

Pancreatic Pseudocysts in Chronic Pancreatitis. Surgical or Interventional Drainage?



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Introduction

Incidentally a pseudocyst may develop due to blunt or penetrating abdominal trauma, but in the majority of patients the pseudocyst occurs in the course of acute or chronic pancreatitis. In acute pancreatitis pseudocysts are the result of extravasation of enzyme-rich fluid into the parenchyma or surrounding structures. In chronic pancreatitis pseudocysts develop in 30-40% of the patients, as a result of pancreatic duct obstruction by stones, strictures or protein plugs, leading to increased intraductal pressure that can be followed by disruption of the pancreatic duct (1-4). An inflammatory reaction gives rise to a fibrous wall that encapsulates the extravasated fluid. Typically, the wall of a pseudocyst lacks an epithelial lining (5). Pseudocysts in patients with chronic pancreatitis behave differently from those following an attack of acute pancreatitis and the management of these cysts is different, in particular since the introduction of non-operative drainage techniques. This overview will focus on pseudocysts developing in patients with chronic pancreatitis. Diagnostic work-up, the natural course of (chronic) pseudocysts and the various treatment options will be addressed.

Diagnosis

The reported incidence of pseudocysts has increased during the past decades, most likely due to the rapid expansion of advanced radiological diagnostic techniques (6). Ultrasonography is non-invasive and the least costly method to demonstrate a cystic lesion with a reported sensitivity of 75-90% (7). Ultrasound investigation seems therefore in particular useful for follow-up of a known pseudocyst in time. But CT scanning has a higher sensitivity

Abstract

Pseudocyst formation is a well-known complication of acute and chronic pancreatitis. Many pseudocysts are asymptomatic and may resolve without intervention. For a symptomatic pseudocyst drainage is indicated. Although surgical cystoenterostomy has been the treatment of choice for many years, recently invasive but non-operative treatment methods have challenged surgical drainage as the standard therapy for pancreatic pseudocysts. Both the method as well as the timing of intervention has become a matter of debate. Percutaneous catheter drainage and endoscopic drainage have proven beneficial in the treatment of pseudocysts, although long-term outcome remains to be awaited. Resolution rates after surgical and non-surgical methods are comparable, but clinical and technical aspects may mandate either method. Each patient requires an individual, multidisciplinary approach, thereby obtaining optimal treatment-outcome.

Key words: Chronic pancreatitis, pseudocysts, treatment.

Riassunto

PSEUDOCISTI PANCREATICHE NELLA PANCREATITE CRONICA. INTERVENTO CHIRURGICO O DRENAGGIO

La formazione di pseudocisti è una ben nota complicazione delle pancreatiti acute e croniche. Molte pseudocisti sono asintomatiche e possono risolversi senza ricorso alla terapia chirurgica. Per le cisti sintomatiche esiste indicazione al drenaggio. Anche se la cistoenterostomia chirurgica è stata l'intervento di scelta per molti anni, recentemente hanno preso piede alcune tecniche non invasive che si sono poste come alternativa alle tecniche chirurgiche standard per il trattamento delle pseudocisti pancreatiche. Entrambi i metodi così come il timing dell'intervento sono stati materia di dibattito. Il catetere percutaneo di drenaggio e il drenaggio endoscopico hanno dimostrato di fornire benefici nel trattamento delle pseudocisti anche se non sono disponibili dati sui risultati a lungo termine. La percentuale di successo della tecnica chirurgica e dei metodi non chirurgici sono sovrapponibili, tuttavia gli aspetti clinici e tecnici mettono in discussione entrambi i metodi. Pertanto il paziente richiede un approccio individuale multidisciplinare al fine di porre l'indicazione al trattamento ottimale.

Parole chiave: Pancreatite cronica, pseudocisti, trattamento.

(90-100%) to demonstrate a cyst and also provides more accurately information on other important factors determining the treatment strategy (6). The size of the pseudocyst can be measured and the number and exact location of the cysts can be established. Also the surrounding anatomy, the maturity of the cyst wall and secondary complications (bleeding, infection, obstruction), or involvement of adjacent structures (spleen, liver, vessels, urinary tract) can be visualised. CT scan may reveal other pathology, such as pancreatic carcinoma or a cystic neoplasm. A CT-guided puncture may support the final diagnosis and if indicated a drain may be positioned via the initial puncture tract for prolonged external drainage.

ERCP provides valuable information about the ductal anatomy and possible communication of the pseudocyst with the pancreatic duct. It thus can contribute to plan the appropriate intervention (3). Also ERCP can offer the possibility for endoscopic treatment of concomitant abnormalities, such as removal of pancreatic stones, dilatation of strictures or drainage of fistulas, and the treatment of concomitant biliary obstruction during the same session (8). It was reported in a randomised study that preoperative ERCP changed the management in more than half of the patients with pancreatic pseudocysts[?]. Unfortunately ERCP carries the risk of secondary infection of the pseudocyst and therefore broad-spectrum antibiotic coverage is indicated (9, 10).

MRCP has come to use more recently and probably plays an important role in the future especially in the identification of the local anatomy of the pancreatic duct

and the cyst, and potentially will replace ERCP. The incidence of infections and other complications after invasive diagnostic procedures might decrease. The early results of MRCP are encouraging (Figure 1), but results of comparative studies should be awaited (11).

Natural history

Until recently the presence of a persisting, asymptomatic pseudocyst, with a mature wall, larger than 6 cm. in diameter, was considered to be a clear indication for intervention (12). Although patients with pseudocysts present for less than 6 weeks could be managed expectantly (40% spontaneous resolution, only 20% secondary complications), after 12 weeks no pseudocyst resolved, and complications occurred in 67% of the patients. At that time, using these criteria, the morbidity after surgery was reported to be 10-30% and mortality 5-10% (12).

More recent studies have demonstrated the safety of an expectant policy. In a series of 75 consecutive patients with pancreatic pseudocysts, of whom 39 patients had chronic and 36 patients had acute pancreatitis, 48% were managed expectantly: 60% of the cysts resolved completely and the remaining 40% had decreased in size and were asymptomatic after 1 year of follow-up (4). Secondary complications occurred in 11% of the patients. The location of the cyst, multiplicity and thickness of the cyst-wall were not different in both the expectant and the surgical group. The size of the pseudocyst correlated with the resolution rate: 40% of the lesions smaller than 6 cm. in diameter required intervention, versus 67% of the cysts larger than 6 cm. However, even 27% of giant cysts (> 10 cm.) resolved spontaneously (4). Similar results were reported by others who found spontaneous resolution in 63% of 68 expectantly managed consecutive patients, respectively 83% for smaller cysts (< 5 cm.) versus 50% for larger cysts (> 5 cm.). Again few cyst-related complications occurred (9%), and in that series 38% of the pseudocysts resolved even later than 6 months (13).

Management

A pseudocyst, as a space-occupying lesion, may cause symptoms such as abdominal pain (90%), nausea and vomiting (65%) and weight loss (30%) (14). Treatment options consist of percutaneous catheter drainage (PCD), endoscopic drainage and surgical treatment. The choice of intervention depends on the location of the pseudocyst, size, maturity, number, anatomic relations, content of the cyst, ductal pathology, and the presence of secondary complications such as haemorrhage or infection (2, 15, 16). It is believed that the longer a pseudocyst remains or in case of enlargement, the higher the risk of complications and the lower the chances for spontaneous regression (4).

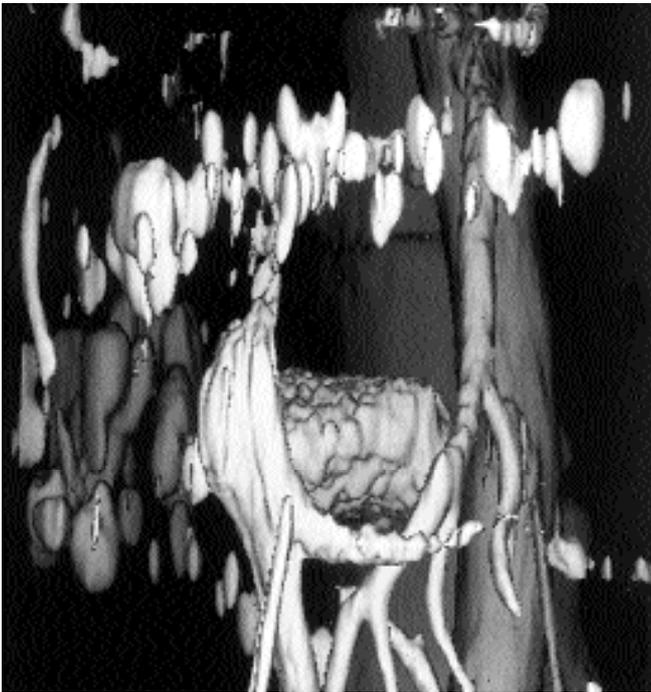


Fig. 1: MRCP of a patient with chronic pancreatic and a pseudoaneurysm in the head of the gland, surrounded by the pancreatic duct (above), the superior mesenteric artery originating from the aorta (left) and the duodenum (right).

Percutaneous catheter drainage

Indications: The indications for PCD are the same as for surgical drainage: persistent pain, sepsis, increasing size, CBD obstruction, involvement of other structures. PCD is especially successful in pseudocysts with an immature wall, as in case of infection or in acute pseudocysts, but is no option when the cyst cavity contains necrotic tissue leading to insufficient debridement. When the pseudocyst communicates with the pancreatic duct catheter drainage should probably be avoided, because drainage may be prolonged and a pancreatic fistula may develop (15, 17). Also in case of a downstream pancreatic duct stenosis the risk of fistula formation is high (18). Thus, only when the pseudocyst does not communicate with the pancreatic duct, percutaneous catheter drainage should be considered as a therapeutic option. It is questionable whether a cyst with a mature wall can be managed by percutaneous drainage, although in a large series maturity and thickness of the wall were not indications for or against percutaneous drainage (19). In critically ill patients percutaneous catheter drainage is clearly useful as initial treatment to guide later surgical exploration.

Technique: In percutaneous drainage a catheter is placed in the cyst cavity using the initial puncture needle. The size of the catheter is selected on basis of viscosity of fluid (varying from 8 French for clear fluid to 24 French or a sump-drain for pus and debris). Once the catheter is in place, the contents of the cavity are evacuated by aspiration and a small amount of contrast medium is injected to confirm the catheter position and to detect fistulous connections with other organs. The catheter is fixed by a suture and the drain is connected with a low-positioned plastic bag. The cyst cavity may be irrigated with sterile saline two to four times daily, with a volume of 25% of the volume of the collection. After 7-10 days of drainage a follow-up CT scan and contrast study is performed. In case of decrease of the cyst size, the catheter is changed for a smaller one; did the cyst increase however, a bigger catheter may be placed or more catheters inserted. The finding of a viscous or solid content dictates replacement of the initial catheter with a larger sump drain. Along the course of irrigation of the cyst, a decreasing output should lead to step-wise catheter withdrawal (Figure 2) (20).

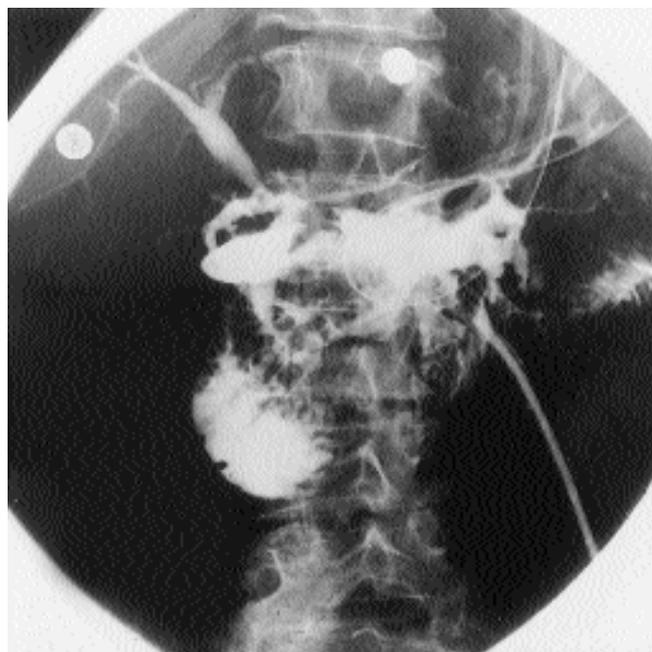


Fig. 2: Percutaneous drainage of a pancreatic pseudocyst that developed during an attack of acute pancreatitis.

Percutaneous catheter drainage may be performed either transperitoneal, or transgastric, or transhepatic. A transperitoneal approach remains first choice since it avoids puncture of solid or hollow organs (19, 20). However, a cyst located in the lesser sac or retrogastrically will require a transhepatic or transgastric approach. Transenteric drainage, similar to surgical cystoenterostomy, seems promising, however, no published series reports superiority and this technique is more demanding.

Complications: Percutaneous catheter drainage may be necessary between 20-60 days until complete resolution is achieved. Complications consist of infection of the drain tract in almost 50% of the patients and fistula formation (21).

Results: Success rates of percutaneous catheter drainage from series in the literature are listed in Table I. The listed series describe consecutive patients with pseudocysts, chronic *and* acute; series concerning only acute pseudocysts are excluded.

Tab. I – RESULTS OF PERCUTANEOUS CATHETER DRAINAGE OF CHRONIC (AND ACUTE) PANCREATIC PSEUDOCYSTS

	<i>N</i>	<i>resolution</i> (%)	<i>drainage time</i> (mean days)	<i>complications</i> (%)	<i>recurrence</i> (%)	<i>follow-up</i> (mean months)
vanSonnenberg (1989) (19)	77	90	20 (3-102)	13%	12	26 (5-54)
Grosso (1989) (22)	40	65	22	6%	27	27
Andersson (1989) (23)	22	86	1-7 (range)	0	NM	5 (1-18)

* Series concerning only acute pseudocysts are excluded.

*NM: not mentioned

Endoscopic pseudocyst treatment

Indications: In most patients the primary indication for endoscopic drainage of a pseudocyst is to relieve pain, or to treat biliary / duodenal obstruction by the cyst. In some centres endoscopy is preserved for those patients too ill for surgery, whereas in others it is a first choice procedure. Prerequisites for endoscopic transmural drainage are bulging of the cyst into the lumen, a close anatomical relationship between pseudocyst and gastric or bowel wall (< 10 mm), and exclusion of stomach varices (24-26). A pseudocyst located in the head of the pancreas, bulging into the duodenum, can be treated by endoscopic cystoduodenostomy. Pseudocysts located in the body or tail of the gland require transgastric drainage. Transpapillary drainage is indicated when the pseudocyst communicates with the pancreatic duct (i.e. in 50% of the patients), but pseudocysts located in the tail of the pancreas often require transgastric drainage anyway.

Technique: Endoscopic drainage of a pseudocyst may be performed via the stomach, the duodenum or transpapillary, generally under antibiotic prophylaxis. In cystoenterostomy, a diathermic pre-cut needle is used for a small incision in the gastric or duodenal wall at the site of the maximum impression. After obtaining access to the pseudocyst, the needle is removed from the catheter of the needle knife papillotome and contrast medium is injected to confirm correct positioning of the catheter. Subsequently, a guide wire is inserted through the catheter and a single, straight, Amsterdam-type polyethylene stent with multiple side-holes (7 or 10 French) is inserted over the catheter into the pseudocyst (Figure 3). In transpapillary drainage a guidewire is inserted into the main pancreatic duct, mostly after papillotomy, and is positioned beyond or into the cyst. A stent is inserted over the guidewire and left in situ for around 3 months (24). Whether the tip of the endoprosthesis should be in or beyond the cyst cavity remains controversial (27, 28).

Complications: The main complications reported after endoscopic drainage are haemorrhage, due to injury of intervening (gastric) vessels, or perforation (17, 29). Other

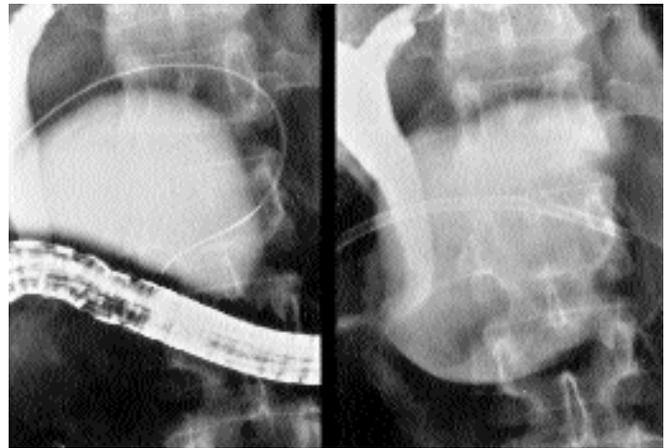


Fig. 3: A guide-wire is inserted through the duodenal wall into the chronic pseudocyst (left), and subsequently an endoprosthesis is positioned in the cyst cavity (right).

complications consist of post-ERCP-pancreatitis (5%), migration or clogging of the stent (seldom), or secondary infection of the cyst (3-6%) (8, 17, 27, 28). Another important long-term complication is stent induced ductal strictures, reported in 2% (17, 27, 30).

Results: The results of endoscopic treatment of symptomatic pseudocysts are listed in Table II. Endoscopic drainage is initially successful in 60-95% of patients, but long-term success rates are still lacking. Combined procedures of transgastric and transpapillary drainage of one cyst do not improve the resolution rate (27).

Surgical treatment of pseudocysts

Surgical management of symptomatic pseudocysts consists of internal drainage (cystoenterostomy), external drainage or resection.

Cystoenterostomy

Indications: Depending on the localisation, multiplicity

Tab. II – RESULTS OF ENDOSCOPIC DRAINAGE OF CHRONIC PANCREATIC PSEUDOCYSTS

	<i>N</i>	<i>resolution (%)</i>	<i>complications (%)</i>	<i>recurrence (%)</i>	<i>follow-up (mean days)</i>
Cremer (1989) (25)	33	82	6	12	31
Grimm (1989) (31)	18	88	13	0	19
Dohmoto (1992) (32)	19	94	0	0	5-40 (range)
Kozarek (1991) (33)	18	61	11	6	16 (median)
Benjanin (1993) (34)	22	86	18	18	33
Smits (1995) (24)	37	65	16	16	32 (3-127)
Beckingham (1999) (35)	20	75	NM	0	46 (median)

* NM: not mentioned

and concomitant morphological changes, a cystogastrostomy, cystoduodenostomy or cystojejunostomy may be performed, or a pancreatico-cysto-jejunosomy.

Technique: Internal drainage of a pseudocyst may be performed via cystogastrostomy, cystoduodenostomy or Roux-en-Y cystojejunostomy. In cystogastrostomy and cystoduodenostomy an incision is made in the anterior gastric or duodenal wall respectively, corresponding to the location of the cyst (on palpation). The cyst is aspirated and, with the needle in situ, an incision is made in the posterior gastric / duodenal wall including the cyst wall. The cyst wall is sutured to the posterior gastric / duodenal wall with a running one layer suture (3/0 prolene) to minimalise the risk of haemorrhage, after which the anterior incision is closed. In cystojejunostomy the cyst is anastomosed with a defunctionalised Roux-en-Y limb. A laparoscopic equivalent of the open internal drainage has proven successful (36). To avoid contamination of the abdominal cavity laparoscopic intraluminal cystogastrostomy (by insufflating the gastric cavity) has been suggested (37).

Complications: Morbidity and mortality have decreased over the past years. Internal drainage carries the lowest risk of morbidity and mortality of all surgical procedures, although this is partially due to patient selection (29).

Results: In our series of 43 patients operated between 1984 and 1994 all pseudocysts resolved after internal surgical drainage, with low morbidity (16%) and no mortality. The median hospital stay was 11 days and during long-term follow-up (mean 7.3 years) three recurrences occurred (8). These findings are in accordance with other series, reporting resolution rates between 70-90% and recurrences in 5-10% of the patients (Table III).

External drainage

Indications: External drainage is reserved for those patients in whom the cyst wall is not firm enough to make a safe anastomosis. In patients with a chronic pseudocyst external drainage may be indicated for infected cysts.

Technique: Surgical external drainage is generally performed by placing a large tube in the cyst lumen, brought out through the abdominal wall.

Complications: Postoperative pancreaticocutaneous fistulas along the drain tract develop in 20-40% of the patients after external drainage of infected pseudocysts (42, 43). Internal fistulas may develop due to erosion of the colonic wall by the catheter. When conservative treatment methods are followed (no oral intake, high-dose pancreatic enzymes or octreotide) most external fistulas will resolve spontaneously, although this may take several months. When the fistula production is associated with a downstream pancreatic duct stenosis, spontaneous resolution of the fistula is unlikely to occur, and additional treatment (endoscopic or surgical duct drainage) may be required (42, 43).

The mortality of external pseudocyst drainage is around 10% (44), partly due to the poor preoperative condition of the patients.

Results: The resolution rate of pseudocysts drained externally is satisfactory, although recurrent or persisting cysts may require additional, elective procedures during follow-up in about one third of the patients (43).

Resection

Indications: Resection is reserved for recurrent or multiple cysts and in particular for cysts located in the tail of the pancreas. In case of concomitant ductal dilatation a pancreatico-cysto-jejunosomy can be created. Doubt about the nature of the cyst (suspicion of cystadenocarcinoma) is an important indication to perform resection as the primary treatment.

Technique: After laparotomy part of the pancreas is mobilised and transected just proximal to the pseudocyst. Depending on the anatomical relations with the spleen or splenic vessels a concomitant splenectomy may be necessary. The stump of the pancreas may be closed or anastomosed end-to-side with a blind jejunal loop to

Tab. III – RESULTS OF SURGICAL INTERNAL DRAINAGE OF CHRONIC PSEUDOCYSTS

		<i>complications</i>		<i>mortality</i>	<i>recurrence</i>	<i>follow-up</i>
	<i>N</i>	<i>(%)</i>	<i>(%)</i>	<i>(%)</i>	<i>(%)</i>	<i>(months)</i>
Shatney (1979) (39)	117	38	13	17	NM	NM
Warsaw (1985) (40)	19	NM	0	NM	NM	NM
Vitas (1992) (13)	26	19	0	12	40 (mean)	
Boerma (1996) (38)	43	14	0	8	88 (mean)	
Spivak (1998) (41)	21	29	0	13	36 (median)	

* NM: not mentioned

prevent leakage, in particular in case of a distal stenosis in the duct. A pancreaticoduodenectomy is performed in case of a pseudocyst in the head of the pancreas.

Complications: Morbidity and mortality have decreased (15% and < 5% resp.) and recurrence rates are low. However, resection of pancreatic parenchyma may result in pancreatic insufficiency.

Results: The results of resection of pseudocyst in terms of cyst-related symptoms are good, since the cyst is removed.

Complications

Complications of a pseudocyst may produce symptoms and sometimes require urgent intervention.

Rupture

When a pseudocyst ruptures into the GI-tract or into the pancreatic duct, prior symptoms may decrease and although temporary melena or hematemesis may occur due to bleeding, the patient will improve without intervention. Rupture may also lead to massive peritonitis when into the free abdomen, or to fistula formation with GI-structures, the pleural cavity or the mediastinum. Urgent surgical intervention is mandatory in such cases. In most patients external drainage and peritoneal lavage will be performed. Incidentally an anastomosis can be created and internal drainage can be performed.

Infection

Secondary infection of a chronic pseudocyst may occur spontaneously or may be iatrogenic after manipulations to the cyst, in particular after ERCP or interventional drainage procedures. The patient becomes septic, with high fever and tachycardia and urgent treatment is required. Endoscopic drainage probably plays a limited role in the treatment of infected pseudocysts, due to inadequate drainage and consequently a high risk of rupture of the cyst, resulting in life-threatening complications (generally peritonitis). Percutaneous catheter drainage has been reported to be highly effective, with success-rates of 90% and recurrence rates of around 10%. External surgical drainage may be necessary to evacuate necrotic debris. To avoid fistula formation surgical internal drainage can be performed safely when the cyst has a firm wall and is adjacent to a hollow organ, as shown in a recent series from our hospital (43).

Haemorrhage

Haemorrhage into the cyst cavity is a rare but extremely

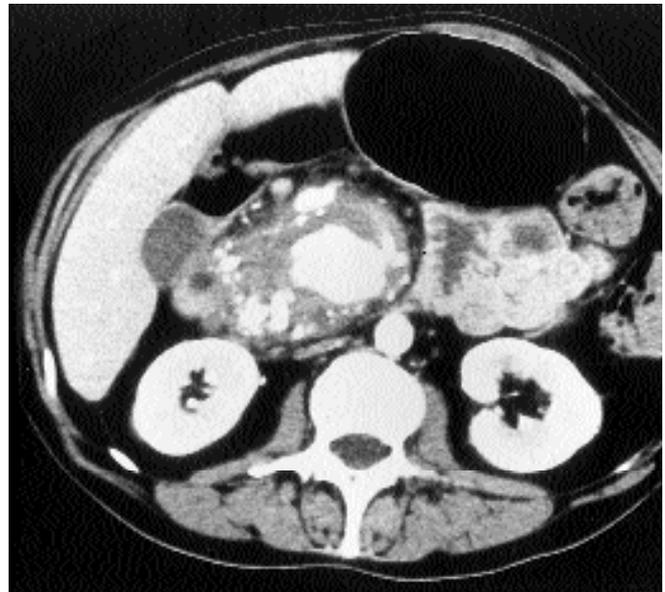


Fig. 4: A contrast enhanced CT-scan of a pseudoaneurysm in the pancreatic head, with active bleeding from the gastroduodenal artery in the cyst cavity.

serious complication (45-47). It is important to have a detailed diagnosis of the localisation of the bleeding before intervention is undertaken. Due to erosion of surrounding arteries in the inflamed cyst wall, such as the splenic, the gastroduodenal or the pancreaticoduodenal artery, profuse bleeding into the cavity may occur (Figure 4). The patient becomes painful due to rapid enlargement and a hypovolemic shock is often seen. Treatment consists of embolisation to control haemorrhage and in a second phase resection or drainage of the cyst. Surgical ligation of the artery and subsequent drainage or excision is an alternative. Overall mortality rates are high (46).

Biliary obstruction

Obstruction of biliary tract by a pseudocyst located in the head of the pancreas may be revealed by jaundice and discoloured stools and occurs in \pm 10% of the patients (16). Several treatment options are available. An endoprosthesis may be inserted into the CBD until resolution of the cyst is achieved, or the cyst itself may be drained, also in case of duodenal obstruction.

Venous obstruction

A pseudocyst may comprise the splenic or portal vein, resulting in variceal bleeding. Differential diagnosis consists of segmental portal hypertension due to chronic pancreatitis, requiring a pancreatic tail resection.

Suspicion of neoplasm

A newly formed cystic lesion, in particularly without a previous history of pancreatitis, should be suspected for malignancy or malignant potential until proven otherwise. Radiological imaging with puncture and cyst fluid analysis may be helpful, but has not proven to be sensitive and specific. When in doubt, resection of the lesion is indicated (48-50).

Conclusion

With the increasing experience on less invasive treatment methods for chronic pancreatic pseudocyst, the discussion on whether, when and how to drain a cyst has revived. Whether intervention is indicated depends on the chance of resolution. Size, chronicity, multiplicity, enlargement, aetiology or communication with the duct are believed to be decisive factors. Based on the present experience it seems that many patients can be safely managed expectantly, with careful clinical and radiographic follow-up. Percutaneous catheter drainage seems mainly effective in infected pseudocyst with a friable wall, or to immediately relieve clinical symptoms. In the treatment of chronic pseudocysts PCD is often not a definitive procedure. Endoscopic drainage may be performed when no more than 1 cm of tissue remains between the cyst cavity and the enteral lumen, and intervening vessels have been excluded. After endoscopic drainage, in contrast to the percutaneous approach, drainage is internalised and pancreatic fistula formation is avoided. Non-surgical drainage methods do not preclude further surgical treatment and long-term success rates are still lacking. One should realise that failed endoscopic or percutaneous treatment leads to more infectious complications of the subsequent surgical intervention, and the time between diagnosis and resolution is prolonged (21). Early postoperative complications have decreased in the past decades but long-term complications such as pancreatic insufficiency must not be overlooked. An important drawback of non-surgical drainage may be the lack of histology. Pre-interventional fluid analysis can be helpful but is not satisfactorily sensitive, as has extensively been discussed (48-50).

Decision on operative or non-operative management remains a controversial issue in the treatment of symptomatic pseudocysts. Increasingly important in the management of pancreatic pseudocysts is, also depending on the local expertise, a multidisciplinary approach towards each individual patient.

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