Repair of an EUS – induced duodenal perforation with endoscopic clips

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Abstract

Endoscopic ultrasound (EUS) is considered a safe procedure ; however, rare deaths have been reported due to complications such as perforation of the gastrointestinal tract. Several factors including age, the presence or absence of cervical osteophytes or duodenal diverticula, history of difficult intubation with prior endoscopic procedure, endosonographer's inexperience, or EUS guided interventions such as the drainage of the pancreatic duct or pseudocyst and fine needle aspiration may increase the risk of EUS related perforation of the gastrointestinal tract. We report a patient with pancreatic mass who developed duodenal perforation during EUS and was treated successfully with an immediate closure of perforation using endoscopic clips combined with bowel rest and antibiotics. Based on our patient and others reported in the literature, immediate recognition and closure of perforation with endoscopic clips may be useful in the management of patients with EUS induced duodenal perforation. However, surgical consultation and close clinical monitoring is required in the management of these patients. (Acta gastroenterol. belg., **2009**, 72, **361-364**).

Key words : endosonography ; endoscopic clips ; duodenum ; perforation.

Introduction

Endoscopic ultrasound (EUS) is generally considered to be a very safe procedure. A single center review of 3324 consecutive examinations which focused on tolerability, patient satisfaction and complications reported two EUS-related deaths, giving a mortality rate of 0.06% (1). Perforation of the gastrointestinal tract is a major complication of EUS that usually requires surgery to repair it. However, with the advent of endoscopic clipping devices, patients with gastric (2), duodenal (3) and colonic perforations (4,5) have been treated endoscopicaly. We describe a patient with pancreatic mass who developed duodenal perforation during linear endosonography and was treated successfully with immediate closure of perforation with endoscopic clips in combination with bowel rest and antibiotics.

Case report

An 82-year-old Caucasian woman underwent EUS for staging and fine needle aspiration of pancreatic mass that was detected on abdominal imaging. She was noted to have an ill-defined pancreatic head mass on computerized tomography during the course of an evaluation for iron deficiency anemia and occult gastrointestinal bleeding. Upper endoscopy and colonoscopy were unremarkable. There was no duodenal diverticulum or stenosis due to the pancreatic mass. She also had an endoscopic retrograde cholangiopancreaticography that showed a short stricture in the distal common bile duct. A biliary stent was placed. On radial EUS, a small 1.2×1.3 cm hypoechoic lesion was seen in the pancreas near the ampulla. No local or regional adenopathy was identified. Patient was then intubated with a linear EUS scope (EG – 3630U, Pentax, Montvale, NJ) for fine needle aspiration of the pancreatic mass. During the passage of scope from the duodenal bulb into the descending portion of the duodenum, a mucosal tear occurred that appeared suspicious for a free duodenal perforation. The linear EUS scope was withdrawn and a forward viewing scope was inserted to visualize the mucosal tear, which appeared deep and linear measuring approximately 10 mm. The duodenal tear was then immediately closed using multiple endoscopic clips (QuickClip2, Olympus America, Center Valley, Pennsylvania, USA ; maximum opening width 9 mm) (Fig. 1). Each endoscopic clip was first positioned over the edges of the tear and then suction was applied to approximate edges prior to closing and release of the clip. Longitudinal closure (clipped in the 6- to 12-o'clock direction) was performed because of technical ease. We did not use the cap technique. After the procedure during recovery period patient developed abdominal pain and on examination her abdomen appeared distended and tender with sluggish bowel sounds. Plain abdominal X-ray revealed free air under the dome of the diaphragm. Intraperitoneal and retroperitoneal air was also demonstrated by computerized tomographic scan but no leakage of contrast could be seen (Fig. 2). Surgery consultation was obtained ; however, patient and her family declined Whipple procedure but agreed to proceed with exploratory laparotomy for duodenal perforation if needed. She was monitored closely with serial abdominal examinations, bowel rest, and antibiotics. Her abdominal pain resolved in a few hours. She remained stable over the next few days and tolerated oral diet on day 5 of her hospital stay. She was discharged from hospital after a total stay of 7 days. On her revisit 1 month

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Fig. 1. — Endoscopic image showing closure of the perforation with endoscopic clips.

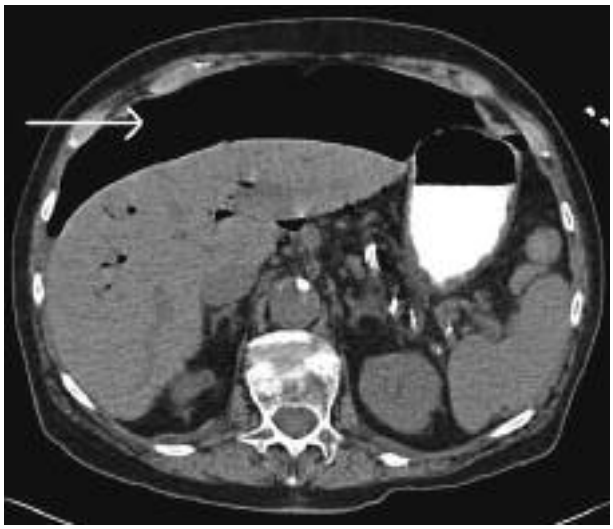

Fig. 2. — Computerized tomographic image showing intraperitoneal air (arrow).

later, she was noted to be asymptomatic and her abdominal exam was unremarkable.

Discussion

Most cases of duodenal perforation at endoscopy are reported after therapeutic endoscopy such as polypectomy, use of electrocautery or argon plasma coagulation, control of bleeding or endoscopic sphincterotomy. EUS related gastrointestinal tract perforations are reported in the esophagus and duodenum (Table 1). The mechanism of EUS related perforation of the esophagus or duodenum is either mechanical trauma from the endoscope and/ or fine needle aspiration needle. Perforation may also result from use of electrocautery during EUS-guided drainage of pancreatic cyst or duct.

We identified 12 reports of EUS related gastrointestinal tract perforations published in the literature by using MeSH terms, "endosonography" and "complications". These reports are summarized in Table 1. Of the 35 cases reported, 22 patients had esophageal perforation and 12 patients had duodenal perforation. One patient had perforation of a pancreatic pseudocyst. Out of 22 patients with EUS – related esophageal perforation, 16 were in the cervical esophagus and the remainder either at or away from the level of esophageal tumor. The indication of EUS among the patients with cervical perforation was not described, however, the patients with perforation at or near the esophageal tumor had undergone EUS for staging of esophageal malignancy without dilation of the malignant stricture. In all patients except 1, a radial echoendoscope was used. Ninety-four percent of patients with EUS – related cervical esophageal perforation were elderly, 44% of them had history of difficult intubation with prior endoscopic procedures and 19% had large cervical osteophytes. In 9 (56%) patients, the procedure was done by an endosonographer with less than 1 year of experience.

Twelve patients had duodenal perforation related to EUS, linear echoendoscope was used in 10 patients and radial in 2 patients. Only 2 patients had fine needle aspiration performed. Duodenal diverticulae were found in 4 patients. In 5 cases, the procedure was done by operators with experience of having personally performed fewer than 300 EUS procedures. In our case, the endosonographer had performed over 1000 EUS using linear echoendoscope prior to this case and is performing 300 to 400 echoendoscopies per year.

The timing of diagnosis was reported in 13 patients, except 1, all perforations were recognized either immediately during the procedure or within 24 hours of the procedure. Eight of these patients died. Overall mortality rate was 25.7% (9 deaths out of 35 patients). Surgery was performed to treat EUS – related esophageal or duodenal perforation in 8 patients, 4 of these died. Conservative therapy alone was used in 19 patients, all made full recovery. Additional 3 patients also made full recovery with conservative treatment combined with an immediate closure of perforation with endoscopic clips in 2 patients and esophageal stent placement in 1 patient. Treatment was unknown in 5 patients, 4 of these were reported as deaths due to EUS – related duodenal perforation.

Our patient developed duodenal perforation likely due to mechanical trauma from manipulating the tip of the endoscope, particularly during the intubation of descending portion of the duodenum. Standard treatment of a duodenal perforation is surgical closure ; however, favorable outcome has been reported with conservative management of iatrogenic duodenal perforation (Table 1). Spontaneous duodenal perforation usually results in contamination of peritoneal cavity resulting in

Table 1. — **Summary of patients reported as EUS – related gastrointestinal tract perforations**

Year	*Author (Reference)*	*Country*	*Number of patients*	*Age (years)/ Sex*	*FNA*	*Indication*	*Type of echo-endoscope used*	*Site of perforation*	*Timing of diagnosis*	*Treatment*	*Outcome*
2001	Das A. (6)	USA	16	> 65 (15)*/ M (9)*	No	NR	Radial (15)*	Cervical esophagus	NR	Surgery (2)* ; Conservative (13)*	Death (1)* ; Full recovery (15)*
2002	Chandrashekar M. (7)	UK	1	68 M	No	Staging of gastroesophageal junction tumor	Radial	Gastroesophageal junction	Immediate	Surgery	Full recovery
2003	Seibert D. (8)	USA	1	78 F	No	Weight loss, abdominal pain, enlarged pancreatic head on CT	Radial	Duodenal bulb	Immediate	Endoscopic clips with conservative therapy	Full recovery
2003	Siemsen M. (9)	Denmark	1		Yes	Staging of esophageal cancer	Linear/radial	At tumor level	3 days	Surgery	Died
2004	Sebastian S. (10)	Ireland	1	66 F	No	Staging of mid-esophageal tumor	Radial	Post wall of the duodenal bulb	Immediate	Endoscopic clips with conservative therapy	Full recovery
2005	Cahen D. (11)	Netherlands	1		Yes	Pancreatic pseudocyst drainage	Linear	Pseudocyst	NR	Surgery	Full recovery
2005	Mortensen M. (1)	Denmark	3		No	Staging of esophageal tumor	Radial	Esophagus	NR	Surgery (1)* ; Stent (1)* ; Conservative (1)*	Full recovery
2006	Bournet B. (12)	France	1	59 F	Yes	Pancreatic cystic lesion	Linear	Duodenum	6 hours	Conservative	Full recovery
2007	Kalaleh M. (13)	USA	1		Yes	EUS guided pancreaticogastrostomy	Linear	NR	NR	Conservative	Full recovery
2007	Will U. (14)	Germany	1	55 F	Yes	EUS guided pancreaticogastrostomy	Linear	NR	NR	Conservative	Full recovery
2007	Jacobson B. (15)	USA	1		No	Staging of esophageal cancer	Radial	Esophagus	After 24 hours	Conservative	Full recovery
2007	Lachter J. (16)	Israel	1	72 F	No	Suspected CBD stone	Radial	Duodenum	Immediate	Surgery	Died
			1	80	No	Suspected CBD stone	Radial	Duodenum	Immediate	Surgery	Died
			5	NR	No	NR	NR	Duodenum	Immediate (3)*, 6-24 hours (2)*	NR	Deaths (5)*

M : male, F : female, EUS : endoscopic ultrasound, CT : computed tomography, CBD : common bile duct, FNA : fine needle aspiration,*Number of patients, NR : not reported.

peritonitis. On the other hand, endoscopy-related perforations theoretically have a relatively lower chance of bacterial contamination in a fasting patient and therefore may be managed by non-surgical means. The following factors may help in the decision between operative and non-operative management : the mechanism and size of the perforation, adequacy of bowel preparation, underlying pathologic process, general health of the patient, and time of diagnosis relative to the time of perforation (17).

Endoscopic clips have been used for closure of perforations in the esophagus, stomach, duodenum and colon (3). Theoretically immediate closure of perforation would minimize the contamination of peritoneal cavity ; however, controlled data is lacking. In our patient, a surgical option was considered because of the coexisting malignancy. However, patient and her family declined surgery and therefore she was managed conservatively in addition to immediate repair of duodenal perforation with endoscopic clips. She had favorable outcome with non-surgical management likely because of relatively small size of perforation and an immediate closure minimizing the risk of contamination of peritoneal cavity.

In conclusion, several factors, including age, the presence of absence of cervical osteophytes or duodenal diverticula, history of difficult intubation with prior endoscopic procedure, endosonographer's inexperience, or EUS guided interventions such as the drainage of pancreatic duct or pancreatic pseudocyst and fine needle aspiration may increase the risk of EUS related gastrointestinal perforation. Based on our patient and other reports in the literature, immediate recognition and closure of perforation with endoscopic clips may be useful in the management of patients with EUS induced duodenal perforation. However, surgical consultation and close clinical monitoring is required in the management of these patients.

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