

Endoscopic Ultrasound-Guided Drainage of Pelvic Fluid Collections with Lumen-Apposing Metal Stents

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Keywords

Lumen-apposing metal stent · Endoscopic ultrasonography · Pelvic collection

Abstract

Introduction: A pelvic abscess is a potential life-threatening condition that should be managed conservatively whenever possible. Currently, computed tomography or ultrasound-guided percutaneous drainage is still the gold standard approach for pelvic fluid collections (PFCs) requiring intervention. More recently, endoscopic ultrasound (EUS) drainage using lumen-apposing metal stents (LAMSs) has been used off-label in PFCs with similar efficacy, a favorable safety profile, better quality of life, and generally a shorter duration of treatment when compared to the gold standard treatment. **Methods:** An observational retrospective analysis of 6 patients who underwent EUS-guided PFC drainage with LAMS at our institution was conducted. Records were reviewed to identify etiology, size of the collection, number of endoscopic procedures required until complete resolution, stent indwelling time, concomitant surgical or percutaneous associated procedures, successful removal and resolution. **Results:** The 6 patients included had an average age of 69 years old and 5 (83.3%) were male. The average size of the PFCs was 72.5 mm. All patients (100%) had successful drainage following LAMS

placement, though 1 patient had an early recurrence. The mean stent indwelling time in our study was 6.7 days. An additional percutaneous or surgical drainage intervention was not required in any of the participants. Also, no adverse events related to the procedure were reported during the follow-up period. **Conclusion:** EUS-guided drainage of PFCs with LAMS is a safe and minimally invasive technique, which allows rapid PFC resolution, with no need for percutaneous or surgical drainage interventions.

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Drenagem de coleções pélvicas líquidas guiadas por ecoendoscopia com próteses metálicas de aposição de lúmen

Palavras Chave

Prótese metálica de aposição de lúmen · Ultrassonografia endoscópica · Coleção pélvica

Resumo

Introdução: Um abscesso pélvico é uma condição potencialmente ameaçadora da vida que deve ser tratada de forma conservadora sempre que possível. Atualmente,

a drenagem percutânea guiada por tomografia computadorizada ou ultrassonografia ainda é considerada a abordagem *standard* para coleções pélvicas líquidas que necessitem de intervenção. Mais recentemente, as próteses metálicas de aposição de lúmen têm sido usadas *off-label* nas mesmas coleções com eficácia semelhante, um perfil de segurança favorável, uma melhor qualidade de vida e, geralmente, uma duração mais curta de tratamento em comparação com o tratamento *standard*.

Métodos: Foi realizada um estudo observacional retrospectivo de 6 doentes submetidos a drenagem de coleções pélvicas guiada por ecoendoscopia com LAMS no nosso hospital. Os registos foram analisados para identificar etiologia, tamanho da coleção, número de procedimentos endoscópicos necessários até a resolução completa da coleção, tempo de permanência da prótese, procedimentos cirúrgicos ou percutâneos concomitantes, remoção bem-sucedida da prótese e resolução da coleção. **Resultados:** Os 6 doentes incluídos no estudo tinham uma idade média de 69 anos, sendo 5 deles do sexo masculino. O tamanho médio das coleções pélvicas era de 72.5 mm. Todos os doentes (100%) tiveram uma drenagem bem-sucedida da coleção após a colocação da prótese, embora uma doente tenha tido uma recorrência precoce da mesma. O tempo médio de permanência da prótese foi de 6.7 dias. Nenhum doente necessitou de um procedimento adicional de drenagem percutânea ou cirúrgica para resolução e não foram relatados eventos adversos relacionados à colocação da prótese.

Conclusão: A drenagem de coleções pélvicas guiada por ultrassonografia endoscópica com recurso a LAMS é uma técnica segura e minimamente invasiva, que permite resolução rápida das coleções, sem necessidade de intervenções adicionais de drenagem percutânea ou cirúrgica.

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Introduction

A pelvic abscess is a life-threatening condition that might occur either as a complication of an abdominopelvic surgical procedure or spontaneously as a consequence of an underlying medical condition, such as pelvic inflammatory disease, diverticulitis, appendicitis, inflammatory bowel disease, ischemic colitis, sexually transmitted diseases [1–3].

Abscess management has evolved considerably over time from surgery to minimally invasive techniques. Pelvic abscesses should be managed conservatively with

antibiotic treatment when possible. However, due to the thickness of the abscess wall, antibiotic treatment often fails to reach appropriate concentrations within pelvic fluid collections (PFCs). Therefore, drainage should be considered for individuals who present with abscesses larger than 3 cm or in the presence of sepsis [2]. PFCs are routinely drained surgically or via computed tomography (CT) or ultrasound (US)-guided procedures [4]. CT-guided percutaneous drainage may be performed through a transabdominal or transgluteal route [1], which requires a catheter placement that may need to remain in situ for weeks or months. This is not only uncomfortable and potentially painful but is also associated with an increased risk of fluid and electrolyte loss, catheter dislodgement and cutaneous fistula formation [1, 5]. Nowadays, surgery is usually reserved for patients with perforation or those unresponsive to minimally invasive CT or US-guided drainage procedures [1].

Endoscopic ultrasound (EUS)-guided pelvic abscess drainage offers an alternative to CT and US-guided percutaneous and transanal drainage procedures. This method was first described in 2003 as a minimally invasive alternative for PFCs located adjacent to the rectum and left colon [6].

The use of lumen-apposing metal stents (LAMSs) was first reported in 2011 [7]. LAMSs were originally developed for the management of symptomatic pancreatic fluid collections, such as pancreatic pseudocysts and walled-off necrosis [5, 7–9]. However, novel off-label indications for their use include the management of gallbladder and bile duct drainage, gastrointestinal strictures, creation of gastrointestinal and enteroenteric anastomoses, management of patients with altered gastrointestinal anatomy and drainage of intra-abdominal and pelvic abscesses [5, 9]. EUS-guided drainage with LAMS has been shown to be a minimally invasive, efficient and safe alternative treatment for pelvic abscesses [3, 4], especially for those collections less than 1 cm from the gastrointestinal lumen and more than 6–8 cm from the anal verge [8]. Furthermore, it avoids the complications associated with percutaneous drainage and has been proven to improve the quality of life [5].

Methods

We conducted an observational retrospective study involving 6 patients referred to our hospital for EUS drainage after a PFC was identified on cross-sectional

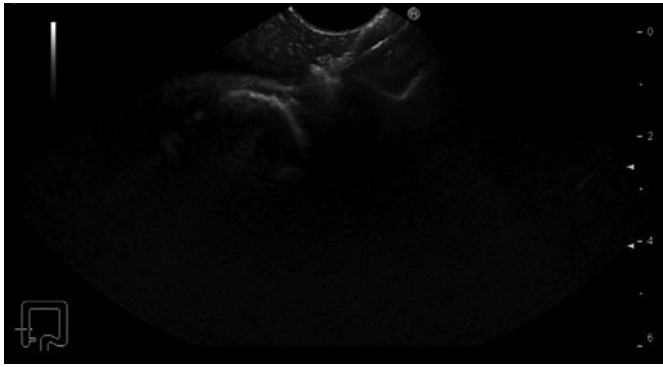


Fig. 1. LAMS placement on EUS.

imaging studies. The PFCs were deemed too large for conservative antibiotic therapy and were associated with septic complications. Due to their location, they were not considered manageable by percutaneous drainage and surgery was avoided due to patients' comorbidities and the aim to prevent increased morbidity and mortality associated with a more invasive surgical procedure. Patient records were reviewed to identify the etiology, size of the collection, number of endoscopic procedures required until complete PFC resolution, stent indwelling time, concomitant surgical or percutaneous associated procedures, successful LAMS removal and PFC resolution.

Informed consent was obtained from all patients prior to the procedure. All procedures were performed under anesthesiologist-monitored deep sedation and by the same experienced interventional endoscopist using a linear-array PENTAX® echoendoscope and a Hitachi HI VISION Preirus ultrasound platform.

Prior to the puncture, the PFC was carefully evaluated for size and location, ensuring the collection was within 1 cm from the rectosigmoid wall and that no intervening blood vessels would impede the procedure. An electrocautery-enhanced LAMS delivery system (Hot-Axios®; Boston Scientific, Marlborough, MA, USA) with a stent diameter of 15 or 20 mm was used based on the endoscopist's discretion and availability at the time of the procedure. The ERBE VIO 200D electrosurgical unit, using AUTOCUT mode, effect 5, power 100 W, was employed for the transrectal puncture with the Hot-Axios® system. The direct puncture technique was performed under EUS guidance alone (without fluoroscopic assistance). The distal phalanx deployment was executed under ultrasound visualization, while the proximal phalanx release was conducted with endoscopic or/and ultrasound view (Fig. 1, 2).

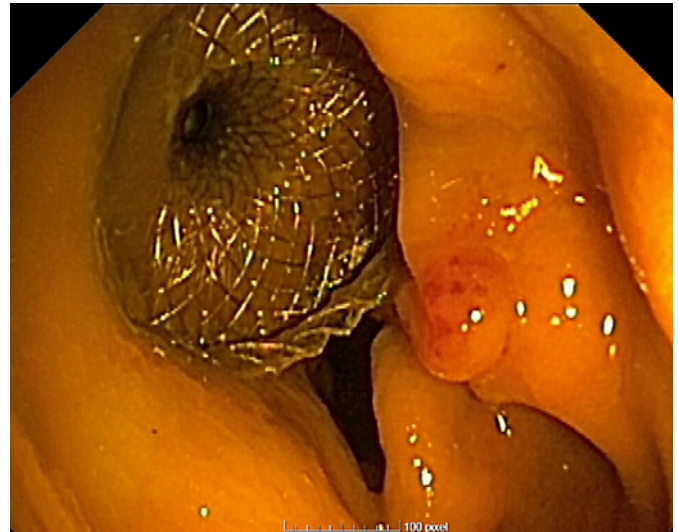


Fig. 2. Proximal phalanx endoscopic visualization.

The primary endpoint was clinical success, defined by successful LAMS deployment followed by PFC resolution based on endoscopic evaluation, clinical and biochemical improvement and no need for additional drainage intervention. Secondary endpoints included adverse events; re-intervention; PFC recurrence and need for surgery.

Given the limited literature regarding this use for LAMS, the collection was evaluated endoscopically during follow-up. The decision to remove LAMS was based on evidence of a residual collection covered by granulation tissue without purulent drainage, alongside evident clinical and biochemical improvement. LAMS removal was performed using alligator foreign body forceps with a 2.3 mm diameter and 230 cm working length, with spontaneous tract closure and complete abscess resolution confirmed via a follow-up CT scan. The time of follow-up varied according to the case. A descriptive analysis of the results was conducted.

Results

The characteristics of individual cases are shown in Table 1, while the sample's baseline characteristics are summarized in Table 2. Six patients were included in this study, five of whom were male, with ages between 51 and 84 years (average age of 69 years).

Regarding the etiology of the PFCs, three cases were related to acute diverticulitis, two were due to anastomotic

Table 1. Cases' characteristics

Case	Age	Gender	Etiology	Collection diameter, mm	LAMS diameter, mm	Number of endoscopic interventions	Stent indwelling time, days	Successful LAMS removal	Percutaneous/surgical drainage	Efficacy
1	67	Male	Anastomotic dehiscence	70	15	3	9	Yes	No	Resolution
2	74	Male	Prostate biopsy	80	15	1	7	Yes	No	Resolution
3	84	Male	Anastomotic dehiscence	100	15	1	7	Yes	No	Resolution
4	54	Male	Acute diverticulitis	80	15	1	6	Yes	No	Resolution
5	51	Male	Acute diverticulitis	66	15	1	4	Yes	No	Resolution
6	84	Female	Acute diverticulitis	39	20	1	7	Yes	No	Recurrence

dehiscence and one case followed a prostate biopsy (Fig. 3). The size of the PFCs ranged from 39 to 100 mm.

In all cases, a 15 mm stent diameter was used, except in one case where a 20 mm stent diameter was utilized. Only the first procedure performed at our department required more than one endoscopic session prior to stent removal for cleansing, washing and debris removal. All other stents were removed during the subsequent endoscopic reevaluation. The stent indwelling time ranged from 4 to 9 days, with the first case having the longest duration.

No patients required additional percutaneous or surgical drainage procedures for PFC resolution. However, 1 patient (16.7%) underwent a diversion colostomy following LAMS placement to expedite the clinical resolution of a concomitant Fournier's gangrene.

All patients (100%) experienced successful PFC drainage following LAMS placement. Nonetheless, 1 patient (16.7%) had an immediate recurrence (less than a week) after LAMS removal. This same patient not only had a recurrence at the original site but also developed a new PFC in a different location related to complicated acute diverticulitis. As both PFCs were smaller than 3 cm no re-intervention was performed and the patient was considered unsuitable for surgery due to concomitant comorbidities. No adverse events related to LAMS placement were reported during the follow-up period.

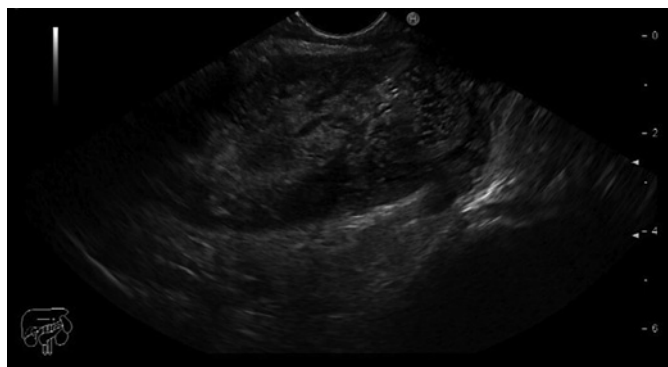
Discussion

Our six-case study suggests that EUS-guided drainage with LAMS is an effective and relatively safe treatment option for PFCs. The large stent diameter facilitates rapid drainage, enables endoscopic access for cleansing and direct evaluation of the collection, and minimizes the risk of stent obstruction. Additionally, the dumbbell shape of LAMS reduces the risk of migration. Given the limited literature on the use of LAMS for PFCs, we propose that endoscopic evaluation might suffice for fluid collections without necrotic tissue, as observed in our study. However, radiological follow-up may be necessary for more complex collections. Spontaneous tract closure after stent removal can be confirmed via follow-up CT scans.

Several particularities of our study merit consideration. The first case performed at our institution required more endoscopic procedures and a longer stent indwelling time, which can only be partially attributed to

Table 2. Study summarized results

Baseline characteristics	
Age, mean (SD), years	69 (14.339)
Sex, male, %	83.3%
Longest diameter of PFC, mean (SD), mm	72.5 (20.197)
Etiology	
Medical/surgical procedure	50%
Underlying medical condition	50%
Stent diameter	
15 mm	83.3%
20 mm	16.7%
Stent indwelling time, mean (SD), days	6.667 (1.633)
Endoscopic interventions per patient, mean (SD)	1.333 (0.816)
Successful LAMS retrieval	100%
Clinical success	83.3%

**Fig. 3.** Iatrogenic pelvic abscess due to a prostate biopsy.

the PFC characteristics. However, this was also likely influenced by the fact that it was the first procedure performed at our institution, with the endoscopist exercising extra caution regarding PFC resolution before stent removal.

Another noteworthy case involved a female patient with a 39-mm PFC. Early recurrence in this case was likely due to a complicated acute diverticulitis. This patient had a history of multiple episodes of acute diverticulitis, with the current episode complicated by a pelvic abscess unmanageable by percutaneous drainage due to its location. Antibiotics were ineffective and the patient was not a candidate for surgery. EUS-guided drainage was considered the last resort for PFC resolution. Consistent with the existing literature, patients with diverticulitis pose significant challenges due to the extent and recurrent nature of the disease. These patients are

also more prone to procedure-related complications, such as perforation. As with all endoscopic procedures, patient selection is critical.

While CT/US-guided percutaneous drainage remains the gold standard approach for managing pelvic abscesses, EUS-guided LAMS drainage has proven to be more efficient and safer compared to other methods [3, 7]. The wider diameter allows for transmural drainage and direct passage of the endoscope through the stent for inspection and debridement. However, its placement is not devoid of complications, such as stent obstruction, stent migration and bleeding. The larger diameter reduces the risk of obstruction and the dumbbell shape minimizes the risk of migration compared to plastic stents [9, 10]. The use of LAMSs should be considered in immunocompromised patients, when percutaneous drainage is technically challenging or when surgical drainage is not feasible [8].

Conclusions

EUS-guided drainage of PFCs with LAMSs is a safe and minimally invasive technique that allows rapid PFC resolution without the need for percutaneous or surgical drainage interventions. However, since our study did not include a comparative analysis with other methods (percutaneous or surgical), no comparative results can be drawn. Additionally, a formal quality-of-life assessment was not performed, so we cannot make conclusions about quality-of-life parameters. Further and larger prospective studies are

needed to confirm our findings and to evaluate the impact on quality of life, hospitalization time and cost-effectiveness.

Statement of Ethics

Ethical approval was provided by the Local Ethical Committee – Comissão de Ética da ULSCB, E.P.E., in “Ata No. 1 (Extraordinária) of June 6, 2024.” Informed consent was obtained from all participants in the study.

Conflict of Interest Statement

There are no potential conflicts of interest to mention.

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Author Contributions

All authors have participated in the drafting of the manuscript and read and approved the final version of the manuscript. Ana Caldeira was also the endoscopist in all the procedures and revised the manuscript critically.

Data Availability Statement

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.