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ORIGINAL PAPER

Endoscopic ultrasound guided versus surgical transrectal drainage of pelvic abscesses

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ABSTRACT

Background: Pelvic abscesses are common but only small case series reporting outcome of either endoscopic ultrasound (EUS) guided or surgical transrectal drainage have been reported.

Methods: We performed a retrospective consecutive cohort study, assessing effectivity and safety of EUS guided or surgical transrectal drainage of previously untreated pelvic abscesses from all causes, diagnosed using CT scan between 09/2010 and 06/2014 in a Dutch teaching hospital.

Results: Forty-six patients with comparable demographics, apart from stoma presence ($p = .016$), were included. The success rate after a single intervention was 83% in the EUS guided compared to 48% in the surgical transrectal drainage group ($p = .013$). However, the mean duration of drainage was threefold in the EUS group [42 versus 13 days ($p = .001$)]. The length of stay in hospital was similar for both EUS and surgical group [24 versus 20 days ($p = .56$)] as was abscess resolution during follow-up [78% versus 74%]. We recorded a total of 12 anastomotic leaks [3 versus 9]. In the occurrence of leakage, only one stoma was finally closed in each group.

Conclusion: EUS guided and surgical transrectal drainage of pelvic abscesses from any cause are safe, nonetheless EUS guided drainage(if feasible) seems more effective after a single treatment, with high overall cure rates.

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Pelvic abscess; endoscopic ultrasound; transrectal surgery; drainage

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Introduction

Pelvic abscesses are a common phenomenon and may occur after surgery or arise as a result of an inflammatory bowel condition [diverticulitis, inflammatory bowel disease (IBD), pelvic inflammatory disease, appendicitis, ischemic colitis] [1].

The presenting symptoms are those of the underlying disease with typically intermittent high-grade fever, shaking and chills, abdominal pain and tenderness over the involved area. However, it can also present atypically due to prior use of antibiotics or in elderly patients as hypotension alone [2]. The diagnosis is facilitated by a thorough clinical examination, laboratory workup and a good quality ultrasound and/or CT scan [3]. It is of utmost importance to treat the abscess and the underlying disease since it is associated with significant acute morbidity, long-term sequelae – including adhesion formation, chronic pelvic pain and impaired fertility – and even mortality [4].

Several techniques have been proposed to drain these abscesses: surgical drainage, percutaneous or transvaginal drainage using ultrasound/CT scan or in few cases linear endoscopic ultrasound (EUS).

The first record of surgical drainage dates from 1908 when Maclaren described his experience in a small series of five patients with complicated appendicitis. All Douglas' abscesses were drained through the anterior rectal wall with favourable outcome [5]. Decades later, in the mid-seventies, ultrasound and CT developed offering new diagnostic and therapeutic possibilities for guided percutaneous puncture [6,7]. In 2003, Giovanni *et al.* [8] published their promising new technique using EUS; only then the full potential was discovered as it has many advantages over conventional endoscopy and percutaneous ultrasound. EUS for example enables access to abscess cavities that do not cause luminal compression. Furthermore, drainage can be performed real time under sonographic guidance, intervening vasculature can be

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Table 1. Review of literature on surgical and EUS guided transrectal drainage.

Year of publication	Author	Technique	Design	Origin	Number of patients	Result (successful recovery after single intervention +− drain)
1908	MacLaren	Surgical transrectal drainage	Cohort	Appendicitis	5	5 (100%)
2003	Giovannini	EUS guided transrectal drainage	Cohort	Postsurgical, diverticulitis, hysterectomy	12	9 (75%)
2009	Varadarajulu	EUS guided transrectal drainage	Retrospective consecutive cohort	Postsurgical, diverticulitis, appendicitis, ischemic colitis, infective endocarditis, gunshot injury	25	24 (96%)
2012	Ulla-Rocha	EUS guided transrectal drainage	Retrospective consecutive cohort	Postsurgical	3	3 (100%)
2013	Ramesh	EUS guided transrectal drainage	Retrospective consecutive cohort	Postsurgical, diverticulitis, perforated viscus	27	26 (96%)
2014	Puri	EUS guided transrectal drainage	Retrospective consecutive cohort	Postsurgical, diverticulitis	30	23 (77%)
2014	Hadithi	EUS guided transrectal drainage	Retrospective consecutive cohort	Postsurgical, IBD, diverticulitis, iatrogenic	8	8 (100%)

avoided and last but not least an alternative diagnosis can be established in a small subset of patients [8,9]. Nevertheless EUS guided drainage is not suitable for all abscesses. Puncturing in multiloculated abscesses, abscesses measuring less than 4 cm in size, abscesses without a mature wall with a definitive rim and abscesses located at the level of the dentate line or at greater distance than 2 cm from the EUS transducer should be avoided, since it can result in therapeutic failure or even induce complications as free perforation [10].

Several small historical and contemporaneous case series have been described, all reporting encouraging results, but up to date, no comparative studies looking at both EUS guided and surgical transrectal drainage have been performed [5,8,11–15] (Table 1).

We hypothesize, based on the available literature, that both minimal invasive EUS guided and surgical transrectal drainage of pelvic abscesses are safe and effective.

Method

Patients

All consecutive patients treated using EUS guided and surgical transrectal drainage for previously untreated pelvic abscesses from all causes during a period of more than 3.5 years (September 2010–June 2014) were included in this retrospective cohort study. The patient characteristics, e.g. age, sex, as well as pelvic abscess characteristics were retrospectively collected using the hospital's digitized patient information system. In 2011, the departments of Surgery of the Atrium Medical Centre (Heerlen, the Netherlands) and the Orbis Medical Centre (Sittard, the Netherlands) merged into one regional Department of Surgery and act as regional teaching centre in the south of the Netherlands.

Diagnosis

The diagnosis of pelvic abscesses was made using good quality CT scans by board qualified radiologists. Patients were excluded from this study if they were younger than 18 years of age, if there was inadequate available patient data or follow-up (<14 days after treatment or removal of pigtail catheter), pregnancy, rectovaginal fistulisation, spontaneous drainage or recurrent pelvic sepsis from all causes [inflammatory bowel disease (IBD), malignancy, surgery].

The treating surgeon was responsible for the treatment strategy. But the attending gastroenterologist was consulted in case of optimal abscess characteristics for EUS guided transrectal drainage (non-multi-loculated abscesses, measuring less than 4 cm in size, with a mature wall with a definitive rim and located above the dentate line or at a distance no greater than 2 cm from the lumen).

An informed consent was obtained from every patient prior to either procedure.

Interventions

EUS guided transrectal drainage was performed under conscious sedation using a Pentax/Hitachi based system with 3.7 mm working channel, allowing the use of accessories up to 19 Gauche [G]. Using the EUS the abscess was localised, while making sure not to perforate any overlying vessels, the abscess cavity was punctured and drained using a 19G needle. This was followed by aspiration of the collection and deployment of a CRE™

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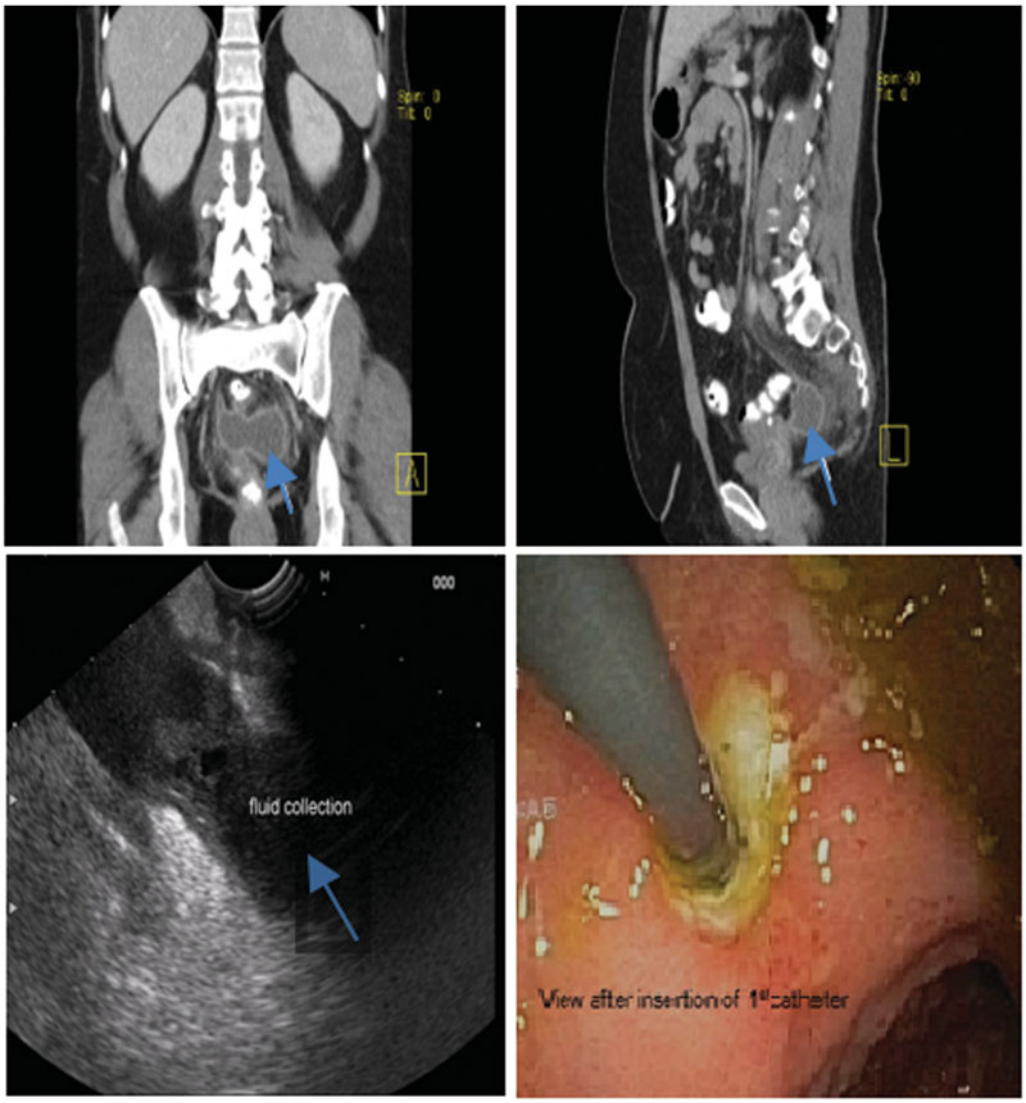

Figure 1. Localisation of abscess cavity.

Balloon Dilator or Cystotome® – from respectively Boston Scientific™ or Cook® – to dilate the entrance. Finally, (one or) two 7G Zimmon® Biliary stents from Cook® (reference ZSO-7-4) were left in place in the abscess cavity through the rectal wall (Figure 1).

The surgical drainage was performed under general anaesthesia in stirrups position and – if possible – a single lumen catheter was left in after drainage and rinsing of the abscess cavity.

All patients were hospitalised after the procedure and remained under follow-up till after removal of the catheters. The moment of catheter removal was individualised and based on clinical grounds, no routine post-intervention CT scan or blood tests were instituted. All data were extracted retrospectively from the hospital's electronic database by the primary investigator and an anonymised dataset was used for further analysis.

Outcome variables

The primary outcome measure was effectiveness of therapy (defined as no need for additional treatment or intervention be it surgical/endoscopic or radiological). Secondary outcome measures were length of stay, drainage time, morbidity (stoma closure/chronic wound problems/oncological state) and mortality.

Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics for Windows, Version 22, Released 2013, Armonk NY: IBM Corp. The Chi-Square (categorical dependent variables) or independent samples *t*-test (interval dependent variables) were used to assess the mean difference and standard deviation between the EUS guided and surgical transrectal drainage group. A *p*-value of $< .05$ was deemed as statistically significant.

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Table 2. Patient characteristics.

Parameter	Variable	EUS guided drainage (23 patients)	Surgical drainage (23 patients)	*p* value
Sex, *n* (%)	Male	12 (52)	10 (43)	.56
	Female	11 (48)	13 (57)	
Age (years)	Mean (SD)	57 (20)	58 (20)	.84
	Range	13–88	19–86	
	Median (IQR)	56 (29)	63 (25)	
Aetiology, *n* (%)	Tumor/Surgery for tumor	6 (26)	14 (61)	
	M1	1	0	
	T1	0	1	
	T2	3	4	
	T3	1	8	
	T4	2	0	
	N+	1	5	
	Diverticulitis/Surgery for diverticulitis	2 (9)	3 (13)	
	Cholecystitis/Cholecystectomy	1 (4)	0 (0)	
	Appendicitis/Appendectomy	8 (35)	4 (17)	
	Other	4 (17)	2 (9)	
	IBD/Surgery for IBD	1 (4)	0 (0)	
	Bariatric surgery	1 (4)	0 (0)	
Time to drainage after surgery/antibiotic treatment (days)	Mean (SD)	16 (11)	21 (17)	.22
	Range	4–49	4–66	
	Median (IQR)	14 (13)	14 (16)	
Stoma, *n* (%)	Present	1 (4)	0 (0)	
	Due to prior intervention	5 (22)	13 (57)	.016

Results

A total of 56 patients were retrieved from the hospital's database, 27 in the EUS guided and 29 in the surgical transrectal drainage group. After implementation of the in- and exclusion criteria, respectively, four and six patients were withheld from further analysis: one due to lost to follow-up before drain removal, two due to incomplete data, three due to duplicate entry and four due to recto-vaginal fistulisation.

As a result, both groups consist of 23 patients, with comparable demographics (Table 2) and aetiology of abscess formation (Figure 2) ranging from benign to malignant, from inflammatory bowel disease to diverticulitis/appendicitis, from primary to secondary abscesses and also some rare other causes; abscess of unknown origin, prostate abscess, after stoma closure, right hemicolectomy for caecal blowout, adhesiolysis. Only the presence of a stoma ($p = .016$), which occurred five times in the EUS guided drainage group compared to 13 times in the surgical transrectal drainage group, showed a significant statistical difference.

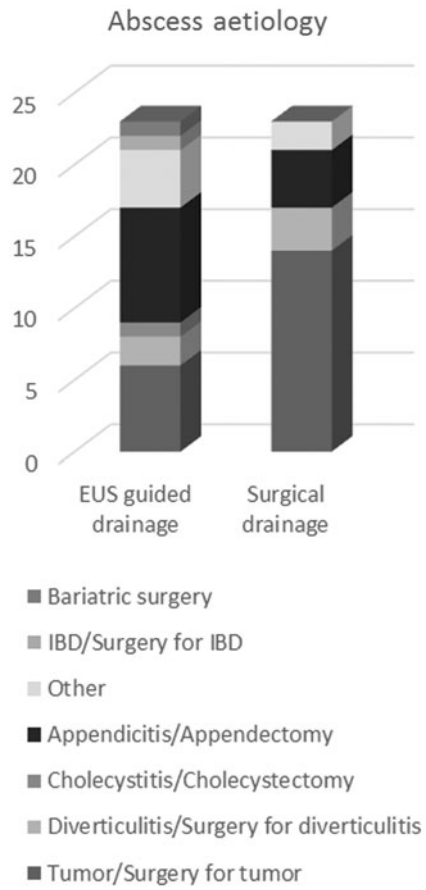

Figure 2. Aetiology of pelvic abscess.

Primary outcome

The success rate after a single intervention was considerably higher in the EUS guided transrectal drainage group with 83% (19 patients) after a single drainage compared to 48% (11 patients) in the surgical transrectal drainage group ($p = .013$). All others needed additional interventions (extra drainage, stoma formation, resection of source) to salvage the problem and therefore failed to meet our primary endpoint (Table 3).

The presence of a stoma prior to abscess drainage does not seem to have any impact on drainage success rate as four out of six patients with a

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Table 3. Clinical outcome.

Parameter	Variable	EUS guided drainage (23 patients)	Surgical drainage (23 patients)	*p*-value
Success, *n* (%)	Single treatment	19 (83)	11 (48)	.013
	No (additional treatment)	4 (17)	12 (52)	
Drainage time (days)	Mean	42 (22)	13(17)	.001
	Range	19–107	0–41	
	Median (IQR)	39 (22)	11 (12)	
Length of stay (days)	Mean (SD)	24 (29)	20(15)	.56
	Range	4–146	1–68	
	Median (IQR)	18 (21)	19 (13)	
Follow-up (days)	Mean (SD)	261 (214)	301 (261)	.57
	Range	34–387	17–962	
	Median (IQR)	149 (270)	281 (441)	

Table 4. Clinical outcome.

Parameter	Variable	EUS guided drainage (23 patients)	Surgical drainage (23 patients)
Stoma, *n* (%)	New	2 (9)	2 (9)
Stoma closure, *n* (%)	Yes	3 (38)	4 (27)
	No	5 (62)	11 (73)
Anastomotic leak, *n*	Per total number of anastomoses	3/9	9/14
Stoma, *n* (%)	Permanent after leak	2/3 (67)	8/9 (89)
	Permanent without leak	0/2	0/1
End result, *n* (%)	Cured	18 (78)	17 (74)
	Wound problem	1 (4)	1 (4)
	Intermittent recurrence	1 (4)	1 (4)
	Oncologic progression	1 (4)	4 (17)
	Died	2 (9)	0 (0)

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stoma recovered after a single drainage in the EUS guided drainage group compared to five out of thirteen in the surgical transrectal drainage group.

Secondary outcomes

Due to complications four patients, two in each group, received a stoma after the drainage. Most patients recovered slowly and only in, respectively, three and four cases could the stoma be reversed during the follow-up period. Unfortunately, two stomas needed to be replaced due to leakage after stoma closure.

We recorded a total of twelve anastomotic failures, after emergency surgical interventions for cancer/infection or elective procedures such as stoma closures. Of those leaks three occurred in the EUS guided transrectal drainage group versus nine in the surgical transrectal drainage group.

In the occurrence of leakage only one stoma was finally reversed in each group, so respectively two out of three and eight out of nine stomas persisted after an anastomotic leak or breakdown.

The mean time between the primary treatment – be it surgery or unsuccessful antibiotic treatment for complicated appendicitis, cholecystitis or diverticulitis – and need for drainage tends to be shorter for the EUS guided transrectal drainage group with 16 versus 21 days ($p = .22$) but it failed to reach any statistical significance.

The mean duration of drainage on the other hand was statistically significant shorter in the surgery group, as the mean time needed for drainage or rather pigtail removal in the EUS guided drainage group was 42 days compared to just 13 days in the surgical transrectal drainage group ($p = .001$).

When the total length of stay was analysed, we observed no significant difference in the, respectively, 24 versus 20 days of admission ($p = .56$).

The duration of follow-up in both groups is similar, with 261 days in the EUS guided transrectal drainage group compared to the 301 days of the surgery group.

Respectively 18 (78%) and 17 (74%) patients were cured from their abscess and related problems during the follow-up period. However, in this period two people died due to oncological progression in the EUS guided transrectal drainage group after a successful drainage. Respectively three patients from the EUS group and six from the surgical transrectal drainage group had continued need for medical care: two due to intermittent recurrence, two due to wound problems and another five due to progressive oncological disease (Table 4) (Figure 3).

Discussion

In this study, two different pelvic abscess treatment strategies were investigated. We retrospectively compared the EUS guided with the surgical transrectal drainage with a high success rate in favour of the EUS guided transrectal drainage

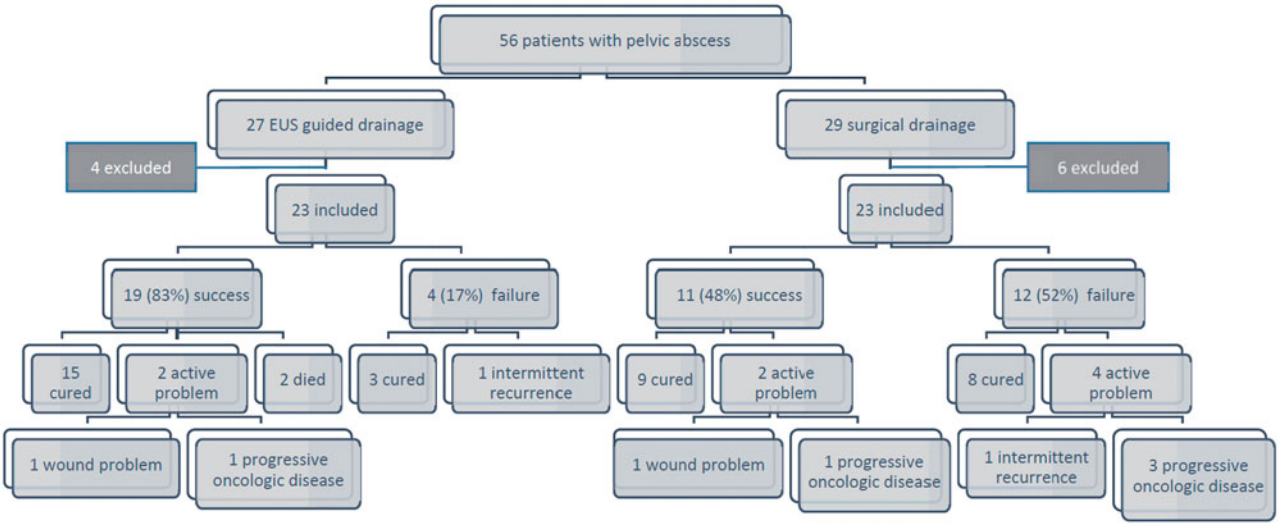

Figure 3. Flow diagram of included patients.

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group (83% compared to a 48%) after a single intervention.

We observed a high overall cure rate during the follow-up period.

EUS guided transrectal drainage seems especially appealing for high risk patients in poor overall health and of course in patients with ideal abscess characteristics as described by Holt *et al*. [10]; single cavity, diameter of more than 4 cm in size, with a mature wall and definitive rim, located above the dentate line and at less than 2 cm from the EUS transducer. It cannot be excluded that abscesses meeting these criteria are easier to drain, whether drained surgically or endoscopically. Furthermore decisional bias by the treating physician is possible, hence repetition of this trial in a prospective randomised manner would be advisable to further clarify the benefits of surgical versus endoscopical drainage of pelvic abscesses.

The formation of an abscess/abscedation was mainly due to cancer (as primary presentation or as complication after surgery for cancer) in, respectively, 26 and 61% of cases. However, there were considerably more rectal cancer patients in the surgical transrectal drainage, which may have attributed to the two-and-half fold increase of stoma formation in disadvantage of the surgically drained group. We know from experience and international literature that every anastomosis – whether it is small bowel, colonic or rectal – has an inherent leak rate and that there are subgroups with an even increased risk for anastomotic complications, such as oncological patients because they have a higher risk of malnourishment, may have undergone neoadjuvant radio-chemotherapy and tend to be older [16,17]. Nonetheless also cultural, patient and/or surgeon preference can be attributable factors in stoma formation [18].

Despite the leak rate, the oncologic evolution was quite favourable as only one-third – 7 out of 20 treated oncologic patients, of whom one was already metastatic and five had nodal involvement at the time of primary intervention – developed progressive disease [19]. We did notice however, that anastomotic leakage results in reduced chance of stoma closure as only one stoma could be reversed in each drainage group, which has also been independently confirmed by other groups [20].

Drainage times from the EUS guided transrectal drainage group (42 days) are threefold those of the surgically drained group (13 days). This is due to differences in management, as all drains were removed in the surgical transrectal drainage group at discharge and all EUS guided transrectal drainage patients left the hospital with their drain in position. All drains were removed after further patient recovery during their planned follow-up visit in the outpatient clinic about 4 weeks later. Since no surgical intervention is needed in these patients and no extracorporeal drain is present that needs to be flushed or cared for, this has only minor clinical relevance and we therefore believe patient satisfaction will even be higher.

Interestingly, no statistical significant differences could be observed in length of stay in hospital, per procedural morbidity and mortality. Therefore, we anticipate that earlier drain removal in the EUS guided transrectal drainage group might not pose a problem, but would require the patient to return to the hospital shortly after discharge. This could create logistical concerns for the elderly and cause discomfort due to transport in the recovering patient.

Conclusion

Pelvic abscesses from any cause can be amended by both EUS guided and surgical transrectal drainage, as both are safe. Nonetheless EUS guided drainage (if feasible) seems more effective after a single treatment, albeit with a longer duration of drainage in a selected group of abscesses.

Both treatments yield high overall cure rates with minor long-term sequelae, as only a minority of patients experience prolonged medical problems – mainly due to progressive oncological disease – during the follow-up period. However, in case of anastomotic failure there is a high risk of permanent stoma.

We believe it is imperative for every centre to monitor their results and complications as quality control and to facilitate clinical research to improve patient treatment and outcome [21].

This study suggests a role for a multidisciplinary approach to the pelvic abscess, as surgeons, gastroenterologists and radiologists are all stakeholders in the decision making and treatment.

Disclosure statement

No potential conflict of interest was reported by the authors.

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