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Transperineal Ultrasound In Clinically Diagnosed Fistula-In Ano Cases - A Cross-Sectional Study In A Tertiary Care Center.

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Abstract:
Fistula-in-ano (FIA) is a chronic and often recurrent anorectal condition characterized by an abnormal communication between the rectum or anal canal and the perianal skin. Accurate diagnosis and management of FIA remain challenging due to the complexity of fistula tracts and potential complications.
Traditional diagnostic methods like clinical examination and fistulography are commonly employed, but these methods often lack detailed visualization of the fistulous tracts. In recent years, transperineal ultrasound (TPUS) has emerged as a non-invasive, radiation-free, and cost-effective tool in the assessment of FIA.
This study aims to review the role of transperineal ultrasonography in the assessment of fistula-in-ano, with respect to its current techniques, advantages, clinical applications, and future directions.

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I. Introduction:

Fistula-in-ano (FIA) represents a common surgical problem, with patients often presenting with recurrent abscesses, pain, and discharge. The disease process is associated with significant morbidity and often require multiple surgical interventions. An accurate preoperative assessment is crucial for successful management. Traditionally, clinical examination, fistulography, magnetic resonance imaging (MRI), and endoanal ultrasound (EAUS) have been utilized for diagnosing and classifying fistulas. However, each of these modalities comes with limitations, such as invasiveness, high costs, or limited availability [01].

Transperineal ultrasound (TPUS) is a relatively newer modality that has shown advantages in the evaluation of FIA [02]. This article reviews its role as a diagnostic tool and compares it to other imaging modalities.

Anatomy and Pathophysiology of Fistula-in-Ano: Fistula-in-ano is classified according to the relationship of the fistulous tract to the anal sphincter. Parks et al. developed a classification system that divides anal fistulas into four categories: intersphincteric, trans-sphincteric, suprasphincteric, and extrasphincteric. Most fistulas arise from the cryptoglandular infection that starts in the anal glands and subsequently leads to abscess formation. Recurrent infection often results in fistula formation, which may have a complex course with multiple internal and external openings [03].

Radiological classification of fistulas is based on landmarks on the axial plane and incorporates abscesses and secondary extensions to the grading system, and is called the St James's University Hospital classification [04].

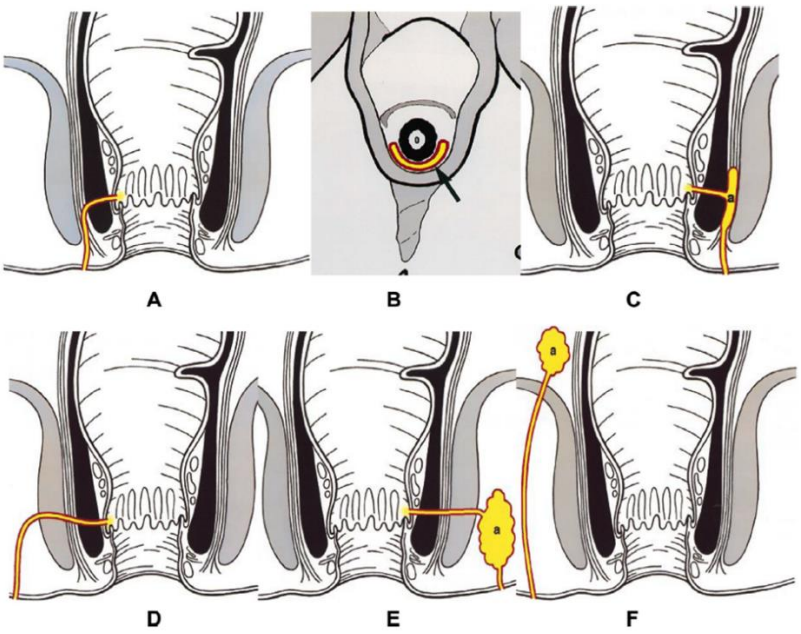

Figure 01. St James's University Hospital classification: (A) Grade 1: Intersphincteric fistula. (B) Grade 2: Intersphincteric fistula with extension. (C) Grade 2: Intersphincteric fistula with intersphincteric abscess. (D) Grade 3: Trans-sphincteric fistula. (E) Grade 4: Trans-sphincteric fistula with ischioanal abscess. (F) Grade 5: Supralevator extension.[05]

The accurate delineation of fistulous tracts, their relation to the sphincter muscles, and the presence of abscesses or secondary tracts is crucial for planning the appropriate surgical intervention. Misdiagnosis or inadequate treatment may result in recurrence or incontinence.

The Role of Imaging in Fistula-in-Ano: Imaging is essential for identifying the full extent of the fistula, especially in cases where clinical examination is inadequate. MRI has long been considered the gold standard due to its excellent soft-tissue contrast and ability to detect complex fistulae and secondary tracts [06]. However, it is expensive and may not be universally available. EAUS, though widely used, has a limited field of view and can be technically challenging in patients with extensive or high-lying fistulae [07]. This highlights the need for an alternative imaging modality like TPUS [02].

II. Objectives:

To study the radiological spectrum of cases clinically diagnosed as Fistula-in-ano and to determine the commonest types of Fistula-in-ano and a note about the complications according to St James's University Hospital classification.

III. Methodology:

Digitalized records are retrieved from department of Radiodiagnosis of the patients who had been referred from surgery department for suspicion of Fistula in ano for a time period of 10 months (January 2024 to October 2024).

Procedure implemented for TPUS: Preparation is not required for examination. Equipment used: Mindray Resona I9 ultrasound machine with a Linear probe L9-3S. The probe is covered with a probe cover for hygienic reasons, filled with gel and in turn covered with contact gel. With the patient in the left lateral position or dorsal lithotomy, the probe is placed directly above the anus (usually in sagittal plan), or if a fistula is present on its external orifice, to then follow its course up to the internal opening. Standard images are obtained from axial and longitudinal viewpoints on the perineal body or above the anus by angling the probe posteriorly, anteriorly or laterally to entirely assess the anal canal and the perianal fistulous tracts and potential collections. High-resolution images may be also obtained from the transvaginal/transvulvar approach.

The presence or absence of fistula in ano, other features, complications are recorded and categorized radiologically as per St James's University Hospital classification.

IV. Results:

A total of 30 patients were referred to our department of radiology,
Demographic details of the population are reported in Table1.

Table 1: Demographic characteristics of patients enrolled in the study.

Gender	Mean age
Male: 18	42
Female: 12	40

Of the total 30 cases included in the study Grade 1: Simple linear intersphincteric fistula were 05 cases, Grade 2: Complex intersphincteric fistula with abscess or secondary track were 06 cases, Grade 3: Trans-sphincteric fistula which pierces the external sphincter ending into the ischioanal fossa were 08 cases, Grade 4: Trans-sphincteric fistula with abscess or secondary track were 11 cases, Grade 5: Suprasphincteric/Extra sphincteric fistulas were 0 cases.

Table 2: Distribution of fistula according to St James's University Hospital classification.

Grade	Number of cases
1	05 (16.6%)
2	06 (20%)
3	08 (26.6%)
4	11 (36.6%)
5	00 (0%)

Figure 2 & 3: (Fig 2) TPUS – axial plane: Grade 1- Low inter-sphincteric fistula seen with its internal opening at 1-2 o' clock position with no complications. (Fig 3) TPUS – axial plane: Grade 2- Inter-sphincteric fistula with internal opening at 12 o' clock position with inter-sphincteric collection.

Figure 4 & 5: (Fig 4) TPUS – Sagittal plane: Grade 3- Two trans- sphincteric fistula with internal opening at 2-3 o' clock position without any complications. (Fig 5) TPUS – Sagittal plane: Grade 4 – Trans- sphincteric fistula with hair pin curve and anterior and posterior ramifications.

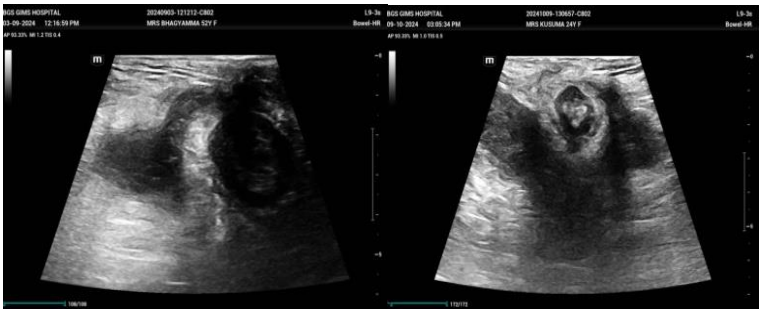

Figure 6 and 7: TPUS – axial plane: (Fig 6) Grade 4 - Trans-sphincteric fistula with ischio-rectal collection. (Fig 7) Grade 4 - Trans – sphincteric fistula with horse –shoe shaped ischiorectal collection.

V. Discussion:

Transperineal Ultrasound (TPUS): Technique and Procedure - Transperineal ultrasound (TPUS) involves placing an ultrasound probe on the perineal skin to obtain real-time images of the anal canal, perianal soft tissues, and fistula tracts. The probe is usually placed in the sagittal and transverse planes to visualize the entire perineal region. High-frequency probes (typically 7-12 MHz) are used to provide detailed images of superficial structures, including the sphincter complex, anal canal, and any fistulous tracts. Additionally, TPUS allows for dynamic assessment, where the operator can identify fluid collections, track the course of the fistula, and assess any communication with internal structures [02] [08].

The procedure is non-invasive, quick, and can be performed on an outpatient basis without requiring special patient preparation. TPUS is also well tolerated and can be repeated to monitor treatment response or progression of the disease.

Advantages of TPUS in Fistula-in-Ano [02] [08]:

Non-invasive and patient-friendly: TPUS is a non-invasive technique that does not require sedation or anaesthesia, making it more comfortable for patients compared to endoanal ultrasound or invasive procedures like fistulography.

Real-time imaging: TPUS provides real-time, dynamic imaging, allowing the operator to assess fluid movement and fistula tract characteristics with ease.

Cost-effective and accessible: TPUS is more cost-effective compared to MRI and does not require the same level of infrastructure or expertise. Its accessibility makes it a valuable tool in resource-limited settings.

No radiation exposure: Unlike fistulography or computed tomography (CT) scans, TPUS does not involve any radiation, making it a safer option for repeated imaging.

Assessment of external openings and surrounding soft tissues: TPUS provides a clear view of the external openings, perianal soft tissues, and superficial fistula tracts, which can sometimes be missed by EAUS.

Limitations of TPUS in Fistula-in-Ano [08] [09] [10].

Limited penetration/depth: TPUS is less effective in visualizing deep-seated or complex fistula tracts that extend beyond the reach of the high-frequency probe.

Operator-dependent: The accuracy of TPUS relies heavily on the operator's experience and expertise in interpreting ultrasound images.

Limited field of view: TPUS, while effective for superficial and moderately deep fistulae, may not provide as comprehensive a view as MRI, especially in patients with complex, high-lying fistulae.

Difficulty in identifying Secondary Tracts: Identifying secondary tracts and internal openings may be more challenging compared to MRI, especially in patients with recurrent or complex disease.

Comparative analysis: TPUS vs. Other Modalities

MRI: MRI remains the gold standard for complex fistulae and provides excellent soft-tissue resolution. However, TPUS is a more practical option for initial assessment and follow-up, especially in cases of superficial and simple fistulae [11] [12].

Endoanal Ultrasound (EAUS): EAUS offers detailed images of the sphincter complex and is often used for planning sphincter-preserving surgeries. TPUS complements EAUS by providing a broader field of view of the external openings and perianal tissues [10].

Fistulography and CT: These methods involve radiation and may not be as effective in identifying fistulous tracts as MRI or TPUS. TPUS offers the advantage of being radiation-free while still providing detailed information about superficial fistulae [13].

Clinical Applications and Outcomes of several studies have demonstrated the efficacy of TPUS in diagnosing and classifying fistula-in-ano. It has proven particularly useful in cases of simple or low-lying fistulas, where it offers a cost-effective, non-invasive alternative to MRI. For patients with recurrent or complex fistulae, TPUS may be used as an adjunct to MRI. Additionally, TPUS has been shown to aid in surgical planning by accurately identifying the external and internal openings of the fistula, leading to better clinical outcomes and follow-up assessments [13][14].

VI. Conclusion:

Transperineal ultrasound represents a promising, non-invasive tool for the diagnosis and management of fistula-in-ano. While it may not entirely replace MRI or EAUS in complex cases, TPUS offers significant advantages in terms of cost, accessibility, and patient comfort. Its real-time imaging capabilities and lack of radiation exposure make it an attractive option for both initial diagnosis and follow-up [15]. Future research should focus on standardizing the use of TPUS in clinical practice and further exploring its role in guiding surgical intervention and postoperative monitoring [16].

Ethical committee clearance:

The study is approved by institutional ethical committee.

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