Only few severe complications after endoscopic ultrasound guided drainage of pancreatic pseudocysts

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ABSTRACT

INTRODUCTION: Pancreatic pseudocysts arise as a complication to acute or chronic pancreatitis. Transmural drainage under guidance of endoscopic ultrasound (EUS) is a minimally invasive approach. The results of a case series was retrospectively reviewed with a mean follow-up of 441 days.

MATERIAL AND METHODS: Twenty-two consecutive patients (mean age 51 years, 13 men) who had undergone EUS-guided drainage of pancreatic pseudocysts were included between December 2005 and August 2010. The mean cyst size was 8.1 cm. One or two 10 Fr. double pigtail stents were inserted into the pseudocyst from either the stomach or the duodenum.

RESULTS: Insertion of a stent failed in three of 22 patients. Two cases were discontinued due to technical difficulties. One procedure was converted to a surgical cystogastrostomy. In 19 patients, a stent was successfully inserted. Three developed symptomatic recurrences due to stent malfunction. One developed a pseudocyst that mechanically obstructed the common bile duct. One developed a malignant cyst. One had a surgical cystogastrostomy for reasons unrelated to the stent insertion. For 13 patients (59%), a single endoscopic treatment resulted in relief of symptoms and resolution of the pseudocysts. However, one of these subsequently developed an asymptomatic pseudocyst.

CONCLUSION: EUS-guided endoscopy has only few severe complications and long-term results are acceptable. Nevertheless, insertion can be technically challenging and stent-related complications may cause recurrence.

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A pancreatic pseudocyst (PPC) is a localized collection of amylase-rich fluid situated within or adjacent to the pancreas enclosed by a non-epithelial wall. A PPC may develop as a consequence of pancreatic inflammation or injury.

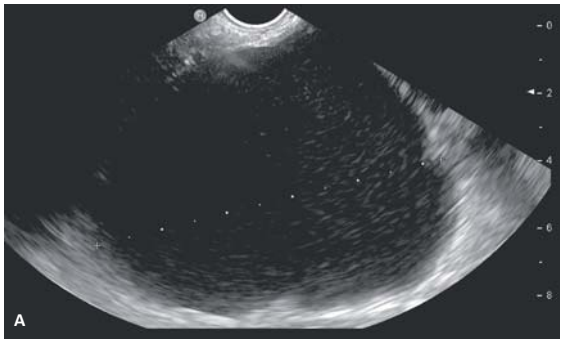
Most pseudocysts are asymptomatic and resolve spontaneously. Treatment is required only in cases of persisting PPCs causing symptoms such as abdominal pain, infection or compression into the gastrointestinal tract, pancreatic duct or the common bile duct. Management of pancreatic pseudocysts has traditionally been surgical open internal drainage. Open surgery, however, is associated with complications and mortality [1].

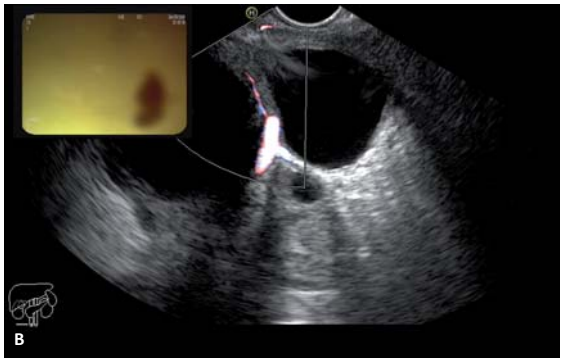
Endoscopic drainage is a minimally invasive alternative which may be performed by a trans-papillary or a trans-mural approach. Drainage of the cyst fluid by the trans-mural approach is achieved by inserting a stent between the pseudocyst and the gastric lumen (cystogastrostomy) or between the pseudocyst and the duodenal lumen (cystoduodenostomy). The drainage procedure may either be performed by endoscopy as a "semi-blind" procedure, if an impression caused by the cyst is present. Alternatively, it may be guided by endoscopic ultrasonography (EUS). The latter method is believed to be less risky since damage to interposed vessels can be avoided during the creation of the fistula tract between the cyst and the gut lumen.

The aim of the present retrospective study was to evaluate the technical success and long-term clinical outcome in patients with symptomatic PPCs treated by EUS-guided transmural drainage.

MATERIAL AND METHODS

The inclusion period of this study covered the period from December 2005 to August 2010. In this period,





A. Endoscopic ultrasound image of a 10 cm pseudocyst in the tail of the pancreas. Note the short distance between the transducer and cyst. **B.** Endoscopic ultrasound image of two pseudocysts with colour Doppler examination showing a significant vessel separating the two cysts. The corresponding endoscopic picture in A is also seen in the upper left corner.

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TABLE 1

Demographic data of patients scheduled for endoscopic ultrasound-guided cystoenterostomy.

Patients, n	22
Male/female, n	13/9
Age, mean (range), years	51 (23-73)
Aetiology of PPC, n (%)	
Alcoholic pancreatitis	9 (41)
Gallstone	9 (41)
Idiopathic pancreatitis	2 (9)
Traumatic pancreatitis	1 (5)
Pancreas divisum	1 (5)
Health status, n (%)	
ASA 1	7 (23)
ASA 2	13 (59)
ASA 3	2 (9)
Location of PPC, n (%)	
Pancreatic head	4 (18)
Pancreatic body	6 (27)
Pancreatic tail	6 (27)
Behind the stomach	3 (14)
Adjacent to the liver	1 (5)
Not reported	2 (9)
Symptoms caused by the PPC, n (%)	
Vomiting and abdominal pain	4 (18)
Vomiting	2 (9)
Abdominal pain	16 (82)

ASA = American Society of Anesthesiologists.
PPC = pancreatic pseudocyst.

EUS-guided transmural drainage of pseudocysts was performed in 22 consecutive patients at Gentofte Hospital. Demographic patient data are displayed in **Table 1**.

All patients suffered from symptomatic pseudocysts. In 15 patients, percutaneous drainage had been performed once prior to referral. In three additional patients, percutaneous drainage had been performed two or more times. In all of these 18 patients, the PPC had recurred. Six of the patients had an infected PPC on the day of endoscopic treatment. A PPC was evaluated and reported by the endoscopist as being infected based on observation of pus or sediment. Five patients had more than one cyst. In these patients, only the largest cyst was drained. The records did not facilitate assessment of possible communications between plural cysts.

The sequence of individual procedural steps may be delineated as follows:

- The ultrasound endoscope was advanced to the stomach or the duodenum.
- The PPC and the pancreas were assessed by EUS and the location most suitable for the puncture was selected. Doppler imaging was used to reduce the risk of damaging interposed vessels.
- The cyst was punctured under EUS-guidance using a 19 G aspiration needle (Cook Medical).
- A guidewire was advanced via the needle and coiled-up inside the cyst monitored by EUS.
- The needle was then retracted and removed from the endoscope.
- A dilation catheter with a diameter of 8-10 mm or a dilation balloon (TTS balloon, Boston Scientific) was used to enlarge the cyst fistula. In some cases, it was necessary due to a fibrous cyst wall to enter the cyst using electrocauthery by means of a cystotome.
- One or two 10 Fr. straight stents or double pigtail stents were subsequently inserted.
- The functioning of the stent as well as the correct position was confirmed by endoscopy and EUS.

Informed consent was obtained from every patient prior to the procedure.

In order to evaluate the long-term results of the drainage procedure, a post-procedure follow-up was performed by reviewing the medical history of the patient following the procedure.

Trial registration: not relevant.

RESULTS

A total of 23 patients were referred for EUS-guided drainage during the inclusion period. Twenty-two patients were found eligible for the procedure. One patient was found ineligible for transmural drainage since the pseudocyst was located too remotely as seen from the stomach. In addition, vessels were interposed as seen from the duodenum thereby preventing access. This patient was therefore not included in the present study.

Out of 22 patients in whom drainage was attempted, the average cyst diameter was 8.1 cm (3.8-18 cm) measured by EUS.

In three patients (14%), the procedure was unsuccessful. The sizes and locations of the cysts in these patients were 3.8 cm at the tail, 4 cm at the body and 8 cm including the tail and body of the pancreas, respectively. In one procedure, the pigtail stent was displaced into the cyst and could not be retrieved. This procedure was subsequently converted to a surgical cystogastrostomy. In two patients, the procedure was discontinued at an early stage after EUS-guided needle insertion. In the first patient, it proved impossible to bring the endoscope into a favourable position. In the second patient, the guidewire was displaced several times. No attempt was made in these two patients to enlarge the fistula tract or to insert a stent.

In one patient, the opening created between the cyst and the stomach was found too large to support a stent. A week later another endoscopist was, however,

able to successfully place two double pigtail stents via the opening.

Thus, insertion of a functioning stent was successful in 19 of 22 patients (86%). Additional data are shown in **Table 2**.

In one case a conscious sedation had to be converted to general anaesthesia.

The outcome of the endoscopic treatment for the 19 patients (86%) with a functioning stent can be described as follows:

The median follow-up was 230 days (range 85-1,547 days). During this period four patients (18%) developed complications related to malfunctioning of the stent. Stent clogging caused one patient (5%) to be hospitalized with epigastric pain, infection and recurrence of the PPC. This case was managed with a nasocystic drain.

Stent migration caused two patients (9%) to develop symptomatic recurrence of the PPC. In one case, the migrated stent was replaced with a second stent under a repeated EUS-guided procedure. This second stent successfully drained the PPC and caused the symptoms to disappear. In the other case, an attempt to replace the migrated stent was unsuccessful.

In one patient (5%), the PPC became infected shortly after insertion. Meanwhile, the same patient was scheduled for elective cholecystectomia 20 days after the endoscopy. The patient was then informed about two options for treatment of the infected pseudocyst. These options were either a repeated endoscopic procedure or a surgical cystogastrostomy during the elective laparoscopic cholecystectomy. The latter was chosen as the final outcome.

TABLE 2

Data on the procedure in patients treated by endoscopic ultrasound-guided drainage.

Patients with a stent inserted, n	19
Site of endoscopic puncture, n (%)	
Stomach	17 (89)
Duodenum	1 (5)
Both	1 (5)
Number of stents inserted, n procedures (%)	
1 stent	6 (32)
2 stents	13 (68)
Anaesthesia, n (%)	
General anaesthesia	10 (53)
Sedation with propofol	4 (21)
Midazolam analgesia	5 (26)
Antibiotic prophylaxis, n (%)	
No antibiotics	5 (26)
Antibiotic prophylaxis	14 (74)
Setting, n (%)	
Outpatient	15 (79)

TABLE 3

Follow-up on the stents in patients treated by endoscopic ultrasound-guided cystoenterostomy.

Stents in follow-up procedures, n (%)	
Number of stents	19 (86)
Migrated, causing symptoms	2 (11)
Migrated, asymptomatic	2 (11)
Status of stent not reported	2 (11)
Patency period known, n (%)	
Number of stents	13 (67)
Clogged	1 (5)
Replaced by surgical cystogastrostomy	1 (5)
Removed endoscopically as planned	11 (58)
Patency for these, mean (range), days	147 (85-354)

During the follow-up period, one patient (5%) developed a PPC that mechanically obstructed the common bile duct. Nineteen days after the first stent insertion, this case was managed by insertion of a stent in the pancreatic duct using ERCP.

A single patient (5%) developed a new cyst in the tail of the pancreas which was subsequently diagnosed as malignant. The tumour was removed by radical excision.

Seven months after endoscopy, another patient (5%) developed an asymptomatic persistent PPC with a diameter of 8 cm, despite a stent. No further treatment was performed in this case.

Twelve patients experienced relief of symptoms and did not develop new pseudocysts or complications due to the endoscopic procedure during the follow-up period. Thus, a single endoscopic procedure was the curative treatment for 12 patients (55%). However, two of these were admitted to hospital with abdominal pain during the follow-up period. Examinations, nevertheless, showed that their pain was not caused by a recurrent PPC, but could be ascribed to exacerbation of chronic pancreatitis.

If the case of asymptomatic recurrence is also regarded as a treatment succes, the number increased to 13 patients (59%).

Additional data on the inserted stents are shown in **Table 3**.

DISCUSSION

In the present study, a single endoscopic procedure was curative in 13/22 patients (59%) when the single case of asymptomatic recurrence of PPC wasis regarded as a treatment success. The analysis of data presented by Azar et al in a study of 23 patients showed this figure to be 61% [2]. In another study of 51 patients, the figure was 84% [3], and in a study of 11 patients [4] the figure was 73%.

TABLE 4

Encountered complications and their frequency in comparable studies.

Complication	In present study	Reference
Conversion to surgical cystogastrostomy due to stent displacement into the PPC	1 of 22	1 of 36 [3] 1 of 11 [4]
Recurrence of the PPC due to stent clogging	1 of 22	2 of 36 [3] 3 of 24 [5] 1 of 6 [6] 1 of 3 [7]
Symptomatic recurrence of PPC due to stent migration into the gastrointestinal tract	2 of 22	4 of 36 [3] 1 of 11 [4] 1 of 3 [8] 3 of 24 [5]
Abdominal pain continues despite no recurrence of the pseudocyst	2 of 22	1 of 14 [9]

PPC = pancreatic pseudocyst.

Table 4 lists the complications encountered in the present study and their frequency in comparable studies.

Other authors reported that conversion to surgery had been required due to bleeding [10], pneumoperitoneum [3, 5] and peritonitis [5]. None of these complications occurred in the present study.

In the present study, no perforation occurred. Other authors were less fortunate [10, 11].

No significant bleeding occurred in the present study. This may be so owing to the use of Doppler imaging to avoid interposed vessels in our study. Some authors have, however, found standard ultrasonic imaging without the use of Doppler to be adequate to secure safe drainage of pseudocysts, even in patients at a high risk of bleeding [12].

Returning to the one case (5%) of conversion from conscious sedation to general anaesthesia in the present study as reported above, a similar anaesthetic incident was reported by Azar et al [2]. These cases should not be considered a complication to the endoscopic procedure. In the latter case, the endoscopic procedure was cancelled, while in the present study the endoscopist was able to complete the procedure.

EUS-guided procedures have been reported to take longer than conventional procedures [13]. Another author found that time could be saved if the transmural drainage was performed as a single-step procedure as was the case in the present study [14]. A single step procedure was conducted with an EUS-endoscope as opposed to a multistep procedure in which an EUS-endoscope would have had to be exchanged by a therapeutic duodenoscope.

Some authors have used fluoroscopic control to optimize access into the pseudocyst. This was not used in the present study, and EUS-guided drainage has been argued to be efficient and safe without fluoroscopy [15].

In the present study, one or two stents with a diameter of 10 Fr. were used. The insertion of two stents may be more advantageous than one [16]. It has been suggested that a stent diameter of 10 Fr. may cause fewer cloggings than a stent diameter of 7 Fr. [17]. Randomized studies are required to draw any firm conclusions.

EUS-guided drainage was compared with conventional endoscopic drainage in a prospective randomized study [18] and a prospective non-randomized study [17].

These studies showed that the EUS-guided procedure was advantageous when compared with the conventional endoscopic procedure. The difference between the two methods could be explained by conventional endoscopy not being able to handle non-bulging PPCs. The two methods were equally efficient for managing PPCs that did show luminal bulging.

Two prospective, but non-randomized studies [13, 19] supported the use of EUS in selected patient populations. In the first study, EUS guided drainage was used for patients not considered ameanable to a conventional procedure [19]. These patients had either gastric varices, uncontrolled coagulopathy or pseudocysts that did not display bulging. The technical success rates for the selected group treated with EUS-guided drainage and the group treated with conventional endoscopy did not differ.

In the second study, EUS-guided drainage was used only when conventional endoscopic drainage was unsuccesful [13]. All pseudocysts located in the tail of pancreas failed to be managed with a conventional endoscopic procedure, while EUS-guided drainage proved sucessful.

The literature offers conflicting recommendations as to the optimal time for stent retrieval, ranging from a few weeks to no retrieval. Two major concerns are associated with leaving a stent in situ for an extended period of time, namely stent clogging and the risk of bacterial colonization of the stent. On the other hand, some authors believe that premature retrieval of a stent may increase the risk of PPC recurrence. The effect of the patency period was evaluated in a randomized study [20]. In the first group of 15 patients, stent retrieval took place after two months. In a second group of 13 patients, stent retrieval was scheduled for 12 months after insertion. In five of the 15 patients whose stent was removed after two months, a recurrence occurred, whereas by contrast none of the 13 patients who had their stent removed after 12 months experienced a recurrence of their cyst. Stent clogging or infection related to the stent was not reported in any of the 13 patients with an extended drainage period.

CONCLUSION

EUS-guided drainage of PPCs is a technically challenging

procedure which is not successful in all cases. Despite the present patient series being small and the study being retrospective, the data showed that the procedure had only few severe complications. In those who succeeded, the functional long-term results were acceptable. Immediate complications were stent dislodgement and in the short term infections due to clogging.

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CONFLICTS OF INTEREST: none

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