Effectiveness of EUS in drainage of pelvic abscesses in 25 consecutive patients (with video)

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Background: Preliminary evidence suggests that EUS is a minimally invasive alternative to surgery and percutaneous techniques for drainage of pelvic abscesses. The EUS 2008 Working Group identified the technique as a priority for research and recommended its validation in a larger cohort of patients.

Objective: To evaluate the rates of technical and treatment success, rate of recurrence, and complications of EUS-guided drainage of a pelvic abscess in a large cohort of patients.

Study design: Observational study.

Setting: Academic tertiary referral center.

Patients: Consecutive patients referred for EUS-guided drainage of a pelvic abscess that was not amenable to drainage under US or CT guidance.

Methods: In patients with an abscess that measured less than 8 cm in size, two 7F transrectal stents were deployed. In patients with an abscess that measured 8 cm or more in size, an additional 10F drainage catheter was deployed. All patients underwent follow-up CT at 36 hours to assess response to therapy. If the abscess had decreased in size by more than 50%, the drainage catheters were discontinued and patients were discharged from the hospital. The stents were then retrieved by sigmoidoscopy at 2 weeks.

Main Outcome Measurements: We evaluated the rates of technical and treatment success, rate of recurrence, and complications of the EUS-based approach. Technical success was defined as the ability to drain the abscess under EUS guidance. Treatment success was defined as symptom relief in association with complete resolution of the abscess on follow-up CT at 2 weeks. Recurrence was defined as the need for repeat EUS-guided drainage of a pelvic abscess within 90 days after the stent retrieval.

Results: The procedure was technically successful in all 25 patients (100%) in whom it was attempted, and no complications were encountered. Mean size of the abscess was 68.5 × 52.4 mm. In addition to transrectal stents, a drainage catheter was deployed in 10 patients. Treatment was successful in 24 (96%) of 25 patients. The mean duration of the postprocedure hospital stay was 3.2 days. At a mean follow-up of 189 days (range 93-817), all 24 patients were doing well without abscess recurrence.

Conclusions: EUS is a minimally invasive, safe, and effective technique that affords long-term benefit for patients undergoing pelvic abscess drainage. (Gastrointest Endosc 2009;70:1121-7.)

A pelvic abscess occurs as a complication of surgery or medical conditions such as inflammatory bowel disease, diverticulitis, and ischemic colitis.[1-3] Historically, pelvic abscesses have been drained via the transrectal or transvaginal route under US guidance, percutaneous route under CT guidance, or by surgery.[4-6] However, the complex anatomy of the pelvis with surrounding bones, vascular structures, and organs makes access to the abscess cavity a technical challenge. Recently, EUS has been proposed as a minimally invasive alternative for drainage of pelvic abscesses.[6-8] In the first report by Giovannini et al[7] of 12 patients, EUS-guided transrectal stent placement was successful in 75% of cases. The mean duration of stenting was 4.3 months. However, the technique was ineffective in patients with abscesses

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that measured more than 8 cm. The second study of 4 patients was reported by our group in which a EUS-guided transrectal drainage catheter was deployed to provide access to the abscess cavity for continued evacuation.[8] Although 1 patient died of unrelated causes, the clinical outcome was successful in the 3 others. The mean duration to abscess resolution was 6 days, and all cases were managed as inpatients. To minimize the potential for accidental dislodgment of the drainage catheter, patient discomfort, and a longer hospital stay, we then evaluated a combined technique that involved transrectal placement of both a drainage catheter and stent in patients with abscesses that measured 8 cm or more.[9] While the short-term drainage catheter (36 hours) provided access for continued evacuation of the abscess, the medium-term stent facilitated maintenance of a patent transmural tract for eventual abscess resolution. This technique yielded treatment success in all patients in whom it was attempted and reduced the mean length of hospital stay to 2 days.

On the eve of the 16th International Symposium on Endoscopic Ultrasonography, a working group meeting of experts was convened to deliberate on the applications of interventional EUS.[10] The EUS 2008 Working Group consensus statement opined that EUS-guided drainage of a pelvic abscess was an important application and recommended validation of the technique in a large cohort of patients.[11] In this study, we evaluate the rates of technical and treatment success, rate of recurrence, and complications of EUS-guided drainage of a pelvic abscess in 25 consecutive patients.

Capsule Summary

What is already known on this topic

- Pelvic abscesses commonly are drained transrectally or transvaginally under US guidance, percutaneously under CT guidance, or surgically.
- The complex pelvic anatomy can make access to such abscesses technically challenging.

What this study adds to our knowledge

- EUS-guided drainage of a pelvic abscess was successful in 24 of 25 consecutive cases not amenable to drainage under US or CT guidance.
- No complications or recurrences occurred at a mean follow-up of 189 days.

MATERIALS AND METHODS

This study was executed by analyzing data that were collected prospectively for all patients who underwent EUS-guided drainage of pelvic abscesses over a 28-month period between January 2007 and April 2009. The institutional review board–approved interventional EUS database comprises 64 variables that includes all demographic and clinical information of patients, technical data, and clinical outcomes of patients with long-term follow-up. All patients were referred by GI surgeons or interventional radiologists. A dedicated pelvic CT was performed before EUS in all patients. Inclusion criteria were patients in whom an adequate window could not be found to drain the abscess via the transgluteal, transvaginal, or transrectal routes by using US and/or CT guidance. Excluded were patients with coagulation disorders, multiloculated abscess, rectocele, J pouch, abscesses that were perianal in location, and fluid collections with immature walls (free fluid without a surrounding rim). The distal colon and rectum were prepared by administration of tap water or phosphate enema. Patients were instructed to void urine before the procedure because a distended bladder may preclude adequate visualization of the pelvic abscess during EUS. All procedures were performed with the patients under conscious sedation by using a combination of midazolam, meperidine, diazepam, or ketamine, and every patient was given 2 g amoxicillin plus clavulinic acid before the procedure and continued on oral antibiotics for 3 days. All procedures were undertaken by 1 endoscopist (S.V.) who underwent 2 years of formal training in ERCP and EUS and performs 850 EUS and 120 interventional EUS procedures annually. Procedural and informed consents were obtained from all patients before EUS, and the study was approved by the institutional review board of our hospital.

Procedural technique

The pelvic abscess was first located (Fig. 1A; Video 1, available online at www.giejournal.org) by using a therapeutic curvilinear array echoendoscope (Olympus GF-UCT 140; Olympus Corp, Center Valley, Pa). After excluding the presence of intervening vasculature by using color Doppler, a 19-gauge needle (EchoTip; Wilson-Cook, Winston-Salem, NC) was used to puncture the abscess cavity. After removal of the stylet, normal saline solution was flushed into the abscess with a 10-mL syringe and reaspirated to clean out the cavity of as much pus as possible. A sample of the aspirate was sent for Gram stain and culture. A 0.035-inch guidewire was then passed via the 19-gauge needle and coiled into the abscess cavity (Fig. 1B) under fluoroscopic guidance. The transmural tract was then sequentially dilated by using a 5F ERCP cannula (Fig. 1C) passed over the guidewire and an 8-mm over-the-wire biliary balloon dilator (Fig. 1D). In patients with a pelvic abscess that measured less than 8 cm, one or two 7F 4-cm double pigtail stents were deployed (Fig. 1E). The decision to place 1 or 2 transrectal stents was made by the endoscopist based on density of the abscess contents. After deployment of the first stent, an ERCP cannula preloaded with a 0.035-inch guidewire was

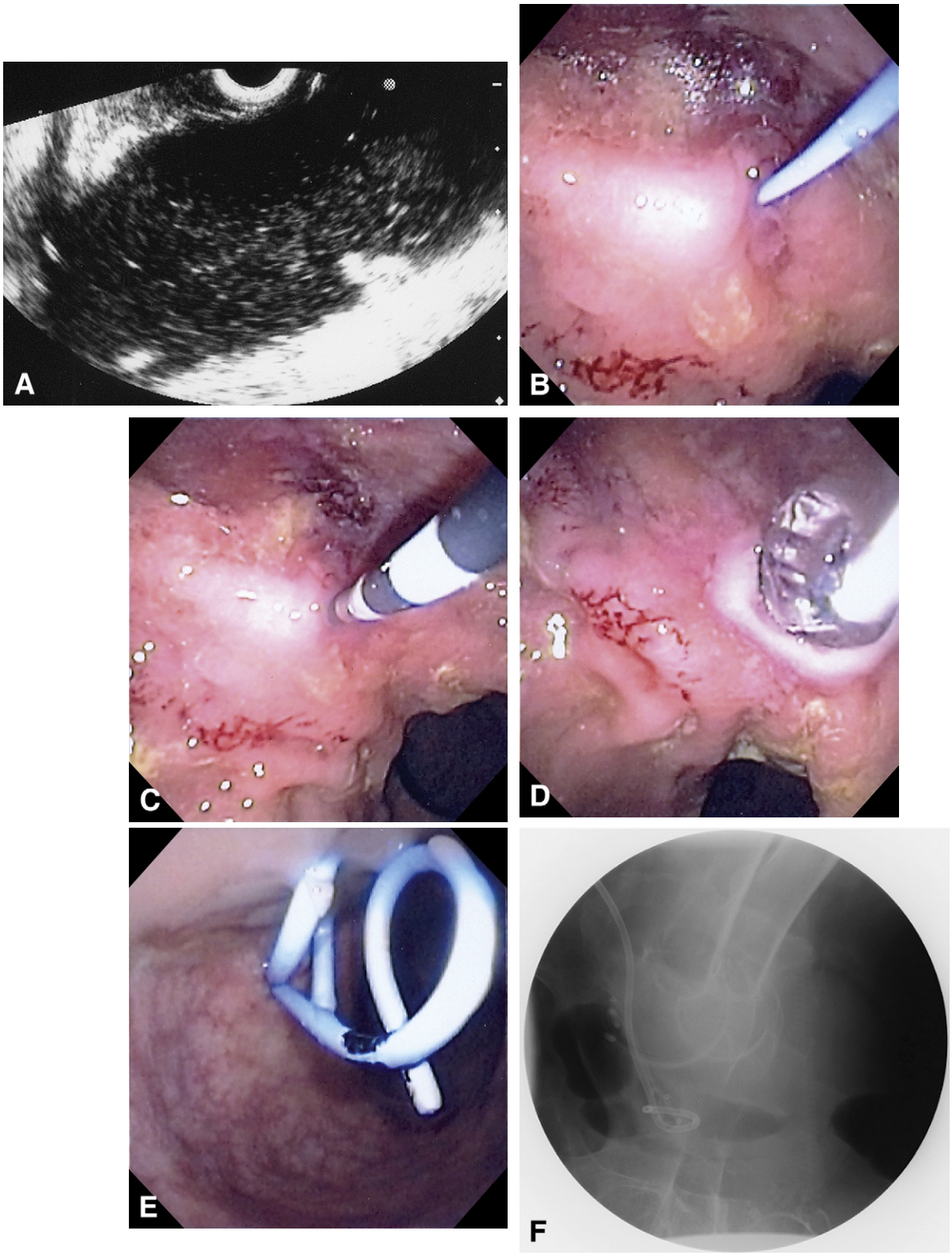

Figure 1. A pelvic abscess is identified by using a linear array echoendoscope. **B,** The abscess is punctured by using a 19-gauge FNA needle, and a 0.035-inch guidewire is coiled within the abscess cavity. The transmural tract is then sequentially dilated by using a 5F ERCP cannula (**C**), and then an 8-mm over-the-wire balloon dilator (**D**). Transrectal stents are then deployed within the abscess cavity (**E**) followed by placement of a drainage catheter (**F**), as noted on fluoroscopy.

passed adjacent to the stent into the abscess cavity. After coiling the guidewire under fluoroscopic guidance, the second stent was deployed into the abscess cavity. In patients with an abscess that measured 8 cm or more, a 10F transrectal drainage catheter (Flexima; Boston Scientific, Natick, Mass) was deployed in addition to the transrectal stents (Fig. 1F). The drain exited the anus and was secured to the patient's gluteal region by application of tape. The drain was then flushed with 50 mL of normal saline solution every 4 hours until the aspirate was clear. The decision to place an additional drainage catheter was based on poor outcomes with stenting alone in this cohort of patients (abscess $\geq$8 cm).

A follow-up CT was obtained at 36 hours to assess the response to treatment (Fig. 2). If the abscess had decreased by more than 50% in size and if the patient was afebrile and pain free, the drainage catheter was discontinued and the patient was discharged home. A repeat CT was obtained at 2 weeks in all patients. If the abscess had resolved completely, the stents were retrieved by outpatient sigmoidoscopy. Long-term follow-up was obtained by contacting patients or their referring physicians by telephone or by evaluation of their most recent medical records.

Definition of outcomes

Technical success was defined as the ability to drain the abscess under EUS guidance. Treatment success was defined as symptom (abdominal pain and fever) relief in association with complete resolution of the abscess on follow-up CT at 2 weeks. Recurrence was defined as the need for repeat EUS-guided drainage of a pelvic abscess within 90 days after stent retrieval.

RESULTS

Thirty patients were referred for EUS-guided drainage of a pelvic abscess. Clinical presentation included abdominal pain in all 30 patients and fever in 19. Five patients were excluded from the study because the abscess was perianal in location in 2, the walls were immature in 1, an alternative diagnosis of perirectal cyst was established by EUS in 1, and the pelvic fluid collection was diagnosed as an anastomotic dehiscence in 1. The procedure was technically successful in all the 25 (100%) patients in whom it was attempted, and no complications were encountered. The demographic and clinical presentation of patients who underwent EUS-guided drainage of a pelvic abscess is shown in Table 1. Seventy-two percent of the abscesses were postsurgical or posttraumatic in nature, and others were caused by medical illnesses. Two patients had undergone previous percutaneous drainage catheter placement, but the treatment was ineffective. Although most procedures were undertaken in the endoscopy suite, 2 were undertaken at the patient's bedside

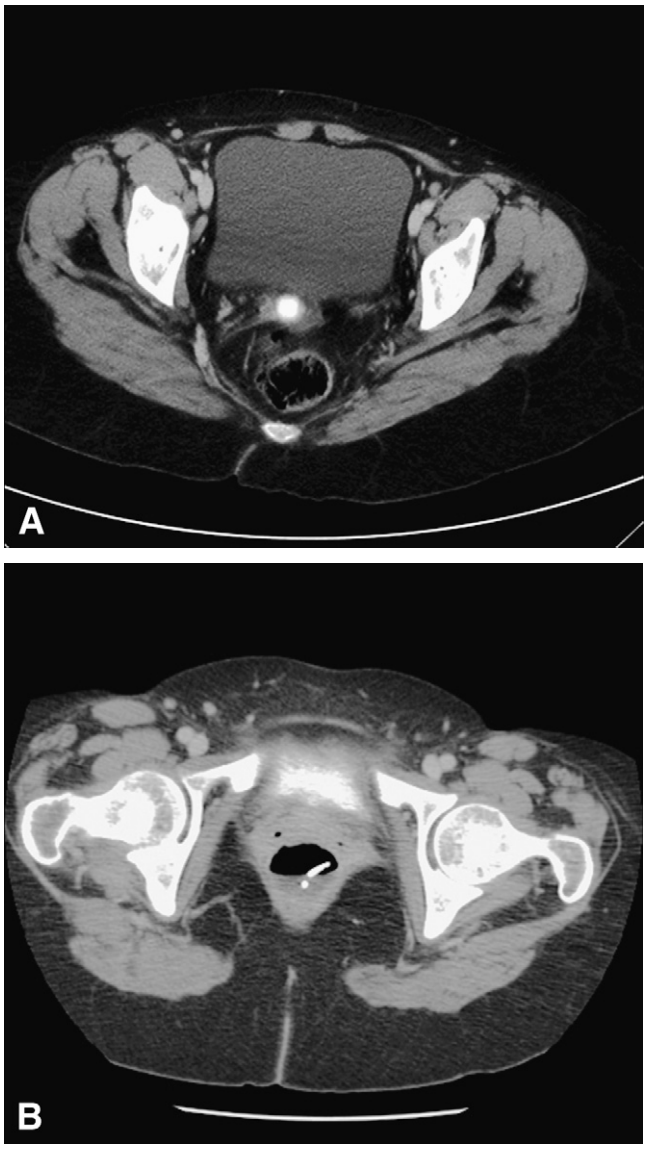

Figure 2. CT of the abdomen (axial view) reveals a large pelvic abscess measuring 9 × 8 cm (**A**). A follow-up CT scan at 36 hours after transrectal stenting reveals nearly complete resolution of the abscess (**B**).

in the surgical intensive care unit (Table 2). The 2 patients who underwent bedside EUS were American Surgical Association class IV and were deemed to be unsafe to be transported to the endoscopy suite. Bedside procedures were undertaken with the aid of a C-arm fluoroscopy machine and an EUS processor (Olympus Exera EU-C60) mounted on a endoscopy cart.

Technical data and clinical outcomes of patients who underwent EUS-guided pelvic abscess drainage are shown in Table 2. All abscesses were located within 2 cm of the EUS transducer, and definitive luminal compression was evident in 5 (20%) of 25 patients. Seventy-six percent of the abscesses were drained via the transrectal route and others via the left side of the colon. Both drainage catheters and stents were deployed in 40% of cases because

TABLE 1. Demographic features and clinical characteristics of patients who underwent EUS-guided drainage of a pelvic abscess

No. patients	26
Male, no. (%)	16 (64)
Mean age, y, range	48.3 (20-84)
Size of pelvic abscess by CT, mm	
Large axis	
Mean (SD)	68.5 (18.8)
Median (range)	60 (40-96)
Short axis	
Mean (SD)	52.4 (10.5)
Median (range)	50 (30-86)
Etiology, no. (%)	
Postsurgical*	17 (68)
Perforated diverticulitis	3 (12)
Perforated appendicitis	2 (8)
Ischemic colitis	1 (4)
Infective endocarditis	1 (4)
Gunshot injury	1 (4)
Ineffective percutaneous drainage, no. (%)	2 (8)

SD, Standard deviation.
*Postsurgical etiology was low anterior resection in 16 and after cystectomy in 1.

TABLE 2. Technical data and clinical outcomes of the 25 patients who underwent EUS-guided drainage of a pelvic abscess

Technical success, no. (%)	25 (100)
Treatment success, no. (%)	24 (96)
Mean duration of follow-up, days (range)	189 (93-817)
Procedure venue, no. (%)	
Endoscopy suite	23 (92)
Patient bedside	2 (8)
Drainage route, no. (%)	
Transrectal	19 (76)
Transsigmoid	6 (24)
Drainage modality, no. (%)	
7F stents	25 (100)
Additional 10F drainage catheter	10 (40)
Procedural duration, min	
Mean duration (SD)	23.4 (17.3)
Median duration (range)	18 (7-85)
Repeat interventions, no. (%)	3 (12)
Postprocedure length of stay, days	
Mean (SD)	3.2 (14.8)
Median (range)	2 (2-20)

SD, Standard deviation.

the abscess measured 8 cm or more; only transrectal stents were deployed in others. Two stents were deployed in 18 patients and 1 stent in 7 patients. The mean procedure duration was 23.4 minutes. The average duration for performing the first 15 cases was 30 minutes and 18 minutes for performing the later 10 cases. The drainage catheters were discontinued at 36 hours in 10 patients because follow-up CT revealed more than 50% decrease in size of the pelvic abscess; in the 2 patients who had bedside EUS, the drainage catheters were discontinued on day 3 because of a delay in obtaining follow-up CT scans. A second intervention was required in 3 cases because of inadvertent dislodgment of the drainage catheter in 2 patients and poor response to therapy in 1 patient with perforated diverticulitis. Both patients in whom the drainage catheter was replaced had a successful treatment outcome; the patient with perforated diverticulitis continued to experience symptoms, and a follow-up CT revealed persistence of the abscess, thereby necessitating surgical drainage. Of the 2 other patients with perforated diverticulitis, 1 had severe chronic obstructive pulmonary disease and was managed conservatively with antibiotics and outpatient follow-up. One other patient had chronic renal failure and underwent elective surgery 5 weeks after EUS-guided drainage. Of the 2 patients with perforated appendicitis, both abscesses were drained under EUS guidance after surgery that was undertaken at outside hospitals. CT at the time of surgery in these patients revealed only a small fluid collection. However, because of an increase in size of the abscesses on follow-up cross-sectional imaging and the presence of abdominal pain, EUS-guided drainage was performed. Both patients were discharged from the hospital within 3 days after their procedures. No procedural complications were encountered in any patient. Gram staining in almost all patients was positive for cocci, and microbiological cultures revealed multiple organisms.

The treatment was successful in 24 (96%) of 25 patients: At 2-week follow-up, all 24 patients were symptom free with complete resolution of the pelvic abscess on CT. The stents were retrieved successfully at sigmoidoscopy in 23 patients; in 1 patient, the stent had migrated spontaneously. After stent retrieval, at a mean follow-up of 189 days (range 93-817), all 24 patients whose treatment was successful were doing well without any evidence of pelvic abscess recurrence.

DISCUSSION

In this study, the largest reported to date on EUS-guided drainage of a pelvic abscess, the technique was found to be safe and highly effective, yielding long-term clinical benefit to most patients. Anastomotic leak after colorectal resection is the most common surgical cause for pelvic abscess formation.[1-3] Despite establishing adequate blood supply and ensuring a tension-free anastomosis, leaks develop in 0.5% to 6% of patients. No major difference in outcomes has been reported between the stapled or hand-sewn techniques in patients undergoing left-sided anastomosis.[12] Although intraoperative air leak testing has been shown to be effective in predicting postoperative disruption, it does not eliminate the risk of anastomotic leak completely, despite corrective measures.[13] Postoperatively, pelvic fluid collections are generally drained via the transrectal or transvaginal route under US guidance and the transgluteal route under CT guidance or may require surgery.[4-6] US-guided transrectal and transvaginal drainage is possible only when the pelvic abscess is within the reach of the US probe. Also, this technique does not allow the deployment of transrectal stents. Close to 20% of patients who undergo CT-guided drainage of a pelvic abscess via the transgluteal route experience pain at the procedural site and limitations in ambulation and bed rest from the catheter, which protrudes through the buttocks.[6]

EUS is a minimally invasive alternative that can be performed not only in the endoscopy suite but also at the bedside if the patient is critically ill.[14] The procedure can be undertaken within 30 minutes, and with experience, the technical proficiency seems to improve, yielding treatment success in a majority of patients, as observed in this study. A major advantage of EUS over percutaneous techniques is that an internal stent can be deployed, thereby minimizing patient discomfort and facilitating quick discharge of patients from the hospital. Current data suggest that the time to resolution of a pelvic abscess is approximately 8 days with percutaneous techniques.[6] In this study, the mean and median duration of the postprocedure hospital stay was only 3.2 and 2 days, respectively. Also, indwelling drainage catheters are prone to infection and when left for prolonged periods may predispose to fistula formation. In this study, we administered prophylactic antibiotics to all patients and did not encounter postprocedural sepsis in any patient. The role of antibiotics in pelvic abscess drainage is unclear. It is our opinion that if the abscesses are drained successfully, antibiotic coverage need not be continued after the procedure. If technical failure is encountered, then the antibiotics may have to be continued until the abscesses can be drained by an alternative modality. In this study, EUS-guided drainage was effective not only for postoperative abscesses but also those secondary to medical illnesses such as ischemic colitis and diverticulitis. A disadvantage of EUS is that the technology is fairly new and is not widely available at institutions outside of the academic setting. Also, a thorough knowledge of the pelvic anatomy is important before undertaking therapeutic interventions by using the linear echoendoscope.

A major limitation of our study is that the outcomes of the EUS-based approach were not compared with that of surgical drainage. Another limitation is that we did not evaluate the effectiveness of the technique in patients with abscess secondary to inflammatory bowel disease. This was borne out of concern that the procedure may result in permanent internal fistula formation. All 25 patients in this study underwent EUS-guided drainage via the rectum or left side of the colon. Although most anastomotic leaks occur in this region, the role of EUS in drainage of fluid collections adjacent to the transverse or right side of the colon is unclear. The current linear-array echoendoscopes (oblique view) are limited in their ability to access these areas. The role of the prototype forward-view echoendoscope for accessing the right side of the colon requires further evaluation.

In conclusion, EUS, in expert hands, is a minimally invasive, safe, and effective technique that affords long-term clinical benefit for patients undergoing pelvic abscess drainage.

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