

Transrectal ultrasonography of anorectal diseases: advantages and disadvantages

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Transrectal ultrasonography (TRUS) has been widely accepted as a popular imaging modality for evaluating the lower rectum, anal sphincters, and pelvic floor in patients with various anorectal diseases. It provides excellent visualization of the layers of the rectal wall and of the anatomy of the anal canal. TRUS is an accurate tool for the staging of primary rectal cancer, especially for early stages. Although magnetic resonance imaging is a modality complementary to TRUS with advantages for evaluating the mesorectum, external sphincter, and deep pelvic inflammation, three-dimensional ultrasonography improves the detection and characterization of perianal fistulas and therefore plays a crucial role in optimal treatment planning. The operator should be familiar with the anatomy of the rectum and pelvic structures relevant to the preoperative evaluation of rectal cancer and other anal canal diseases, and should have technical proficiency in the use of TRUS combined with an awareness of its limitations compared to magnetic resonance imaging.

Keywords: Ultrasonography; Rectal neoplasms; Anal canal; Fistula

Introduction

Transrectal ultrasonography (TRUS) has been widely accepted as a popular imaging modality for evaluating the lower rectum, anal sphincter, and pelvic floor in patients with various anorectal diseases [1]. Exact knowledge of the normal ultrasonographic (US) anatomy of the rectal wall and anal canal provides an important foundation for identifying abnormalities. Preoperative staging of rectal cancer is an important factor in determining optimal treatment and requires accurate diagnostic tools for clinical use. TRUS is a safe imaging modality for the evaluation of tumor invasion and lymph node metastasis in patients with rectal cancer. When performing the procedure, it is crucial to be aware of how signs of anorectal disease appear in ultrasonogram and the proper indications and limitations of the technique. Although TRUS has several limitations in the evaluation of rectal cancer and perianal fistulas, improved US transducers with three-dimensional (3D) equipment provide a better depiction of the anatomic relationship between the rectal wall and anal canal [2,3]. Radiologists should understand the advantages and disadvantages of TRUS compared with magnetic resonance imaging (MRI) for the accurate assessment of anorectal diseases. An overview is herein provided of the anatomy of the rectum and pelvic structures relevant to the preoperative evaluation of rectal cancer and diseases of the anal canal along with a review of the techniques, applications,

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and limitations of TRUS compared to MRI.

Technique and Preparation

TRUS is operator-dependent like other US examinations. For an accurate exam, the rectum should be cleansed thoroughly to avoid artifacts. Patients are given a routine cleansing enema two hours before the examination. It is very important that the rectum is clear and empty before the examination because image quality can be impaired by residual stool or air. Sedation is not necessary before the procedure, and the examination is usually performed with the patient placed in the left lateral decubitus position, in the knee-chest position. A digital rectal examination should be performed to identify the lesion size, location, and the mobility of the tumor before the operator inserts the probe into the rectum. For optimal distension of the rectum, a water-filled balloon (usually 30–60 mL water instillation) should be inserted with an appropriate degree of contact with the rectal wall [4]. When the probe is placed into the rectum, it is aligned in standard orientation, in which the anterior anatomical structures are at the uppermost or 12 o'clock side of the image, the patient's left side is at 3 o'clock, the patient's posterior side is at 6 o'clock, and the patient's right side is at 9 o'clock. Then the probe is slowly withdrawn to the anal canal until the hyperechoic puborectalis muscle is seen. Images of the anal canal are taken at the upper, middle, and lower levels. Ideally, all five layers of the rectum should be clearly visible (Fig. 1).

In order to obtain high-quality images of the anal canal and the rectal wall layers, the equipment used must meet certain specifications. The transrectal probe mechanically rotates 360° with a variable ultrasound frequency of 5–15 MHz, depending on the lesions under investigation [5–7]. Higher frequencies provide better resolution with clear definition of the rectal wall layers, whereas lower frequencies are essential for the assessment of enlarged lymph nodes and perirectal tissue. In the 3D acquisition system, the probe automatically moves inward and outward over a distance of 6 cm [4]. Stored data can be reviewed at any time, and it is possible to select any axis for visualization, allowing the operator to obtain the most information from the data (Fig. 2). The 3D image acquisition is automated and the moving parts inside the probe do not touch the patient.

To evaluate an entire lesion, the probe should be inserted above the lesion of interest as carefully as possible and then withdrawn with the probe kept at the center of the rectal lumen. All critical points of the tumor should be recorded, along with surrounding lesions from the anal verge to the upper rectum. Careful examination of the entire rectum below and above the lesion is also an essential component of the procedure. The operator should pay particular

attention to the perirectal area in order to identify enlarged lymph nodes. Using a water balloon as a sonic window has the potential disadvantage of not clearly delineating the mesorectum, perirectal lymph nodes, and the rectal wall. The use of 3D data reconstruction can compensate for this potential disadvantage.

Normal US Anatomy of the Rectum and Anal Canal

The rectal wall is composed of five layers that can be clearly visualized by TRUS. The innermost hyperechoic line shows the interface of the balloon and the mucosal surface of the rectal wall. The inner hypoechoic layer represents the mucosa and muscularis mucosa, followed by a slightly thicker hyperechoic submucosal layer. The outer hypoechoic layer represents the muscularis propria, and the outermost hyperechoic layer corresponds to the perirectal fatty tissue (Fig. 3) [1,2]. When staging rectal cancer with TRUS, the operator must make every effort to image all five layers clearly at all points of the tumor because tumor infiltration can differ significantly along the body of the tumor. The thickness and continuity of the

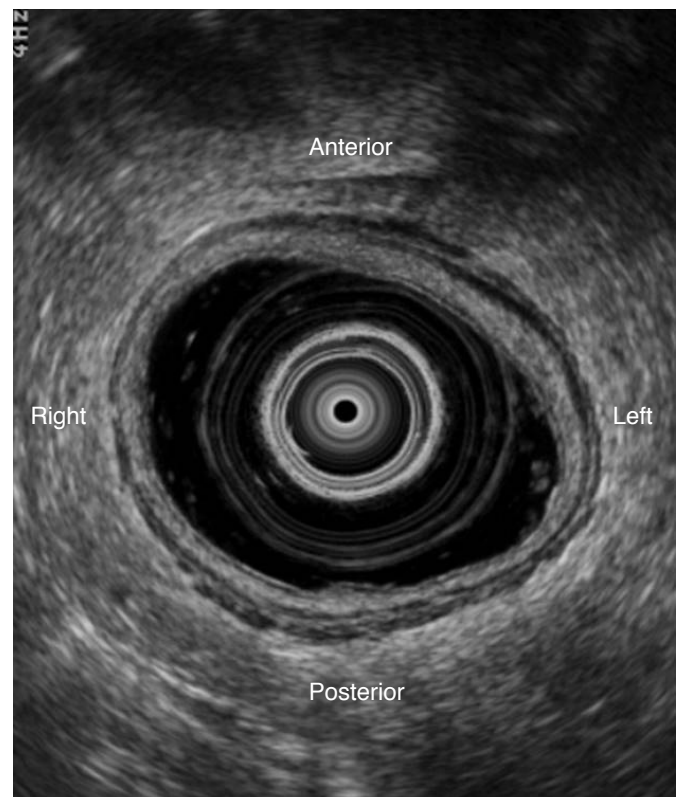


Fig. 1. Optimal transrectal ultrasonography scan. The axial view clearly shows the layers of the rectal wall with proper rectal distension after cleansing with an enema. The transducer is placed in the center of the rectal lumen.

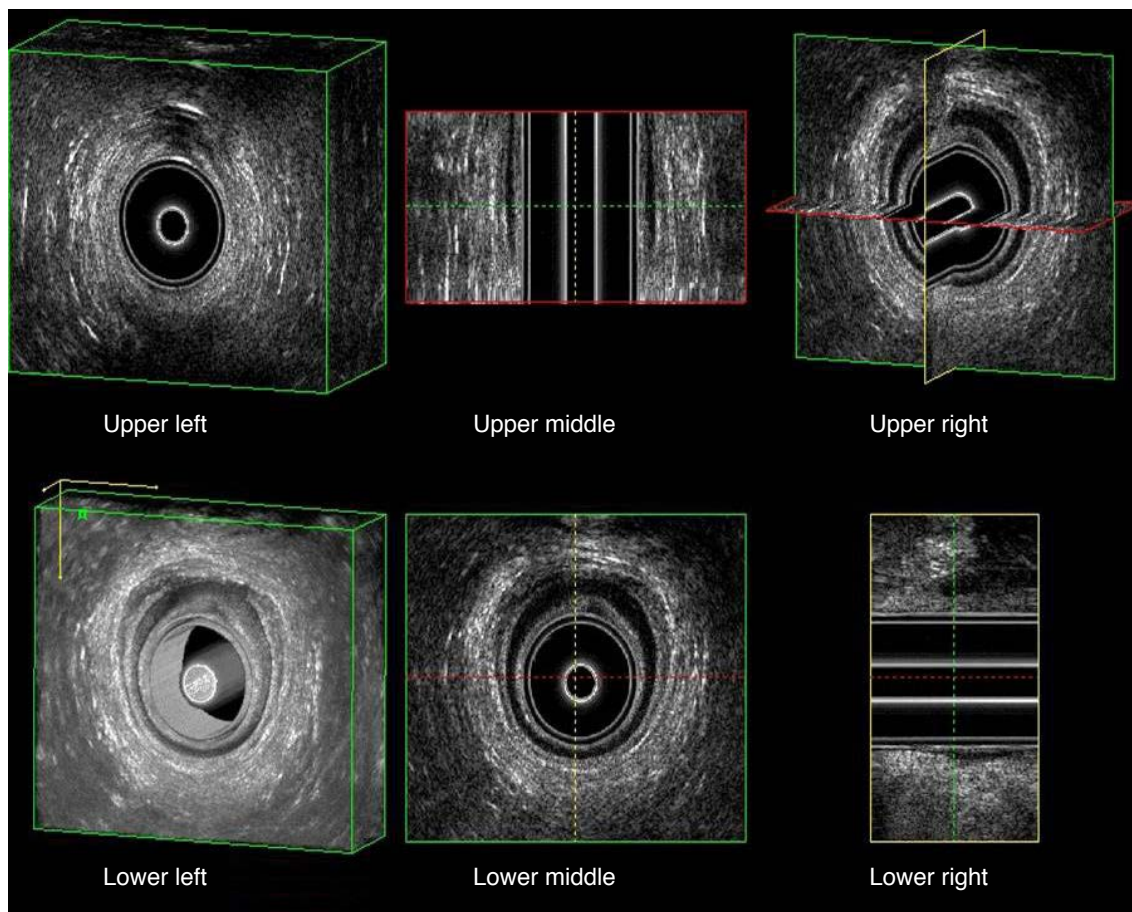


Fig. 2. Three-dimensional (3D) transrectal ultrasonography images from data transportation. After 3D acquisition, the axial (upper left and lower middle) images are immediately reconstructed to correspond to any axis that the operator wants, such as coronal (upper middle) and sagittal (lower right) views. The upper right image shows an orthogonal view. In addition, the 3D dataset can be manipulated to render images with enhanced surface features (surface render mode, lower left) and depth features (opacity, thickness, luminance, and filter settings), facilitating the further identification of surrounding tissues.

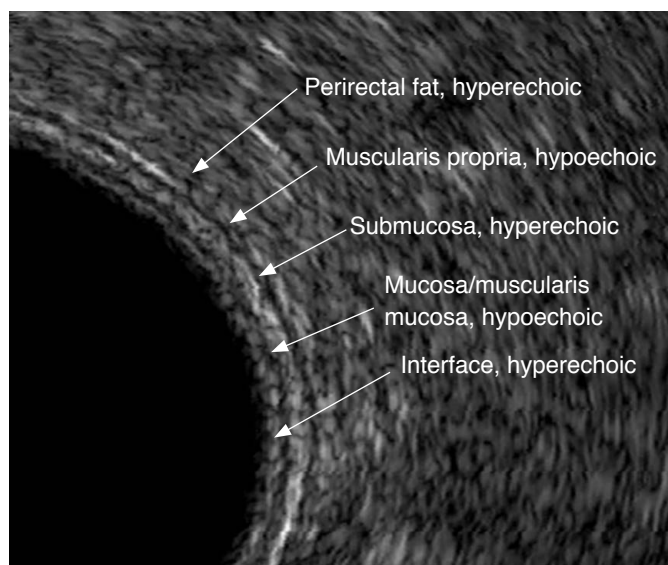
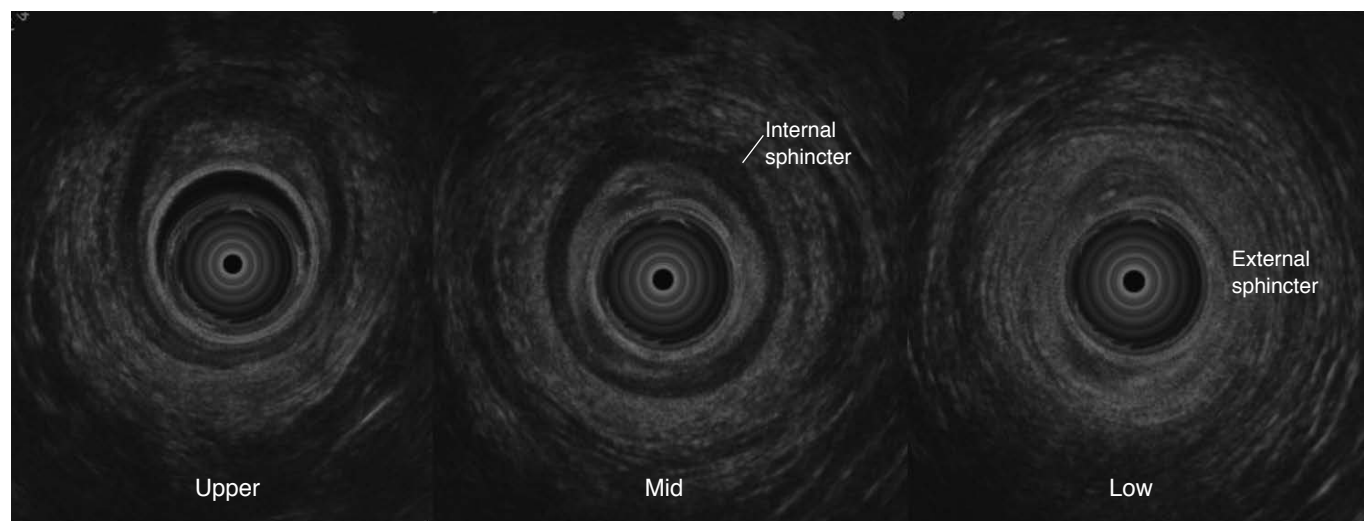


Fig. 3. Normal rectal wall layers shown with ultrasonography. The innermost hyperechoic layer indicates the interface of the balloon and the mucosal surface of the rectal wall. The inner hypoechoic layer represents the mucosa and muscularis mucosa, followed by a thicker hyperechoic submucosa layer. The next hypoechoic layer shows the muscularis propria and the outermost hyperechoic layer corresponds to the perirectal fatty tissue.

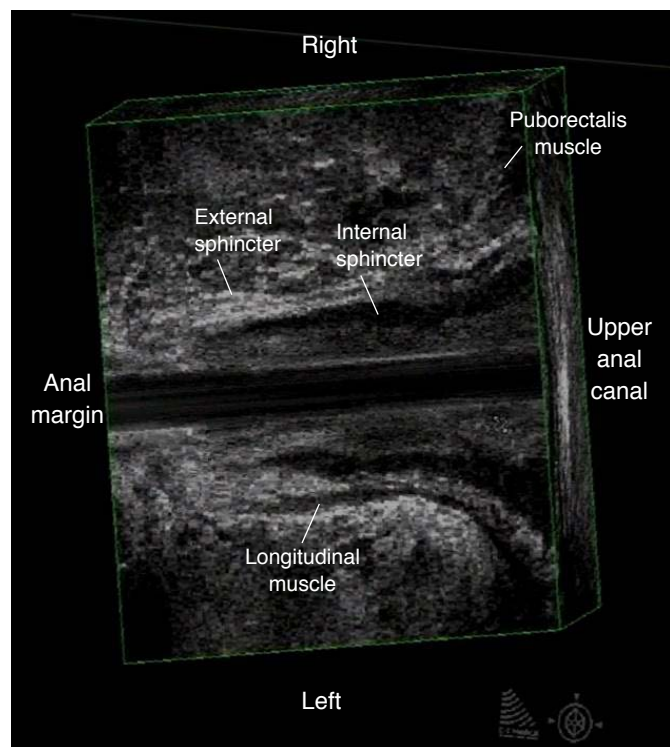
rectal wall layers should be carefully evaluated; for advanced cancer located in the anterior rectal wall, it is essential to determine the degree of invasion of adjacent organs. The operator must also focus on the mesorectum and surrounding tissues to evaluate possible lymph node involvement.

The anal canal is usually divided into three levels during the examination (Fig. 4). The puborectalis muscle is easily seen and appears as a U-shaped echogenic band (sometimes described as a horseshoe sling) in the upper anal canal. When retracting the probe,

this hyperechoic band closes anteriorly and forms the external anal sphincter. The internal anal sphincter displays a band of maximum thickness anteriorly in the middle anal canal, in combination with the external anal sphincter ring [8]. The external anal sphincter is usually hyperechoic, broad, and lies immediately outside the internal anal sphincter. In the lower anal canal, the internal anal sphincter terminates and the subcutaneous external anal sphincter is present [1]. The internal anal sphincter increases in thickness and echogenicity with age [8]. 3D TRUS also provides anatomic



A



B

Fig. 4. Normal ultrasonogram of the anal canal.

A. The anal canal is usually divided into three levels for examination. In the upper anal canal, the puborectalis muscle is seen as a U-shaped echogenic band. In the middle anal canal, the internal anal sphincter is most clearly seen as a thickened hypoechoic layer. In the lower anal canal, the echogenic external anal sphincter is seen together with the termination of the internal anal sphincter. **B.** On coronal reformatted three-dimensional ultrasonogram, a hypoechoic longitudinal layer indicates the internal sphincter, terminating at the lower anal canal. The external anal sphincter is represented by a hyperechoic layer running through the outer aspect of the internal anal sphincter.

details of perianal spaces that are located in the intersphincteric space between the internal and external anal sphincters: the pyramid-shaped ischioanal space surrounds the anal canal, and the supralelevator space is located superior to the levator ani muscle (Fig. 5).

Staging of Rectal Cancer

Preoperative rectal tumor staging includes factors such as the depth of tumor invasion, lymph node involvement, and metastasis (TNM staging), as well as extramural venous invasion and the presence of circumferential resection margin involvement [9]. For the local tumor staging of rectal cancer, TRUS and MRI each have distinct advantages and disadvantages (Table 1).

Tumor Depth (T Staging)

Tumor depth is an important factor for planning the treatment of both early and locally advanced cancer abutting the mesorectum. Rectal cancer appears on TRUS as a hypoechoic lesion interrupting the normal rectal layers. A T1 cancer is confined to the submucosa (Fig. 6). Thickening of the muscularis propria and/or the extension of the hyperechoic tumor into the muscularis propria indicate T2

Table 1. Advantages and disadvantages of evaluation of rectal tumor comparing MRI and TRUS

Variable	MRI	TRUS
Availability	Radiology department	Office
Patient contraindications	Metal implants, claustrophobia	None
Anatomic location	Good	Excellent
Tissue resolution	Excellent	Good
Anatomic coverage	Wide	Narrow
Operator dependency	High	Very high
Early cancer		
T1 vs. T2	Poor	Good
T1/T2 vs. T3	Good	Good
T4	Excellent	Only anterior tumors
Mesorectal nodes	Moderate	Moderate
Internal iliac/superior rectal nodes	Good	Poor
Relationship to mesorectal fascia	Excellent	Poor
Infiltration of levator muscle	Good	Moderate
Infiltration of anal sphincter	Moderate	Good

MRI, magnetic resonance imaging; TRUS, transrectal ultrasonography.

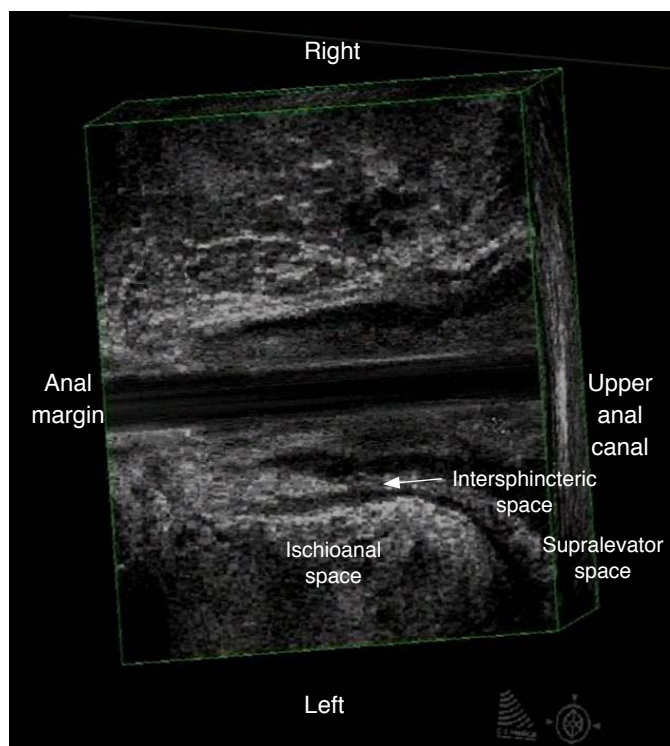


Fig. 5. Perianal anatomic areas on three-dimensional (3D) transrectal ultrasonography. Intersphincteric, ischioanal, and supralelevator spaces are defined by the muscular landmarks on the coronal view.

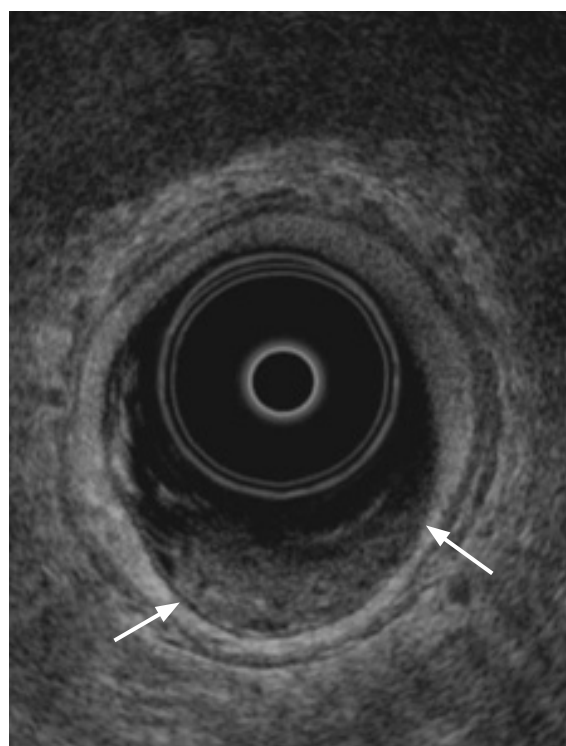


Fig. 6. T1 rectal cancer. Axial transrectal ultrasonography shows that the hypoechoic tumor (arrows) is confined to the first inner three layers and that the hyperechoic submucosa layer is slightly thinned.

cancer (Fig. 7). Most early cancer can be treated with surgery alone, such as transanal endoscopic excision or total mesorectal excision [10]. If the tumor disrupts the muscularis propria and breaches the hyperechoic perirectal fat, it is a T3 tumor (Fig. 8), while T4 cancer involves adjacent organs or the pelvic side wall. TRUS is capable of identifying involvement of the vagina, uterus, urinary bladder, prostate gland, and seminal vesicles.

TRUS has 69%–94% accuracy for the T staging of rectal cancer [11]. A meta-analysis showed that TRUS provided more accurate

data than computed tomography or MRI in the evaluation of local tumor invasion in rectal cancer patients [12]. Another meta-analysis including 5,039 patients from 42 different studies between 1980 and 2008 reported that the sensitivity and specificity of TRUS for the T staging of rectal cancers were as follows: T1, 87.8% and 98.3%; T2, 80.5% and 95.6%; T3, 96.4% and 90.6%; and T4, 95.4% and 98.3%, respectively [13]. TRUS may be accurate in distinguishing early lesions from more advanced stage lesions with a sensitivity and specificity of 96% and 85%, respectively [14]. For superficial rectal cancers, the accuracy of T staging has been shown to range from 69% to 97% [15]. The recently updated 3D US system, which enables volumetric evaluation with better anatomic planes for adjacent structures, further enhanced the diagnostic capabilities of TRUS, resulting in reported T staging sensitivities of 92.8% for T1, 93.1% for T2, 91.6% for T3, and 100% for T4 [16].

The accuracy rate of TRUS varies according to different tumor stages. TRUS identifies the depth of tumor invasion less accurately for T2 rectal cancer lesions than for early T1 lesions or advanced T3 and T4 lesions, due to a tendency toward overstaging [13]. A prospective multicenter study demonstrated that the accuracy of TRUS for all T stages was 65.8%, which was lower than previous data had indicated; the moderate experience of the investigators was proposed to be the major reason for this discrepancy [17]. Variable interobserver agreement has also been noted, with experienced operators reporting higher accuracy. In this study, a sensitivity of 74.9% was observed in the detection of T3 tumors, which was the highest reported sensitivity [17]. Staging tumors with stenosis can be difficult if the scope cannot pass through the narrow segment. In such cases, a flexible probe can be used [6].

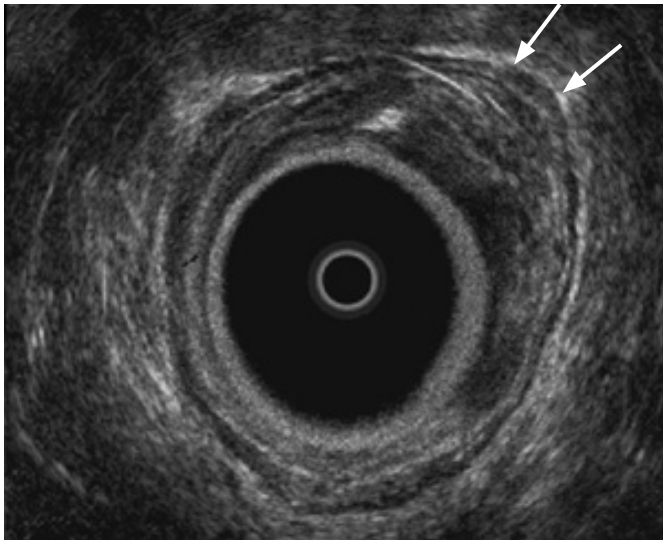
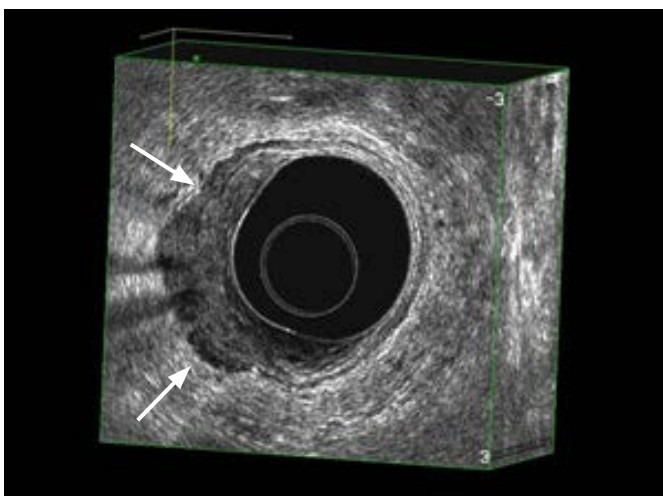
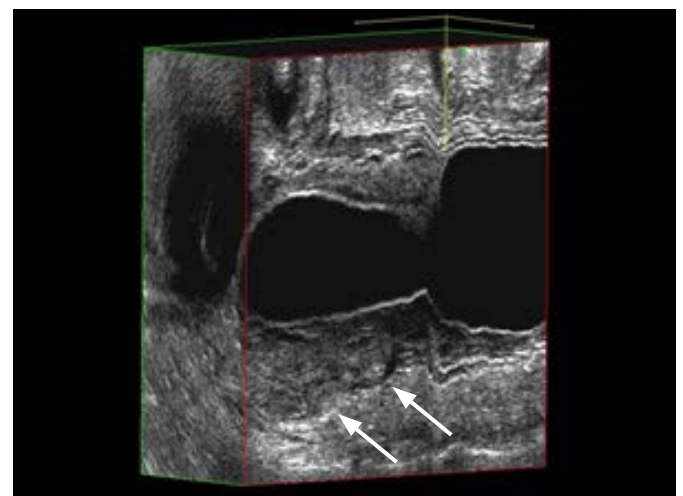


Fig. 7. T2 rectal cancer. The hyperechoic submucosa layer is disrupted by a thickening of the muscularis propria (arrows), which indicates T2 rectal cancer.



A
Fig. 8. T3 rectal cancer.



B
An oblique sagittal reformatted image shows the hypoechoic T3 tumor (arrows) extending into the perirectal fat tissue.

TRUS is more accurate than computed tomography or MRI in evaluating the depth of tumor invasion, especially in the early stages of T1 and T2 tumors, because of its ability to clearly depict the layers of the rectal wall [2,18]. The overall T staging accuracy of TRUS has been reported as 80%–95%, compared to 75%–85% for MRI [1,15,18,19]. MRI has been shown to be the most accurate imaging modality for local rectal cancer staging, particularly in advanced T3 and T4 tumors [4,20]. Although it has difficulties distinguishing between T1 and T2 tumors, MRI is more accurate in staging T4 tumors involving adjacent organs [4,21–23]. Compared to MRI, TRUS has the advantages of being less costly and readily used in the office, and offering real-time imaging [24].

Nodal Metastasis (N Staging)

Assessing the nodal stage is also essential in treatment planning, given the necessity of evaluating possible neoadjuvant treatment and determining the extent of nodal excision [24]. Abnormal lymph nodes are defined by size and echotexture; however, several challenges exist in the accurate US detection of lymph node involvement. Lymph nodes that are larger than 3 mm, uniformly hypoechoic, and round are considered to be metastatic lymph nodes. These criteria are neither sensitive nor specific, because reactive lymph nodes can be enlarged and small nodes may have microscopic malignant foci [11]. A meta-analysis of 35 studies from 1966 to 2008 demonstrated that the overall sensitivity and specificity of TRUS in the diagnosis of lymph node involvement were 73.2% and 75.8%, respectively [25]. TRUS showed a moderate diagnostic capability, but improved diagnostic criteria are needed. Those using MRI encounter similar difficulties when it is used to evaluate whether lymph nodes are malignant. Using only the size criterion may lead to considerable overstaging and thus overtreatment, as reactive lymph nodes may be mistakenly diagnosed as malignant [9]. The addition of other imaging features allowing the visualization of the nodal border, contour, and heterogeneous signal intensities increased the sensitivity and specificity to 85% and 97%, respectively [26]. A meta-analysis including 21 studies showed that the sensitivity and specificity of MRI in detecting lymph node involvement were 77% and 71%, respectively [27]. This result indicates that the current capability of MRI to detect metastatic lymph nodes accurately is limited [12,28].

TRUS detects lymph node metastasis more accurately than MRI due to its higher anatomical resolution [4]. It can easily define nodes as small as 3 mm in diameter. However, an inherent limitation of TRUS is its limited field of view, which makes it impossible to evaluate lymph nodes outside of the US range [5]. In contrast, MRI can visualize the iliac and retroperitoneal lymph nodes [29]. Recently updated 3D TRUS with multi-planar display and better resolution

has improved N-staging accuracy rates compared to conventional two-dimensional (2D) US [30]; however, even with current TRUS and MRI techniques, evaluating lymph nodes for malignancy has remained a challenge [9].

Mesorectal Fascia (Circumferential Resection Margin Involvement)

Involvement of the circumferential resection margin is one of the most important predictors of local recurrence in rectal cancer patients who are treated with total mesorectal excision [4,31]. TRUS can identify the circumferential resection margin at the level of the seminal vesicle, prostate, and vagina; however, it cannot accurately depict the mesorectal fascia, especially in the posterior aspect [4]. A recent meta-analysis has found that MRI has a sensitivity of 77% and specificity of 94% in predicting circumferential resection margin involvement [27]. One study has reported a strong correlation between TRUS and MRI in predicting circumferential resection margin involvement in 52 rectal cancer patients [32]; however, MRI remains preferable to TRUS for evaluating the relationship of a

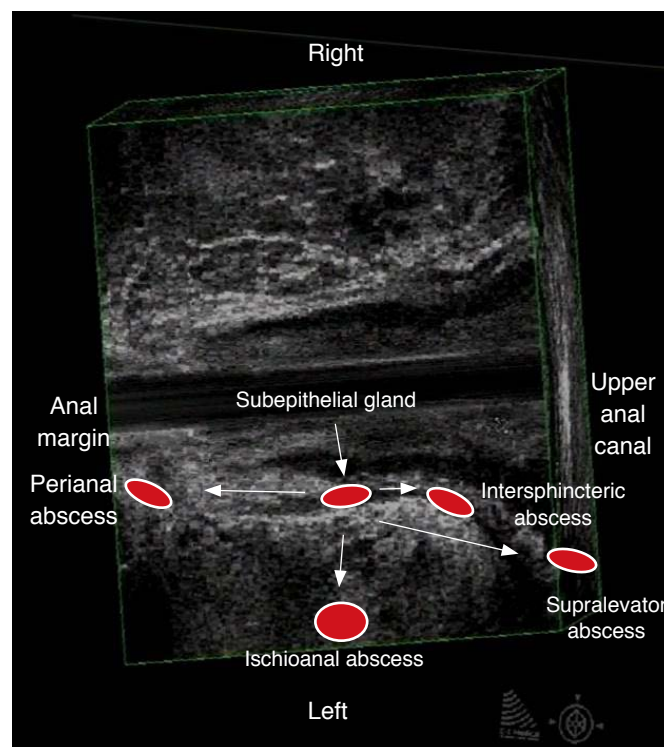


Fig. 9. Extension of perianal inflammation (cryptoglandular hypothesis). If an abscess develops in a superficial gland, the rupture of the abscess extends into the intersphincteric space forming a fistular tract that reaches the skin. Alternatively, a pelvic infection may pass through the external sphincter and enter the ischioanal fossa. The infection sometimes extends to the low perianal space and the supralelevator space.

tumor to the mesorectal fascia.

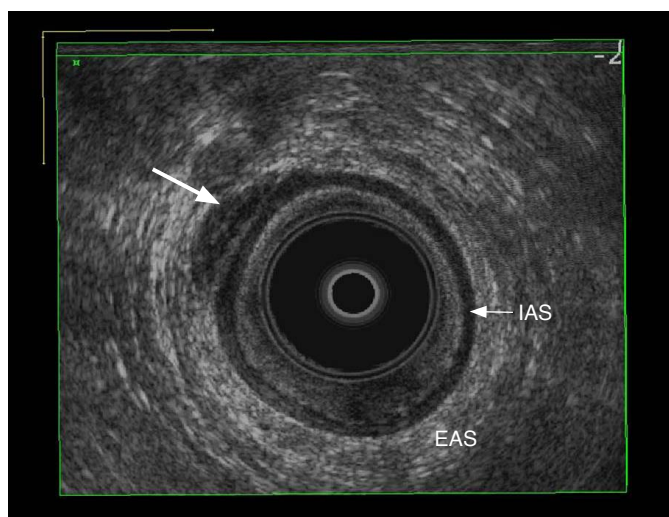
Assessment of Anal Canal Disease

Perianal Fistulas

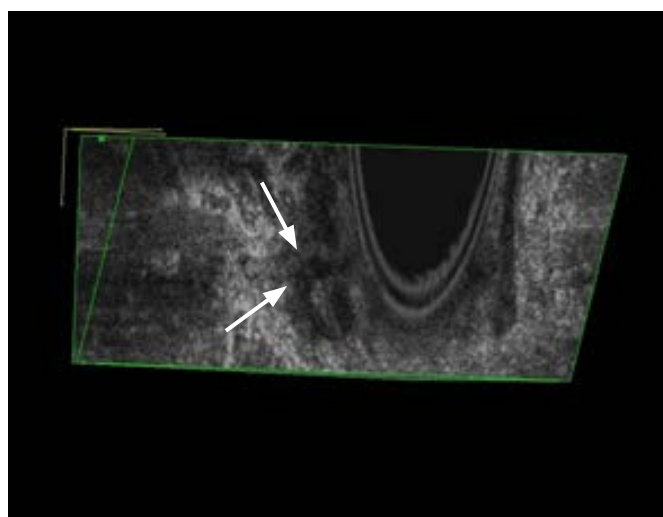
Perianal fistulas are caused by various inflammatory diseases including Crohn disease, pelvic infection, diverticulitis, and tuberculosis, as well as by pelvic malignancy, trauma, or radiation therapy [33]. Fistulas are believed to form most commonly secondary to impaired drainage of the anal glands, which is known as the cryptoglandular hypothesis (Fig. 9) [34]. Perianal fistulas have been divided into inter-, trans-, extra-, and suprasphincteric types by Parks et al. [35]. The treatment of perianal fistulas is primarily surgical and includes a fistulotomy or fistulectomy of the tracts combined

with abscess drainage [36]. The major role of imaging modalities in evaluating perianal fistulas is identifying the anatomic relationship of the fistula and demonstrating the extent of inflammation, internal opening, and fluid collection [33]. To reduce the rate of disease recurrence and postoperative fecal incontinence, it is important to evaluate the anatomic details of the fistulas and the presence of anal sphincter defects before therapy [8].

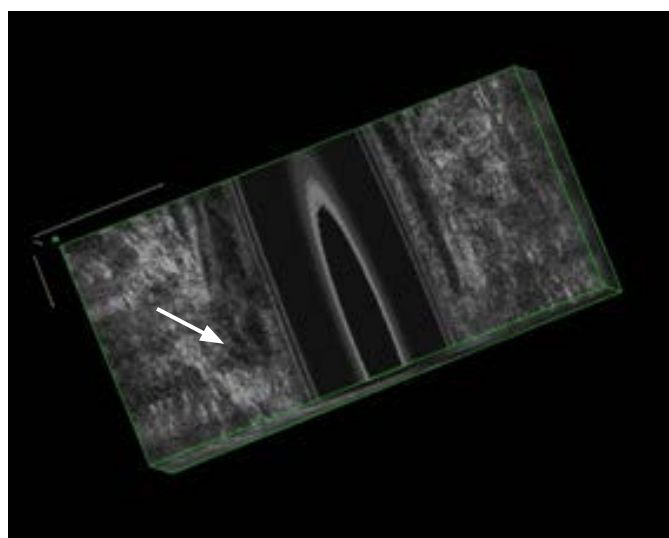
Perianal fistulas appear as hypoechoic tracts or focal soft tissue lesions within anal wall structures (Video clips 1, 2). Abscesses may contain internal gas or hyperechoic debris, and fistulas show a narrow and irregular path on TRUS (Figs. 10, 11, Video clip 3). Depending on the internal composition or stage of inflammation, the primary fistula tract appears as variable echogenic fluid with a thickened wall (Fig. 12). Compared to an active anal fistula



A



B



C

Fig. 10. Intersphincteric perianal fistula.

A. The hypoechoic tract (arrow) is seen between the internal (IAS) and external anal sphincters (EAS) in the axial image. B, C. Three-dimensional reconstructed sagittal (B) and coronal (C) images better represent the exact location of the fistula (arrows).

containing fluid-like material, inactive fistulas are tubular fibrotic bands without fluid content. The fistula tract extends through the perianal spaces while crossing the subepithelium, internal, or

external sphincter [37]. TRUS provides excellent imaging of the rectal wall layers and anal sphincter, and therefore is excellent at visualizing intersphincteric fistulas and their relationship to the anal

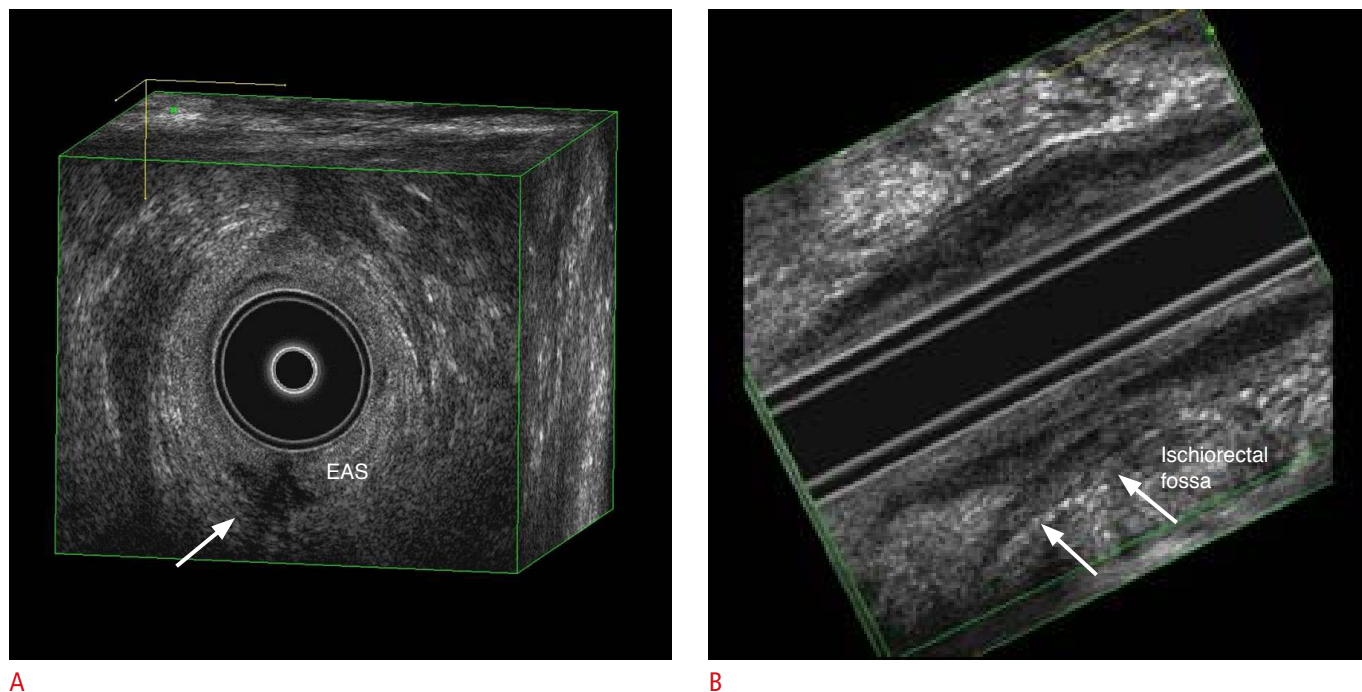


Fig. 11. Extraspincteric perianal fistula.
A. An axial three-dimensional ultrasonogram shows that the hypoechoic tract (arrow) lies along the intersphincteric space, extending into the external anal sphincter (EAS). **B.** The hypoechoic tract (arrows) passes from the intersphincteric space through the external sphincter into the ischiorectal fossa on coronal image.

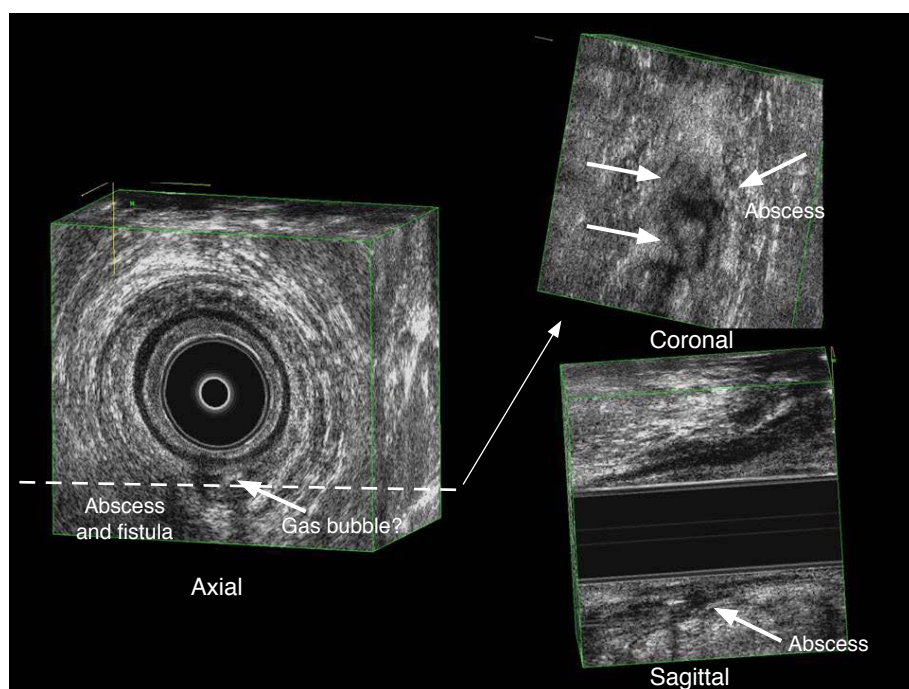


Fig. 12. Perianal abscess. At the level of the middle anal canal, a perianal abscess is visible in the 6 o'clock direction. It contains a hyperechoic focus with an acoustic shadow (arrow) that is presumably a gas bubble. The coronal image reflects the overall shape of the abscess (arrows). The sagittal three-dimensional image displays the perianal abscess (arrow) with a gas bubble.

canal [1,33]. TRUS with a high frequency transducer (81%) has been shown to be more accurate than digital examination (61%) in 108 primary fistula tracts [38]. A meta-analysis reported the sensitivity and specificity of TRUS in the detection of fistulas as 0.87 (95% confidence interval, 0.70 to 0.95) and 0.43 (95% confidence interval, 0.21 to 0.69) [39]. High-resolution 3D US is potentially a useful tool for accurately assessing fistula tracts. The operator can trace the tract by reconstructing all necessary planes from the US images. 3D imaging has improved the accuracy to 98.5% for primary tracts and 96.4% for secondary tracts, compared to accuracies of 83.3% and 87.9%, respectively, for 2D imaging [40].

MRI is considered to be an accurate modality for depicting primary tracts, showing 87% sensitivity and 69% specificity in a recent meta-analysis [39]. Several comparison studies of TRUS and MRI have shown conflicting results. Both hydrogen peroxide-enhanced 3D TRUS and endoanal MRI showed good agreement in the evaluation of perianal fistulas, particularly in the identification of primary fistulas and the location of the internal opening; both modalities agreed well with surgical findings [41,42]. Regarding the identification of intersphincteric fistulas, a meta-analysis reported that MRI and TRUS showed sensitivities of 88%–95% and 50%–79% and specificities of 92%–100% and 84%–100%, respectively [39]. This study suggests that MRI and TRUS have similar sensitivities, but that MRI has a better specificity for the identification of fistulas. The advantage of TRUS is that it provides accurate visualization when the tract is close to the probe, but structures further from the probe are visualized less clearly. An

inconvenient aspect of TRUS is its limited field of view and inability to accurately delineate anatomic spaces outside the external anal sphincter [1]. MRI offers a wider field of view and is better for assessing complex tracts, lateral extension into the perianal space, and fistulas crossing the levator ani muscle [36].

Anal Neoplasms

The most common malignancy of the anal canal is squamous cell carcinoma. These tumors are technically easier to image than rectal cancer due to their location in the anal canal and the fact that they do not necessarily need rectal distention. TRUS can accurately detect the depth of anal cancer into the sphincters with a focus on tumor penetration [2], which is important because the depth of penetration is more closely associated with the prognosis of patients receiving chemoradiation therapy than the size of the lesion. Anal cancer appears as a hypoechoic mass infiltrating the anal sphincter (Fig. 13). TRUS and MRI appear to be comparable modalities for the staging of anal cancer [43]. TRUS may be superior for the detection of superficial small anal cancers and is therefore recommended for T staging. However, for lymph node staging, TRUS should be supplemented by MRI because US has a limited field of view [2,44].

Fecal Incontinence

Sphincter injury is the most common cause of fecal incontinence, and frequently occurs as the consequence of birth trauma, anorectal surgery, or other accidental injuries. Birth trauma results in tears in the anal sphincter, especially the external sphincter, and laceration of

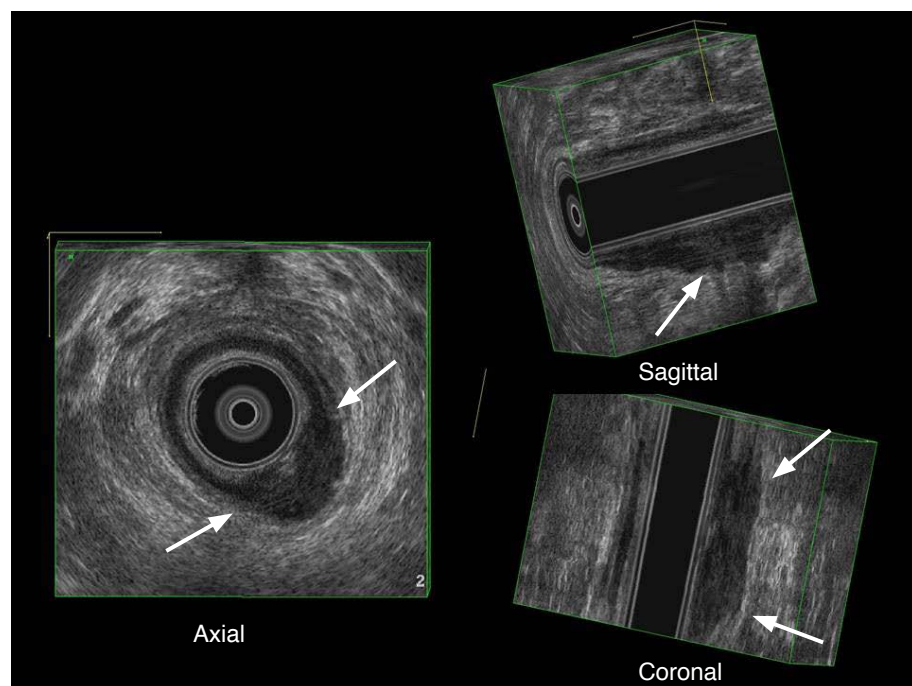


Fig. 13. Anal cancer. Using three-dimensional images, the tumor location, shape, and size can easily be defined. The anal cancer appears as a lesion (arrows) that penetrates into the perianal fat interrupting the internal anal sphincter.

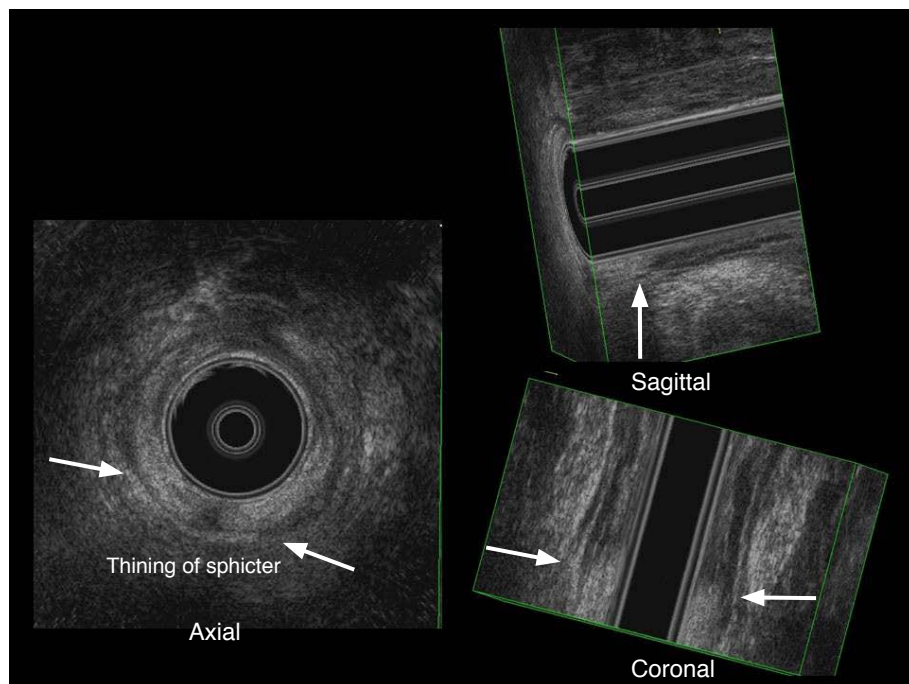


Fig. 14. Sphincter trauma. In the 6–8 o’ clock direction, the external and internal anal sphincters show discontinuation and thinning at the level of the lower anal canal (arrows). Axial transrectal ultrasonography shows localized hypoechoic scar tissue in the external sphincter at the seven o’clock position. Sagittal and coronal three-dimensional images also display abrupt interruptions (arrows) of the sphincters.

the sphincter. TRUS provides accurate images of the anal sphincter and surrounding tissues and can show breaks in the hypoechoic internal anal sphincter or interruption of the external anal sphincter. Discontinuity of the external anal sphincter indicates the presence of a tear (Fig. 14). It has been reported that the accuracy of TRUS in diagnosing sphincter disruption approaches 95% [45].

Conclusion

TRUS provides excellent visualization of the layers of the rectal wall. It is an accurate and useful tool for staging primary rectal cancer and determining rectal wall integrity. It is a fast and minimally invasive technique performed with portable equipment. TRUS can also accurately assess the anal sphincter and provide critical information helpful for planning the appropriate treatment of perianal fistulas and fecal incontinence. TRUS is better than MRI for the evaluation of superficial tumors, whereas MRI provides a better visualization of locally advanced or stenosing cancers. TRUS is comparable to MRI in the staging of perirectal lymph nodes. Although TRUS is limited in the evaluation of the circumferential resection margin due to its small field of view, 3D TRUS can improve the accuracy of diagnoses of anorectal diseases and therefore should have an expanded role in the management of patients with anorectal diseases.

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Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Supplementary Material

Video clip 1. A transsphincteric fistula using three-dimensional (3D) ultrasonography. This video clip shows a transsphincteric fistula. 3D volume rendering images show a hypoechoic structure in the posterior rectal wall. It reaches from the external sphincter to the internal sphincter. The tract that crosses the sphincters can be visualized on the other plane (<http://dx.doi.org/10.14366/usg.14051.v001>).

Video clip 2. Identification of the internal opening. This video shows a fistulous tract that leads to the internal sphincter and a suspicious defect at that site. It is important to determine whether there actually is a break in the subepithelial tissue. The posterior aspect, in the 6 o’clock direction, is suspicious (<http://dx.doi.org/10.14366/usg.14051.v002>).

Video clip 3. Perianal abscess. A large hypoechoic lesion is seen along the left anterior aspect in the 2 o’clock direction. This demonstrates a perianal abscess (<http://dx.doi.org/10.14366/usg.14051.v003>).

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