



Original Article

Role of Ultrasonography in the Evaluation of Perianal Fistula and Sinus: A Prospective Observational Study

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ABSTRACT

Background: Perianal fistula is a common anorectal condition resulting from chronic infection of the anal glands and is often associated with recurrent discharge, pain, and abscess formation. Accurate preoperative identification of the fistulous tract, internal opening, and associated extensions is essential for effective surgical management and prevention of recurrence. Imaging modalities play a significant role in delineating fistula anatomy. Ultrasonography (USG), including transperineal and endoanal approaches, has emerged as a useful, non-invasive, and cost-effective imaging technique for evaluating perianal fistulas. **Objective:** To evaluate the role of ultrasonography in detecting primary tracts, internal openings, secondary tracts, and associated abscesses in patients with perianal fistula and sinus, and to compare ultrasonographic findings with surgical findings. **Methods:** This prospective observational study included 140 patients clinically suspected to have perianal fistula or sinus. Ultrasonographic examination of the perianal region was performed using high-resolution probes. Parameters evaluated included visualization of the primary tract, identification of internal openings, detection of secondary tracts, abscess formation, and horseshoe extensions. Ultrasonographic findings were subsequently compared with intraoperative surgical findings to determine diagnostic accuracy. **Results:** The mean age of patients was 39.2 ± 11.5 years, with a male predominance (male:female ratio 4:1). Perianal discharge was the most common symptom (85%), followed by pain (74.3%). Ultrasonography visualized the primary tract in 88.6% of patients, internal opening in 69.3%, secondary tracts in 72.1%, abscesses in 66.4%, and horseshoe extension in 27.1% of cases. Comparison with surgical findings showed high diagnostic performance, with sensitivity of 92.5% for primary tract detection and overall diagnostic accuracy ranging from 81.4% to 89.3%. **Conclusion:** Ultrasonography is a reliable, non-invasive imaging modality for evaluating perianal fistula and sinus. It provides accurate anatomical delineation of fistulous tracts and associated complications, thereby aiding in surgical planning and improving treatment outcomes.

Keywords: Perianal fistula, Ultrasonography, Sinus.

INTRODUCTION

Perianal fistula is a common anorectal condition characterized by an abnormal tract connecting the anal canal or rectum to the perianal skin. It usually represents the chronic phase of anorectal sepsis that originates from infection of the anal glands located within the intersphincteric plane. The disease often follows a perianal abscess and may lead to persistent discharge, pain, and recurrent infection if not appropriately managed. Perianal fistulas significantly affect quality of life and are associated with considerable morbidity due to recurrence and complications after surgery. The prevalence of perianal fistula has been reported to be approximately 1 in 10,000 individuals, with a higher incidence among males and individuals in the fourth and fifth decades of life.¹

Successful treatment of fistula-in-ano requires accurate identification of the fistulous tract, internal opening, and associated secondary extensions or abscesses. The primary goal of surgical management is to eradicate the fistulous tract and internal opening while preserving the anal sphincter mechanism to prevent postoperative incontinence. However, complex fistula anatomy and occult extensions may result in incomplete treatment, recurrence, and sphincter injury. Therefore, precise preoperative assessment of fistula anatomy is crucial for appropriate surgical planning and improved clinical outcomes.² Clinical examination alone may be insufficient for identifying the full extent of the disease, particularly in complex or recurrent fistulas. Imaging techniques therefore play an important role in delineating the fistulous tract and associated complications. Historically, fistulography was used for evaluating fistula-in-ano, but it has largely been abandoned due to poor accuracy and limited anatomical information. Currently, magnetic resonance imaging (MRI) and endoanal ultrasonography (EAUS) are considered the most useful imaging modalities for preoperative evaluation of perianal fistulas.³ Magnetic resonance imaging is widely regarded as the gold standard imaging modality for complex perianal fistulas because of its excellent soft-tissue contrast and ability to provide multiplanar visualization of the anal sphincter complex and surrounding structures. MRI can accurately demonstrate secondary tracts, abscesses, and supralelevator extensions that may not be evident on clinical examination. However, MRI has certain limitations, including higher cost, limited availability in many healthcare settings, and longer examination time. These limitations may restrict its routine use, particularly in resource-limited environments.⁴

Ultrasonography has emerged as a valuable alternative imaging modality in the evaluation of perianal fistula. Endoanal and transperineal ultrasonography allow detailed visualization of the anal sphincter complex and surrounding tissues, enabling identification of primary tracts, internal openings, and associated abscesses. Ultrasonography is widely available, relatively inexpensive, non-invasive, and can be performed quickly in an outpatient setting. These advantages make it an attractive diagnostic tool for the evaluation of anorectal disorders.⁵ Several studies have demonstrated the diagnostic accuracy of ultrasonography in detecting perianal fistula anatomy. Endoanal ultrasonography has shown high sensitivity and acceptable specificity in identifying fistulous tracts and associated complications. In one study, endorectal ultrasonography demonstrated sensitivity of approximately 97.9% and specificity of around 89.5% in the diagnosis of perianal fistula.⁶ Similarly, transperineal ultrasonography has been reported to have high diagnostic performance, with sensitivity and specificity exceeding 90% in identifying fistula tracts and abscesses.⁷

Advancements in ultrasonographic techniques, including three-dimensional endoanal ultrasound and the use of contrast agents such as hydrogen peroxide, have further improved the diagnostic capability of ultrasonography in fistula evaluation. These techniques enable better delineation of complex fistulous pathways and their relationship with the anal sphincter complex. Consequently, ultrasonography has become an increasingly important tool in the preoperative evaluation of perianal fistula, especially in settings where MRI is not readily available.³

Despite the growing use of ultrasonography, variations exist in its diagnostic performance depending on operator experience, imaging technique, and fistula complexity. Moreover, there is a need for further studies comparing ultrasonographic findings with surgical findings to determine its accuracy in identifying fistula components such as primary tract, internal opening, secondary extensions, and abscess formation. Such studies can help establish the clinical value of ultrasonography as a reliable imaging modality for the evaluation of perianal fistula and sinus. Therefore, the present study was conducted to evaluate the role of ultrasonography in the assessment of perianal fistula and sinus, with particular emphasis on identifying fistulous tracts, internal openings, secondary extensions, and associated abscesses, and to compare ultrasonographic findings with intraoperative surgical findings.

METHODOLOGY

Study Design and Setting

This study was designed as a prospective observational study conducted in the Department of Radio-diagnosis at a tertiary care teaching hospital. The study duration was approximately 18 months. The objective of the study was to evaluate the role of ultrasonography in the diagnosis and assessment of perianal fistula and sinus. Early and accurate identification of the fistulous tract, internal opening, and associated complications is essential to guide appropriate surgical management and reduce recurrence. Ultrasonography offers a non-invasive, cost-effective, and widely available imaging modality for evaluating perianal fistulous disease.

Study Population

The study population consisted of patients presenting with clinical suspicion of perianal fistula or perianal sinus attending the tertiary care hospital. All eligible patients who met the inclusion criteria and provided informed consent were included in the study. Patients were selected using a simple random sampling technique.

Inclusion Criteria

Patients aged 18 years or older with clinical suspicion of perianal fistula or sinus were included in the study. Patients who were willing to undergo ultrasonographic examination and participate in the study were also included.

Exclusion Criteria

Patients who were pregnant, those with active severe perianal infection, patients diagnosed with active anorectal malignancy, and patients with incomplete follow-up or unwillingness to undergo ultrasonographic examination were excluded from the study.

Sample Size Calculation

The sample size for the study was calculated based on the expected prevalence of perianal fistula cases accurately diagnosed by ultrasonography.

Based on previous literature, the expected prevalence (P) was considered to be 91%. With a confidence level of 95% (Z = 1.96) and a precision (d) of 5% (0.05), the sample size was calculated using the formula:

$$n = Z^2 \times P \times (1 - P) / d^2$$

Substituting the values into the formula resulted in a calculated minimum sample size of approximately 126 patients. To account for potential non-response and data loss of approximately 10%, the sample size was increased accordingly. The final sample size was rounded to 139 participants.

Patients fulfilling the inclusion criteria during the study period were enrolled consecutively until the required sample size was achieved.

Data Collection

After explaining the purpose and nature of the study, informed consent was obtained from all participants. Data were collected using a pre-designed and pretested questionnaire. The collected information included socio-demographic details, clinical history, presenting symptoms, and relevant clinical findings. Clinical symptoms recorded included perianal discharge, pain, swelling, fever, and pruritus.

Ultrasonographic Evaluation

Perianal ultrasonography was performed using a BPL Alpinion ultrasound machine. High-resolution linear transducers with frequencies ranging from 3–10 MHz and sector or micro-convex probes of 2–5 MHz were used for imaging. The examination was performed with the probe placed over the perianal region. Both transperineal and endoanal ultrasound approaches were used depending on the clinical requirement, and in some cases a combination of both techniques was utilized. The fistulous tract was evaluated in axial, sagittal, and coronal planes to determine its course, length, and anatomical relationship with the anal sphincter complex. The presence of primary tract, internal opening, secondary tract extension, abscess formation, and horseshoe extension was documented. Fistulas were also categorized based on type, including intersphincteric, transsphincteric, suprasphincteric, and extrasphincteric types. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Confidentiality of patient information was maintained throughout the study. Written informed consent was obtained from all participants prior to inclusion in the study.

RESULTS

Table 1: Demographic Profile of Patients

Parameter	Observation
Total Patients	140
Age Range	18–65 years
Mean Age	39.2 ± 11.5 years
Gender Ratio	Male:Female = 4:1 (112:28)

Table 2: Clinical Presentation of Perianal Fistula

Symptom	No. of Cases	Percentage (%)
Perianal discharge	119	85.0
Perianal pain	104	74.3
Perianal swelling/lump	63	45.0
Fever	28	20.0
Pruritus	20	14.3

Table 3: Ultrasonographic Findings

USG Parameter	No. of Cases	Percentage (%)
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<i>Primary tract visualized</i>	124	88.6
<i>Internal opening identified</i>	97	69.3
<i>Secondary tract visualized</i>	101	72.1
<i>Abscess detected</i>	93	66.4
<i>Horseshoe extension</i>	38	27.1

Table 4: Comparison of Ultrasonography with Surgical Findings

<i>Parameter</i>	Sensitivity (%)	Specificity (%)	Accuracy (%)
<i>Primary tract detection</i>	92.5	80.0	89.3
<i>Internal opening detection</i>	84.2	76.0	81.4
<i>Secondary tract detection</i>	86.7	78.9	83.6
<i>Abscess identification</i>	89.3	82.5	86.4

A total of 140 patients clinically suspected to have perianal fistula or sinus were included in the study. The age of the patients ranged from 18 to 65 years, with a mean age of 39.2 ± 11.5 years. The study demonstrated a clear male predominance, with 112 males and 28 females, resulting in a male-to-female ratio of 4:1.

Regarding the clinical presentation, the most common symptom was perianal discharge, which was present in 119 patients (85%). Perianal pain was reported in 104 patients (74.3%), while perianal swelling or lump was observed in 63 patients (45%). Other less common symptoms included fever in 28 patients (20%) and pruritus in 20 patients (14.3%). Ultrasonographic evaluation demonstrated that the primary fistulous tract was visualized in 124 patients (88.6%). Internal openings were identified in 97 patients (69.3%), while secondary tracts were detected in 101 patients (72.1%). Associated abscess formation was identified in 93 patients (66.4%), and horseshoe extension was observed in 38 patients (27.1%).

When ultrasonographic findings were compared with surgical findings, ultrasonography demonstrated a high diagnostic performance. For primary tract detection, the sensitivity was 92.5%, specificity was 80%, and overall accuracy was 89.3%. Detection of the internal opening showed sensitivity of 84.2%, specificity of 76%, and accuracy of 81.4%. For secondary tract detection, sensitivity was 86.7%, specificity was 78.9%, and accuracy was 83.6%. Identification of perianal abscess showed sensitivity of 89.3%, specificity of 82.5%, and accuracy of 86.4%. These findings demonstrate the ability of ultrasonography to accurately identify the anatomical components of perianal fistula and its complications.

DISCUSSION

Perianal fistula is a common anorectal disorder that typically develops as a chronic consequence of anorectal infection originating from anal glands. Accurate identification of the fistulous tract, internal opening, and associated complications is crucial for successful surgical management and prevention of recurrence.¹ In the present study, the mean age of patients was 39.2 years, and a strong male predominance (4:1) was observed. Similar demographic patterns have been reported in previous studies where perianal fistula is more frequently observed in males and typically affects individuals in the third to fifth decades of life.¹ The higher prevalence among males may be related to anatomical and hormonal differences influencing the susceptibility to anal gland infections.² Regarding clinical presentation, perianal discharge was the most common symptom observed in this study (85%), followed by pain (74.3%) and swelling (45%). These findings are consistent with previously published studies which report persistent discharge as the most characteristic symptom of fistula-in-ano. Chronic infection and inflammation of the fistulous tract lead to continuous or intermittent drainage from the external opening.³

The present study demonstrated that ultrasonography successfully visualized the primary tract in 88.6% of cases, internal openings in 69.3%, and secondary tracts in 72.1% of patients. These findings support the growing evidence that ultrasonography is a valuable imaging modality for evaluating perianal fistula. Endoanal and transperineal ultrasonography provide detailed visualization of the anal sphincter complex and surrounding tissues, allowing accurate identification of fistulous tracts and associated abscesses.⁵ In addition, abscess formation was detected in 66.4% of patients, which is clinically important because undetected abscesses can lead to persistent infection and postoperative recurrence. The identification of horseshoe extension in 27.1% of patients also highlights the importance of imaging in detecting complex fistula anatomy that may not be apparent on clinical examination alone.^{6,7}

When ultrasonographic findings were compared with intraoperative surgical findings, the diagnostic performance of ultrasonography was found to be high. The sensitivity for detecting the primary tract was 92.5%, which is comparable to results reported in earlier studies evaluating the diagnostic accuracy of endoanal ultrasound. Previous research has shown that ultrasonography can achieve sensitivity levels approaching 90–97% in fistula detection. Similarly, the detection of

internal openings and secondary tracts in this study demonstrated good diagnostic accuracy. Accurate identification of the internal opening is particularly important because failure to treat the internal opening is a major cause of fistula recurrence after surgery.⁴

Although MRI remains the gold standard imaging modality for complex fistula evaluation due to its superior soft tissue contrast, ultrasonography offers several advantages including low cost, wide availability, rapid examination, and absence of radiation exposure. ⁴ These characteristics make ultrasonography particularly valuable in resource-limited healthcare settings. Overall, the findings of the present study are consistent with previous literature and demonstrate that ultrasonography is a reliable imaging technique for identifying the anatomical features of perianal fistula and guiding surgical management.

CONCLUSION

The present study demonstrates that ultrasonography is an effective imaging modality for the evaluation of perianal fistula and sinus. Ultrasonography was able to accurately detect the primary fistulous tract, internal opening, secondary extensions, and associated abscesses in a majority of patients. The comparison of ultrasonographic findings with surgical findings showed high sensitivity, specificity, and overall diagnostic accuracy, particularly in identifying the primary tract and abscess formation.

Because ultrasonography is non-invasive, cost-effective, widely available, and easy to perform, it can serve as an important first-line imaging modality for the assessment of perianal fistula. It helps in accurate preoperative mapping of the fistulous tract, which is essential for planning appropriate surgical treatment and reducing recurrence rates. Therefore, ultrasonography plays a significant role in the diagnosis and management of perianal fistula and sinus, especially in settings where advanced imaging modalities such as MRI may not be readily available.

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