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Long-term outcome of endoscopic ultrasound-guided pelvic abscess drainage: a two-center series

Authors

Laurent Poincloux[1,2], Fabrice Caillol[3], Christophe Allimant[1], Erwan Bories[3], Christian Pesenti[3], Aurélien Mulliez[4], Frederic Faure[5], Olivier Rouquette[1], Michel Dapoigny[1], Armando Abergel[1,2], Marc Giovannini[3]

Institutions

1 Department of Digestive and Hepatobiliary Diseases, Estaing University Hospital, Clermont-Ferrand, France
2 UMR Auvergne University/CNRS 6284 ISIT (Image Sciences for Innovations Techniques), Clermont-Ferrand, France
3 Endoscopy Unit, Paoli Calmette Institute, Marseille, France
4 Biostatistics Unit, DRCI, Gabriel Montpied University Hospital, 63003 Clermont-Ferrand, France
5 Clinical Research Unit, Estaing University Hospital, Clermont-Ferrand, France

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Corresponding author
Laurent Poincloux, MD, PhD, Department of Digestive and Hepatobiliary Diseases, CHU Estaing, 1 place Lucie et Raymond Aubrac, F-63003 Clermont-Ferrand, France
Fax: 33-4-73750761
lpoincloux@chu-clermontferrand.fr

ABSTRACT

Background and study aim Endoscopic ultrasound (EUS)-guided pelvic abscess drainage has been reported but long-term data remain limited. This two-center study evaluated long-term outcome of EUS-guided pelvic abscess drainage.

Patients and methods Between May 2003 and December 2015, 37 consecutive patients were treated for perirectal or perisigmoid abscesses via EUS-guided drainage using plastic or lumen-apposing metal stent (LAMS). Clinical success was defined as complete resolution of the abscess on follow-up computed tomography (CT) scan at 4 weeks with symptom relief. Long-term success was defined as abscess resolution without the need for surgery and without recurrence on long-term follow-up (>12 months).

Results Median abscess size was 60 mm (interquartile range 41–70). Causes were postsurgical (n = 31, 83.8 %) or secondary to medical conditions (n = 6, 16.2 %). EUS-guided drainage involved needle aspiration (n = 4), plastic stent placement (n = 29) or LAMS placement (n = 4 patients). Technical and clinical success was achieved in 37 patients (100 %; 95 % confidence interval [CI] 91–100) and 34 patients (91.9 %; 95 %CI 78–98), respectively (5 patients needed a second EUS-guided intervention within 14 days after drainage). One patient required surgery and one required best supportive care owing to persistent abscess. Early complications were perforation requiring surgery (n = 1), stent migration (n = 1), and rectal discomfort (n = 1). At a median follow-up of 64 months (IQR 19–81), two patients experienced abscess recurrence, at 3 and 12 months, respectively, and were treated surgically. Long-term success was achieved in 32 of 37 patients (86.5 %; 95 %CI 71–95).

Conclusion EUS-guided drainage of pelvic abscess is safe, has good long-term outcome, and should be considered as an alternative to percutaneous and surgical drainage.

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Introduction

Pelvic abscess may be a complication of colorectal or gynecological surgery [1] or occur in various conditions such as perforated viscus, inflammatory bowel disease (IBD), appendicitis, diverticulitis, ischemic colitis, endocarditis, and sexually transmitted diseases [2, 3]. Pelvic abscess is associated with significant morbidity and mortality [4]. Treatment has historically been surgical but it is now well accepted that pelvic abscess can be managed by noninvasive methods. Indeed, surgery is usually reserved for patients presenting with perforation or those who do not respond to minimally invasive techniques, including transrectal or transvaginal drainage under ultrasound guidance or percutaneous drainage under computed tomography (CT) guidance [5].

Ultrasound-guided drainage has been reported to have a high rate of success [6, 8], but it is only possible when the pelvic abscess is within the reach of the ultrasound probe. CT-guided percutaneous drainage of pelvic fluid collections has been used via the transabdominal (anterior) or transgluteal (posterior) route with good results [9]. Nevertheless, 20 % of patients experience pain at the puncture site with the transvaginal or transgluteal approach, and these procedures do not allow transmural stent placement, making it necessary to use uncomfortable and potentially painful drainage catheters [10].

Deep pelvic collection drainage is a technical challenge because of the surrounding anatomical and vascular structures. Endoscopic ultrasound (EUS) offers the technical advantage of avoiding passage through other organs, as most pelvic abscesses are within the reach of an echoendoscope. Over the past decade, several case series have demonstrated the safety and

utility of EUS guidance to perform drainage of pelvic abscesses [11–16], but there are still few large-cohort or multicenter series [17, 18]. Here we report on a two-center, 12-year, cumulative experience and long-term outcome of EUS-guided transrectal or transcolonic drainage of pelvic abscesses using plastic or lumen-apposing metal stents (LAMS) in a series of 37 patients.

Patients and methods

Study population

This two-center retrospective study was conducted at two tertiary-care referral centers: the University-affiliated Hospital of Clermont-Ferrand, and the Paoli Calmette Institute Oncology Center in Marseille. Medical records of patients who underwent EUS-guided drainage of a pelvic abscess during a 12-year period, between May 2003 and November 2015, were reviewed and analyzed. None of the data reported here has been published previously.

During this period, 98 consecutive patients were referred by gastrointestinal surgeons for minimally invasive techniques when surgical drainage was considered to be difficult to perform or for patients in poor general health. All patients underwent a pre-procedure CT scan or magnetic resonance imaging of the pelvis. Inclusion criteria for EUS-guided drainage were patients in whom the multidisciplinary coordination team ruled out CT-guided pelvic abscess drainage because of the lack of a safe and suitable window for puncture or patients in whom percutaneous drainage had failed. Exclusion criteria were patients with multiloculated or non-walled-off abscess on CT, perforation or coagulation disorders. After multidisciplinary decision, 61 patients (62.2 %) underwent percutaneous drainage, including 3 patients who did not meet inclusion criteria for EUS-guided drainage (2 multiloculated, 1 non-walled-off), and 37 patients (37.8 %) underwent EUS-guided drainage (24 in Clermont-Ferrand and 13 in Marseille). Of these 37 patients, two patients had previously undergone unsuccessful percutaneous drainage and one patient presented a pelvic abscess that was due to an early recurrence after post-surgical transanal drainage.

Written informed consent was obtained from all patients prior to endoscopic procedures. The study was performed in accordance with the Declaration of Helsinki, good clinical practice, and all applicable regulatory requirements. The Clermont-Ferrand Institutional Review Board approved the analysis of data collected to perform this study (IRB #00008526/Ref: 2015/CE110).

Procedural techniques

The bowel was prepared using polyethylene glycol and enema to optimize endoscopic visualization and minimize contamination. All patients received 2 g amoxicillin plus clavulanic acid or 1 g ceftriaxone before the procedure, and continued oral antibiotics for 5 days, with any necessary adjustments being made following culture sensitivity testing of aspirated specimens. The EUS-guided procedure was performed under general anesthesia using propofol.

All procedures were performed using therapeutic linear array echoendoscopes (EG38UTK [Pentax, Tokyo, Japan] or GF-UCT 140 [Olympus Corp., Tokyo, Japan], with large working channels of 3.7 and 3.8 mm, respectively) under triple guidance with ultrasound, and endoscopic and fluoroscopic control, and with patients in the supine position (▶ **Fig. 1**, ▶ **Fig. 2**). Lesion size, location, and relationship with pelvic organs and structures were recorded by the echoendoscope. A puncture site was then selected based on a minimal distance between the EUS transducer and the abscess cavity, and to availability of a safe window without intervening vasculature according to color Doppler assessment of the bowel wall. Initially, in the first patient, one-step drainage was performed using the Giovannini Needle-Wire OAsis system (NWOA; Cook Medical – Endoscopy, Winston Salem, North Carolina, USA) with an 8.5 Fr straight plastic stent. This device consists of a 0.035-inch needle-wire suitable for cutting current, a 5.5 Fr dilator, and an 8.5 or 10 Fr stent preassembled on the same catheter. We then used two modified options to perform the drainage process, as follows.

1. The pelvic abscess was punctured using a 19-gauge needle (EUS19T or EUSN-19A [Cook Medical – Endoscopy] or 19Flex [Boston Scientific, Marlborough, Massachusetts, USA]). The stylet was removed and physiological saline solution was flushed into the abscess cavity to help aspirate the pus and preclean the cavity. A standard or superstiff 0.035-inch guidewire was passed through the needle and coiled into the cavity under EUS and fluoroscopic guidance. The needle was exchanged over the guidewire for a 5.5 Fr needle-knife catheter for electrocautery to create a fistula between the rectum or colon and the abscess cavity. The fistula tract was then dilated using an 8 mm over-the-wire biliary balloon dilator (Hurricane; Boston Scientific) or a 10 – 12 mm or 12 – 15 mm controlled radial expansion wire-guided balloon (CRE Microvasive; Boston Scientific). Next, one, two, or three double-pigtail plastic transmural stents (7 – 10 Fr, 4 – 5 cm in length; Cook Medical – Endoscopy) were deployed through the fistula between the abscess cavity and the bowel lumen. The decision to place one or several plastic stents was based on viscosity of the abscess contents. A second or third plastic stent was inserted after reintroducing the guidewire through the needle-knife catheter that was passed parallel to the first stent into the abscess under endoscopic and fluoroscopic control.

2. The puncture of the pelvic abscess and dilation of the fistula track were performed in one step using a 10 Fr cystotome (CST-10; Cook Medical – Endoscopy) with a pure cutting current. After the cystotome had been inserted into the abscess cavity, the metal part and Teflon catheter of the cystotome were withdrawn, and aspiration of the collection was performed using a 10 or 20 mL syringe. The cystotome was flushed with saline. Two standard or superstiff 0.035-inch guidewires were passed through the cystotome and coiled into the cavity for one-step deployment of two parallel transmural pigtail stents across the dilated tract, or only one guidewire was passed through to deploy a transmural LAMS (Nagi 10 × 30 mm; Taewoong-Medical Co., Ltd., Seoul, South Korea).

For all procedures, aspirated specimens were sent to the bacteriology laboratory for Gram determination and culture in

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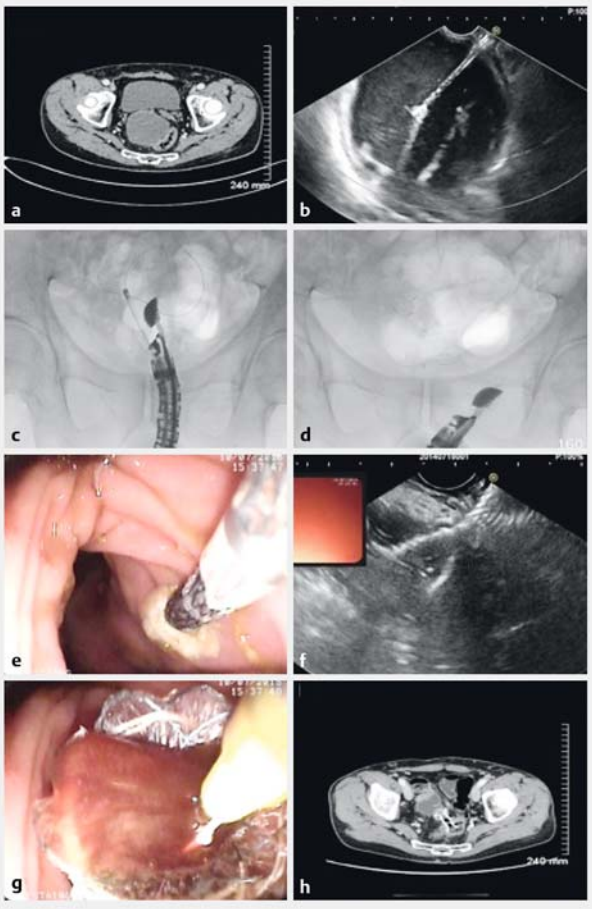
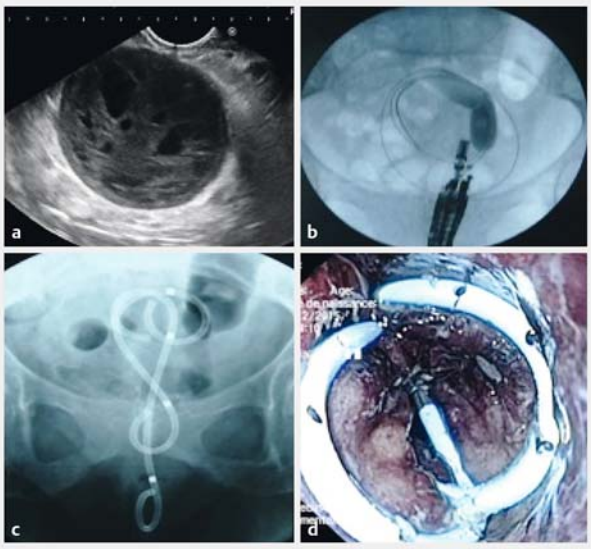


▶ **Fig. 1** Endoscopic ultrasound (EUS)-guided pelvic abscess drainage using a lumen-apposing metal stent (LAMS) **a** Initial computed tomography (CT) scan showing pelvic abscess. **b** EUS-guided cystotome puncture of the pelvic abscess. **c** Fluoroscopic view of the cystotome in the cavity, with the guidewire coiled into the abscess. **d** Fluoroscopic view of a transrectal LAMS. **e** Endoscopic view of the transrectal LAMS deployment. **f** EUS control of the transmural LAMS deployment. **g** Endoscopic view showing successful drainage, with release of pus. **h** CT scan 4 weeks later, showing complete resolution of the abscess.



▶ **Fig. 2** Endoscopic ultrasound (EUS)-guided pelvic abscess drainage using two plastic pigtail stents. **a** Pelvic abscess detected by linear EUS. **b** Dilation of transmural tract using a 12 – 15 mm over-the-wire enteral balloon. **c** Fluoroscopic view of two transrectal plastic pigtail stents inserted into the pelvic abscess. **d** Endoscopic view of two transrectal parallel pigtail stents in the bowel lumen.

order to optimize the antibiotic therapy. No external drainage catheter was used in the study.

Definitions and follow-up

Pelvic abscess was defined as a well-delimited, hypodense image with hydric tone on CT scan associated with abdominal pain and fever. Transrectal drainage was defined as drainage distal to the rectosigmoid junction as identified on the CT scan. Transcolonic drainage was defined as drainage proximal to the rectosigmoid junction. Technical success was defined as the ability to drain the pelvic abscess under EUS guidance. Clinical success was defined as a complete resolution of the abscess on outpatient follow-up CT scan at 4 weeks with symptom relief (no abdominal pain and fever). If repeat EUS-guided drainage was required in order to reach clinical success, this was also reported. Complications were classified as major and minor: severe sepsis, perforations or bleeding that required endoscopic treatment or transfusion were classified as major complications; fever without hypotension, self-limited bleeding, and stent migration were classified as minor.

In addition to the CT scan at 4 weeks, a further follow-up CT scan was carried out at 3 months or in the event of recurrent symptoms associated with endorectal EUS. Stents were removed after verification of complete abscess resolution: LAMSs were removed within 6 weeks after the procedure, and plastic stents were removed between 3 and 6 months after the procedure. Pelvic abscess development after stent removal was defined as a recurrence.

Long-term success was defined as abscess resolution without the need for surgery and without recurrence on long term follow-up (>12 months). Long-term follow-up data were obtained from medical records of clinical follow-up visits with the endoscopist, surgeon, oncologist or primary care physician, or by contacting patients or their referring physicians by telephone. The beginning of follow-up was defined as the day of EUS-drainage (i.e. Day 0), and the end of the follow-up period was defined as either complication or recurrence requiring surgical drainage or last known date of contact/death

Statistical analysis

Study data were collected and managed using REDCap electronic data capture tools hosted at Clermont-Ferrand University Hospital. Data are expressed as frequencies and associated percentages for categorical variables, and as mean and range or median and interquartile range (IQR) for quantitative variables. The 95 % confidence intervals (CIs) were given for technical,

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clinical, and long-term success rates. Pelvic abscess sizes were compared between aspiration and stenting EUS procedures using a Student's *t* test. Outcomes were compared according to dilation diameters using Fischer's exact test. Statistics were computed with STATA V12 (Stata Corp., College Station, Texas, USA). Tests were two sided, and a *P* value of <5% was considered to be statistically significant.

Results

Between May 2003 and December 2015, 37 patients (17 women and 20 men; mean age 61.4 [range 23–94]) were treated for perirectal (n=34) or perisigmoid (n=3) abscess using EUS-guided drainage. Clinical presentation included fever and/or abdominal pain in all patients. The abscess was postsurgical in 31 patients (83.8%) or secondary to medical illness in 6 patients (16.2%). The median largest diameter of abscess was 60 mm (IQR 41–70). Patient characteristics and causes of pelvic abscess are reported in ▶**Table 1**.

Technical success was achieved in all 37 patients (100%, 95% CI 91–100). Technical data and clinical outcomes are reported in ▶**Table 2**. Stent insertion was technically successful in 33 patients, with an overall mean stenting duration of 1.7 months (range 0–6). Plastic stents were used in 29 patients (28 transrectal and 1 transcolonic) and LAMSs were used in 4 patients (3 transrectal and 1 transcolonic). The transmural tract was dilated using an 8-mm over-the-wire biliary balloon dilator in 11 procedures, a 10–12-mm or 12–15-mm over-the-wire enteral balloon dilator in 8 procedures, and was not dilated in 14 procedures. In 4 patients, stenting was not performed because abscess-to-digestive wall distance was >20 mm, and aspiration only was performed (3 transrectal and 1 transcolonic).Abscess size in these cases was 25, 28, 30, and 39 mm, respectively, which makes these abscesses smaller in size compared with the rest of the cohort (median size 29 mm [IQR 26.5–34.5] vs. 60 mm [IQR 47–70]; =0.006).

Patient outcomes are reported in ▶**Fig. 3**. Clinical success was achieved in 34 (91.9%; 95%CI 78–98) of the 37 patients. Five cases required a second EUS intervention for the following reasons: early pigtail stent migration at Day 4 in one patient; early removal of pigtail stent because of rectal discomfort at Day 6 in one patient; and incomplete response revealed on an early follow-up CT within 14 days in three patients treated with one pigtail stent. These five patients underwent a second EUS-guided drainage with multiple plastic stents within the 14 days post-initial procedure, with successful treatment outcomes.

EUS-guided drainage was unsuccessful in three patients. Of these, two patients had undergone EUS-guided drainage using plastic stents: one patient experienced sepsis, and the CT scan at 4 weeks revealed a persistent abscess requiring transanal surgical drainage; one patient with a Fournier's gangrene needing an orchidectomy presented a persistent postoperative EUS-drained abscess at the 4 week CT scan and was offered only the best supportive care as he also presented with acute myeloid leukemia, with fatal outcome at Day 90. Finally, one patient who was receiving long-term corticosteroid treatment for inflammatory rheumatism and had presented a pericolonic abscess as a complication of diverticulitis, underwent successful drainage with a transcolonic LAMS, with pus released into the bowel lumen. The patient experienced postprocedure abdominal pain and sepsis at Day 1 and required surgical intervention, which revealed perforation of an infected diverticulum. Postoperative outcome was favourable.

The median patient follow-up was 64 months (range 0–149; IQR 19–81). During this period, two patients presented with

▶**Table 1** Patient characteristics and causes of pelvic abscess.

Patients, n	37
Age, mean (range), years	61.4 (23–94)
Sex, n (%)	
▪ Male	20 (54.1)
▪ Female	17 (45.9)
Location of abscess, n (%)	
▪ Perisigmoid	3 (8.1)
▪ Perirectal	34 (91.9)
▪ Anterior	11 (29.7)
▪ Posterior	26 (70.3)
Underlying pathology, n (%)	
Postsurgical	31 (83.8)
▪ Rectal surgery	
– Rectal carcinoma	12 (32.4)
– Ovarian carcinoma	1 (2.7)
▪ Colon surgery	
– Colon cancer	4 (10.8)
– Sigmoid diverticulitis	4 (10.8)
– Crohn's disease	2 (5.4)
– Familial adenomatous polyposis	1 (2.7)
▪ Other surgery	
– Ovarian cystectomy	1 (2.7)
– Hysterectomy (uterus cancer)	2 (5.4)
– Appendicectomy	1 (2.7)
– Adhesiolysis	1 (2.7)
– Orchidectomy (Fournier's gangrene)	1 (2.7)
– Gastric ulcer surgery	1 (2.7)
De novo	6 (16.2)
▪ Sigmoid diverticulitis	2 (5.4)
▪ Crohn's disease	1 (2.7)
▪ Septicemia	1 (2.7)
▪ Unknown	2 (5.4)
Size of pelvic abscess by EUS, median (IQR), mm	60 (41–70)

EUS, endoscopic ultrasound; IQR, interquartile range.

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▶ **Table 2** Technical data and clinical outcomes (n = 37 patients).

Drainage modality, n (%)	
▪ Aspiration only	4 (10.8)
▪ Plastic stents – 1 stent – 2 stents – 3 stents	29 (78.4) 13 (35.1) 13 (35.1) 3 (8.1)
LAMS	4 (10.8)
Drainage route, n (%)	
▪ Transrectal	34 (91.9)
▪ Transcolonic	3 (8.1)
Fistulotomy, n (%)	
▪ NWOA system	1 (2.7)
▪ 19-G needle (aspiration only)	4 (10.8)
▪ Needle-knife	9 (24.3)
▪ Cystotome	20 (54.1)
▪ None (spontaneous fistula)	3 (8.1)
Second EUS drainage, n (%)	5 (13.5)
Complications, n (%)	
▪ Perforation	1 (2.7)
▪ Stent migration	1 (2.7)
▪ Rectal discomfort	1 (2.7)
Technical success, n (%)	37 (100)
Clinical success, n (%)	34 (91.9)
Follow-up, median (IQR), months	64 (19 – 81)
Duration of stenting, mean, months	
▪ All stents	1.7
▪ Plastic stents	2.1
▪ LAMS	1.3
Recurrence, n (%)	2 (5.4)

LAMS, lumen-apposing metal stent; NWOA, needle-wire Oasis system; EUS, endoscopic ultrasound; IQR, interquartile range.

recurrence: one patient who had undergone EUS-guided drainage with a LAMS for a postoperative abscess related to uterus cancer presented with recurrence at 3 months; and one patient who had undergone EUS-guided drainage using two plastic stents for a resurgence of colorectal anastomosis leakage with complex fistula presented at 12 months. Recurrent abscess size in these two patients was 42 and 72 mm respectively, and both were treated surgically.

Overall, there were two minor complications (one stent migration and one rectal discomfort) and one major complication (one perforation) with no procedure-related mortalities. Balloon dilation diameter (no dilation vs. 8 mm vs. > 10 mm) was not related to complication rate ($P = 0.58$) or recurrence rate ($P = 0.72$). Long-term success was achieved in 32 of 37 patients (86.5 %; 95 %CI 71 – 95).

Discussion

This study on EUS-guided drainage of abdominopelvic abscess is the largest series reported to date (along with Ramesh et al. [17]), and with longer follow-up and experience from two centers. Technical success was 100 %, and clinical success was 91.9 %, with one major complication (perforation), two minor complications (one stent migration and one rectal discomfort), and only two recurrences during a median follow-up of 64 months. Rectal discomfort was due to over-long pigtail stents and was managed by changing to shorter pigtail stents, with complete resolution of symptoms. These results confirm the safety, efficacy, and favorable long-term outcome of this technique, which was reported first by Giovannini et al. [11] followed by a few case series [12 – 16].

Pelvic abscess is a well-known postoperative complication. Anastomotic leakage after low anterior resection of the rectum is one of the most common surgical causes [19], with an incidence rate of up to 15 % of cases (12.4 % in laparoscopic surgery and 15.3 % in open surgery), according to a recent observational study in more than 1000 patients [20]. Postsurgical colorectal abscess is a common problem in practice and represented 65 % of cases in this study. This technique could also be useful with good long-term outcome in pelvic abscess secondary to medical illness, including IBD. EUS-guided drainage of IBD was suspected to result in permanent internal fistula formation [14], but it did not lead to complications in the IBD patient in the current study.

In our cumulative experience over 12 years with EUS-guided drainage of pelvic collections and abscesses, the technique has evolved and spurred recent developments. We originally used the Giovannini NWOA system, as this one-step technique was relatively quick and easy to perform. However, this system can only place one plastic stent and is associated with a risk of migration and early obstruction due to the straight stent design, and a risk of suboptimal abscess release in cases of large collection diameter or thick contents owing to a narrow fistula tract. Moreover, as the needle-knife of this system is flexible, the procedure can only be a technical success if the pelvic abscess is very close to the bowel wall. Indeed, puncture using a stiffer 19 G needle appears to be safer in cases where the abscess is relatively distal to the digestive wall or if the abscess wall is particularly thick.

Over-the-wire balloon dilation of the tract was performed mainly using an 8 mm biliary balloon, but 12- or 15-mm enteral balloons were also used in certain cases to facilitate the insertion of more than one parallel stent. There were no significant procedural complications with the use of the enteral balloon. However, it remains unclear whether dilation with a larger-diameter balloon would allow better drainage, as use of an enteral balloon does not seem to influence the recurrence rate.

Inserting larger-caliber or multiple stents maintains the patency of the transmural tract and decreases the risk of clogging with fecal matter or pus. To address this risk of clogging and

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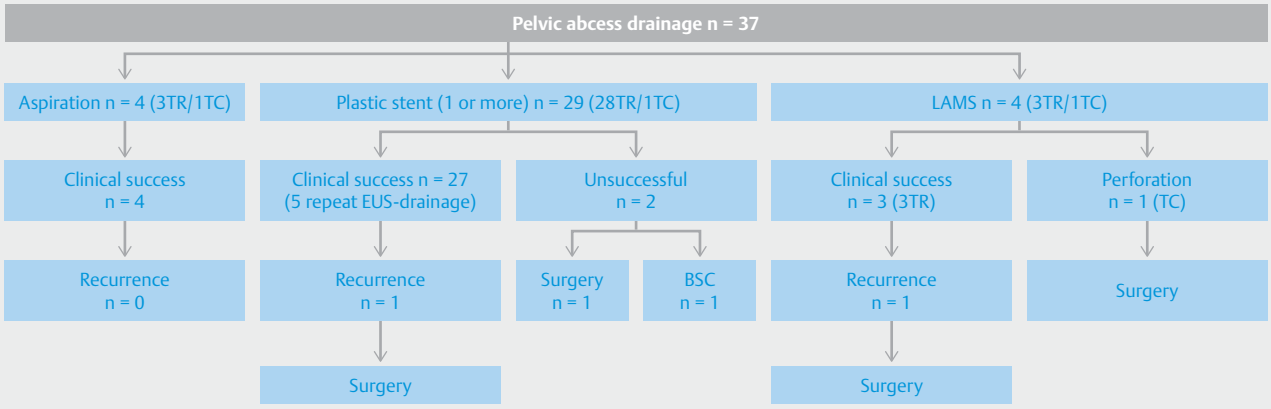

▶ **Fig. 3** Flow chart of outcomes of patients who underwent endoscopic ultrasound (EUS)-guided drainage of pelvic abscesses. LAMS, covered lumen-apposing metal stent; TR, transrectal; TC, transcolonic; BSC, best supportive care.

also the risk of stent migration, some authors have advocated the placement of an additional flushing catheter for a few days, particularly for abscesses >6 cm [13, 14]. However, given the high clinical success rate found in the current study, with a mean series-wide abscess diameter of 59 mm, along with results from other series [15, 16] and the discomfort that an additional flushing catheter would induce, this point does not seem crucial. Furthermore, using a double-pigtail stent may decrease the risk of dislodgement and, in the current study, only one stent migration with plastic stents was observed.

Over the course of our study experience, we started using a 10 Fr cystotome as it has been reported to be useful in patients undergoing EUS-guided drainage of peripancreatic fluid collections [21] and can also be applied in pelvic abscess [16]. Using the cystotome allows a one-step process of puncture, tract dilation, and insertion of two guidewires into the cavity, thereby eliminating the need to pass a catheter adjacent to the primary stent to place a second or more stents. This approach decreases procedure time and facilitates the drainage process.

In the current study, all procedures were performed under triple guidance. Although two case series report the feasibility and safety of EUS-guided drainage of pelvic abscess without fluoroscopy [15, 16], there is only limited control of guidewire coiling under EUS guidance, and the placement of a second stent can prove challenging or even risky.

More recently, as shown in the current study, we used LAMS in four patients, as has also been described for EUS-guided drainage of pancreatic pseudocysts [22]. Two case reports have described the use of a LAMS in EUS-guided drainage of pelvic abscess [23, 24]. This design is an attractive option as it offers repositionability and antimigration features in the form of wide flared ends. Large body diameter (10 or 16 mm) could also help to avoid early occlusion [25]. This device could also avoid rectal discomfort for abscesses located close to the lower rectum, as a plastic pigtail stent can make contact with the dentate line in these situations. In the current study, successful and safe transrectal abscess drainage with LAMS was achieved in three cases without stent migration with a mean follow-up of 11.7 months, but with one recurrence at 3 months, which was treated by surgery.

One patient who had a perisigmoid abscess as a complication of diverticulitis and who underwent transcolonic EUS-guided drainage using LAMS presented a perforation at Day 1, which required surgery. The deleterious context of this patient (long-term corticoids for chronic inflammatory disease), diverticular etiology, and transcolonic route for drainage may have promoted this complication. Indeed, reports on drainage for diverticular abscess point to significantly lower treatment success compared with other abscess etiologies [17, 18]. There is already one reported case of perforation post-EUS transcolonic drainage for diverticular abscess [26], in which Piraka et al. used a needle-knife before plastic stent placement. Some authors argue that electrocautery can increase the risk of perforation, as the needle-knife could cut outwards from the axis of the guidewire during fistula creation [27]. This problem does not arise with the cystotome [28], which we used before transcolonic LAMS placement. However, even if perforation of an infected diverticulum was found during laparotomy, we cannot rule out perforation related to metal stent placement, and therefore transcolonic LAMS placement should be avoided pending larger data sets.

The recurrence rate found in the study (5.4 %, 2/37) is consistent with that reported in the literature [18, 29] and concerned large abscesses >4 cm and both plastic or metal stent use. Nevertheless, we cannot reach a definitive conclusion on this point. Surprisingly, there was no recurrence after aspiration procedures, probably because of the smaller size of pelvic abscess among the four patients given EUS aspiration alone (range 25 – 39 mm) and the lack of fistula in these smaller collections.

Limitations to this study include the fact that it was a retrospective analysis and that the outcome of EUS-guided drainage was not compared with outcomes following percutaneous or surgical drainage in pelvic abscess.

In conclusion, EUS-guided drainage of pelvic abscess is safe and efficient with a good long-term outcome, and should be

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considered as a viable alternative to percutaneous or surgical drainage. LAMS use in this indication requires further evaluation.

Competing interests

None

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