

Rectal ultrasound with fine needle aspiration: an underutilized modality for delineating and diagnosing perirectal, presacral, and pelvic lesions



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ABSTRACT

Background and study aims The merits of rectal ultrasound for rectal cancer staging are well documented. Conventional approaches to accessing perirectal and presacral lesions entail computed tomography guidance via a transgluteal approach or frank surgical exploration. We report on the safety and efficacy of performing rectal ultrasound

with fine-needle aspiration (RUS-FNA) for evaluating perirectal, presacral, and pelvic abnormalities.

Patients and methods Patients who underwent RUS-FNA of perirectal, presacral, or pelvic lesions between August 2005 and September 2016 were identified using an institutional database. Subjects were all individuals treated at Wake Forest Baptist Medical Center in Winston-Salem, North Carolina, United States. Patient demographics and imaging characteristics were noted. Procedural details included lesion size, location, echo appearance, and technical information. Patients were given antibiotics prior to FNA attempt and for 3 days after. Diagnostic yield, clinical utility, and complications were noted.

Results Twenty-seven patients met criteria during the specified study time period. The cohort consisted of 12 males (44.4%) and 15 females (55.5%). RUS-FNA was diagnostic in 24 patients (88.8%) and obviated the need for surgery in 14 patients (51.9%). There were four complications (14.8%): two perirectal and two presacral abscesses.

Conclusion While the diagnostic yield of RUS-FNA is high and the potential to affect clinical decision-making is substantial, risk of complication is not negligible. RUS-FNA should only be performed if the result will substantially alter clinical management, and the decision to perform RUS-FNA should be made with close consultation between the endosonographer, surgeon, and/or medical or radiation oncologist.

Introduction

Rectal cancer is one of the most commonly diagnosed malignancies with an estimated 40,000 new cases a year in the United States with reported local recurrence rates ranging from 3% to 9.2% after treatment [1–5]. These recurrences, as well as other primary/malignant pathological lesions, can manifest as perirectal, presacral, and pelvic lesions. Rectal ultrasound (RUS), computed tomography (CT), and magnetic resonance imaging (MRI) have all been utilized to evaluate and stage these primary and recurrent rectal malignancies [6–10]. However, effective and safe tissue diagnosis in the perirectal, presacral,

and pelvic lesions is crucial for effective management as these lesions can encompass a broad differential.

The ability to perform RUS fine-needle aspiration (FNA) allows for pathological confirmation that can have considerable clinical impact on managing patients. This modality has been used in diagnosing perirectal, pelvic, and urologic lesions [11–15]. However, there is a paucity of data about the diagnostic yield and inherent risks of RUS-FNA compared to the conventional approaches of CT-guided transgluteal or surgical assessment of perirectal, presacral, and pelvic lesions. The purpose of this study was to evaluate the efficacy and safety of performing RUS-FNA for presacral, perirectal, and pelvic abnormalities.

Patients and methods

This study was approved by the Institutional Review Board of Wake Forest Baptist Medical Center. Our retrospective case series used an institutional database to investigate patients who underwent RUS-FNA of perirectal, presacral, or pelvic lesions between August 2005 and September 2016. Twenty-seven patients met criteria during the specified study time period. Data including age, gender, prior imaging modalities utilized, pathology results, and outcomes were collected. All procedures were performed in an outpatient setting using moderate sedation by administering both midazolam and fentanyl or deep sedation with IV propofol by a licensed CRNA. All endoscopic procedures were performed using an Olympus UM130 or UM160 radial and linear echoendoscope with dopplers (Olympus America, Inc, Center Valley, Pennsylvania, United States). Furthermore, RUS-FNA was performed with a 22- or 25-gauge needle by experienced endosonographers at our tertiary referral center. All subjects received prophylactic ciprofloxacin 400 mg prior to FNA and 3 days following the procedure.

Results

Our patient cohort consisted of 12 males (44.4%) and 15 females (55.5%) with an average patient age of 51 (range 19–80). Information for each case is summarized in ► **Table 1**. Twelve patients (44.4%) had known prior rectal or colon adenocarcinoma. One patient (3.7%) had known endometriosis. All but one patient had prior imaging. A perirectal mass was detected at hysterectomy in the patient with no prior imaging. Imaging modalities included CT (22, 81.5%), MRI (4, 14.8%), and positron emission tomography (12, 44.4%). On imaging, a presacral mass was present in 12 patients (44.4%), a perirectal node was present in two patients (7.4%), a perirectal abnormality was present in 11 patients (40.7%), and a pelvic mass was present in one patient (3.7%). The average size of lesion present on imaging was 3.58 cm (range 0.9 to 16.0 cm). Excluding the 16-cm lesion that was too large to be measured on RUS, the average size of lesion recorded on RUS was 3.12 cm (range 0.9 to 7.6). Eighteen lesions (66.7%) were hypoechoic and nine lesions (33.3%) were heterogeneous on RUS.

FNA pathology distribution was as follows: adenocarcinoma (6, 22.2%), squamous cell carcinoma (2, 7.4%), benign lymphoid hyperplasia (2, 7.4%), benign epithelial cells (3, 11.1%), benign atypical or nonspecific cells (2, 7.4%), benign reactive or inflammatory cells (2, 7.4%), myelolipoma (1, 3.7%), benign, cystic lesion (dermoid cyst, inclusion cyst, or teratoma) (4, 14.8%), non-diagnostic (2, 7.4%), sarcoma (1, 3.7%), seminal vesicle (1, 3.7%), urothelial bladder cancer (1, 3.7%). All adenocarcinomas were recurrent malignancies. RUS-FNA provided an effective diagnosis in 24 patients, giving a diagnostic yield of 88.8%, and diagnosed recurrent adenocarcinoma in six patients.

RUS-FNA was non-diagnostic in three cases (11%). In one case, a specimen was initially labeled benign-appearing cells, however, subsequent surgical pathology reported a cystic hamartoma. In a second case, a specimen was initially labeled be-

nign atypical glandular cells, however, subsequent surgical pathology determined the specimen to be endometriosis. In the third case, a specimen was incorrectly read by pathology as a gastrointestinal stromal tumor (GIST) but subsequent surgical pathology revealed the lesion to be endometriosis. Five individuals (18.5%) were lost to follow-up.

We encountered four complications in two presacral and two perirectal mass FNAs (► **Table 2**). Our complication rate was approximately 25% with biopsies of presacral masses and 8% of the perirectal biopsies. No complications were observed with the pelvic mass RUS-FNA. The overall total complication rate was approximately 14.8% in the form of abscess formation requiring either drainage or surgical intervention. Average needle passes performed in the four cases with complications was 2.5 passes. The location of abscess formation coincided with the original biopsy site. The echo characteristics of the four lesions were as follows: two heterogeneous and two hypoechoic. All four individuals had benign cytopathology on FNA. One out of the four individuals had an extended hospital course requiring two different incision and drainage (I&D) procedures and prolonged course of antibiotics because of an infected sacral teratoma. That individual subsequently improved after intervention but was lost to follow-up. The other individual with a presacral abscess had subsequent abscess excision with improvement of symptoms. The two individuals with perirectal abscesses both presented with fever and rectal pain. Both individuals underwent I&D with no reported complications. The two individuals' symptoms improved after treatment.

Discussion

RUS-FNA provides unparalleled ability to sample lesions surrounding the perirectal space including presacral and pelvic lesions. Previous studies have highlighted RUS-FNA's role in diagnosing local pelvic urologic malignancies/masses, in confirming nodal metastases in early rectal cancer, in accurately diagnosing perirectal lesions (CRC and other lesions), and in preventing aggressive surgical interventions for benign conditions [12–16]. Our study is one of the larger descriptive cohort studies that highlights the clinical utility of RUS-FNA for assessing and accessing perirectal, presacral, and pelvic lesions. However, few have reported on diagnostic and safety data on RUS-FNA. Our study shows that RUS-FNA alters management in patients with perirectal, presacral, and pelvic lesions. Notably, our study had a diagnostic accuracy of 88.8% which coincided with previous reports of FNA procedures in perirectal, intraluminal, and pelvic lesions [15–17]. Surgery was avoided in 55.5% of our subjects and clinically impacted approximately 60% of subjects, indicating the importance of RUS-FNA's ability to obtain a tissue diagnosis and inform a decision about institution of medical and/or surgical therapy. These findings suggest that RUS-FNA is an accurate and useful clinical tool in management of patients with presacral, perirectal, and pelvic lesions.

Although RUS-FNA is relatively safe, we found a significantly higher complication rate. Approximately 15% of our patients developed an abscess. This higher complication rate is in stark contrast to the relatively uncommon reported complications

► **Table 1** Patient and clinical characteristics.

	Age/ Sex	Radiographic findings	Overall U/S ap- pearance	Fine- needle gauge	Pathology ob- tained from FNA	Compli- cations	Outcome	Surgery avoided (Yes/No)
1	43/F	CT: presacral mass, right hydronephrosis PET: pelvic enhance- ment	Hypoe- choic	Not re- corded	Adenocarcinoma, recurrent	No compli- cation	Neoadjuvant chemo- therapy, radiation, surgical resection Deceased 5/20/08	No
2	58/F	CT: presacral mass PET: presacral mass enhancement	Hypoe- choic	Not re- corded	Adenocarcinoma, recurrent	No compli- cation	Resection of recur- rence 4/10/06. Post op. CVA dehiscence w eviscera- tion Deceased 10/4/06	No
3	44/M	CT: presacral mass PET: negative	Heteroge- neous	Not re- corded	Atypical glandular cells with abun- dance of mucous	No compli- cation	Spontaneous reces- sion of presacral mass. Pulmonary metastasis s/p chemotherapy/re- section	Yes
4	80/F	CT: presacral mass	Heteroge- neous	Not re- corded	Myolipoma	No compli- cation	Stable repeat imaging	Yes
5	36/F	CT: presacral mass	Heteroge- neous	22- gauge needle	Anucleated squa- mous cells and rare spindled cells favoring teratoma	Perirectal abscess	Successful I&D of peri- rectal abscess 2/2 to infected biopsy of sac- ral teratoma Lost to follow up	Not ap- plicable
6	61/M	CT presacral mass PET: rising SUV of presacral mass.	Heteroge- neous	22- gauge needle	Adenocarcinoma, recurrent	No compli- cation	Unknown	Not ap- plicable
7	48/M	MRI/CT: presacral mass PET: rising SUV of presacral mass	Hypoe- choic	22- gauge needle	Adenocarcinoma, recurrent	No compli- cation	Unknown	Not ap- plicable
8	57/F	CT: 1.5-cm node in sigmoid mesocolon PET: no evidence of tumor from previous colorectal cancer	Hypoe- choic node	25- gauge needle	Benign lymphoid hyperplasia	No compli- cation	Reoccurrence of colo- rectal cancer with me- tastatic disease	Yes (Sur- gery a- voided at time of RUS- FNA)
9	43/F	MRI: multilocular presacral cystic mass without worrisome enhancement.	Heteroge- neous	25- gauge needle	Mucous with be- nign appearing epithelial cells, overall non-diag- nostic	No compli- cation	Presacral cysic mass: Coccygectomy, partial sacrectomy, presacral mass resection. Path returned retro- rectal cystic hamarto- ma.	No
10	48/F	CT: rectal mass PET: large hypermeta- bolic mass at the rec- tosigmoid junction with hypermetabolic retroperitoneal left iliac chain lymph nodes concerning for metastatic nodal spread.	Hypoe- choic	22- and 25- gauge needle	Squamous cell carcinoma	No compli- cation	T3N2 stage IIIB anal/ rectal squamous cell carcinoma s/p chemo/ radiation with com- plete response	Yes

► Table 1 (Continuation)

	Age/ Sex	Radiographic findings	Overall U/S ap- pearance	Fine- needle gauge	Pathology ob- tained from FNA	Compli- cations	Outcome	Surgery avoided (Yes/No)
11	62/F	CT: presacral mass	Heteroge- neous	22- gauge needle	Numerous anucle- ate and nucleated squamous, colum- nar cells, and cho- lesterol crystals DDx: teratoma, epidermal cyst and tailgut cyst	Rectal pain; sepsis; pre- sacral ab- scess with drainage, hemorrhagic stroke, ARF	I&D	No
12	64/M	MRI: suggestive of duplication cyst	Heteroge- neous	22- gauge needle	Benign squamous epithelial cells and crystals.	No compli- cation	Unknown	Yes
13	34/F	MRI: rectal mass	Hypoe- choic	Not re- corded	GIST, epithelioid type with atypia	No compli- cation	Hysterectomy and partial vaginectomy for what was originally thought to be a GIST; ultimately turned out to be endometrial de- posit in cul-de-sac.	No
14	53/F	CT: thickened rectal wall	Hypoe- choic	22- gauge needle	Adenocarcinoma, recurrent	No compli- cation	Received neoadjuvant chemotherapy/radia- tion, Surgical resection	No
15	31/F	No prior imaging re- ported	Hypoe- choic	22- gauge needle	Colorectal-type epithelium and abundant mucus	No compli- cation	Lost to follow up	Yes
16	59/M	CT: rectosigmoid mass	Hypoe- choic node	Not re- corded	Adenocarcinoma, recurrent	No compli- cation	Neoadjuvant chemo- therapy, resection	No
17	57/M	PET/CT: presacral soft tissue lesion concern- ing for local recurrence vs inflammation	Hypoe- choic	25- gauge needle	Inflammation con- sistent with ab- scess	No compli- cation	Treated with antibio- tics	Yes
18	30/M	CT: circumscribed soft tissue/fluid density structure in the presac- ral space	Hypoe- choic	22- gauge needle	Benign squamous epithelial cells query cystic terato- ma	Rectal pain and infected presacral mass-presac- ral abscess	Excision of infected presacral mass: rup- tured dermoid cyst with prominent mel- anin pigmentation	No
19	63/M	CT: thickening of the mid and distal esopha- gus consistent with history of esophageal carcinoma. Soft tissue enhancement anterior to the rectum. PET: soft tissue lesion in the pelvis, between the urinary bladder and rectum shows hy- permetabolic activity with a maximum SUV of 4. Concerning for a peritoneal metastatic deposit.	Hypoe- choic	22- gauge needle	Amorphous materi- al of uncertain type and a few clusters of pig- ment-containing epithelial cells. No malignancy is identified in this material. The find- ings raise the pos- sibility of seminal vesicle sampling.	No compli- cation	Progressive esopha- geal cancer	Yes
20	37/M	CT/PET: perirectal mass	Hypoe- choic	22- and 25- gauge needle	Anucleated squa- mous cells and rare benign glandular cells. No malign- ancy identified.	Perirectal abscess	Transrectal drainage of perirectal abscess	Yes

► **Table 1** (Continuation)

	Age/ Sex	Radiographic findings	Overall U/S ap- pearance	Fine- needle gauge	Pathology ob- tained from FNA	Compli- cations	Outcome	Surgery avoided (Yes/No)
21	75/F	PET: rectal hypermeta- bolic area	Hypoe- choic	22- gauge needle	Marked acute in- flammation consis- tent with benign reactive process. Negative for malign- ancy.	No compli- cation	No recurrence to date of previous diagnosed colorectal cancer	Yes
22	53/F	CT: irregular enhanc- ing mass along the posterior right vaginal wall adjacent to the rectum.	Hypoe- choic	25- gauge needle	Poorly differenti- ated squamous cell carcinoma.	No compli- cation	T2N0 anal canal can- cer. Definitive che- moradiation	Yes
23	19/F	CT/RUS: lymph node seen	Hypoe- choic	25- gauge needle	Benign lymphoid hyperplasia	No compli- cation	Lynch positive family; neoadjuvant chemo- therapy, radiation ther- apy, and protocolect- omy	No
24	54/M	CT: large calcified mass in the pelvis with erosion of portions of the ischium and the superior pubic ramus.	Heteroge- neous	25- gauge needle	Spindle cell neo- plasm. Immuno- histochemical profile in keeping with a diagnosis of a primitive neuroectodermal tu- mor/soft tissue sarcoma	No compli- cation	Pulmonary metastasis; received chemother- apy	Yes
25	46/F	CT: thickened sigmoid and adnexal mass	Hypoe- choic	25- gauge needle	Atypical glandular cells. No malign- ancy is identified	No compli- cation	Mass over 2 cm under- went sigmoid resec- tion and pathology re- vealed endometriosis	No
26	46/M	CT: bowel thickening at ileoanal anastomo- sis	Heteroge- neous	25- gauge needle	Anus biopsy: tub- ular adenoma. FNA: abundant amorphous debris, pigmented gland- ular cells and sper- matozoa consis- tent w seminal ve- sicle sampling. No neoplasia	No compli- cation	Continued follow up	Yes
27	73/M	CT: pelvic mass PET: large hypermetabolic mass along the right pelvic sidewall along with a smaller hyper- metabolic nodule slightly more superior are consistent with re- currence of disease in this patient with a his- tory of bladder cancer.	Hypoe- choic	Not re- corded	Metastatic bladder cancer	No compli- cation	Continued follow-up Received chemother- apy	Yes

U/S, ultrasound; FNA, fine-needle aspiration; CT, computed tomography; PET, positron emission tomography; I&D, incision and drainage; SUV, standard uptake value; MRI, magnetic resonance imaging; ARF, acute renal failure; GIST, gastrointestinal stromal tumor; RUS, rectal ultrasound

► **Table 2** RUS-FNA findings.

Lesion	Size (cm) ¹	Avg number of passes	Findings	Complication
Presacral mass (n = 12)	4.2 (range 2.5–7.6)	2.6 (range 1–5)	Adenocarcinoma (n = 4) Cystic lesion (n = 3) Other benign cells (n = 2) Myelolipoma (n = 1) Sarcoma (n = 1) Non-diagnostic (n = 1)	3 25%
Perirectal abnormality (n = 12)	2.7 (range 1.3–4.5)	2.9 (range 1–5)	Adenocarcinoma (n = 2) Squamous cell carcinoma (n = 2) Other benign cells (n = 4) Cystic lesion (n = 1) Seminal vesicle (n = 1) Non-diagnostic (n = 2)	1 8%
Perirectal node (n = 2)	0.95 (range 0.9–1.0)	4 (both 4)	Benign lymphoid hyperplasia (n = 2)	0
Pelvic mass (n = 1)	4.7 (range 4.7)	2 (range 2)	Urothelial Bladder Cancer (n = 1)	0

RUS, rectal ultrasound; FNA, fine-needle aspiration

¹ Does not include a 16-cm lesion that was too large to be measured on RUS.

with EUS-FNA from the upper gastrointestinal tract. Studies show that upper gastrointestinal FNAs appear to have fewer complication rates compared to lower gastrointestinal FNAs. The reported complication rate performing an endoscopic ultrasound (EUS)-FNA of the pancreas is 1% to 2.5% [18, 19]. In comparison, a study evaluating adverse events (AEs) in lower gastrointestinal EUS-FNA reported AEs in 20.6% of cases, mostly in the form of bleeding and pain, with 5.6% of those events being serious [20]. Interestingly, few infectious complications have been reported in upper and lower gastrointestinal FNAs [19, 20]. RUS-FNA has been proven a safe method for tissue sampling, with incidence of bacteremia similar to or less than that seen in diagnostic colonoscopy [21]. A lesion's characteristics appear to contribute to risk of complications. An increased risk of febrile episodes or sepsis has been observed in upper gastrointestinal FNAs of cystic lesions [20, 22, 23]. It is unclear why our study showed such a high rate of infectious complications. Two out of the four lesions were heterogeneous and not purely solid, which may have increased the likelihood of infectious complications. Studies suggest that biopsy of presacral lesions does not add to the surgical strategy and that biopsies vary in accuracy [24]. However, the utility of tissue sampling has been increased with improved techniques and preoperative treatments. Presacral lesions such as Ewing sarcomas, osteosarcomas, lymphomas, and fibrous tumors are examples of lesions that could benefit from neoadjuvant therapy [25]. Patients' medical treatment would be improved by preoperative biopsy of such lesions. Certainly, continued use of prophylactic antibiotics, minimization of needle passages, and use of experienced endosonographers can minimize complications in RUS-FNA.

To our knowledge, there is little data in the literature outlining the diagnostic yield or complication rate of CT-guided biopsy via a transgluteal approach for perirectal, presacral, or pelvic lesions. Success rates with CT-guided prostate biopsies have been upward of 95% to 97% and a study performed in 2003 showed a 93% diagnostic yield of pelvic lesions by an extraperitoneal approach [26–28]. Despite this lack of data, CT-guided percutaneous biopsy has been described as being an appropriate method for biopsy of lesions located in perirectal, presacral, and posterior pelvic regions and superior in distant or metastatic disease [29, 30]. However, there are disadvantages to transgluteal CT-guided FNA, including pain, patient discomfort due to lying in prone position for an extended period of time, and risk of gluteal vessel, sciatic nerve, and sacral plexus injury [29]. It can be argued that RUS-FNA may palliate many of the aforementioned disadvantages by minimizing pain, allowing patients to lie in the left lateral decubitus position, and providing the proceduralist with closer anatomic proximity to lesions to accurately obtain a tissue diagnosis and improve staging of primary/recurrent malignancies.

Our study is limited by a small sample size of 27 patients and the retrospective design. Admittedly, there are concerns about later complications possibly being missed as patients could have gone to their local community hospital or physician rather than returning to our facility. All biopsies could not be corroborated with surgical specimen pathology because results of FNA biopsies dictated medical decision-making and prevented some patients from having a surgical intervention. Also, our study was not a comparative study to differentiate the diagnostic yield between CT-guided biopsy versus RUS-FNA. Ideally, these two imaging modalities should have much larger studies for comparison in diagnostic yield and complication rates.

Conclusion

In summary, RUS-FNA is an accurate and relatively safe method for obtaining tissue diagnosis of presacral, perirectal, and pelvic lesions when performed by experienced endosonographers. While the diagnostic yield of RUS-FNA is high and the potential to affect clinical decision-making is real, the risk of complication is not negligible. RUS-FNA should only be performed if the result will substantially alter clinical management, and the decision to perform RUS-FNA should be made by a multidisciplinary team.

Competing interests

Girish Mishra – Consultant, Cook Medical, Pentax Medical.
Norman Clark – none. Landon Brown – none. Jason Conway – Consultant, Cook Medical, Pentax Medical

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