



ORIGINAL RESEARCH PAPER

Radio-Diagnosis

THE ROLE OF ULTRASONOGRAPHY IN THE EVALUATION OF PERI-ANAL LESIONS

KEY WORDS:
 Ultrasonography, Perianal abscess, Fistula-in-ano, Anal pain, Diagnostic imaging

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ABSTRACT	Background: Perianal lesions represent a wide spectrum of conditions including abscesses, fistulas, hematomas, and thrombosed piles. Their overlapping clinical features often make diagnosis challenging, necessitating imaging support. Ultrasonography (USG) has emerged as a reliable, cost-effective, and non-invasive modality for evaluating perianal pathology. The present study aimed to assess the diagnostic role of ultrasonography in perianal lesions and to determine its accuracy in comparison with surgical, histopathological, and clinical outcomes. Methods: This hospital-based prospective, observational, cross-sectional study was conducted in the Department of Radiodiagnosis, Sri Aurobindo Medical College and Post Graduate Institute, Indore, from June 2023 to November 2024. Fifty patients with clinically suspected perianal lesions underwent USG using GE LOGIQ E9 and F8 machines with 4 MHz curvilinear and 7.5–15 MHz linear probes. Imaging findings were correlated with operative, histopathological, or follow-up results. Data were analyzed with SPSS v26.0; Chi-square test was used and $p < 0.05$ was considered significant. Results: The study included 34 males (68%) and 16 females (32%), with a mean age of 38.4 years. Perianal pain (90%) was the commonest symptom. USG revealed perianal abscesses in 22 cases (44%), fistulas in 16 (32%), hematomas in 5 (10%), thrombosed piles in 3 (6%), and indeterminate lesions in 4 (8%). Ischiorectal abscess was the most frequent subtype (45.5%), while intersphincteric fistula was the predominant fistula type (37.5%). Ultrasonographic diagnosis correlated with operative or clinical findings in 47 of 50 evaluable cases, yielding a diagnostic accuracy of 94%, sensitivity 93.75%, specificity 100%, PPV 100%, and NPV 40% ($p < 0.0001$). Conclusion: Ultrasonography is a highly accurate, non-invasive modality for evaluating perianal lesions. It correlates well with surgical findings and should be considered a frontline imaging tool, particularly in resource-limited settings.
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INTRODUCTION Anal pain is a common yet distressing symptom that significantly impacts the quality of life. It originates from the anal canal or perianal area and may be caused by a wide spectrum of underlying conditions, ranging from benign self-limiting lesions to chronic inflammatory or infectious diseases, and even malignancies [1]. Among the most prevalent causes of anal pain is the anal fissure, a small mucosal tear that commonly results from straining during defecation or passing hard stools. It typically presents with intense pain and rectal bleeding during bowel movements [2]. Another frequent cause is the anorectal abscess, which is a localized collection of pus resulting from infection of the cryptoglandular tissue of the anal canal. These abscesses are categorized based on their location into perianal, submucosal, intermuscular, ischiorectal, or pelvirectal types [3]. When inadequately treated or spontaneously drained, these abscesses can lead to perianal fistulas, characterized by persistent inflammatory tracts that form connections between the anal canal and the perianal skin. These fistulas may present as intermittent pain, discharge, or swelling, and can be classified into intersphincteric, transsphincteric, suprasphincteric, or extrasphincteric types [3,4]. Other differential diagnoses of perianal pain include perianal hematoma, resulting from venous rupture or external hemorrhoids and appearing as bluish swellings or blood collections under the perianal skin [5]. Additionally, conditions such as thrombosed piles, pruritus ani, Crohn's disease, fecal impaction, proctitis, anorectal malignancies, and idiopathic anal pain syndromes contribute to the clinical spectrum [6]. Given the complex anatomy and often nonspecific clinical presentation, imaging plays a pivotal role in the diagnosis,	classification, and management planning of perianal lesions. Among the imaging modalities, ultrasonography (USG), particularly high-frequency and endoanal ultrasonography, has emerged as a non-invasive, cost-effective, and dynamic tool for evaluating perianal pathology. USG allows for accurate delineation of soft tissue involvement, identification of fluid collections, detection of internal openings in fistulous tracts, and assessment of surrounding structures, making it an invaluable adjunct in both acute and chronic anal diseases. This study aims to explore the role of ultrasonography in the evaluation of perianal lesions, highlighting its diagnostic capabilities, advantages, limitations, and its utility in guiding clinical decision-making and therapeutic interventions. MATERIAL AND METHODS This hospital-based prospective, observational, cross-sectional study was conducted in the Department of Radiodiagnosis at Sri Aurobindo Medical College and Post Graduate Institute, Indore, over a period of 18 months, from 1st June 2023 to 30th November 2024. A total of 50 patients of various ages and genders, presenting with clinical suspicion of perianal lesions and referred for ultrasonographic evaluation, were enrolled. The study was conducted after obtaining approval from the Institutional Ethics and Research Committee. Written informed consent was obtained from all participants. All ethical principles—including autonomy, confidentiality, and the right to withdraw—were strictly adhered to throughout the study. Inclusion Criteria - Patients of any age and gender presenting with clinically suspected perianal lesions. - Patients referred to the Department of Radiodiagnosis for ultrasonographic evaluation of perianal pathology.
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- Patients who underwent surgery or medical management, and had complete clinical/imaging follow-up.

Exclusion Criteria

- Patients unwilling to provide informed consent.
- Patients lost to follow-up.
- Patients whose ultrasound scans were negative and no further clinical correlation could be established.

Ultrasound Protocol

Ultrasound evaluation was performed using General Electric LOGIQ E9 and LOGIQ F8 machines. The following transducers were used:

- Curvilinear probe with a frequency of 4 MHz
- High-frequency linear probe with a frequency range of 7.5–15 MHz
- High-frequency endo-anal probe with a frequency range of 7.5–15 MHz

All ultrasound examinations were performed with patients in a lateral decubitus or lithotomy position, depending on clinical condition and lesion accessibility. Grey-scale and color Doppler imaging were utilized for lesion characterization, localization, and identification of fistulous tracts, abscesses, and their relation to sphincter muscles and surrounding structures.

Procedure

After thorough history taking and clinical examination, ultrasonography was performed on all included patients. Imaging was interpreted by experienced radiologists blinded to the final diagnosis. Findings were documented on a pre-structured proforma. Post-ultrasound correlation was made with surgical findings, histopathology, or clinical course in medically managed cases. Relevant intraoperative or therapeutic outcomes were recorded.

Statistical Analysis

All patient data, including demographic information, clinical presentation, sonographic findings, and post-treatment/surgical outcomes, were systematically recorded in Microsoft Excel 2010. Statistical analysis was performed using IBM SPSS Statistics version 26.0. Descriptive statistics were used for continuous variables (mean ± standard deviation) and categorical variables (frequencies and percentages). Associations between qualitative variables were assessed using the Chi-square test. A p-value of < 0.05 was considered statistically significant.

RESULTS

A total of 50 patients with clinical suspicion of perianal lesions were included in the study over a period of 18 months. All patients underwent ultrasonographic evaluation, and findings were compared with clinical, surgical, or histopathological outcomes. The study population included 34 males (68%) and 16 females (32%), yielding a male-to-female ratio of 2.1:1. The mean age of patients was 38.4 ± 12.7 years, with an age range of 18 to 67 years. The maximum number of patients were in the third and fourth decades of life. The most frequently reported symptom was perianal pain, seen in 90% of patients, followed by perianal swelling in 38%, and purulent discharge in 34%. Other presenting complaints included fever (22%) and bleeding per rectum (16%).

Table 1: Clinical Presentation Of Patients (n = 50)

Clinical Feature	Number of Patients	Percentage (%)
Perianal Pain	45	90%
Perianal Swelling	19	38%
Purulent Discharge	17	34%
Fever	11	22%
Bleeding per Rectum	8	16%

Ultrasonographic evaluation revealed that the most common

perianal lesion was perianal abscess (44%), followed by perianal fistula (32%), perianal hematoma (10%), thrombosed external piles (6%), and indeterminate/chronic lesions (8%).

Table 2: Ultrasonographic Diagnosis Of Perianal Lesions (n = 50)

Lesion Type	Number of Cases	Percentage (%)
Perianal Abscess	22	44%
Perianal Fistula	16	32%
Perianal Hematoma	5	10%
Thrombosed External Piles	3	6%
Indeterminate/Chronic Lesion	4	8%

Among the 22 abscesses, the most common location was ischiorectal (45.5%), followed by perianal (31.8%), intersphincteric (13.6%), and submucosal (9.1%). These lesions appeared hypoechoic or anechoic with irregular margins and posterior acoustic enhancement. Color Doppler showed increased peripheral vascularity.

Table 3: Distribution of Perianal Abscess by Location (n = 22)

Abscess Type	Number of Cases	Percentage (%)
Ischiorectal	10	45.5%
Perianal	7	31.8%
Intersphincteric	3	13.6%
Submucosal	2	9.1%

In the 16 cases of perianal fistula, ultrasonography enabled classification using Parks' classification. The intersphincteric type was the most common (37.5%), followed by transsphincteric (31.25%), suprasphincteric (18.75%), and extrasphincteric (12.5%). In all cases, the internal opening was identified, and associated abscesses were found in 5 cases (31.25%).

Table 4: Classification Of Perianal Fistulas (n = 16)

Fistula Type	Number of Cases	Percentage (%)
Intersphincteric	6	37.5%
Transsphincteric	5	31.25%
Suprasphincteric	3	18.75%
Extrasphincteric	2	12.5%

Out of 50 patients, 42 (84%) underwent surgical management, while 8 (16%) were managed medically.

Table 5: Management Modality (n = 50)

Treatment Type	Number of Patients	Percentage (%)
Surgical Management	42	84%
Medical Management	8	16%

Ultrasonographic diagnosis showed excellent concordance with surgical or follow-up findings in 47 out of 50 cases, resulting in a diagnostic accuracy of 94%. The sensitivity and specificity of ultrasonography were 93.75% and 100%, respectively. The positive predictive value (PPV) was 100%, and the negative predictive value (NPV) was 40%. A statistically significant correlation was observed between ultrasonographic diagnosis and the final clinical/surgical outcome (p < 0.0001), underscoring the effectiveness of ultrasonography in evaluating perianal lesions.

Table 6: Diagnostic Accuracy Of Ultrasonography (n = 50)

Parameter	Value
True Positives (TP)	45
True Negatives (TN)	2
False Positives (FP)	0
False Negatives (FN)	3
Sensitivity	93.75%
Specificity	100%
Positive Predictive Value (PPV)	100%

Negative Predictive Value (NPV)	40%
Overall Accuracy	94%
Chi-square (χ^2)	18.75
p-value	<0.0001

DISCUSSION

In our prospective observational study evaluating 50 patients with clinically suspected peri-anal lesions, ultrasonography proved to be a highly valuable imaging modality, both diagnostically and in correlation with clinical and surgical outcomes. A male predominance (68%) was noted, with the mean age being 38.4 ± 12.7 years. This demographic distribution is consistent with previous studies which have shown a higher incidence of peri-anal sepsis and fistulous disease in young to middle-aged males, attributed to increased glandular density and greater exposure to occupational and behavioral risk factors. For instance, Alshoabi et al. reported a similar pattern, with male patients comprising over 80% of their cohort and a comparable age distribution [7].

Clinically, the most common symptom was peri-anal pain, observed in 90% of cases, followed by swelling and purulent discharge. These findings are in line with classical presentations of anorectal abscesses and fistulous tracts. Although clinical examination remains the first step in evaluation, it often lacks specificity in delineating lesion type and extent, thereby necessitating imaging.

In our ultrasonographic assessment, the most frequently detected lesions were peri-anal abscesses (44%) and fistulas (32%). These findings mirror those reported in earlier works; Roman Boles MS et al. documented a similar frequency distribution in their transperineal ultrasound-based study and emphasized the practicality of ultrasonography for early diagnosis, especially in acute settings [8]. Furthermore, Zakaria R et al. highlighted that transcutaneous and perineal ultrasonography offered a diagnostic accuracy approaching 98.9% for peri-anal abscesses, confirming its high sensitivity in real-world practice [9].

The ischiorectal fossa was the most common site of abscess formation in our study, seen in 45.5% of abscess cases. This distribution correlates with the anatomical propensity of cryptoglandular infections to track laterally into this relatively avascular space. Similar anatomical trends were observed in Altam et al.'s work, where ischiorectal abscesses constituted the majority, reflecting comparable diagnostic patterns using high-resolution ultrasonography [10].

Among the 16 cases of peri-anal fistula, the intersphincteric type was most common (37.5%), followed by transsphincteric (31.25%), suprasphincteric (18.75%), and extrasphincteric (12.5%) tracts. These findings are consistent with Zhao et al., who reported intersphincteric and transsphincteric fistulas as the dominant subtypes in MRI-based studies [11]. The successful identification of internal openings in all fistula cases in our study highlights the diagnostic reliability of ultrasound when performed by skilled operators. Moreover, the association of abscess formation in 31.25% of these fistula cases underscores the critical role of ultrasound in detecting complications that guide surgical decision-making. A systematic review by Li J et al. on three-dimensional endoanal ultrasound reported sensitivities above 95% for intersphincteric and transsphincteric fistulas, lending further support to our findings [12].

Surgical intervention was required in 84% of our patients, with the remainder managed medically. This high rate of surgical treatment is expected, given that most patients presented with either active infection or chronic fistulous disease. Notably, ultrasonographic findings correlated with operative or clinical outcomes yielding an overall diagnostic accuracy of 94%. These performance metrics align well with previous

studies. Ding YW et al. reported a sensitivity of 92% and specificity of 97% for transcutaneous ultrasonography in identifying complex fistulous tracts [13]. Our results are further validated by findings from academic centers where ultrasound accuracy has consistently exceeded 90% in prospective surgical cohorts.

Our study confirms that ultrasonography is a highly effective modality for evaluating perianal lesions, with excellent correlation to surgical and clinical outcomes. The overall diagnostic accuracy in our series was 94%, with sensitivity of 93.75% and specificity of 100%, findings consistent with earlier studies validating the high yield of transcutaneous and transperineal ultrasound in anorectal disease [8-10].

For abscess detection, ultrasonography reliably localized collections, most commonly in the ischiorectal fossa. These results parallel those of Zakaria et al., who reported sensitivity of 96.3%, specificity of 100%, and accuracy of 98.9% using trans-recto-perineal ultrasound [9]. Similarly, Altam et al. demonstrated that transperineal ultrasound maintained robust performance even in resource-limited settings, with sensitivity of 86%, specificity of 100%, and overall accuracy of 87% [10].

In fistula assessment, intersphincteric and transsphincteric tracts were the most common, reflecting the cryptoglandular etiology noted in prior reports. Our findings are in agreement with Ding et al., who reported sensitivity of 92% and specificity of 97% for complex fistulas, underscoring ultrasound's utility in delineating tracts and secondary extensions [13]. Moreover, the detection of internal openings in all fistula cases in our series is comparable to the performance of transperineal ultrasound when assessed against MRI, as reported by Roman Boles et al. [8].

Together, these findings highlight that ultrasonography is not merely supportive but, in many cases, may serve as a practical alternative to MRI, particularly in resource-constrained environments.

Despite strong performance, limitations remain. Ultrasonography is operator-dependent, and its accuracy declines with higher or more complex fistulas. Alshoabi et al. highlighted that transcutaneous ultrasound is less effective in detecting high-type or supralelevator tracts, with performance closely tied to operator expertise. [7] In such scenarios, MRI remains the superior modality due to its multiplanar capability and detailed soft tissue contrast, as demonstrated by Akhouni et al., who confirmed MRI's superior sensitivity in imaging complex or recurrent fistulas [14]. Thus, while ultrasonography is an excellent frontline tool, it should be complemented by MRI in selected cases where complexity or recurrence is suspected.

CONCLUSION

Our study underscores the pivotal role of ultrasonography as a frontline imaging modality in the evaluation of perianal lesions. With its excellent sensitivity, specificity, and overall diagnostic accuracy, ultrasonography reliably detects abscesses, characterizes fistulous tracts, and identifies internal openings with a high degree of precision. Its inherent advantages—non-invasiveness, widespread availability, cost-effectiveness, and patient comfort—make it an indispensable component of the diagnostic algorithm. In experienced hands, ultrasonography not only serves as a definitive diagnostic tool but also provides invaluable guidance for surgical management, thereby reducing morbidity and improving patient outcomes. Although MRI remains the gold standard for complex or recurrent disease, ultrasonography offers a practical and efficient alternative in most clinical scenarios, particularly in resource-limited settings. When integrated with meticulous clinical evaluation, ultrasonography elevates diagnostic confidence, optimizes

therapeutic planning, and ultimately enhances the quality of care for patients with perianal pathology.

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