EUS-guided drainage and stent placement for postoperative intra-abdominal and pelvic fluid collections in oncological surgery

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Ther Adv Gastroenterol

[2012] 5(2) 95–102

DOI: 10.1177/
1756283X11427420

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Abstract:

Objectives: The objective of this study was to evaluate the role and benefits of endoscopic ultrasonography (EUS) in the management of postoperative intra-abdominal fluid collections after attempted curative surgery for abdominal cancer.

Methods: The authors retrospectively analysed the Endobase from 1 July 2007 to 30 January 2011 for patients with a postoperative intra-abdominal fluid collection who had undergone EUS-guided drainage and the placement of a stent. The data analysed included the demographics, type of surgery and clinical indications of each patient as well as their clinical and radiological findings.

Results: Six patients (three men and three women; mean age, 61.8 years [range, 38–78 years]) with intra-abdominal and pelvic fluid collections after abdominal surgery for cancer had undergone EUS-guided internal drainage. All procedures had been performed using linear EUS guidance and 8-Fr stent drainage catheters ('one step device', Giovannini, NWOA system Needle-Wire, Cook). The collection types included perigastric abscess ($n = 3$), perigastric hematoma and rectal hematoma ($n = 1$), perirectal biloma ($n = 1$), and perirectal abscess ($n = 1$). Patients had undergone the following types of surgery: lower-anterior rectal resection ($n = 2$), Whipple's duodenopancreatectomy type ($n = 1$), total gastrectomy ($n = 1$), splenectomy ($n = 1$), and distal pancreatectomy ($n = 1$). The number of stents inserted for each collection was one (five patients) and two (one patient).

Conclusions: EUS-guided drainage and stenting provide another option for the management of postoperative collections. It allows access to areas that are difficult to reach with the CT-guided approach and it can be performed accurately, efficiently and safely. In addition to this, the internal nature of the drainage offers patients more comfort.

Keywords: endoscopic ultrasonography; interventional ultrasound; internal drainage

Introduction

Percutaneous radiological drainage of symptomatic postsurgical abdominal collections has been for many years the standard approach [vanSonnenberg *et al.* 1997; Gazelle and Mueller, 1994] to avoid repeat surgery. However, there are some technical difficulties associated with these procedures, especially if we consider some percutaneous routes at certain locations. Linear endoscopic ultrasonography (EUS) [Chang and Wieserma, 1997] was recently introduced to overcome this issue. One of

its first applications was the drainage of peripancreatic collections [Giovannini *et al.* 1998]. Since then, this procedure has been updated and improved [Vilman *et al.* 1998] which now means that EUS can be performed quickly, safely and in a controlled way. Cases that can now be considered as candidates for EUS with a minimal risk of bleeding or perforation include gallbladder collections [Kahaleh *et al.* 2005], perirectal collections [Giovannini *et al.* 2003], splenic abscesses [Lee *et al.* 2006] and more recently bilomas [Shami *et al.* 2008].

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Figure 1. Image of the Giovannini Needle-Wire system: needle, dilator and stent (one-step device).

Objective

The objective of this study was to evaluate the role and benefits of EUS in the management of postoperative intra-abdominal fluid collections.

Methods

The database of our endoscopic ultrasonography unit was retrospectively reviewed in order to check all the diagnostic and therapeutic procedures that took place between 1 July 2007 and 30 January 2011.

The study was approved by the Ethics Committee of our hospital (Complejo Hospitalario de Pontevedra, Pontevedra, Spain), which provides a service for a mixed urban and rural area with a population of approximately 300,000 inhabitants. The inclusion criteria for this study were all EUS-guided drainage procedures carried out for postsurgical abdominal and pelvic collections within the above mentioned period. The only surgery included was that of an abdominal cancer with a curative intention. The exclusion criteria included the drainage of a pseudocyst, nonperioperative conditions or surgery for cancer with only a palliative intention. Particular attention was paid to the type of surgery performed in each case and to the circumstances that surrounded this procedure.

In every case, the drainage procedure had been delivered by the same endoscopist, who has over 10 years of experience. The EUS was performed with the Olympus UT-140 electronic sectorial scanner with the Aloka alpha 5 control, as required by the General Surgery Service.

The procedure had been carried out in the following manner: anaesthesia had been achieved with propofol by an anaesthetist ($n = 1$) or by sedation with a mixture of midazolam and fentanyl administered by the endoscopist ($n = 5$). In all cases, the distance between the collection and the echoendoscope was <1 cm. The mean duration of the procedure from the introduction of the endoscopy to its extraction was 30 min (range 17–41 min).

The technique employed included the prior examination of the post-surgical fluid collection via ultrasonography and the use of a Doppler ultrasound to exclude the involvement of vessels.

Following this, the collections were punctured with a recently developed 'one step device' (Giovannini NWOA system Needle-Wire, Wilson Cook Corporation) (Figure 1).

The device consists of three parts: a needle-wire, a dilator catheter of 5.5 Fr and an 8.5-Fr stent. A 0.035-inch guide wire was inserted into the collection, over which an 8.5-Fr stent was passed in all cases. This bedside procedure was carried out with concurrent endoscopic and ultrasonographic scanning in all cases without fluoroscopy. All patients included in our analysis gave informed consent before they were referred for EUS drainage.

Results

From 1 July 2007 to 30 January 2011, six patients (three men and three women; mean age 61.8 years, range 38–78 years) with intra-abdominal and pelvic collections, after surgery for abdominal cancer, underwent EUS-guided internal drainage. All procedures were performed using linear EUS guidance and 8-Fr stent drainage catheters. Immediate technical success was achieved in all five collections. No procedural complications were observed. Long-term complete drainage by echoendoscope was achieved in 100% of cases (6/6). The specific details of the postsurgical endoscopic drainage procedures have been recorded in Table 1 and are explained in further detail below. There has been no tumour recurrence during the follow-up period. All patients received intravenous anti-biotherapy to avoid systemic infections.

Case reports

(i) A 74-year-old woman was referred to us for the drainage of two hematomas, which comprised a perigastric collection that measured 12.3 cm $\times$ 8.6 cm in size and a perirectal collection measuring 4.13 cm $\times$ 3.3 cm in size. Two weeks earlier, she had

Table 1. Descriptive study of the postsurgical collections ($N = 6$).

Patients/age/sex	Type of surgery	Type of collection	Position	Size	Need of complementary drainage
1/74 years/female	Whipple PDC	Haematoma	Perigastric	12.3 cm × 8.6 cm	No
1/74 years/female	Whipple PDC	Haematoma	Perirectal	4.1 cm × 3.3 cm	No
2/75 years/male	Gastrectomy total + splenectomy	Biloma	Perirectal	5 cm × 5 cm	No
3/38 years/male	Open lower anterior rectal resection	Abscess	Perirectal	5 cm × 5 cm	No
4/78 years/female	Laparoscopic lower anterior rectal resection + splenectomy	Abscess	Perigastric	4 cm × 3 cm	No
5/44 years/male	Splenectomy	Abscess	Perigastric	5 cm × 7 cm	No
6/62 years/female	Distal pancreatectomy	Abscess	Perigastric	5 cm × 5 cm	No
PDC, Whipple's pancreatoduodenectomy.					

undergone pancreatic surgery for an intraductal papillary mucinous tumour (IPMT) in the head of the pancreas. A Whipple's duodenopancreatectomy and a right hemicolectomy had been performed (poor vascularization was noted at the level of the hepatic angle). During the surgical intervention, the patient suffered an anterior myocardial infarction that required immediate anticoagulation. This resulted in a perioperative haemorrhage, which was responsible for the formation of the two hematomas. During this time, several surgical drainage attempts were made without success. Therefore, the EUS procedure, which consisted of the drainage of both collections via a linear ultrasonographic endoscope and the positioning of transgastric (Figure 2) and transrectal 8.5-Fr stents, was performed. The contents of both hematomas were successfully evacuated.

One month later, the collections had not re-accumulated and the patient was discharged from hospital. In the follow up (2 years), the patient is asymptomatic and the abdominal CT is completely normal.

(ii) A 75-year-old male patient developed a biloma between the rectum and the bladder 1 month after a total gastrectomy due to a poorly differentiated gastric adenocarcinoma (pT2, N0, M0). Three days following the surgery, a dehiscence of the anastomoses developed with biliary fistula, which required a second surgical intervention through the anterior abdominal wall in order to close it. Five weeks later, a 5-cm persistent perirectal biloma was discovered when the patient developed a spiking temperature so EUS-guided drainage was performed (Figure 3). A week after the procedure, the stent was repositioned as the patient had developed further temperature and a

multidetector-CT image showed that the stent had bent. From this point, the patient progressed favourably and he was discharged from hospital 3 weeks later after CT imaging showed that the collection had resolved. In the follow up (2 years), the patient is asymptomatic and the abdominal CT is completely normal.

(iii) A 38-year-old male patient was referred to us for the drainage of a presacral abscess that measured 5 cm × 5 cm in size. A month earlier, he had undergone a low anterior resection for colorectal cancer (pT3, N0, M0) with the formation of ultra-low anastomoses. Ultrasonography showed evidence of a perirectal fluid collection and therefore an 8.5-Fr transrectal stent was inserted (Figure 4). The patient was released from hospital a week later and a month later a follow-up CT scan showed no collection was present. In the follow up (18 months), the patient was asymptomatic and the abdominal CT resulted completely normal.

(iv) A 78-year-old woman was referred to our unit for the drainage of a perigastric abscess that measured 4 cm × 3 cm in size. Eight weeks before, she had undergone a laparoscopic sigmoidectomy for colonic adenocarcinoma (pT2, N1). During the intervention, a splenic laceration was detected and a laparoscopic splenectomy was required. Postoperative evaluation showed an abscess in the splenic area so percutaneous drainage was performed under CT imaging. This remained *in situ* for 2 weeks and she received antibiotics. She was discharged at this point, but later returned to the hospital as a result of pain and fever. A second percutaneous drainage was attempted but failed, so an internal drainage under EUS guidance was performed (Figure 5). The patient was discharged

Figure 2. Image of a perigastric hematoma with transgastric drainage.

Figure 3. Transrectal stent for a biloma.

10 days after she became fully asymptomatic and completed a course of antibiotics. In the follow up (2 years), the patient is asymptomatic and the abdominal CT is completely normal.

(v) A 44-year-old male patient was sent to our unit for the drainage of a chronic perigastric abscess that measured 5 cm × 5 cm in size. In 2005, he was diagnosed with follicular non-Hodgkin's lymphoma and a surgical splenectomy had been performed. Since then, he had been treated with chemotherapy but

developed a persistent perigastric collection. Two drainage attempts in 2006 (radiological) and 2009 (surgical) were unsuccessful. After performing endoscopic internal drainage (two stents; Figure 6), the collection resolved completely. In the follow up (1 years), the patient is asymptomatic and the abdominal CT is completely normal.

(vi) A 62-year-old woman patient was referred to our unit for drainage of a chronic perigastric collection that measured 5 cm × 5 cm in size. Six

Figure 4. Ultrasonographic image of the placement of a transrectal stent for a perirectal abscess.

Figure 5. A single transgastric stent with drainage of pus.

months earlier, she had undergone laparoscopic distal pancreatectomy for a pancreatic tail mucinous cystadenoma with high dysplasia. In the posterior postoperative evolution, the patient developed mild progressive epigastric pain and the abdominal CT showed a 5 cm × 5 cm perigastric collection (abscess). Endoscopic drainage was achieved by the insertion of one transgastric 8.5-Fr stent (Figure 7). The patient was discharged from our unit on the

same day without any complications. A 6-month period of clinical and radiological follow up verified a complete resolution.

Discussion

Percutaneous routes have been well described for the drainage of abdominal collections. Nevertheless, in certain locations these procedures are painful and prolonged [Kuligowska *et al.* 1995] and can

Figure 6. Two transgastric stents for the drainage of pus.

Figure 7. Perigastric abscess, insertion of an 8-Fr stent.

have a difficult access [Noh *et al.* 2010]. Therefore, internal drainage with linear EUS has emerged as a technique that is inexpensive and entails minimal complexity.

Surgical drainage should be the final step to drainage of collections when other less-invasive techniques (radiological or endoscopic) have failed. In spite of this, surgical drainage has been attempted before EUS-guided drainage on two patients; in fact, the care of postsurgical patients was the responsibility of the surgical team. The

route and type of initial drainage used were based on the general condition of the patient and on the location of the collection. When access to the area to perform the collection drainage was not possible via surgery without causing significant morbidity or a progressive deterioration of the patient's general condition, EUS-guided drainage was performed as recommended by the surgeons.

The EUS-guided drainage of the large hematoma after anticoagulation in our first patient is one of the very few such cases in the medical literature

[Lee *et al.* 2006]. The use of a unique stent in each area (perigastric and perirectal) was sufficient to resolve the case, stabilize the patient and led to their discharge. The collection of drainage samples following a Whipple's pancreatoduodenectomy have been recorded, but they were only resolved via the use of EUS-guided suction [Jah *et al.* 2008]. With our patient we opted for the positioning of stents owing to their blood-based contents.

With regards to the technique of stent positioning, many methods have been described with a variety of different stents [Hookey *et al.* 2006]; however, we have found the one-step NWOA (Wilson-Cook Salem) needle method to be the optimal technique, as it is simple, fast and easy to perform [Vila *et al.* 2010]. The positioning of two stents has the added advantage of assuring a prolonged effect, especially in the case of large abscesses [Varadarajulu and Drelichman, 2009], but in our experience two stents were only necessary in a single patient.

The Wilson-Cook Giovannini Needle-Wire System has two stents of different diameters: 8 Fr and 10 Fr; in our unit we use 8-Fr stents because the insertion is easier than that of the 10-Fr stent.

Some authors have suggested that the transperitoneal stent should be removed after a period of 2 months [Seewald *et al.* 2009]. However, we have chosen to leave this stent indefinitely in its place, which renders an endoscopic extraction process unnecessary. As the posterior radiological tests were unclear, we have deduced that they must have been spontaneously expelled once the collections resolved [Krüger *et al.* 2006]. We did not use the nasocystic drainage route due to the patient's discomfort it causes and in accordance with previous reports. [Lopes *et al.* 2008].

Furthermore, EUS-guided internal drainage allows effective long-term maintenance of enteral nutrition and intestinal transit [Wehrmann *et al.* 2005]. This procedure provides a valid and quick option to complications such as abscesses and can be performed at the patient's bedside without fluoroscopic guidance. This represents a great advantage particularly when the patient is in a critical care unit [Puri *et al.* 2010].

Future studies will further elucidate whether internal drainage will be the technique of choice for the drainage of accessible abdominal collections from many different aetiologies [Piraka *et al.* 2009]. In

addition, longer-term studies with appropriate follow up of these techniques will be necessary to confirm their efficacy and safety, particularly with regards to the risk of malignant spread.

Conclusions

EUS-guided drainage and stenting provides another option for the management of postoperative collections. It allows access to areas that are difficult to reach with the CT-guided approach and it can be performed accurately, efficiently and safely. In addition to this, the internal nature of the drainage offers patients more comfort.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of interest statement

The authors declare no conflicts of interest in preparing this article.

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