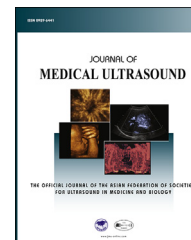


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ORIGINAL ARTICLE

# Use of Ultrasonography in Clarifying the Etiology of Anal Pain



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## KEYWORDS

anal pain,  
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**Abstract** *Introduction:* Anal pain is defined as pain originating from the anal canal or the perianal area that can be attributed to a variety of medical problems. The current study's aim was to evaluate the role of combined endoanal, transperineal, and in married women, transvaginal ultrasound in clarifying the etiology of anal pain among our patient study group. *Methodology:* A total of 180 patients presented to our radiology department complaining of anal pain and were examined using transperineal, endoanal, and in women, transvaginal ultrasound aided with three-dimensional capability. The final diagnosis was reached, according to the surgical results and the histopathology reports in cases diagnosed with anorectal neoplasms and perianal masses.

*Results:* A total of 100 patients were diagnosed with perianal fistulas. Twenty-five cases presented with anal abscesses. In four cases, pilonidal sinus extended to the perianal spaces. Three cases had hidradenitis suppurativa, 13 cases showed occult anal sphincter defects, two cases had anorectal neoplasms, and one case was diagnosed with soft tissue ependymoma overlying the coccyx. Three cases were diagnosed with perianal soft tissue masses. One case was detected with recto vaginal fistulas, 10 cases showed thick internal anal sphincter, two cases had perianal cysts, and one case had perianal hematoma. Two cases showed hemorrhage in Douglas' pouch, and one case had pelvic collection sequelae of perforated pelvic appendicitis. Three cases had pelvic endometriosis; one case was detected with missed contraceptive device in the rectum. Three cases were diagnosed with prostatitis and two cases with prostatic abscesses. Two cases had prostatic carcinoma and one case had prostatic sarcoma.

*Conclusion:* The combined approaches of endoanal, transperineal, and in women, transvaginal ultrasound aided with three-dimensional capability proved highly valuable in clarifying the etiology of anal pain in our study group.

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Conflicts of interest: The author declares that he has no conflict interest.

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## Introduction

Anal pain is defined as pain originating from the anal canal or the perianal area, which can be caused by a variety of medical problems. Anal fissure is the most common cause of anal pain, occurring in the poorest area of perfusion in the anal canal associated with increased resting anal pressure, and the diagnosis is based on the patient's history and gentle external examination [1]. Anorectal abscesses occur commonly because of blockage of the anal crypts with subsequent infection of the cryptoglandular tissue; anorectal abscesses can be perianal, submucosal, intermuscular, ischioanal, or perirectal [2]. Perianal fistula, the progression of an abscess that did not heal completely, is defined as an inflammatory tract with an internal opening in the anal canal wall and external opening in the skin. Perianal fistulas can be intersphincteric, transsphincteric, extrasphincteric, or suprasphincteric [3]. Perianal hematoma is a collection of blood in the perianal area caused by a ruptured vein or an external hemorrhoid. Other causes of anal pain include thrombosed piles, pruritus ani, Crohn's disease, fecal impaction, proctitis, solitary rectal ulcer syndrome, anorectal malignancy, and chronic idiopathic anal pain syndromes that include proctalgia fugax, levator ani syndrome, and coccygodynia [4].

Imaging plays a significant role in clarifying the cause of anal pain when the diagnosis is not clinically evident. Endoanal ultrasound is used to evaluate the anal sphincters and the intersphincteric plane. Magnetic resonance imaging provides high-resolution images to evaluate the anal canal walls and the perianal spaces [5]. Defecography, in which fluoroscopy is used to evaluate the mechanism of defecation and the dynamics of the anorectum and the pelvic floor, helps clinicians evaluate rectal outlet obstruction, rectal incontinence, rectal intussusception, and rectocele [6]. Other investigations include endoscopy (anoscopy—proctoscopy and sigmoidoscopy) and examination under general anesthesia.

## Aim of the study

The aim of the current study was to evaluate the use of combined transperineal, endoanal, and in females transvaginal ultrasound aided with three-dimensional (3D) capability in clarifying the etiology of anal pain among the patients in our study group.

## Methodology

Patients complaining of anal pain, whether acute or chronic onset, were included in the current study, according to the following inclusion criteria: patients showing normal results with clinical examination, endoscopy, and defecography.

Patients with a suspected clinical diagnosis and brought up for further imaging assessment were observed to evaluate the disease severity and extensions.

Patients with anal pain were excluded from the study: These were patients with confirmed diagnosis with clinical examination, endoscopy, or defecography and who required no further imaging assessment—including patients with anal fissures, thrombosed piles, pruritus ani, and rectal intussusception. Also excluded were patients with no

detectable ultrasound abnormality and were diagnosed clinically to have chronic idiopathic anal pain syndromes.

A total of 180 patients were included in the current study, consisting of 110 men and 70 women. Their age ranged from 1 year to 70 years (mean age, 32 years). The duration of symptoms ranged from 2 days to 20 months.

All were examined in the radiology department of our institute from March 2015 to October 2016. All were examined with transperineal ultrasound using a linear probe of frequency 5–12 MHz, a multifrequency endoanal probe, and—for married women—with endovaginal probe of frequency 5–9 MHz. All probes were supplemented with 3D capability using Sonoace x8 ultrasound machine (Medison, Seoul, Korea).

All patients examined in the left lateral decubitus position with the hip and knee joints flexed; for the female patients, an additional transvaginal ultrasound was performed in the dorsal lithotomy position.

The patients were examined with 2D and 3D transperineal ultrasound to assess the perianal region for the presence of abscesses, the extrasphincteric course of fistula tracts, and the side branches, and to assess the presence of perianal sinuses, masses, or cysts.

Endoanal ultrasound was performed to assess the anal sphincters and the intersphincteric planes. In females, an additional transvaginal ultrasound was performed that enabled clinicians to evaluate the anal sphincters and the perianal spaces.

3D image reconstruction with multiplanar image analysis in three orthogonal planes and volume rendering was performed.

All findings were recorded and analyzed. All results were compared with the surgical results and histopathology reports of anorectal neoplasms and perianal soft tissue masses as reference standard.

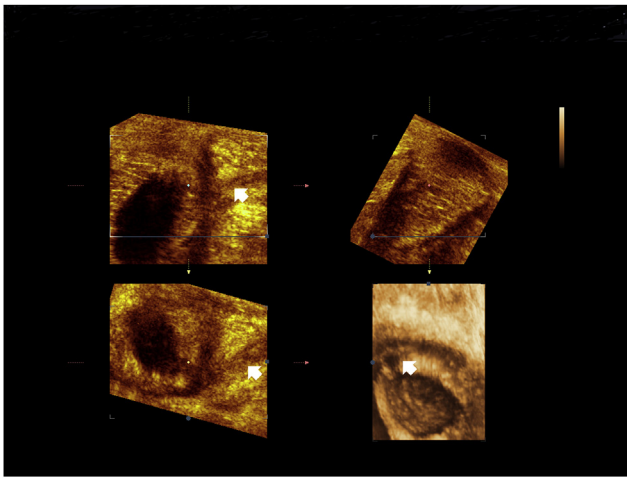
## Results

A total of 180 patients presented to our radiology department complaining of anal pain. They were examined by an experienced radiologist, who performed perineum ultrasound. The results of the ultrasound examination were compared with the patient's diagnosis, which was made based on the surgical results, and the histopathology reports in cases diagnosed with anorectal neoplasms and perianal masses (Table 1).

*Perianal fistula.* One hundred patients were diagnosed with perianal fistula (Figure 1); these included 60 cases with trans-sphincteric fistulas, 30 cases with intersphincteric fistulas, four cases with extra sphincteric fistulas, three cases with suprasphincteric fistulas, and three cases with submucosal fistulas. Ultrasound clarified the etiology in 97 cases (97%); in three cases, the diagnosis was not certain and ultrasound findings revealed mildly distended intersphincteric plane, and these were later proved (at surgery) to be intersphincteric fistulas. The type of fistula was wrongly diagnosed in five cases: three cases with high transsphincteric fistulas, a case with extrasphincteric fistula, and a case with suprasphincteric fistula—representing an estimated percent accuracy of 95% in detecting the type of fistula.

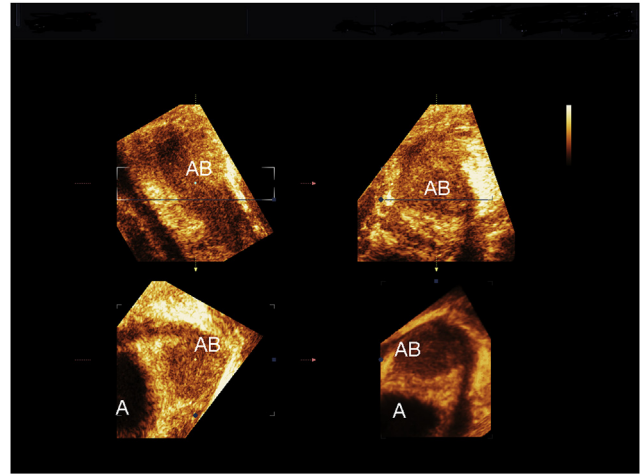
**Table 1** Demonstrating the number (%) and the sex of patients complaining of anal pain and their diagnosis.

Diagnosis	%	Sex		No. of cases
		Female	Male	
Perianal fistula	55.6	27	73	100
Anal abscess	13.9	10	15	25
Pilonidal sinus	2.2	—	4	4
Hiradenitis suppurativa	1.7	1	2	3
Thick internal sphincter	5.5	7	3	10
Occult sphincter tear	7.2	10	3	13
Anal tumor	0.55	—	1	1
Rectal tumor	0.55	1	—	1
Soft tissue ependymoma	0.55	1	—	1
Perianal masses	1.7	2	1	3
Hemorrhage in Douglas' pouch	1.1	2	—	2
Pelvic collection	0.55	1	—	1
Pelvic endometriosis	1.7	3	—	3
Missed loop in the rectum	0.55	1	—	1
Rectovaginal fistula	0.55	1	—	1
Prostatitis and prostatic abscess	2.8	—	5	5
Prostatic neoplasm	1.7	—	3	3
Perianal hematoma	0.55	1	—	1
Perianal cyst	1.1	2	—	2
	100	70	110	180



**Figure 1** Three-dimensional reconstruction with multiplanar image analysis and volume rendering of trans-sphincteric perianal fistula (arrows).

**Anal abscess.** Twenty-five cases were detected with anal abscesses (Figure 2), with an excellent correlation between the ultrasound findings and the results of the surgery. The current study demonstrated that ultrasound has an estimated sensitivity and specificity of 100%, with no false positive or false negative results in the diagnosis of anal abscesses. Thirteen patients had ischiorectal abscesses, six patients had intersphincteric abscesses, two patients had pelvirectal abscesses, two patients had horseshoe abscesses, and two patients had submucosal abscesses.



**Figure 2** Three-dimensional reconstruction with multiplanar image analysis and volume rendering of ischiorectal abscess (AB).

**Pilonidal sinus.** Four cases were diagnosed by ultrasound and proved at surgery, showing that the pilonidal sinus extended to the perianal spaces. The ultrasound showed the sinus tract extending to the natal cleft region and showed an echogenic linear pattern suggesting hair inside.

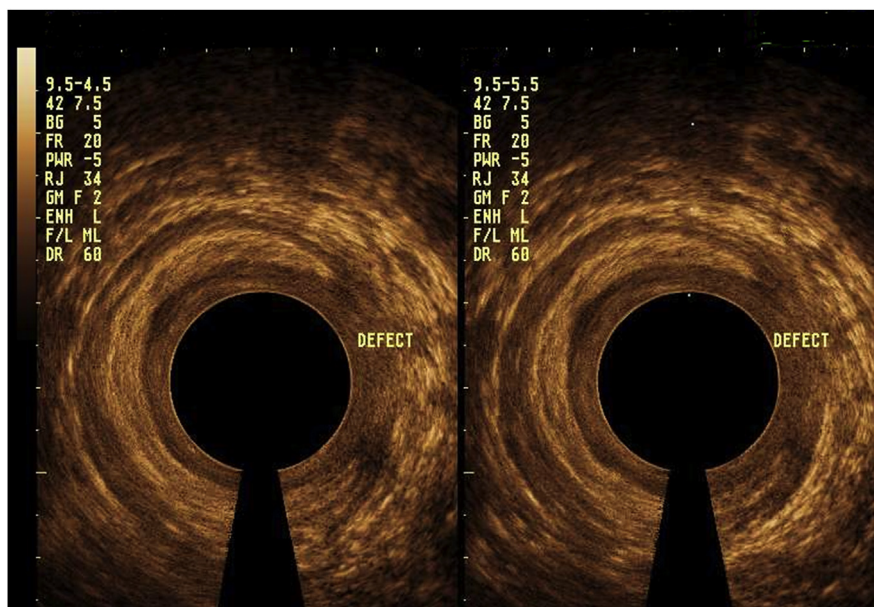
**Hiradenitis suppurativa.** Three cases were diagnosed with hiradenitis suppurativa: two cases with Hurley Stage II and a case with Hurley Stage III. The ultrasound showed dilated distal hair follicles communicating with an underlying subcutaneous sinus tract in Hurley Stage II lesions. The sinus showed side branches and abscess formation in Hurley Stage III lesions.

**Anal sphincter tear.** Thirteen cases showed occult anal sphincter defects (Figure 3), exhibiting disruption of sphincter continuity or an area of abnormal echo pattern involving the sphincter with anal ultrasound. 3D endoanal ultrasound helps in estimating the tear extension in three orthogonal planes. Among the 13 cases, five cases showed old internal anal sphincter tear, six cases showed old external anal sphincter tear, and two cases had combined external and internal sphincter tear. Eight cases with sphincter tears were subjected to surgery, showing an excellent correlation with the ultrasound findings as regards the site of the tear, but the extension of the tear was underestimated in two cases.

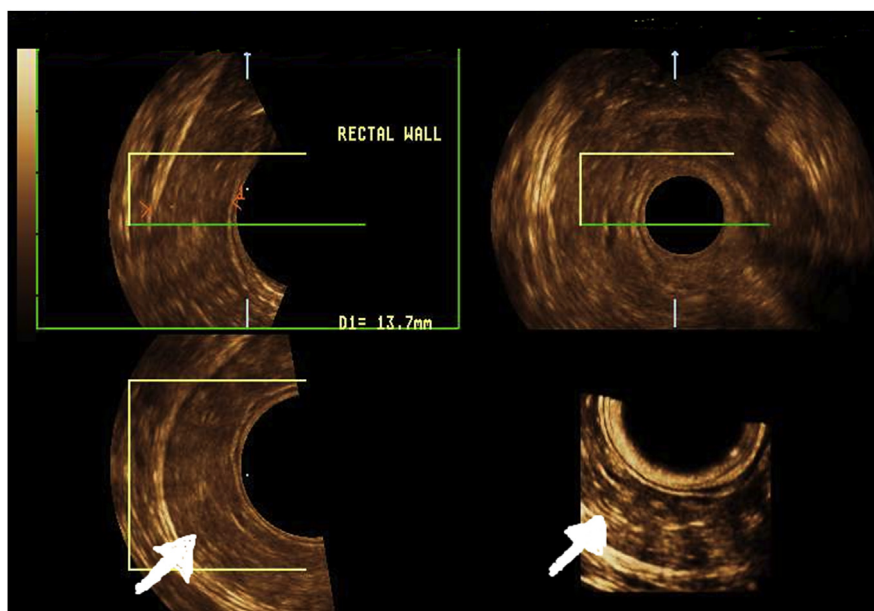
**Anorectal neoplasms.** One case was diagnosed with endoanal ultrasound as anal mass infiltrating the anal internal and external sphincters, and one case had a rectal neoplasm infiltrating the muscle layer in a circumferential pattern (Figure 4). The two cases were biopsy proven as infiltrating squamous cell carcinoma.

**Soft tissue ependymoma.** One case detected with ultrasound showed relatively hypoechoic soft tissue mass overlying the coccyx with a well-defined outline and uniform texture, and was biopsy proven as myxopapillary ependymoma (Figure 5).

**Perianal tumors.** Three cases were diagnosed with ultrasound as perianal soft tissue masses. Among them, a 4-year-old female child presented with a large lobulated perianal soft tissue mass abutting the anal canal wall, and



**Figure 3** Two-dimensional endoanal ultrasound image of occult external anal sphincter defect.



**Figure 4** Three-dimensional endoanal ultrasound with multiplanar image analysis and volume rendering of circumferential infiltrative rectal neoplasm (arrows).

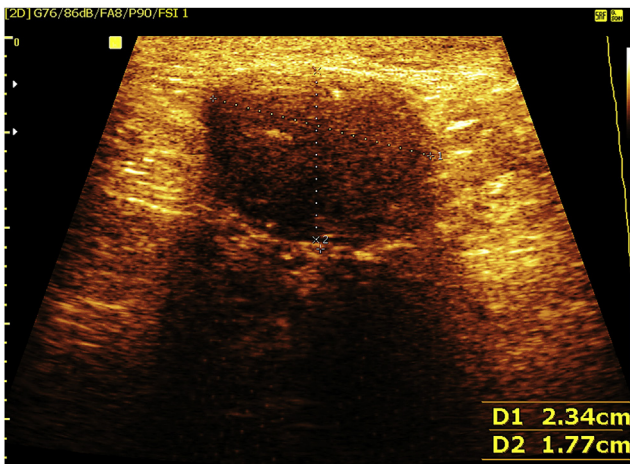
extending anterior to the subcutaneous soft tissue planes of labia major; it was suspected clinically as infected Bartholin's cyst or perianal sepsis and was later biopsy proven as perianal rhabdomyosarcoma (Figure 6). The other two perianal soft tissue masses were biopsy proven aggressive angiomyxoma. One was detected in a 40-year-old female patient, who presented with well-defined soft tissue perianal mass of heterogeneous texture, and the other case was diagnosed with histopathology as liposarcoma that presented with an irregular large soft tissue perianal mass in a 68-year-old man.

*Rectovaginal fistula.* One case was detected with recto vaginal fistulas.

*Thick internal anal sphincter.* Ten cases showed thick internal anal sphincter  $>3.5$  mm at its lateral aspect (Figure 7).

*Perianal cyst.* Two cases were detected with perianal cysts (Figure 8); these were anechoic perianal cysts, of which one showed fine septa and mildly thick walls (complex cyst).

*Hemorrhage in Douglas' pouch.* Three cases showed turbid fluid in Douglas' pouch during transvaginal



**Figure 5** Two-dimensional ultrasound image of a well defined subcutaneous soft tissue mass overlying the coccyx (biopsy proven ependymoma).

ultrasound, two of them due to ectopic pregnancy and the third following rupture of a small ovarian cyst, all detected with hemorrhage in Douglas' pouch during surgery.

*Pus in the pelvis.* One case showed pelvic collection sequelae of perforated pelvic appendicitis.

*Pelvic endometriosis.* Three cases were detected with pelvic endometriosis with transvaginal ultrasound findings showing chocolate ovarian cysts.

*Contraceptive device in the rectum.* One case was evaluated with transvaginal ultrasound and showed missed contraceptive device in the rectum.

*Prostatitis and prostatic abscess.* Three cases were diagnosed with prostatitis using transrectal ultrasound (TRUS) and showed an accentuated periurethral halo of lucency, periurethral hyperemia, and congested periprostatic venous plexus. Two cases were diagnosed with prostatic abscess, which was observed as intraprostatic thick wall cavity lesion

with turbid contents during TRUS and was proved with guided aspiration and culture.

*Prostatic neoplasm.* A case with biopsy-proven prostatic sarcoma showed markedly enlarged prostate of heterogeneous pattern in a young male patient (age: 23 years). Two cases had biopsy-proven prostatic carcinoma seen as irregular hypoechoic hypervascular prostatic focal lesions involving the peripheral zones associated with capsular breaks.

*Perianal hematoma.* One case was diagnosed with perianal hematoma and presented with localized, small encysted subcutaneous perianal fluid showing low levels of echo inside.

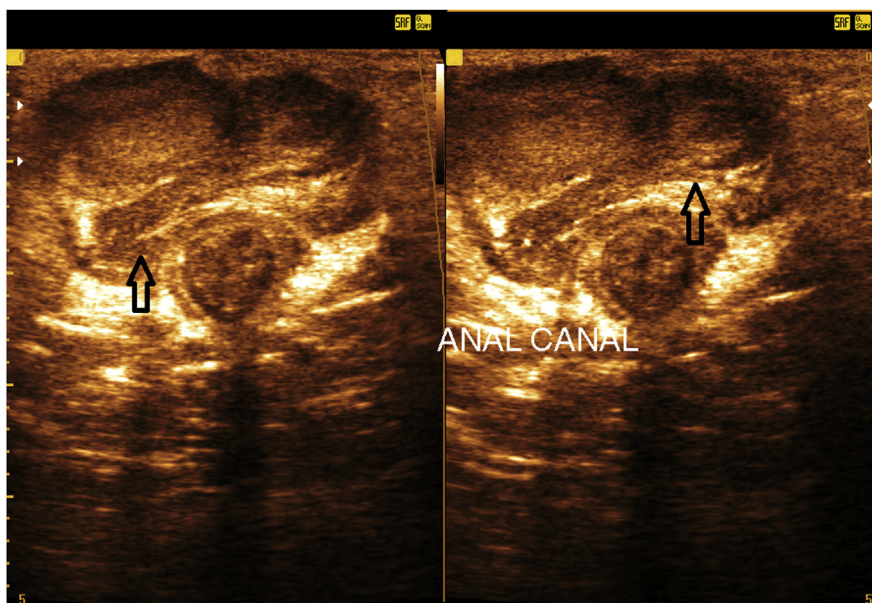
## Discussion

Anal ultrasound examination aided with 3D capability can assist the surgeons in the diagnosis of the precise cause of perianal external opening with respect to the etiology and the extent of the disease, as other etiologies exist aside from perianal fistula. Perianal abscess with fistula formation or with partial spontaneous rupture can lead to the formation of external opening. Hiradenitis suppurativa and deeply extended pilonidal sinus into the perianal spaces can lead to the establishment of the perianal external opening.

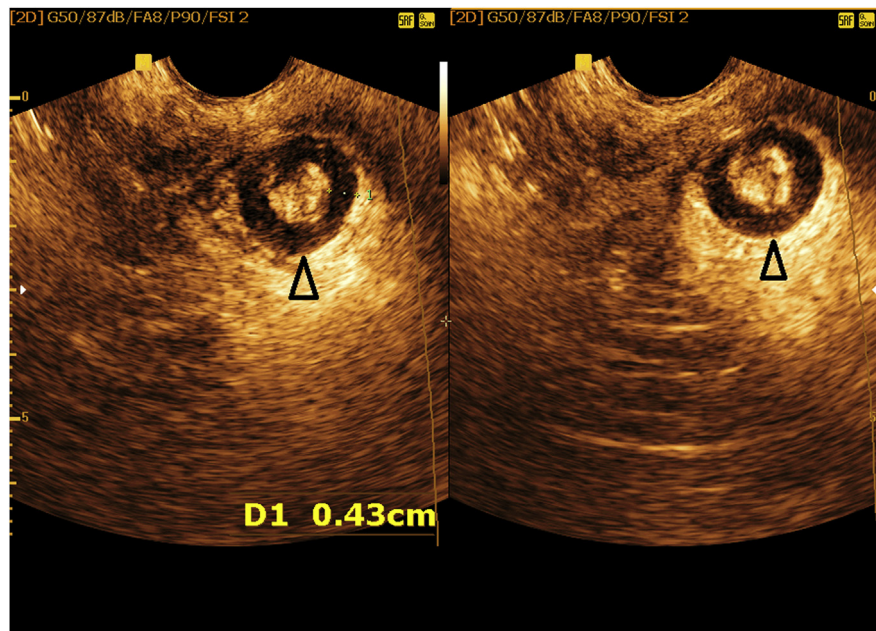
Ultrasound helps in the diagnosis of the transsphincteric perianal sinus tract (fistula in progress), which represents a diagnostic challenge because no external opening is observed and can lead the patient to complain about anal pain and anal discharge.

An intersphincteric fistula is a difficult clinical diagnosis to make, which can be supported or ruled out with anal ultrasound.

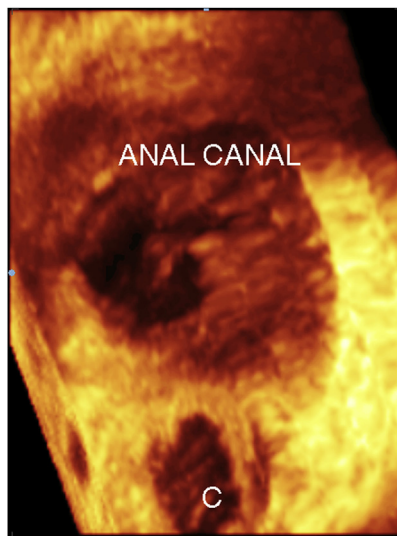
The presence of thick internal anal sphincter measuring  $>3.5$  mm in thickness at its lateral aspect can be linked up with anal pain with no abnormality can be observed with



**Figure 6** Two-dimensional transperineal B mode image of large perianal soft tissue mass seen wrapping around the anterior aspect of anal canal (arrows).



**Figure 7** Transvaginal ultrasound of anal canal with thick internal anal sphincter (arrowhead).



**Figure 8** Three-dimensional reconstruction with volume rendering of perianal cyst (C).

clinical examination or anoscopy; however, anal manometry may show an increased resting pressure of the anal canal [7].

An occult internal, external, or combined internal and external sphincter tears were found among 7.2% of the patients in our study group. Anal sphincter tear can be attributable to birth trauma, anorectal surgery, or accidental injury, and can be seen as an area of abnormal echo pattern involving the anal sphincter, representing granulation tissue and fibrosis at the site of the healed tear or as a disruption of the anal sphincter. The estimated accuracy of anal ultrasound in diagnosing sphincter tear was about 95% [8].

Anal neoplasm and rectal neoplasm were found in two cases among our study group. Anal ultrasound helps in the detection of tumor infiltration into the anal sphincters and

the perianal tissues, and can also help clinicians judge the tumor response to chemoradiotherapy [9]. The detection sensitivity of 3D endonal ultrasound was 97.1% for T1 rectal tumor, 94.3% for T2 rectal tumors, 95.7% for T3 tumors, and 98.5% for T4 tumors [10]. Thus, 3D TRUS can be used as a guide on whether or not to apply radiation and chemotherapy prior to surgery.

Perianal masses and its relations to the anal canal walls can be accurately assessed with 3D anal ultrasound. The most common sarcoma in children is rhabdomyosarcoma, which is quite uncommon in the perianal region and can be mistaken for perianal abscess. It carries a poor prognosis and is very difficult to treat. Patients with tumor size less than 5 cm with no lymph node deposits have a better prognosis. Early detection and treatment without delay is mandatory [11]. Aggressive angiomyxoma is a rare benign tumor that occurs mostly in females of reproductive age. It grows slowly with no tendency to metastasize. Liposarcomas typically occur in the elderly and originate from the fatty tissue in the ischioanal fossa. Other perianal soft tissue masses include proximal-type epitheloid sarcoma, solitary fibrous tumor, and metastasis [12].

One case in our study group showed well-defined, fairly rounded soft tissue mass overlying the coccyx that was biopsy proven as myxopapillary ependymoma. Subcutaneous ependymoma overlying the coccyx is an extra spinal type of ependymoma. It is a rare soft tissue tumor mostly of myxopapillary type with age presentation from 10 months to 47 years and is considered a low-grade malignant tumor, for which patients are recommended to undergo complete local excision and periodic follow-up. It can be clinically mistaken for pilonidal cyst or lipoma [13].

Perianal cysts may be simple or complex cysts due to secondary infection or bleeding within the cyst seen arising in the perianal region of unknown etiology that may be due to the loss of communication during development between the anal glands and ducts, but in which the gland still

preserves its secretory ability, thus creating a cyst, or due to failure of canalization of anal glands during embryogenesis [14].

Transvaginal ultrasound was a valuable approach in women when evaluating the etiology of anal pain as it presents an alternative route of examination when endoanal ultrasound is painful, and it helps in the evaluation of the gynecological causes of anal pain when anal ultrasound reveals no abnormality.

## Conclusion

The combined approaches of endoanal, transperineal, and in women, transvaginal ultrasound aided with 3D capability proved highly valuable in elucidating the etiology of anal pain in our study group.

## Ethical statements

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1964 and later versions. Informed consent was obtained from all patients for their inclusion in the study.

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