

PROCEEDINGS

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# CLINICAL APPLICATION OF ENDOANAL AND ENDORECTAL ULTRASOUND FOR BENIGN AND MALIGNANT CONDITIONS OF THE ANUS, PERIANAL SPACE, AND RECTUM

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## ABSTRACT

**INTRODUCTION:** Benign and malignant conditions of the anus, perianal space, and rectum encompass various disorders: perianal abscesses and fistulas, anal fissures, hemorrhoids, incontinence, defecation disorder, rectovaginal and rectovesical fistulas, rectal prolapse, neoplasms of the anal canal and rectum. Very often patients have more than one condition. The high prevalence of benign anal disorders makes them socially significant. In the last two decades, a lot of new diagnostic methods were introduced. This has improved the understanding of the pathogenesis of these conditions. Endoanal and endorectal endoscopic ultrasound has become an important part of the evaluation of anal and rectal disease. This method is widely preferred because of its low price, accessibility, lack of complications, and good tolerance to the examination without sedation.

**MATERIALS AND METHODS:** Thirty patients have undergone endorectal ultrasound (ERUS) examination, from April 2023 to June 2023. All ERUS examinations were performed using 3D 20R3 and 3D X14L4 endorectal transducers connected to BK 3000 Ultrasound System (BK Medical Aps, Denmark).

**RESULTS:** The mean age was 48.4. Eighteen patients were male (60%). The main clinical indication was an evaluation of perianal abscesses and fistulas or neoplasms. Nine of the examinations, or 30%, were performed for anal and rectal tumors. Perianal abscesses were identified in 7 cases (23%); 5 patients had anal fissures; 4 had perianal fistulas (13%); 1 had a rectovaginal fistula. The rest of the patients had hemorrhoidal disease.

**CONCLUSION:** Endorectal and endoanal ultrasound is a sensitive and reliable method for the assessment of the anatomical structures and diagnosis of benign and malignant diseases of the anus, perianal space, and rectum.

**Keywords:** *endorectal and endoanal ultrasound, benign and malignant anal, perianal, rectal disease*

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## INTRODUCTION

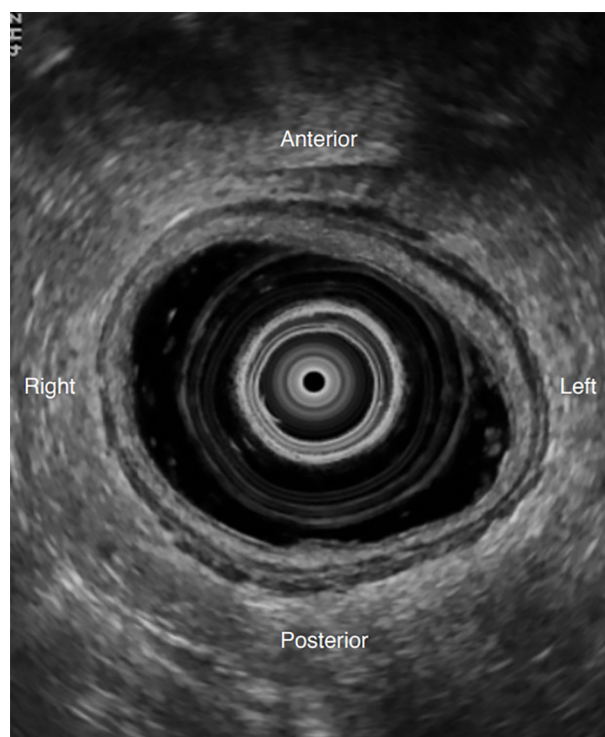
Benign and malignant conditions of the anus, perianal space, and rectum encompass various disorders, including perianal abscesses and fistulas, anal fissures, hemorrhoids, incontinence, defecation disorder, rectovaginal and rectovesical fistulas, rectal prolapse, and neoplasms of the anal canal and rectum. Patients often present with more than one condition. The high prevalence of benign anal disorders and the associated reduction of patients' quality of life makes them socially significant. In the last two decades, a multitude of new methods have been introduced, further improving the diagnosis of these conditions. Endoanal (EAUS) and endorectal ultrasound (ERUS) have become an essential part of the evaluation of anal and rectal diseases. These methods are widely adopted because of the low price, accessibility, safety profile, and good tolerance for the examination without sedation. The terms EAUS, ERUS, and transrectal ultrasound (TRUS) are often used equivocally in the literature. Endoscopic ultrasound (EUS) or endosonography refers to the same examination performed with flexible echoendoscopes.

In order to conduct an adequate TRUS, the operator should be well-versed in the anatomy of the anorectum, as well as be aware of its limitations compared to magnetic resonance imaging (MRI) (1). A better representation of the anatomic relationship between the rectal wall and the anal canal is provided by the advent of enhanced US transducers with three-dimensional (3D) technology, notwithstanding the limitations of standard TRUS in the evaluation of rectal cancer and perianal fistulas (2,3). Transrectal US, like other US exams, is operator-dependent. The rectum should be cleansed before an examination to increase accuracy and reduce artifacts.

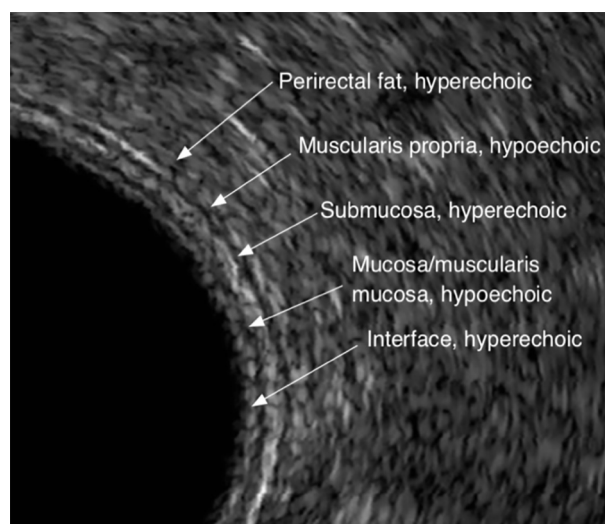
### **Technique and Preparation:**

Before the examination, the rectum must be clear and empty since air or stool remnants can distort the image. Sedation is not required, with the patient being usually positioned in the left lateral decubitus position, with their knees bent to their chests. Before insertion of the probe into the rectum, a digital rectal examination should be conducted to determine the tumor size, localization, and movement. Afterward, the probe is slowly withdrawn to reveal the hyperechoic puborectalis muscle in the anal ca-

nal. The higher, middle, and lower levels are used to capture images of the anal canal. The rectum's five layers should ideally be easily discernible (Fig. 1, 2).



**Fig. 1.** Optimal tranrectal ultrasound view (Kim MJ. *Transrectal ultrasonography of anorectal diseases: advantages and disadvantages. Ultrasonography. 2015 Jan;34(1):19-31. doi: 10.14366/usg.14051.*)



**Fig. 2.** Normal layers of the rectal wall visualized via TRUS (Kim MJ. *Transrectal ultrasonography of anorectal diseases: advantages and disadvantages. Ultrasonography. 2015 Jan;34(1):19-31. doi: 10.14366/usg.14051.*)

Mechanically the transrectal probe rotates 360° with an ultrasound frequency in the 5–15 MHz range, depending on the lesion of interest. Rectal wall layers are better visualized via higher frequencies which provide better resolution. Lower frequencies are used to assess perirectal tissue and enlarged lymph nodes. In the 3D acquisition system, the probe automatically moves inward and outward over a distance of 6 cm. Stored data can be reviewed at any time, and it is possible to select any axis for visualization, allowing the operator to obtain satisfactory information from the gathered data (4). The probe should be inserted above the examined lesion with caution and then withdrawn while positioned centrally to the rectal lumen. Large tumor masses may impede the passage of a rigid probe. In such cases, a flexible echoendoscope can be used (5). In addition, 3D TRUS gives the opportunity for multiplanar visualization of the structures and spaces of the anorectum, thus enhancing more accurate anal sphincter measurements and representation of perianal fistulas (6).

## MATERIALS AND METHODS

Our initial experience includes a total of 30 patients who underwent ERUS examination during the period from April 2023 to June 2023. All of the procedures were performed with 3D 20R3 and 3D X14L4 endorectal transducers coupled to a BK 3000 Ultrasound System (BK Medical Aps, Denmark).

## RESULTS

The mean age of patients included in the present study was 48.4. Eighteen of the patients were male (60%). The main clinical indication for conducting ERUS was perioperative evaluation of perianal abscesses, fistulas and neoplasms. Nine of the examinations were performed for anal and rectal tumors- 30%. A perianal abscess was identified in 7 cases (23%). Five patients had anal fissures, 4 – perianal fistulas and 1 – rectovaginal fistula. 43.3% of the patients had a concomitant perianal condition, with hemorrhoidal disease observed in the majority (84.6%) of cases.

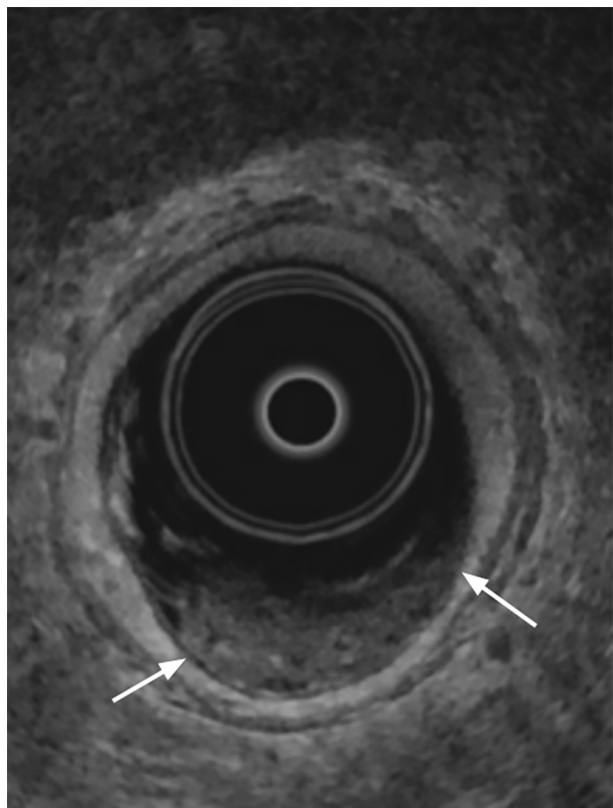
## DISCUSSION

Transrectal US has been widely accepted as a promising imaging modality in patients with diverse anorectal disorders, allowing satisfactory evaluation

of the lower rectum, anal sphincters, and pelvic floor structures (1).

### *Rectal Cancer and Anal Neoplasms*

Colorectal cancer (CRC) is one of the most frequent gastrointestinal malignancies and the second most common cause of cancer-related death in Europe. Imaging studies play an important role in the diagnosis, treatment, and postoperative follow-up period (7). Once the diagnosis of rectal cancer is ascertained, staging should be performed using the latest version of the American Joint Committee on Cancer (AJCC) tumor, node, and metastasis (TNM) classification (8). Preoperative rectal tumor staging includes depth of tumor invasion (Fig. 3), lymph node involvement and metastasis, as well as extramural venous invasion (9). Endoscopic US and MRI are the most common locoregional staging tools in rectal cancer (10).



*Fig. 3. Visualization of T1 rectal tumor (arrows), confined to the first inner three layers, with axial TRUS (Kim MJ. Transrectal ultrasonography of anorectal diseases: advantages and disadvantages. Ultrasonography. 2015 Jan;34(1):19-31. doi: 10.14366/usg.14051).*

Squamous cell carcinoma is one of the most common malignancies of the anal canal. It is technically easier to image compared to rectal cancer due to its more accessible location. TRUS is able to accurately assess the extent of anal cancer penetration into adjacent structures. Anal cancer appears as a hypoechoic mass infiltrating the anal sphincter (2,12). TRUS and MRI appear to be comparable modalities for the staging of anal cancer (11). TRUS may be superior for the detection of superficial small anal cancers and is therefore recommended for tumor staging. TRUS has limitations in terms of lymph node staging and it should be supplemented by MRI (12).

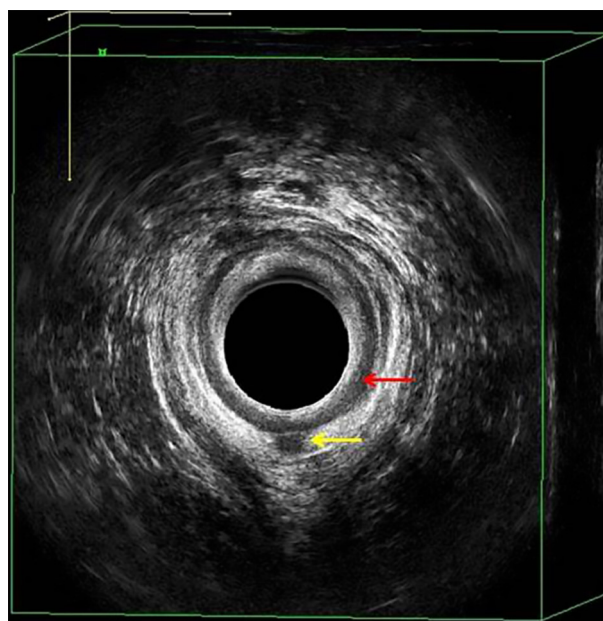
### Assessment of Anal Canal Diseases

#### Perianal Fistulas

The cryptoglandular hypothesis suggests that fistulas occur most commonly as a secondary event to impaired drainage of the anal glands (13). Other causative factors include pelvic malignancy, trauma, radiation therapy, and various inflammatory diseases, such as Crohn's disease, diverticulitis, pelvic infection, and tuberculosis (14). Parks et al. have classified perianal fistulas into four main types: inter-, trans-, extra-, and suprasphincteric (15). Identifying the anatomic connection of the fistula, the extent of inflammation, the internal opening, and the presence of fluid collection is essential for proper management and is achieved with imaging modalities (14). Evaluating the anatomic details of fistulas and the presence of the anal sphincter defects before treatment remains crucial for reducing complications like postoperative fecal incontinence and disease recurrence (16).

Perianal fistulas appear as hypoechoic tracts or focal soft tissue lesions within anal wall structures. Abscesses may contain internal gas or hyperechoic debris, and fistulas show a narrow and irregular path on TRUS. Depending on the internal composition or stage of inflammation, the primary fistula tract appears as variable echogenicity fluid with a thickened wall. 3D TRUS is an effective method for visualizing intersphincteric fistulas and their relationship to the anal canal, as it allows adequate imaging of the rectal wall layers and anal sphincter (Fig. 4) (1,14,17).

A meta-analysis conducted by Siddiqui et al., including 441 fistula cases, compared EAUS and MRI regarding fistula detection. Results revealed com-



*Fig. 4. Intersphincteric fistula (hypoechoic area) marked by the yellow arrow; red arrow – hypoechoic internal sphincter ring (Sharma A, Yadav P, Sahu M, Verma A. (2020). Current imaging techniques for evaluation of fistula in ano: a review. Egypt J Radiol Nucl Med. 2020;51:130. doi: 10.1186/s43055-020-00252-9).*

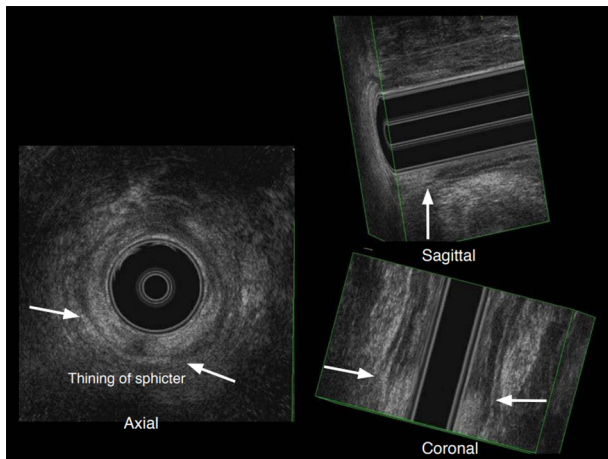
parable sensitivity values (0.87 for EAUS vs. 0.87 for MRI) and low specificity values (0.43 vs. 0.69) of both imaging methods (18). High-resolution 3D US is a valuable tool for adequate evaluation of fistula tracts. The operator can trace the tract by reconstructing all necessary planes from the US images (19).

#### Fecal Incontinence

Fecal incontinence is a common disorder affecting up to 20% of individuals above the age of 65. It is described as “inability to defer the release of gas or stool from the anus and rectum by mechanisms of voluntary control” (20). Common causes include traumatic sphincter defects (e.g., childbirth in women), rectal prolapse, anorectal malformations, complications after surgery for Hirschsprung's disease, and others (1,20,21). Transrectal US is capable of assessing the sphincter integrity in adults and diagnosing sphincter disruption in approximately 95% of cases (Fig. 5) (21).

#### Rectovaginal Fistula

Rectovaginal fistula (RVF) represents an abnormal connection between the vagina and rectum with associated pathological passage of gas or/and fecal matter, leading to significant psychosocial and



**Fig. 5.** Sphincter trauma in the 6-8 o'clock direction. Arrows depict discontinuity and thinning of the external and internal anal sphincters. (Kim MJ. *Transrectal ultrasonography of anorectal diseases: advantages and disadvantages. Ultrasonography. 2015 Jan;34(1):19-31. doi: 10.14366/usg.14051*).

sexual dysfunction in patients (22). The majority of these fistulas occur secondary to obstetrical injury, Crohn's disease, malignant tumors, and trauma (23). Different studies acknowledge the use of standard EAUS to display the sphincter anatomy and internal opening of RVF and anorectal fistulas with accuracy ranging from 7 to 73%. In addition, the injection of hydrogen peroxide ( $H_2O_2$ ) contrast into the fistula tract may enhance accuracy rates to approximately 48 to 73% (22).

## CONCLUSION

Transrectal US is a sensitive and reliable diagnostic method for benign and malignant diseases of the anus, perianal region, and rectum. It provides essential information and adequate assessment of the anorectum anatomy, thus facilitating appropriate treatment planning.

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