EUS-guided transesophageal, transgastric, and transcolonic drainage of intra-abdominal fluid collections and abscesses

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Background: The therapeutic role of EUS is evolving. We report our experience with EUS-guided transesophageal, transgastric, and transcolonic drainage of various intra-abdominal fluid collections.

Objective: To determine the technical feasibility and clinical outcomes of EUS-guided drainage.

Design: Prospective case series.

Setting: Academic tertiary referral center.

Patients: Patients referred for endoscopic drainage of intra-abdominal fluid collections; pancreatic pseudocysts amenable to conventional transgastric or transduodenal drainage were excluded.


Main Outcome Measurements: Technical success, relief of symptoms, and procedural complications.

Results: Nine consecutive patients deemed appropriate for EUS-guided drainage of intra-abdominal fluid collections included transesophageal drainage of pseudocysts (n = 2), transgastric drainage of biloma (n = 2) and upper intra-abdominal abscesses (n = 2), transcolonic drainage of diverticular abscess (n = 1), Crohn’s abscess (n = 1), and postoperative hematoma (n = 1). Endoscopic drainage was successful in all patients. Confirmation of complete resolution of the target fluid collection and symptom relief was achieved in 8 (89%) of 9 patients. Pneumothorax and mediastinitis developed in 1 patient after transesophageal drainage, which resolved with chest tube and medical therapy. During multiple stent placement, one of the stents was fully deployed into the abscess cavity in 2 patients; both were successfully retrieved either endoscopically (Crohn’s abscess) or at the time of primary colonic resection (diverticular abscess).

Limitation: Limited number of patients.

Conclusions: EUS-guided transenteric drainage of bilomas, hematomas, abscesses, and inflammatory fluid collections is technically feasible and generally results in complete drainage and symptom relief. Procedural complications may be minimized with more experience.

EUS-assisted and EUS-guided transgastric or transduodenal drainage has gained acceptance in the therapy of symptomatic pancreatic pseudocysts. The therapeutic indications for EUS are evolving. We report 9 cases of EUS-guided transesophageal, transgastric, and transcolonic drainage of abdominal and pelvic fluid collections of various causes.

PATIENTS AND METHODS

Nine consecutive patients with abdominal and pelvic fluid collections secondary to various causes deemed appropriate for endoscopic drainage were included. Patients with pancreatic pseudocysts amenable to conventional or EUS-guided transgastric or transduodenal drainage were excluded from this series. The procedures...
were performed with the patients under general anesthesia. All patients gave written informed consent to undergo the procedure. Institutional review board approval was obtained for data collection and follow-up of these patients. Patients were followed prospectively for clinical outcomes and complications after endoscopic drainage.

**EUS procedure**

All procedures are performed by using a linear-array echoendoscope with a 3.7-mm operating channel (Olympus America, Center Valley, Pa). Antibiotic prophylaxis is given routinely. After endosonographic localization and evaluation of the fluid collection and surrounding structures, an appropriate site is selected for drainage; in general, this area is in the closest apposition to the fluid collection with no intervening vessels. The fluid cavity is entered by using a 19-gauge EUS-FNA needle, and a fluid sample for analysis is obtained if indicated. A 0.035-inch guidewire with a hydrophilic tip is advanced through the needle and into the fluid collection. The wire is generously looped within the cavity, and the needle is removed. The wire position is confirmed by fluoroscopy. A needle-knife cannula is then advanced over the guidewire to create a tract into the fluid cavity. If it easily traverses the luminal wall into the cavity, then needle-knife electrocautery is not applied, because the initial goal is simply to dilate the tract to allow passage of a dilating balloon. Once the cannula enters the fluid collection, the needle-knife is retracted and the cannula removed over the guidewire. A 8- or 10-mm dilating balloon catheter is advanced over the wire to enlarge the tract. Then 1 or more double pigtail stents are deployed over the wire and left in place for 4 to 12 weeks. Two short 10F stents are used when space allows. Alternately, 2 stents and/or 7F stents are used for smaller fluid collections.

**RESULTS**

**Case reports**

**Transesophageal pseudocyst drainage. Case 1.** A 36-year-old woman with alcohol-induced chronic pancreatitis presented with recurrent abdominal pain. EUS revealed 2 adjacent pseudocysts in the pancreatic body, both greater than 50 mm in size. One pseudocyst was drained transgastrically; the other extended to the chest, and the point of optimal access for endoscopic drainage was at the distal esophagus. No free air was seen in the chest or abdomen after placement of two 10F double-pigtail stents. Several hours later, the patient reported chest pain. A CT scan showed a contained esophageal perforation, mediastinitis, and pneumothorax. The patient recovered with nonoperative management. EUS at 3 months confirmed complete pseudocyst resolution, and the stents were removed.

**Case 2.** A 60-year-old man developed acute pancreatitis while on azathioprine for myasthenia gravis. A 200 × 100-mm pseudocyst with a single compartment, and no associated mass was identified (Fig. 1A). Because the cyst wall was closest to the distal esophagus, two 10F × 3-cm double pigtail stents were placed just proximal to the gastroesophageal junction (Fig. 1B and C). The pain immediately subsided after the cyst esophagostomy. The patient died several weeks later of a recurrent pulmonary
embolism before complete resolution of the pseudocyst could be confirmed.

Transgastric abscess drainage. Case 3. A 54-year-old woman reported abdominal pain and low-grade fever 3 months after a traumatic rupture of the spleen. Gastroscopy revealed a submucosal bulge on the posterior wall of the proximal gastric body associated with spontaneous drainage of purulent material. A CT scan revealed fluid

collections anterior and posterior to the proximal gastric body (Fig. 2A and B). After a course of oral antibiotics, the posterior fluid collection resolved, but the anterior fluid collection increased in size and had a well-organized capsule. On EUS, a bulge was noted at the anterior gastric wall (Fig. 2C). The fluid collection measured 66 mm in maximal diameter with hyperechoic internal debris. Cyst-gastrostomy was performed (Fig. 2D). Cultures of the purulent fluid grew *Staphylococcus epidermis*. CT confirmed complete drainage of the abscess by day 4. Symptoms resolved, and the stent was removed 2 weeks later (Fig. 2E and F). CT at 8 months confirmed sustained resolution of the abscess.

**Case 4.** A subphrenic fluid collection after subtotal colectomy developed in a 44-year-old man with chronic ulcerative colitis. CT-guided FNA grew *Enterococcus faecium*. EUS identified a gastric bulge and 3 discrete fluid collections. One small fluid collection located within the submucosa of the gastric antrum was completely aspirated with a 19-gauge needle, yielding 2 mL of thick purulent material. A 30 × 25-mm abscess located anterior to the pancreatic body was drained with two 7F double-pigtail stents. A third abscess measuring 85 × 50 mm, located adjacent to the pancreatic tail and spleen, was drained by placing two 10F double pigtail stents. A 7F nasocystic tube was also left in place for 48 hours of intermittent irrigation. Cultures from all 3 abscesses grew *Enterococcus* organisms and *Candida albicans*. The patient received 2 weeks of intravenously administered vancomycin and oral antibiotics and fluconazole for a total of 8 weeks. EUS 6 weeks later confirmed resolution of all abscesses. The patient remained asymptomatic at 3.3-year follow-up.

**Biloma drainage.** Case 5. A 35-year-old woman presented with postprandial epigastric pain, nausea, and vomiting 1 week after an open cholecystectomy. CT scan showed a 15 × 17 × 6-cm fluid collection without an enhancing wall extending into the gallbladder fossa and into the foramen of Winslow, Morrison’s pouch, and left subdiaphragmatic space. ERCP revealed no contrast leakage. EUS-guided tran gastric drainage was performed with placement of two 10F double pigtail stents. The biliary fluid had a bilirubin level of 5.5 mg/dL, consistent...
with a biloma. EUS confirmed complete resolution 6 weeks later, and the stents were removed. The patient remained symptom free at 12 months.

Case 6. A 49-year-old man with stage IV rectal adenocarcinoma developed a biloma after left hepatectomy for metastatic disease. ERCP showed extravasation of contrast from the cut surface of the liver and a short stenosis at the origin of the right hepatic duct, treated with balloon dilation and placement of an 8.5F biliary stent. EUS-guided transgastric drainage of a 59/C2 52-mm biloma was performed at the same encounter with placement of two 10F double pigtail stents. EUS 4 weeks after drainage confirmed complete resolution of the biloma. The patient remained asymptomatic at 16-week follow-up.

Transcolonic drainage of abscesses and hematoma. Case 7. A 61-year-old man presented with diverticulitis and a perirectosigmoid abscess. Percutaneous and transgluteal drainage was not attempted because of overlying bowel and bladder and the risk of the spread of infection, respectively. To avoid a 2-stage operation, EUS-guided transcolonic drainage was offered. The 70/C2 50-mm abscess was associated with a visible bulge in the distal sigmoid colon. Two 10F 3-cm double pigtail stents were placed with resulting profuse drainage of pus; cultures grew mixed gram-negative rod species and *Streptococcus anginosus*. Oral clindamycin and levofloxacin were given for 2 weeks. CT scan 11 days after the procedure showed nearly complete resolution of the abscess, and 1 stent was removed. The patient underwent sigmoid colectomy with primary anastomosis 23 days later; the second stent was removed at surgery. The patient continued to do well at 1-year follow-up.

Case 8. A 15-year-old boy with Crohn’s disease presented with worsening abdominal pain, fever, and chills. Serial CT scans demonstrated inflammatory changes in the terminal ileum and a deep pelvic abscess increasing in size despite broad-spectrum antibiotics. The abscess was not accessible to percutaneous drainage, and the consensus was to avoid surgery. EUS-guided transrectal drainage was accomplished by placing three 10F, 3-cm–long double pigtail stents into the 71 × 36-mm abscess. One of the stents migrated completely into the cavity immediately after deployment; the other stents were in good position. Symptoms resolved quickly. The patient resumed a regular diet and was discharged on oral antibiotic therapy.

Three weeks later, EUS revealed no residual fluid. Two stents were removed, but the third stent was completely inside the cavity. The tract was dilated to 10 mm, and the stent was successfully retrieved by using a standard gastroscope with a rat-tooth forceps. No residual fluid or pus was found, but the cavity was noted to be only partially walled off, and some of the peritoneal cavity contents were visualized. One hour after the procedure, the patient developed severe lower abdominal pain. Pneumoperitoneum was noted on x-ray films, and the patient was treated with antibiotics.

Six days later, an ileocecal resection was performed electively, removing approximately 15 cm of intestine. The terminal ileum was tightly adherent to the anterior surface of the rectosigmoid colon. A hole in the rectum corresponding to the endoscopic drainage site was oversewn. There was minimal abdominal contamination and no evidence of any purulent material in the pelvis. As a precaution, an end-ileostomy was performed, and a drain was placed in the presacral space. With subsequent reanastomosis, the patient continues to do well at 28 months of follow-up.

Case 9. A 47-year-old woman was admitted for abdominal pain, fever, and malaise after surgical lysis of adhesions. A CT scan revealed a 5.3 × 5.5-cm fluid collection immediately anterior to the rectum and rectosigmoid (Fig. 3A).
A CT-guided percutaneous approach was deemed difficult. EUS identified a 50 × 43-mm hypoechoic fluid collection with multiple internal septations (Fig. 3B). Forty milliliters of dark brown and bloody fluid was evacuated by using a 19-gauge FNA needle (Fig. 3C), completely draining the old hematoma; stent placement was believed to be unnecessary. Fluid cultures and Gram stain results were negative. The pain rapidly improved, and the patient was discharged the next day. A CT scan 3 weeks later showed complete resolution of the fluid collection (Fig. 3D).

DISCUSSION

We describe 9 cases in which EUS played a therapeutic role in the drainage of thoracic, abdominal, and pelvic fluid collections (Table 1). These cases demonstrate the technical feasibility of EUS-guided drainage of virtually any fluid collection, be it mediastinal, intra-abdominal, or pelvic, as long as it is adjacent to the GI lumen and within the reach of an echoendoscope. Our study is unique in its breadth of indications, including the first reported cases of endoscopic transcolonic drainage of a perirectal hematoma and of a Crohn’s abscess that permitted subsequent primary bowel resection. Symptomatic pancreatic pseudocysts that extend into the mediastinum are usually treated surgically because percutaneous drainage may not be feasible. Our study lends support to the efficacy of transesophageal drainage, although it must be done cautiously given the potential for significant complications. Pneumomediastinum is a complication unique to a transesophageal approach, so careful patient selection and identification of the most appropriate puncture site are particularly important. Because a visible bulge is typically not present at this location, EUS guidance is critical; the proximity of thoracic vessels makes precise needle passage mandatory.

Bilomas may occur as a complication of cholecystectomy or other hepatobiliary surgery and/or after a traumatic liver laceration. Conventional management includes addressing the underlying source of leakage and placement of a percutaneous drain. Shami et al. reported EUS-guided drainage of 5 patients with bilomas. Both of our patients did well after EUS-guided drainage.

Intra-abdominal abscesses are classically treated with surgical or percutaneous drainage plus antibiotic therapy. Diverticular abscesses usually require partial colectomy as well. We include in this series the first reported case of endoscopic drainage of an abscess related to Crohn’s disease. Our experience and other case reports suggest that EUS-guided drainage of intra-abdominal abscesses via a transgastric or transrectal approach is safe and effective.

Percutaneous drainage of fluid collections is not always technically feasible. EUS-guided drainage is an attractive alternative because it does not require external tubes or drains and may convert a 2-step operation into a single surgical procedure or may allow us to avoid surgery altogether. Complications may occur, including leakage, pneumoperitoneum, pneumomediastinum, bleeding, infection, and failure to drain. EUS guidance decreases the risk of injury to intervening vasculature and helps the endoscopist find the optimal puncture site based on the degree of apposition between the cyst or fluid collection and the gut wall. A short distance between the fluid collection and viscus (generally <1 cm), lack of intervening ascites, and maturity of the fluid cavity provide reassurance that the risk of leakage at the puncture site is minimized. Multiple stents may facilitate more complete drainage through or around the stents. Finally, the risk versus benefit in any individual patient between endoscopic and nonendoscopic approaches must be weighed on a case-by-case basis.

Although the techniques described in this case series are similar to single-step EUS-guided pseudocyst gastrostomy, in our experience, these cases tend to be technically more challenging and risky. Previous experience with this technique in more routine cases is recommended before attempting to do EUS-guided drainage of these special types of fluid collections. Currently, standard ERCP accessories are used for these complex procedures. A new generation of dedicated tools and accessories is needed to facilitate performing these procedures with greater ease and safety and to further expand the role of therapeutic EUS.

REFERENCES