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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, aspecimen was initially labeled benign 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 appearance	Fine-needle gauge	Pathology obtained from FNA	Complications	Outcome	Surgery avoided (Yes/No)
1	43/F	CT: presacral mass, right hydronephrosis PET: pelvic enhancement	Hypoechoic	Not recorded	Adenocarcinoma, recurrent	No complication	Neoadjuvant chemotherapy, radiation, surgical resection Deceased 5/20/08	No
2	58/F	CT: presacral mass PET: presacral mass enhancement	Hypoechoic	Not recorded	Adenocarcinoma, recurrent	No complication	Resection of recurrence 4/10/06. Post op. CVA dehiscence w evisceration Deceased 10/4/06	No
3	44/M	CT: presacral mass PET: negative	Heterogeneous	Not recorded	Atypical glandular cells with abundance of mucous	No complication	Spontaneous recession of presacral mass. Pulmonary metastasis s/p chemotherapy/resection	Yes
4	80/F	CT: presacral mass	Heterogeneous	Not recorded	Myolipoma	No complication	Stable repeat imaging	Yes
5	36/F	CT: presacral mass	Heterogeneous	22-gauge needle	Anucleated squamous cells and rare spindled cells favoring teratoma	Perirectal abscess	Successful I&D of perirectal abscess 2/2 to infected biopsy of sacral teratoma Lost to follow up	Not applicable
6	61/M	CT presacral mass PET: rising SUV of presacral mass.	Heterogeneous	22-gauge needle	Adenocarcinoma, recurrent	No complication	Unknown	Not applicable
7	48/M	MRI/CT: presacral mass PET: rising SUV of presacral mass	Hypoechoic	22-gauge needle	Adenocarcinoma, recurrent	No complication	Unknown	Not applicable
8	57/F	CT: 1.5-cm node in sigmoid mesocolon PET: no evidence of tumor from previous colorectal cancer	Hypoechoic node	25-gauge needle	Benign lymphoid hyperplasia	No complication	Reoccurrence of colorectal cancer with metastatic disease	Yes (Surgery avoided at time of RUS-FNA)
9	43/F	MRI: multilocular presacral cystic mass without worrisome enhancement.	Heterogeneous	25-gauge needle	Mucous with benign appearing epithelial cells, overall non-diagnostic	No complication	Presacral cysic mass: Coccygectomy, partial sacrectomy, presacral mass resection. Path returned retrorectal cystic hamartoma.	No
10	48/F	CT: rectal mass PET: large hypermetabolic mass at the rectosigmoid junction with hypermetabolic retroperitoneal left iliac chain lymph nodes concerning for metastatic nodal spread.	Hypoechoic	22- and 25-gauge needle	Squamous cell carcinoma	No complication	T3N2 stage IIIB anal/rectal squamous cell carcinoma s/p chemo/radiation with complete response	Yes

▶ **Table 1** (Continuation)

	Age/ Sex	Radiographic findings	Overall U/S appearance	Fine-needle gauge	Pathology obtained from FNA	Complications	Outcome	Surgery avoided (Yes/No)
11	62/F	CT: presacral mass	Heterogeneous	22-gauge needle	Numerous anucleate and nucleated squamous, columnar cells, and cholesterol crystals DDx: teratoma, epidermal cyst and tailgut cyst	Rectal pain; sepsis; presacral abscess with drainage, hemorrhagic stroke, ARF	I&D	No
12	64/M	MRI: suggestive of duplication cyst	Heterogeneous	22-gauge needle	Benign squamous epithelial cells and crystals.	No complication	Unknown	Yes
13	34/F	MRI: rectal mass	Hypoechoic	Not recorded	GIST, epithelioid type with atypia	No complication	Hysterectomy and partial vaginectomy for what was originally thought to be a GIST; ultimately turned out to be endometrial deposit in cul-de-sac.	No
14	53/F	CT: thickened rectal wall	Hypoechoic	22-gauge needle	Adenocarcinoma, recurrent	No complication	Received neoadjuvant chemotherapy/radiation, Surgical resection	No
15	31/F	No prior imaging reported	Hypoechoic	22-gauge needle	Colorectal-type epithelium and abundant mucus	No complication	Lost to follow up	Yes
16	59/M	CT: rectosigmoid mass	Hypoechoic node	Not recorded	Adenocarcinoma, recurrent	No complication	Neoadjuvant chemotherapy, resection	No
17	57/M	PET/CT: presacral soft tissue lesion concerning for local recurrence vs inflammation	Hypoechoic	25-gauge needle	Inflammation consistent with abscess	No complication	Treated with antibiotics	Yes
18	30/M	CT: circumscribed soft tissue/fluid density structure in the presacral space	Hypoechoic	22-gauge needle	Benign squamous epithelial cells query cystic teratoma	Rectal pain and infected presacral mass-presacral abscess	Excision of infected presacral mass: ruptured dermoid cyst with prominent melanin pigmentation	No
19	63/M	CT: thickening of the mid and distal esophagus 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 hypermetabolic activity with a maximum SUV of 4. Concerning for a peritoneal metastatic deposit.	Hypoechoic	22-gauge needle	Amorphous material of uncertain type and a few clusters of pigment-containing epithelial cells. No malignancy is identified in this material. The findings raise the possibility of seminal vesicle sampling.	No complication	Progressive esophageal cancer	Yes
20	37/M	CT/PET: perirectal mass	Hypoechoic	22- and 25-gauge needle	Anucleated squamous cells and rare benign glandular cells. No malignancy identified.	Perirectal abscess	Transrectal drainage of perirectal abscess	Yes

▶ **Table 1** (Continuation)

	Age/ Sex	Radiographic findings	Overall U/S appearance	Fine-needle gauge	Pathology obtained from FNA	Complications	Outcome	Surgery avoided (Yes/No)
21	75/F	PET: rectal hypermetabolic area	Hypoechoic	22-gauge needle	Marked acute inflammation consistent with benign reactive process. Negative for malignancy.	No complication	No recurrence to date of previous diagnosed colorectal cancer	Yes
22	53/F	CT: irregular enhancing mass along the posterior right vaginal wall adjacent to the rectum.	Hypoechoic	25-gauge needle	Poorly differentiated squamous cell carcinoma.	No complication	T2N0 anal canal cancer. Definitive chemoradiation	Yes
23	19/F	CT/RUS: lymph node seen	Hypoechoic	25-gauge needle	Benign lymphoid hyperplasia	No complication	Lynch positive family; neoadjuvant chemotherapy, radiation therapy, and protocolectomy	No
24	54/M	CT: large calcified mass in the pelvis with erosion of portions of the ischium and the superior pubic ramus.	Heterogeneous	25-gauge needle	Spindle cell neoplasm. Immunohistochemical profile in keeping with a diagnosis of a primitive neuroectodermal tumor/soft tissue sarcoma	No complication	Pulmonary metastasis; received chemotherapy	Yes
25	46/F	CT: thickened sigmoid and adnexal mass	Hypoechoic	25-gauge needle	Atypical glandular cells. No malignancy is identified	No complication	Mass over 2 cm underwent sigmoid resection and pathology revealed endometriosis	No
26	46/M	CT: bowel thickening at ileoanal anastomosis	Heterogeneous	25-gauge needle	Anus biopsy: tubular adenoma. FNA: abundant amorphous debris, pigmented glandular cells and spermatozoa consistent w seminal vesicle sampling. No neoplasia	No complication	Continued follow up	Yes
27	73/M	CT: pelvic mass PET: large hypermetabolic mass along the right pelvic sidewall along with a smaller hypermetabolic nodule slightly more superior are consistent with recurrence of disease in this patient with a history of bladder cancer.	Hypoechoic	Not recorded	Metastatic bladder cancer	No complication	Continued follow-up Received chemotherapy	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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