitable route for catheterization. All pseudocysts treated with percutaneous drainage were confirmed with low-density content in CT scan. Some patients were treated with percutaneous drainage because of an unacceptably high risk for surgical intervention. The other patients were treated surgically. The treatment approaches are listed in Table 2.

**Table 2** Treatment approaches for pancreatic pseudocysts

Group	Methods of treatment (n)			
	Percutaneous drainage	External drainage	Internal drainage	Distal pancreatectomy
I	11	10	6	0
II	5	4	10	2
III	0	2	5	5

### Following-up

After surgical or percutaneous management, patients were followed up regularly by ultrasound for 6 mo to 12 years with an average of 73 mo. Where feasible, follow-up CT scans were

performed to assess recurrence of pseudocyst. All patients were evaluated for complications and recurrence. For percutaneous management, patients who needed to cross over to surgical management were also evaluated.

## RESULTS

The incidence of complications in this patient cohort as a whole was 22% (13/60), with a recurrence rate of 12% (7/60) and a mortality rate of 1% (1/73).

### Group I

Twenty-seven of the 37 patients I received surgical interventions. Eleven patients were treated by percutaneous drainage for 4 to 24 d with an average of 11 d, and 2 of them experienced episodes of infections that were subsequently cured. Ten patients underwent surgical external drainage, and 2 of them developed pancreatic fistulae and another two had hemorrhage. All the 4 patients were cured by conservative treatment. Pseudocyst recurred in 2 of the remaining 6 patients who received surgical external drainage and were cured after cyst-jejunostomy. Six patients underwent surgical internal drainage, one of them experienced gastric hemorrhage that was cured by conservative treatment, and another developed fatal infections.

### Group II

Twenty-one patients were subjected to drainage or surgery, including two patients who were treated surgically after failure of conservative treatment. Five patients underwent percutaneous drainage, one of them developed pancreatic fistulae and was cured by conservative management, and two of them had recourse to surgery, during which cyst-jejunostomy was performed, after 30-d drainage when a cyst-duct communication was identified on the sinogram. Four patients underwent surgical external drainage, and one of them developed a pancreatic fistula that was cured eventually by conservative management, with another having recurrence cured by cyst-jejunostomy. Ten patients underwent surgical internal drainage, and only one of them had recurrence and received cyst-jejunostomy for the cure. The remaining two patients were cured with distal pancreatectomy plus cystectomy.

**Table 3** Rate of recurrence of pseudocyst and complications after treatment in 3 groups

Group	Methods of treatment			
	Percutaneous drainage	External drainage	Internal drainage	Distal pancreatectomy
I	2, 0	4, 2	2, 0	-, -
II	3, 0	1, 1	0, 1	0, 0
III	-, -	1, 1	0, 1	0, 1

In each pair of numbers listed in the table, the former indicates the number of patients who had complications, and the latter is the number of patients who had recurrence.

### Group III

Twelve patients were subjected to drainage or surgery. Two patients had surgical external drainage and pancreatic fistula occurred in one case to require cyst-jejunostomy and the other had recurrence to necessitate distal pancreatectomy. Five patients received surgical internal drainage, and one of them had pseudocyst recurrence and was cured by pancreatic resection. The remaining 5 patients had distal pancreatectomy plus cystectomy, one of them had recurrence probably attributable to pancreatic fistula and was cured by reoperation for pancreatic resection.

The complications and recurrence in this whole patient cohort are summarized in Table 3.

## DISCUSSION

A better definition of pseudocyst that clearly separates it from acute fluid collection, improvements in imaging modalities, and a better understanding of the natural course of pseudocysts have changed the concepts regarding their management. The old teaching that the presence of cysts of more than 6 cm in diameter for 6 wk should be drained is no longer true<sup>[8]</sup>. The outcome of pseudocysts, which either spontaneously resolve or require operation, and the rate of complications and recurrence, are similar regardless of the size (be it less than 6 cm in diameter or larger) and the course of disease<sup>[9-12]</sup>, for the etiology of pancreatitis is a more important determinant of the outcome rather than the size of pseudocyst or course of disease. The indications for drainage are now the presence of symptoms, enlargement of cysts, and complications (infection, hemorrhage, rupture, and obstruction)<sup>[8-13]</sup>. From our experience, D'Egidio type I pseudocyst has a greater chance of spontaneous resolution than the other types because of the normal anatomy of pancreatic duct retained in the former. As for D'Egidio types II and III pseudocysts, more active treatment measures should be taken for a smaller chance of spontaneous resolution due to the pathological changes in the pancreatic duct.

The therapeutic approaches currently available for pancreatic pseudocysts include percutaneous drainage, transendoscopic approach, and surgery. The choice of treatment depends on a number of factors, including the size, number, and location of the cysts, presence of communication of the cyst with the pancreatic duct, and presence of infections<sup>[8-15]</sup>. Although progress has been made with alternative methods such as endoscopic drainage through the contiguous intestine, through the transpapillary route, or using endoscopic ultrasound, a higher complication and recurrence rate was reported in some documents<sup>[16,17]</sup>. All patients in this cohort were treated with percutaneous and surgical approach. The present study also assessed the implications of the underlying diseases as well as pancreatic ductal anatomy in the choice of treatment for pancreatic pseudocysts.

D'Egidio type I pseudocysts occur after an episode of acute pancreatitis, characterized by a shorter disease course and a greater diameter of the pseudocyst, and the patients often have noticeable symptoms<sup>[18]</sup>, which requires intervention with drainage as soon as possible<sup>[19,20]</sup>. External drainage is effective for the pseudocysts without cyst-duct communication. We performed percutaneous drainage with catheter insertion under ultrasound guidance in 11 case of type I pseudocysts. A pigtail catheter greater than 8F gauge in size was left *in situ* until the drainage was completed, which was defined as the total volume of drainage less than 10 mL in 24 h. A sinogram was then taken through the catheter before its removal to exclude a persistent communication with the pancreatic duct. In four cases, the total volume of drainage in 24 h exceeded 1 000 mL, and we treated these patients with octreotide. The drainage was reduced after treatment. Simultaneously, we performed surgical external or internal drainage in 16 cases of type I pseudocyst, with a higher rate of complications or recurrence. We therefore suggest that percutaneous drainage should be performed primarily for D'Egidio type I pancreatic pseudocysts.

D'Egidio type II pseudocysts often occur after an episode of acute pancreatitis associated with chronic pancreatitis. Cyst-duct communication has been identified in about 40% of patients with this type of pseudocysts. The communication between the cyst and pancreatic duct results in a persistent pancreatic fistula. In some cases, the fistula can heal spontaneously after

external drainage<sup>[21]</sup>. But a considerable amount of pancreatic juice is lost in long-term of drainage, which leads to electrolyte and acid-base imbalance. In this cohort, percutaneous or surgical external drainage performed in 9 patients with type II pseudocysts resulted in pancreatic fistulae in 4 patients and recurrence in 1 patient. Another 12 patients with type II pseudocysts had surgical internal drainage or resection, and only one patient had recurrence, showing a lower rate of complications or recurrence in comparison with the patients receiving external drainage. Hence we suggest that patients with D'Egidio type II pseudocysts with a cyst-duct communication should be managed by surgical internal drainage or pancreatic resection in order to decrease the rate of complications or recurrence<sup>[22,23]</sup>. ERCP and other radiological imaging modalities should be used to better understand the anatomy of the pancreatic duct before treatment.

D'Egidio type III pseudocyst is thought to occur in chronic pancreatitis. Long-term infection of the pancreas results in stricture and even obstruction of the pancreatic duct, leading to rupture of the distal pancreatic duct, extravasation of the pancreatic juice, and subsequently pseudocyst formation. The chance for spontaneous healing of the cyst-duct communication is lower than that of other types of pseudocysts due to the fibrosis of pancreatic tissue as a result of infection<sup>[24,25]</sup>. Percutaneous drainage is therefore contraindicated<sup>[5,26-28]</sup> and surgical external drainage would also fail<sup>[3,13]</sup> because of the abnormal anatomy of pancreatic duct. We performed percutaneous drainage in two patients but neither of them was successful, and ten patients had surgical internal drainage or resection. All these patients were cured except for two who had recurrence but eventually cured by surgical correction of the pathological ductal anatomy. Judging from the results of this present study, it seems that simple drainage or cystectomy could lead to an unacceptably high rate of complications and recurrence<sup>[29-31]</sup>. We suggest that surgical maneuvers for this type of pseudocysts should address the specific ductal pathology in addition to complete drainage. Pancreatic resection or cyst-enterostomy plus ductal drainage should be more suitable for this type of pseudocysts.

In conclusion, the choice of treatment of pancreatic pseudocysts depends on a number of factors, including the size, number, and location of cysts, presence of complications, to name a few. But the etiology of pancreatitis is a more important determinant of the choice. The procedure of management should be individualized on the basis of a comprehensive evaluation of these factors. Percutaneous drainage is safe and effective for D'Egidio type I pseudocysts, while appropriate treatment for type II pseudocysts, should be chosen according to the pancreatic anatomy. Surgical internal drainage is adequate for patients with cyst-duct communication. In type III pancreatic pseudocysts, serious pathological changes are often present in the duct and surgical internal drainage or pancreatic resection is needed to address the ductal pathology.

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