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Original Research Article

Correlation between transcutaneous perianal ultrasonography findings and preoperative findings of fistula in ano

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ABSTRACT

Background: Fistula in ano is a common and challenging condition in colorectal surgery. Accurate diagnosis is crucial for effective treatment. This study evaluates the efficacy of transcutaneous perianal ultrasonography (TPUS) in diagnosing fistula in ano, comparing its findings with per-operative observations.
Methods: This cross-sectional observational study was conducted at Shaheed Suhrawardy Medical College, Dhaka, over six months. Fifty patients diagnosed with fistula in ano were included. TPUS was used to detect fistula tracts and internal openings, with findings compared to per-operative observations. Data were analyzed for sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of TPUS.
Results: TPUS demonstrated high sensitivity in detecting fistula tracts (97.80%) and internal openings (95.45%). However, specificity was lower for both fistula tracts (20.00%) and internal openings (33.33%). The PPV and NPV for TPUS in detecting fistula tracts were 91.67% and 50.00%, respectively, and 91.30% and 50.00% for internal openings. The overall accuracy of TPUS was 90.00% for fistula tracts and 88.00% for internal openings.
Conclusions: TPUS is a highly sensitive diagnostic tool for detecting fistula tracts and internal openings in patients with fistula in ano. Despite its lower specificity, TPUS can be an effective component of a multimodal diagnostic approach. Combining TPUS with other diagnostic methods can enhance the accuracy of diagnoses and improve patient outcomes.

Keywords: Fistula in ano, TPUS, Diagnostic accuracy, Per-operative findings, Colorectal surgery

INTRODUCTION

Anorectal disorders, encompassing a range of conditions from benign to potentially malignant, represent a significant global health burden. The prevalence and impact of these disorders, including fistula in ano, have been a subject of extensive research, reflecting their clinical significance and the challenges they pose in diagnosis and treatment.[1-3] This prevalence underscores the need for effective diagnostic and treatment strategies.

In Bangladesh, the healthcare challenges related to anorectal diseases, including fistula in ano, are particularly pronounced. Limited access to diagnostic facilities and a general lack of awareness contribute to delayed or inaccurate diagnosis, exacerbating the burden of these conditions.[4] The impact of fistula in ano on patient quality of life cannot be overstated. This condition, characterized by chronic discomfort and social stigma, significantly impairs the daily lives of affected individuals.[5] Diagnostic challenges are compounded by the complexity of the disease and the limitations of current diagnostic

modalities. The standard methods for diagnosing fistula in ano have evolved over time. Traditional techniques such as digital rectal examination (DRE), proctoscopy, and fistulography have been supplemented by more advanced methods like endoanal sonography, computed tomography (CT) scans, and magnetic resonance imaging (MRI).[6] Each of these modalities offers unique insights into the condition, yet they also come with inherent limitations. For instance, while fistulograms are effective in determining the number and length of fistulous tracts, MR imaging excels in revealing the types, subtypes, and extensions of fistulas.[6] Despite these advancements, accurately diagnosing fistula in ano remains a challenge, particularly in resource-limited settings like Bangladesh, where advanced diagnostic tools may not be readily available.[4] The treatment of fistula in ano is equally challenging. Surgical interventions, while often necessary, carry the risk of postoperative complications such as incontinence, especially in cases of recurrent anal fistulas.[7] In conclusion, fistula in ano represents a complex interplay of diagnostic and therapeutic challenges. The global burden of this condition, coupled with the specific challenges faced in resource-limited settings like Bangladesh, underscores the need for continued research and innovation in diagnostic and treatment modalities. As we advance our understanding of this condition, it is imperative to develop strategies that are not only effective but also accessible to populations in diverse healthcare settings. This study evaluates the efficacy of transcutaneous perianal ultrasonography (TPUS) in diagnosing fistula in ano, comparing its findings with per-operative observations.

METHODS

The study was conducted as a cross-sectional observational study at the Department of Surgery, Shaheed Suhrawardy Medical College, Dhaka, over a period of six months. The study population included all patients diagnosed with fistula in ano admitted to Shaheed Suhrawardy Medical College Hospital during this time frame. The sample population was selected from these patients based on specific inclusion and exclusion criteria. The inclusion criteria were all patients above the age of 18 years admitted with fistula in ano in the surgery ward. The exclusion criteria included patients who were not willing to undergo TPUS and those unwilling to undergo surgery. The sample size for the study was set at 50 patients following the inclusion and exclusion criteria. Sampling was carried out using a purposive sampling technique. Data collection involved a manual process of data editing and clearing, followed by preparation for data entry and analysis. The data analysis was performed using IBM statistical package for he social sciences (SPSS) Statistics for Windows, version 25.0, released in 2017 by IBM Corp., Armonk, NY. Ethical measures were strictly adhered to in accordance with the Helsinki Declaration for medical research involving human subjects, 1964. All study subjects or patients were informed verbally about the study design, its purpose, and their right to withdraw from the study at any time, for any reason. Informed consent was obtained from all subjects who agreed to participate in the study.

RESULTS

The distribution of participants by gender revealed a predominant male representation, with 43 male participants (86%) and 7 female participants (14%). Age-wise distribution showed a higher concentration in the younger age groups. Participants aged between 21-30 years constituted 40% of the sample (20 participants), followed closely by those in the 31-40 years age group, representing 44% (22 participants). The 41-50 years age group comprised 10% of the participants (5 individuals), while the 51-60 years age group accounted for the smallest proportion, with 6% (3 participants) (Table 1).

Table 1: Distribution of baseline characteristics among the participants (n=50).

Baseline demographics	Frequency	Percentage
Gender		
Male	43	86
Female	7	14
Age (years)		
21-30	20	40
31-40	22	44
41-50	5	10
51-60	3	6

TPUS successfully detected the presence of fistula tracts in 48 of the participants, accounting for 96% of the cases. Only in 2 cases (4%) were the fistula tracts not detected by TPUS. Similarly, the detection of internal openings through TPUS was also effective, with 46 participants (92%) showing the presence of internal openings as identified by the ultrasonography. In contrast, TPUS failed to detect internal openings in 4 participants, which constituted 8% of the study population (Table 2).

Table 2: Detection of fistula tract and internal opening by TPUS (n=50).

Variables	Frequency	Percentage
TPUS fistula tract detection		
Present	48	96
Absent	2	4
TPUS internal opening		
Present	46	92
Absent	4	8

In the case of fistula tract detection, per-operative observation identified the presence of fistula tracts in 45 participants, which represents 90% of the study group. Conversely, in 5 participants, equivalent to 10% of the cases, the fistula tracts were not detected during the operative procedure. Internal openings were observed in 44 participants, accounting for 88% of the total number of

cases, while 12% of cases did not have internal openings (Table 3).

Table 3: Detection of fistula tract and internal opening by per-operative observation (n=50).

Variables	Frequency	Percentage
Per-operative fistula tract detection		
Present	45	90
Absent	5	10
Per-operative internal opening		
Present	44	88
Absent	6	12

In a sample of 50 participants, TPUS detected fistula tracts in 48 cases. Of these, 44 were true positives (TP), where both TPUS and per-operative observations confirmed the presence of the tract. However, there were 4 false positives (FP), where TPUS indicated a tract, but it was not confirmed per-operatively. In contrast, TPUS failed to detect fistula tracts in 2 cases. Among these, one was a false negative (FN), where the tract was not detected by TPUS but was present per-operatively. The other case was a true negative (TN), where neither TPUS nor per-operative observation found a fistula tract. The sensitivity of TPUS, was 97.80%, the specificity was 20.00%, the positive predictive value was 91.67%. The negative predictive value was 50.00%. Overall, the accuracy of TPUS in detecting fistula tracts was 90.00% (Table 4).

Table 4: Comparison of fistula tract detection by TPUS with per-operative findings as the gold standard (n=50).

TPUS fistula track	Per operative fistula track		Total
	Present	Absent	
Present	44 (TP)	4 (FP)	48
Absent	1 (FN)	1 (TN)	2
Total	45	5	50
Accuracy measurements			
Sensitivity	97.80		
Specificity	20.00		
Positive predictive value	91.67		
Negative predictive value	50.00		
Accuracy	90.00		

In the study of 50 participants, the detection of internal openings (IO) using TPUS was compared with per-operative findings. TPUS identified internal openings in 46 cases. Of these, 42 were true positives (TP) where TPUS and per-operative findings agreed on the presence of an internal opening. However, 4 cases were false positives (FP), where TPUS detected an internal opening that was not confirmed per-operatively. TPUS failed to detect internal openings in 4 cases. In 2 of these, it was a false negative (FN) – the internal opening was present but missed by TPUS. The other 2 cases were true negatives (TN), where neither TPUS nor per-operative observation detected an internal opening. The accuracy of TPUS in detecting internal openings was as follows: Sensitivity was 95.45%, specificity was 33.33%, positive predictive value was 91.30%, negative predictive value was 50.00%, and overall accuracy was 88.00% (Table 5).

Table 5: Comparison of IO detection by TPUS with per-operative findings as the gold standard.

TPUS internal opening	Per operative internal opening		Total
	Present	Absent	
Present	42 (TP)	4 (FP)	46
Absent	2 (FN)	2 (TN)	4
Total	44	6	50
Accuracy measurements			
Sensitivity	95.45		
Specificity	33.33		
Positive predictive value	91.30		
Negative predictive value	50.00		
Accuracy	88.00		

DISCUSSION

The current study offers valuable insights into the diagnostic accuracy of TPUS for fistula in ano, particularly in comparison with per-operative findings. The demographic distribution, predominantly male (86%) and concentrated in the younger age groups (40% in 21-30 years and 44% in 31-40 years), is consistent with global trends observed in anorectal disorders.[8,9] This demographic pattern is crucial for understanding the disease's epidemiology and tailoring diagnostic approaches. A pivotal aspect of this study is the high sensitivity of TPUS in detecting fistula tracts (97.80%) and internal openings (95.45%). These findings are in line with previous studies that have underscored the utility of ultrasonography in diagnosing anorectal conditions.[10] However, the specificity of TPUS in detecting fistula tracts (20.00%) and internal openings (33.33%) was relatively lower. This contrast between high sensitivity and lower specificity has been a recurring theme in similar research, indicating a potential challenge in ruling out false positives with TPUS.[11] The PPV of TPUS for fistula tracts (91.67%) and internal openings (91.30%) in our study suggests a high likelihood that positive TPUS findings are indicative of actual pathology. However, the lower NPV for both (50.00%) necessitates cautious interpretation of negative TPUS results. This aligns with other research that emphasizes the importance of corroborating TPUS findings with other diagnostic methods, especially in cases with high clinical suspicion despite negative TPUS results.[12] Delving deeper into the comparison of TPUS with per-operative findings, our study revealed interesting nuances. While TPUS showed a higher detection rate for

fistula tracts and internal openings, per-operative findings, considered the gold standard, had slightly lower detection rates (90% for fistula tracts and 88% for internal openings). This discrepancy raises important questions about the sensitivity and specificity of per-operative observations and the potential role of TPUS as a complementary diagnostic tool. The accuracy of TPUS in detecting fistula tracts (90.00%) and internal openings (88.00%) was notable. These findings are supported by other studies that advocate for the integration of TPUS in the diagnostic pathway of anorectal disorders.[13] The high sensitivity of TPUS makes it a valuable tool for initial assessments, while its limitations in specificity and NPV suggest that it should not be the sole diagnostic modality. The study's findings, particularly from the last two tables, highlight the complex nature of diagnosing fistula in ano. The high sensitivity of TPUS is a promising aspect, suggesting its potential as a first-line diagnostic tool. However, the lower specificity and NPV indicate that TPUS is not infallible, especially in excluding the disease. These findings necessitate a balanced approach, combining TPUS with other diagnostic methods, such as MRI or endoanal ultrasound, for a more comprehensive evaluation.[14] The comparative analysis of TPUS and per-operative findings also sheds light on the potential discrepancies between non-invasive imaging techniques and intraoperative observations. The slightly lower detection rates of fistula tracts and internal openings per-operatively suggest that TPUS might detect certain pathologies that are not evident during surgery. This could be due to the dynamic nature of TPUS imaging, which may capture transient pathological features not apparent during static operative assessment.

Limitations

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

In conclusion, this study underscores the significant diagnostic value of TPUS in the evaluation of fistula in ano. Our findings reveal that TPUS exhibits high sensitivity in detecting fistula tracts and internal openings, making it a reliable tool for initial assessment in clinical settings. However, the specificity and negative predictive value of TPUS are comparatively lower, suggesting that while TPUS is effective in identifying the presence of fistula, it should be used in conjunction with other diagnostic methods for a more comprehensive evaluation. The study also highlights the importance of a multimodal approach in the diagnosis and management of fistula in ano, considering the limitations and strengths of each diagnostic modality. Ultimately, the integration of TPUS with per-operative findings and other diagnostic techniques can lead to more accurate diagnoses and better-informed treatment decisions, thereby improving patient outcomes in the management of this complex condition.

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