

## Treatment of pancreatic pseudocysts by percutaneous drainage Review and personal experience

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### Abstract

Pseudocysts are serious complications of acute and chronic pancreatitis.

Asymptomatic pseudocysts require no specific treatment. Symptomatic pseudocysts can be decompressed by surgical, ultrasonographically and endoscopically guided methods. In the absence of randomised prospective trials it can not be stated that one of these techniques is superior to others. Ultrasonographic and endoscopic approaches should be confined to centres with particular expertise in these techniques. (*Acta gastroenterol. belg.*, 1998, 61, 164-168).

**Keywords** : pancreatic pseudocysts, review, treatment, percutaneous drainage.

### Review

Pseudocysts can occur in the course of acute and chronic pancreatitis and require a correct treatment. Nowadays several non-surgical therapies are available for this serious complication : still some controversies remain about the value of the different treatment modalities. The aim of this study is to review the literature and to describe our results of percutaneous drainage of pseudocysts.

Some **definitions** are important to determine the therapeutic strategy (1,2). *Acute pancreatitis* is an acute inflammatory process of the pancreas that may also involve peripancreatic tissues and/or remote organ systems. *Pancreatic necrosis* occurs when areas of non viable parenchyma are present. An *extrapancreatic fluid collection* means that pancreatic fluid extravasates out of the pancreas into the anterior pararenal space and sometimes also into other areas. A *pancreatic pseudocyst* is a collection of pancreatic juice enclosed by a non epithelialized wall that occurs as a result of acute pancreatitis, pancreatic trauma or chronic pancreatitis. It lacks an epithelial lining and persists for more than four weeks. An intra-abdominal collection of pus resulting from an episode of acute pancreatitis or pancreatic trauma is called a *pancreatic abscess*.

The **prevalence** of pseudocysts is often underestimated and occurs in 1 to 21% during the course of an acute pancreatitis (3). The most important causes are biliary causes and alcohol. In approximately 10% pseudocysts are multiple.

The **pathogenesis** of pseudocysts is important for a proposed classification. Pseudocysts are divided into two types : the postnecrotic pseudocyst and the reten-

tion pseudocyst (4). A *postnecrotic pseudocyst* occurs during the course of an acute pancreatitis (Type I) or during acute exacerbation of a chronic pancreatitis (Type II). It results from autodigestion with accumulation of pancreatic juice in the pancreas. Extravasation may also occur into the lesser sac or the peritoneum. A *retention pseudocyst* is related to ductal obstruction in chronic pancreatitis (Type III). There is an increased intraductal pressure that leads to a localized rupture of the pancreatic duct or ductules, with extravasation of pancreatic juice and subsequent pseudocyst formation (Table I).

**Symptoms** are variable : up to 85% complain about abdominal pain. Nausea and vomiting exist in up to 70%. Sometimes patients are asymptomatic even in the presence of a large pseudocyst ; they may be undetected until complications arise (eg. duodenal or biliary compression). In some cases there is a palpable mass (2).

**Natural history** : about 60% of the pseudocysts resolve spontaneously in about 4 to 6 weeks time. If the diameter of the cyst is less than 6 cm the risk of complications is very low (2,5,6). *Infection*, that occurs most often in postnecrotic pseudocysts, has a mortality from 5 up to 40%. It is not always easy to differentiate a surinfected pseudocyst from surinfection of necrosis within the pancreas : however the treatment is different. *Haemorrhage* occurs due to erosion of an arterial wall of a pseudoaneurysm within the cyst. Six to 8% of pseudocysts are complicated by haemorrhage. The bleeding mostly occurs into the cyst, in other cases into the abdominal cavity or surrounding organs or into the main pancreatic duct resulting in Wirsungorrhagia. In these situation an urgent ERCP and angiography with embolisation are needed. *Rupture of a pseudocyst* is mostly associated with postnecrotic pseudocysts. Rupture can occur intraperitoneally : it has a mortality of 80% when associated with hemoperitoneum and 15% if no hemoperitoneum is present. Pseudocysts can also rupture into the stomach, duodenum and the colon. *Trombosis of the spleno-portal vein* rarely occurs ; splenic thrombosis in chronic pancreatitis is in 50% due to a pseudocyst within the tail. Other complications are *fistulisation* (eg. pleura) and *compression of sur-*

Table I. — classification of pseudocysts

	Postnecrotic Type I	Postnecrotic Type II	Retention Type III
Presentation	acute	acute on chronic	chronic
Underlying disease	acute pancreatitis	chronic pancreatitis	chronic pancreatitis
Pseudocyst wall	immature/ mature	immature/ mature	mature
Location of pseudocyst	extrapancreatic	mostly extrapancreatic	mostly intrapancreatic
Communication duct	rare	sometimes	always
ERCP findings	normal duct	abnormal duct, but no stricture	ductal stricture

Table II. — Location of pseudocysts in acute pancreatitis (AP) and chronic pancreatitis (CP)

Location	Head		Body		Tail		Extra pancreatic	
	AP	CP	AP	CP	AP	CP	AP	CP
Frequency (%)	31	67,6	38	19,4	25	12,3	5	0,6
Size								
— Mean (mm)	37	40,3	72	65	48	64,2	35	60
— Range (mm)	10-95	7-120	20-200	10-180	20-100	10-110	20-55	

rounding organs (eg. duodenum which results in gastric outlet obstruction ; jaundice due to compression of the common bile duct).

The **diagnosis** can be made in three clinical stages of the disease : in the intial stage of an acute pancreatitis, in the further course of acute pancreatitis and in chronic pancreatitis. Most pseudocysts are localized in the head of the pancreas (Table II). On *ultrasound* a pseudocyst appears as a hypoechoic area. It can be connected with the main pancreatic duct or not. Sometimes it is filled with echogenic material (eg. blood, necrotic material) which can be a sign of complication. In a few cases doppler ultrasound leads to detection of a pseudoaneurysm within the cyst. This has important therapeutic consequences (eg. no percutaneous puncture). Signs of chronic pancreatitis can ultrasonographically be observed : lithiasis ; heterogeneity of the parenchyma, irregularity of the main duct,... In some cases extrapancreatic extension of a pseudocyst can be observed (eg. into wall of the stomach, into the spleen). *Echoendoscopy* is important in the diagnosis and in the therapeutic approach of pseudocysts (7). First of all, EUS allows detection small cysts, observed as echofree masses, and differentiation from dilated secondary channels. The appearance of internal echoes within the cyst may represent purulent material, blood cloths or necrotic debris. The wall is most often thin and smooth ; septations within a cyst are frequently visualised. Signs of the underlying disease can often be demonstrated such as chronic pancreatitis with obstructive pancreatic duct stones, stones with the common bile duct as aetiologic agent of acute pancreatitis complicated by pseudocyst formation, underlying pancreatic neoplasia, etc... The position of the cyst relative to adjacent organs can easily be determined. The thickness of the wall can be measured. Complications of pseu-

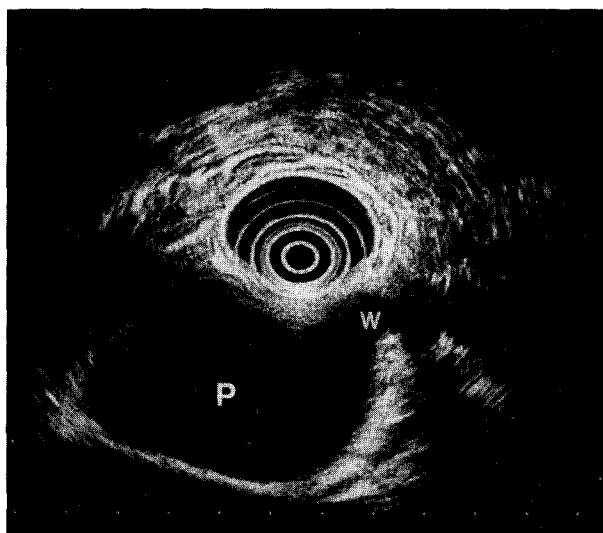


Fig. 1. — Echoendoscopic view of pseudocyst (P) communicating with the main pancreatic duct (W).

docysts such as bleeding can be observed. A connection of the cyst and the main pancreatic duct can sometimes be found (Fig. 1). All these data are important for the futher therapeutic approach. If endoscopic drainage of a cyst is considered, it must be preceded by EUS, in order to measure the distance between the cyst and the wall of the stomach or duodenum. This distance has to be less than 1 cm to avoid complications. The puncture place can also be chosen and marked by two small biopsies or injection of Indian ink through the biopsy channel. Recent EUS scopes (Pentax) have the opportunity to perform a guided drainage of the cyst (8). If the EUS scope (Pentax) has also doppler facility, EUS helps to avoid large vessels during puncture. *Spiral Ct scan* is essential for the diagnosis of

necrosis of the pancreas. *Small bowel radiographs* can be important for documenting small bowel obstruction. Using *endoscopic retrograde cholangiopancreatography* a possible connection of the cyst with the main pancreatic duct can be demonstrated (9,10). However this creates a risk of surinfection. Hence EUS or MRCP should first be used as imaging modalities for that purpose.

The **therapeutic approach** is sometimes difficult. It often depends on the available skills and material. Until now no *medical therapies* have proven to be beneficial in the treatment of pseudocysts. There are even no controlled studies about the benefit of somatostatine or octreotide, often used for that purpose (11,12). As previously mentioned, about 60% of pseudocysts resolve spontaneously. So a *conservative approach* can be advised if a patient has an uncomplicated pseudocyst with a diameter of less than 6 cm. To be sure that there is no infection, a single puncture under ultrasound guidance can be performed. If the cyst is infected drainage and antibiotic treatment are mandatory. If the cyst is not infected and remains unchanged or diminishes during the following 6 weeks conservative treatment can be continued. If the cyst enlarges or is complicated a more invasive approach has to be considered. If the diameter of the cyst is larger than 6 cm the probability of spontaneous resolution is very low and the risk of complications is high which means that those cysts should be drained early. *Surgery* will be performed if there is rupture with a haemoperitoneum ; if the cyst causes portal hypertension and other ways of treatment are contra-indicated ; if the pseudocyst is complicated by eg. hemorrhage or if the pseudocyst is responsible for biliary or antro-duodenal stenosis. The procedures that are performed are : cysto-gastroenterostomy, Roux-en Y-cysto-jejunostomy or distal pancreatectomy. It should be noticed that there is still a recurrence rate of 5 to 10%. The mortality of surgical intervention is generally under 5% but in case of fistula formation however the mortality rises to 10%. A good alternative to surgery is the *endoscopic approach* (13-17). If there is a connection between the cyst and the main pancreatic duct an endoscopic transpapillary cyst drainage can be proposed. This way of non-surgical treatment has a success rate of 66% ; there is however a high morbidity of 20% and a high recurrence rate of 33%. If the cyst is bulging into the stomach or into the duodenum a cysto-enterostomy can be proposed. An important condition to avoid serious complications is that the distance of cyst to the duodenal or gastric wall must be less than 1 cm. As previously mentioned, EUS is thus the examination of choice to measure this distance before considering endoscopic transgastric or transduodenal drainage. The success rate (90%) and the recurrence rate (10-20%) are similar to surgical approach. The complication rate is rather low (10%, essentially hemorrhagic complications), nevertheless there is a mortality rate of 3%.

Contra-indications for performing endoscopic treatment are hemorrhage in the pseudocyst, partial vascularisation of the pseudocyst wall and portal hypertension. *Percutaneous drainage* of the pseudocyst under ultrasound guidance is a minimally invasive technique not associated with mortality (18-21). A single puncture of the cyst under ultrasound guidance is only useful to exclude infection. After puncturing there will be recurrence of the cyst in up to 70% of the cases. In contrast, percutaneous catheter drainage has a success rate of 40-70% and a recurrence rate of 33%. The success rate depends on the selection of the patient : it is not useful to drain a pseudocyst communicating with an obstructed main pancreatic duct (type III pseudocysts). In these cases the recurrence rate will be near to 100%. Percutaneous drainage is also contra-indicated if EUS or doppler ultrasound visualizes large vessels close to the cyst. Furthermore, caution is mandatory if the pseudocyst is associated with considerable underlying necrosis of the rest of the pancreas (22-24). In this situation there is a high risk of surinfection ; in those patients surgery is indicated. The close association between infection and poor outcome in severe pancreatitis may hypothesize that antibiotic prophylaxis might reduce infection and so reduce mortality. However only few studies of good quality are published. If prophylaxis is chosen, a combination of a fluoroquinolone plus metronidazole or a monotherapy with a carbapenem antibiotic are the most appropriate (25-30). There are insufficient data to recommend the use of selective digestive decontamination (31). The morbidity of percutaneous drainage is 12% : mainly abdominal pain, discomfort, dislocation of the drain.

## Personal Experience

### Patients

The last two years pseudocysts of the pancreas were treated by percutaneous drainage in 13 patients (8 men, 5 women) ; mean age : 46.5 years (9-70 years). There were 7 type I pseudo cysts ; 6 type II and no type III pseudocysts. The cause of all the type II pseudocysts was alcoholic pancreatitis. In the patients with type I pseudocysts three developed during an episode of postoperative acute pancreatitis, one during biliary pancreatitis, one during the course of a posttraumatic pancreatitis, one during acute pancreatitis due to hyperlipemia and one in a case of pancreatitis of unknown origin.

### Methods

After local anesthesia with Xylocaine of the skin and subcutaneous tissue, a puncture is performed under ultrasound guidance into the pseudocyst. Depending on the kind of catheter (pigtail or balloon catheter), after removing the stylet, either the pigtail will get

rolled or the balloon inflated. The catheter is then connected with a drainage bag and fixed to the skin. Cultures are twice a week performed to detect surinfection. The position of the catheter is controlled every day. Complications to look for are : bleeding, infection, perforation. To diminish the risk of a surinfection a spiral CT scan should be performed prior to puncture in search for pancreatic necrosis. Necrosis can not be drained and gets easily infected.

Although no proven controlled studies are in favour of the use of somatostatine in pancreatic pseudocysts our patients were treated with a continuous intravenous infusion of 6 mg somatostatine a day during drainage.

**Results**

All pseudocysts were drained during 5 days up to 6 weeks. Ten pseudocysts healed by percutaneous drainage. One had early recurrence (less than one week). Three recurred after 10 days, 3 weeks and 5 weeks respectively. After 6 weeks of unsuccessful drainage another therapeutic approach was considered. Infection or surinfection occurred in seven patients : three mycotic infections and four bacterial infections, requiring an-

timycotics or antibiotics. Three patients who were not cured by drainage were operated upon : one died, in one the pseudocyst recurred after one year and in the third the operation was successful. After an unsuccessful percutaneous drainage of a pseudocyst in a young girl a successful endoscopic approach was considered without recurrence after two years (Table III).

**Discussion**

Our results confirm the usefulness of percutaneous drainage of pancreatic pseudocysts. The success rate in our group was thus 77%, the recurrence rate 40%, the overall healing rate without recurrence was 46%. In our series the morbidity was very limited and no mortality was observed.

Of the six patients that underwent surgery one patient died because of severe underlying infected necrosis. This patient should perhaps have had surgery as the first treatment. Only two pseudocysts recurred after one year. When comparing our results to those published by Barthet our success rate was higher but there was also a slightly higher recurrence rate in our group (Table IV) (18-19). A possible reason for this

**Table III. — Results of percutaneous drainage. F = female ; M = male ; D = percutaneous drainage during 5 days up to 6 weeks ; E = endoscopic drainage ; B = bacterial infection ; My = mycotic infection ; S = surgery ; recur. = recurrence ; inf. = infection ; ther.1 : first therapy ; ther.2 = second therapy ; d = days ; w = weeks ; y = years**

F/M	age (y)	type	alcohol	ther.1	inf.	healed	recur.	ther.2	recur.
F	61	I	—	D:3w	My	+	+:2d	S	—
F	70	I	—	D:3w	My	—	—	S	died
F	39	I	—	D:5d	—	+	—	—	—
F	9	I	—	D:2w	—	+	+:3w	E	—
M	42	I	—	D:5d	—	+	—	—	—
M	37	I	?	D:2w	B	+	+:5w	S	—
M	39	I	—	D:10d	—	+	—	—	—
F	43	II	+	D:5d	B	—	—	S	—
M	43	II	+	D:3w	B	+	+:10d	S	+:1y
M	69	II	+	D:3w	—	+	—	—	—
M	68	II	+	D:6w	B/My	+	—	—	—
M	40	II	+	D:7d	B	—	—	S	+:1y
M	45	II	+	E	—	+	+:1w	D:5d	—

**Table IV. — Literature data (18) for type I pseudocysts (n = 55) and (19) for chronic pancreatitis (n = 143). AP : acute pancreatitis ; CP : chronic pancreatitis. Recurrence was not mentioned in acute pancreatitis, nor was the secondary treatment in chronic pancreatitis**

	percutaneous puncture	percutaneous drainage	endoscopic cystostomy	surgery	ETCD
% patients (AP/CP)	58/32,8	20/6,3	27/49,6	29/44,5	4/10,5
morbidity % (AP/CP)	5/5,2	33/12,5	25/15,3	8/13,2	0/20
mortality % (AP/CP)	5/0	0/0	8/1,3	8/1,3	0/0
recurrence % (AP/CP)	/57	/33	/18	/10	/33
healing % (AP/CP)	66/33	60/40	86/72	100/72	50/30
secondary intervention	57%	20%	43%		50%

discrepancy is the use of somatostatine during drainage. However as already mentioned no controlled studies are available on this matter. The number of patients in the studies of Barthet is large, however only 9 patients with chronic pancreatitis and 11 patients with underlying acute pancreatitis were drained in a percutaneous way (18).

## Conclusion

Percutaneous drainage of a pancreatic pseudocyst is useful. However prior, to puncture the differential diagnosis has to be made between a pseudocyst, infected necrosis and pancreatic abscedation. Spiral Ct scan has a key role in the differentiation from underlying infected necrosis. Infection can be documented by a single percutaneous puncture. In the presence of infected necrosis and abscess surgical intervention is indicated.

If no underlying necrosis is demonstrated, the pseudocysts have to be classified as postnecrotic (Type I and II) or retention pseudocysts (Type III). Patients with type I pseudocysts can be treated by percutaneous drainage. The catheter must be left in place until the drainage has stopped, but no longer than 6 weeks. Repeatedly cultures must be performed in search for surinfection. In type II pseudocysts where EUS or MRCP or ERCP demonstrate signs of chronic pancreatitis without a significant stricture, percutaneous drainage can be helpful. However in one third of these patients a communication exists between the main pancreatic duct and the cyst : in these cases recurrence is likely. A type III pseudocyst is always associated with ductal strictures and communication between the cyst and the main pancreatic duct. In these cases neither percutaneous drainage nor external surgical drainage is indicated because the nearly 100% risk of recurrence.

In our study somatostatine could have slightly affected the results in a positive way. However the role of somatostatine is not proven in controlled studies.

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