Medicina Moderna
ISSN 2360-2473 Volume 13, Issue 2, 4211-4259
Journal link: https://medicina-moderna.co29m/

Evaluation of MRI Accuracy in the Diagnosis of Perianal Fistula: Comparison with Surgical Findings

Submission: 04 October 2024 | Acceptance: 02 November 2024 | Publication: 05 December 2024

1Hira Batool, 2Dr Javaid Iqbal, 3Aiza Fatima, 4Kazim Khalid, 5Parveen Zamin, 6Hania Zahra

[1]Assistant Professor Surgery, BMC/KGN MTI Bannu.

[2] Prof of Surgery, Continental Medical college Lahore.

[3]Ameeruddin medical college / pgmi Lahore

[4]PIMS Islamabad

[5]PIMS

[6]RIC Rawalpindi

ABSTRACT

Introduction: Precise preoperative identification of perianal fistulas is essential for effective surgical intervention. Magnetic resonance imaging (MRI) has become the preferred imaging technique; nevertheless, regional data from resource-constrained environments are still restricted. The objective of this study is to assess the diagnostic accuracy of MRI in identifying perianal fistulas, utilizing operative findings as the gold standard within a Pakistani population.

Subjects & Methods: This cross-sectional study comprised 226 patients with clinically suspected perianal fistulas who had preoperative MRI at a tertiary care facility in Sindh, Pakistan. Employing a 1.5T Philips scanner, standardized MRI protocols were executed, incorporating T1/T2-weighted sequences in three planes (axial, coronal, sagittal; 3-5mm slices) and additional PD/STIR sequences. All photos were analyzed

by a single radiologist who was blinded of the clinical information. Surgical results constituted the benchmark for comparison. Diagnostic accuracy parameters (sensitivity, specificity, positive predictive value, negative predictive value) with 95% confidence intervals were computed using 2×2 contingency tables in SPSS version 23, including subgroup analyses based on age and gender.

Results. The MRI exhibited a sensitivity of 85.3%, specificity of 88.9%, and an overall diagnostic accuracy of 87.2%. The positive predictive value was 87.7%, and the negative predictive value was 86.7%. Stratified analyses demonstrated marginally superior accuracy in females (89.0% compared to 85.9%) and uniform performance across age demographics (≤45 years: 87.1%; >45 years: 87.2%).

Conclusions: The MRI demonstrates a good diagnostic accuracy for perianal fistulas, comparable to the global standards. These results endorse its regular application for preoperative planning even in resource-constrained environments. Future studies should incorporate fistula classification systems and evaluate cost-effective protocols to optimize clinical implementation.

KEY WORDS: Perianal fistula, Magnetic resonance imaging, Diagnostic accuracy, operative findings, sensitivity, specificity

Medicina Moderna
ISSN 2360-2473 Volume 13, Issue 2, 4211-4259
Journal link: https://medicina-moderna.co29m/

INTRODUCTION

A perianal fistula is an aberrant passageway lined with diseased granulation tissue that connects the anal canal or rectum to the skin next to the anus. The wall of this canal is composed of inflammatory granulation and fibrous tissue. It impacts around 10 out of every 10,000 individuals, with a greater prevalence among adult males, especially those in their 30 to 50 years of age.[1,2] In addition to causing pain and suffering, perianal fistulae may act as a possible source of systemic infections. The predominant clinical sign is prolonged discharge, noted in roughly 65% of patients.[1] In certain cases, a perianal fistula may result in acute abscess formation necessitating immediate surgical drainage. Nevertheless, numerous uncomplicated situations can be addressed electively via fistulotomy. The main goal in the management of anal fistulas is to eliminate the internal opening and any related tracts or secondary openings, while maintaining continence[3]

Magnetic Resonance Imaging (MRI) and endoanal ultrasound are frequently utilized in the evaluation of perianal fistulas.[4,5] Endoanal ultrasonography is an economical diagnostic modality that yields results comparable to testing under anesthesia. Nonetheless, it is significantly operator-dependent and may exhibit

1. Torkzad MR, Karlbom U. MRI for assessment of anal fistula. Insights Imaging. 2010;1(2): 62–71.
2. Mahjoubi B, Kharazi H, Mirzaei R, Moghimi A, Changizi A. Diagnostic accuracy of body coil MRI in describing the characteristics of perianal fistulas. Colorectal Dis. 2005;8: 202–7.
3. Singh K, Singh N, Thukral C, Singh KP, Bhalla V. Magnetic resonance imaging (MRI) evaluation of perianal fistulae with surgical correlation. J Clin Diagn Res. 2014 Jun;8(6): RC01-4.
4. Morris J, Spencer JA, Ambrose NS. MR imaging classification of perianal fistulas and its implications for patient management. Radiographics. 2000;20: 623–35.
5. Konan A, Onur MR, Özmen MN. The contribution of preoperative MRI to the surgical management of anal fistulas. Diagn Interv Radiol. 2018;24: 321–27.

limits in identifying tracts or abscesses situated above the puborectalis muscle.[6,7] Recent developments in imaging have led to the emergence of three-dimensional endoanal ultrasonography, demonstrating notable diagnostic accuracy, with sensitivity and specificity area under the curve (AUC) values reported at 0.97 and 1.00, respectively.[8]

MRI provides superior visibility of the anal canal anatomy and is especially effective in delineating fistulous tracts and recognizing accompanying problems such as abscesses and secondary tracts.[9] A standard MRI pelvic procedure for fistula-in-ano comprises sequences including T1-weighted, T2-weighted, short tau inversion recovery (STIR), and contrast-enhanced T1 with fat suppression.[10] Recently, diffusion-weighted imaging (DWI) has been investigated for its possible diagnostic value in these instances.[11] Notwithstanding its exceptional image quality, MRI is expensive and time-consuming. Among the employed sequences,

6. Benjelloun EB, Souiki T, El Abkari M. Endoanal ultrasound in anal fistulas. Is there any influence on postoperative outcome? Tech Coloproctol. 2014;18: 405–06.
7. Visscher AP, Felt-Bersma RJ. Endoanal ultrasound in perianal fistulae and abscesses. Ultrasound Q. 2015;31: 130–37.
8. Luglio G, Giglio MC, Rispo A. Diagnostic accuracy of 3-dimensional endoanal ultrasound in identifying perianal Crohn's fistulas. Dis colon rectum2018; 61:931–37.
9. De Miguel Criado J, del Salto LG, Rivas PF. MR imaging evaluation of perianal fistulas: spectrum of imaging features. Radiographics. 2011;32: 175–94.
10. Torkzad MR, Ahlström H, Karlbom U. Comparison of different magnetic resonance imaging sequences for assessment of fistula-in-ano. World J Radiol. 2014;6: 203–09.
11. Cavusoglu M, Duran S, Cılız DS, Tufan G, Çetin HH, Ozsoy A et al. Added value of diffusion-weighted magnetic resonance imaging for the diagnosis of perianal fistula. Diagn Interv Imaging. 2017;98:401–08.

STIR does not necessitate contrast delivery and has demonstrated great sensitivity in identifying perianal fistulas, as indicated by recent research findings.[12]

This study is necessary to evaluate MRI's diagnostic accuracy for perianal fistulas in our setting, despite prior research, due to variations in expertise and technology across healthcare systems. Accurate pre-surgical diagnosis is critical to reduce complications and improve outcomes. By comparing MRI with surgical findings, we aim to establish its reliability in our hospitals.

[12]. Almeida IS, Wickramasinghe D, Weerakkody P, Samarasekera DN. Treatment of fistula in-ano with fistula plug: experience of a tertiary care centre in South Asia and comparison of results with West. BMC Research Notes. 2018;11:1-5.

MATERIALS AND METHODS

This cross-sectional diagnostic accuracy study was conducted at the Department of Radiology, Dow University Ojha Campus, Karachi, over a period of six months (February 2025 to July 2025). The study aimed to evaluate the diagnostic performance of MRI in detecting perianal fistulas, using operative findings as the gold standard. A total of 226 patients were enrolled using non-probability consecutive sampling. The sample size was calculated based on an expected sensitivity of 92.9% and specificity of 91.7% (based on the study findings of Ishfaq S et al.)[13], with an 8% margin of error and 95% confidence interval. Both male and female patients with 20–70 years of age and presenting with painful defecation for over one month. Pregnant ladies and patients with history of abdominal tuberculosis, malignancy, vasculitis, connective tissue disorders, chronic illnesses (stroke, renal impairment, liver disease, COPD, heart failure, or myocardial infarction) were excluded from the study. After obtaining ethical approval and informed consent, patients underwent MRI scans using a 1.5 Tesla Philips scanner. The imaging protocol included: T1 and T2-weighted images were acquired in axial, coronal, and sagittal planes. Additional sequences PD coronal, STIR coronal, and PD-SPAIR sagittal were also applied. Slice thickness was 3–5 mm. A single consultant radiologist interpreted the scans, while operative findings were later confirmed via surgical notes. To ensure ethical compliance, a female chaperone was present during female patient examinations. Data analysis was performed using SPSS Version 23. Mean ± SD was calculated for normally distributed variables such as age. Sensitivity, specificity, PPV, NPV, and overall accuracy were calculated using 2×2 contingency tables. Stratified analysis was performed based on age and gender to assess MRI performance across subgroups.

[13]. Ishfaq S, Qamar MA, Zaman M. Diagnostic Accuracy of Magnetic Resonance Imaging in Perianal Fistula Taking Surgical Findings as Gold Standard. Age (years). 2016 Jul 1;50: 50.

Medicina Moderna
ISSN 2360-2473 Volume 13, Issue 2, 4211-4259
Journal link: https://medicina-moderna.co29m/

RESULTS

The study comprised of 226 patients in total. The average age of the participants was 49.08±9.99 years, with males representing a greater percentage (59.7%, n=135/226) than females; still, the mean age was comparable across genders, with females averaging 49.44±10.47 years and males averaging 48.84±9.69 years. Detailed analysis of age and gender is illuminated in table 1.

106 out of 226 (46.9%) patients were positive on MRI and 109 (48.2%) patients were positive for perianal fistula on operative findings (figure 1). The MRI exhibited a sensitivity of 85.3% and a specificity of 88.9%. The positive predictive value (PPV) was 87.7%, and the negative predictive value (NPV) was 86.7%. The overall accuracy of MRI in identifying perianal fistula was 87.2% (table 2).

MRI showed comparable diagnostic performance in both genders. In females, sensitivity was 88.9% and specificity was 89.1%. In males, sensitivity was slightly lower at 82.8%, while specificity remained high at 88.7%. When stratified by age, sensitivity was 85.0% and specificity was 88.9% for patients with age ≤45 years. While, sensitivity was 85.5% and specificity was 88.9% for patients with age >45 years (table 3).

Medicina Moderna
ISSN 2360-2473 Volume 13, Issue 2, 4211-4259
Journal link: https://medicina-moderna.co29m/

Table 1: Demographic Profile of the study Population (age and gender distribution)

GENDER	FREQUENCY	PERCENTAGE	MEAN AGE ± SD (YEARS)
Females	91	40.3	49.44 ± 10.47
Males	135	59.7	48.84 ± 9.69
Total	226	100.0	49.08 ± 9.99

Medicina Moderna
ISSN 2360-2473 Volume 13, Issue 2, 4211-4259
Journal link: https://medicina-moderna.co29m/

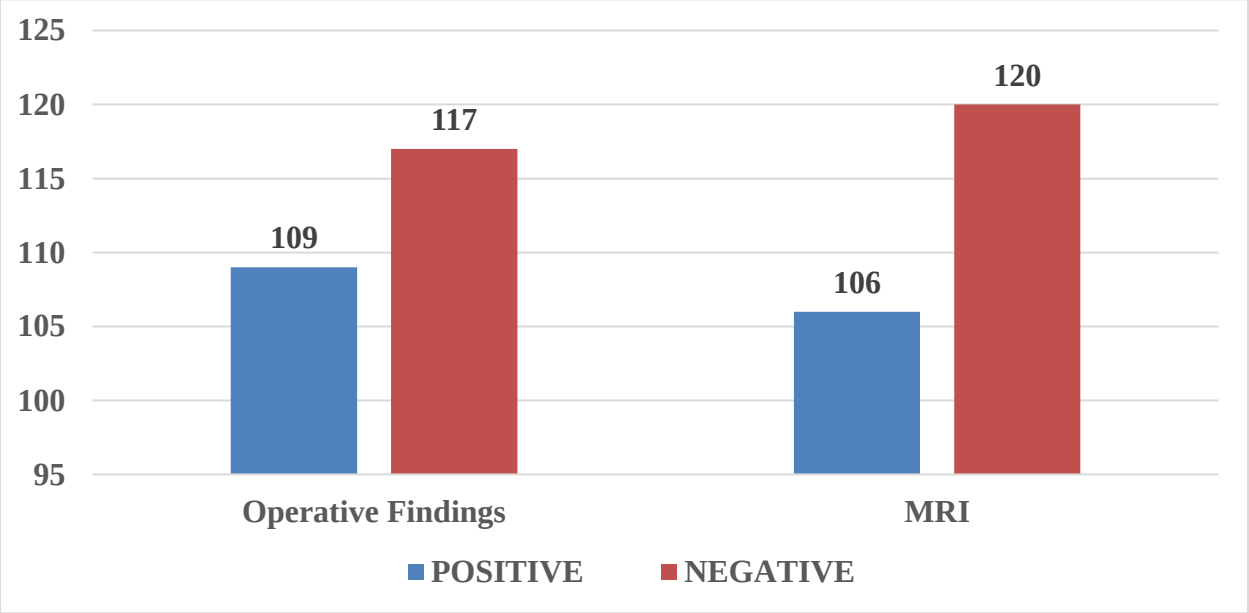

Figure 1: Frequency of positive and negative patients on MRI and operative findings

Medicina Moderna
ISSN 2360-2473 Volume 13, Issue 2, 4211-4259
Journal link: https://medicina-moderna.co29m/

Table 2: Diagnostic accuracy of MRI for the diagnosis of perianal fistula taking operative findings as gold standard

MRI findings for diagnosis of perianal fistula	Operative findings for diagnosis of perianal fistula		
	POSITIVE	**NEGATIVE**	**TOTAL**
POSITIVE	93 (41.15%) (True Positives)	13 (5.75%) (False Positives)	106 (46.9%)
NEGATIVE	16 (7.08%) (False Negatives)	104 (46.02%) (True Negatives)	120 (53.1%)
Total	109 (48.23%)	117 (51.77%)	226 (100.0%)

Sensitivity (%)	**Specificity (%)**	**Accuracy (%)**	**PPV (%)**	**NPV (%)**
85.3	88.9	87.2	87.7	86.7

PPV: Positive Predictive Value, NPV: Negative Predictive Value

Medicina Moderna
ISSN 2360-2473 Volume 13, Issue 2, 4211-4259
Journal link: https://medicina-moderna.co29m/

Table 3: Diagnostic accuracy of MRI for the diagnosis of perianal fistula taking operative findings as gold standard (stratification analysis for study confounders)

Study Confounders	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
Gender					
Female	88.9	89.1	88.9	89.1	89.0
Male	82.8	88.7	86.9	85.1	85.9
Age Groups					
≤45 Years	85.0	88.9	87.2	87.0	87.1
>45 Years	85.5	88.9	88.1	86.5	87.2

PPV: Positive Predictive Value, NPV: Negative Predictive Value

DISCUSSION

Perianal fistulas present significant diagnostic and therapeutic challenges, particularly in populations with high prevalence of Crohn's disease (CD) or cryptoglandular infections.[14] Our study, conducted in Sindh, Pakistan, demonstrates that MRI is a highly accurate tool for diagnosing perianal fistulas, with an overall sensitivity of 85.3% and specificity of 88.9%, aligning with global benchmarks.[15] These findings reinforce the role of MRI as the gold standard for preoperative assessment, offering superior soft-tissue contrast and multiplanar capabilities to delineate complex fistula tracts and abscesses. Notably, our results corroborate recent literature emphasizing utility of MRI in both cryptoglandular and CD-related fistulas, particularly in resource-limited settings where advanced imaging access is constrained.[16] Our study included 226 patients, with a male predominance (59.7%), consistent with global epidemiological trends suggesting a higher incidence of perianal fistulas in males.[17] The mean age of participants was 49.08±9.99 years, with no significant difference between genders (females: 49.44 ± 10.47 vs. males: 48.84 ± 9.69). This age distribution correlates with the peak incidence of perianal fistulas in middle-aged adults, often

[14]. Sohrabi M, Bahrami S, Mosalli M, Khaleghian M, Obaidinia M. Perianal Fistula; from Etiology to Treatment - A Review. Middle East J Dig Dis. 2024;16(2):76-85.
[15]. Arkenbosch JHC, van Ruler O, de Vries AC, van der Woude CJ, Dwarkasing RS. The role of MRI in perianal fistulizing disease: diagnostic imaging and classification systems to monitor disease activity. Abdom Radiol (NY). 2025;50(2):589-97.
[16]. Halligan S, Tolan D, Amitai MM, Hoeffel C, Kim SH, Maccioni F et al., ESGAR consensus statement on the imaging of fistula-in-ano and other causes of anal sepsis. Eur Radiol. 2020;30(9):4734-40.
[17]. Emile SH, Elgendy H, Sakr A, Youssef M, Thabet W, Omar W, et al. Gender-based analysis of the characteristics and outcomes of surgery for anal fistula: analysis of more than 560 cases. J Coloproctol. 2018;38:199-205.

linked to cryptoglandular infections, Crohn's disease, or post-surgical complications.[18] The diagnostic performance of MRI in our cohort was consistent across gender and age groups, though slightly higher accuracy was observed in females (89.0% vs. 85.9% in males). This gender disparity may reflect anatomical differences or sociocultural factors influencing healthcare-seeking behavior. Stratification by age revealed no significant variations, supporting reliability of MRI across demographics. These findings align closely with previous studies. According to several studies, MRI has a high sensitivity (85.3%–96.2%) and specificity (75%–92%) for identifying perianal fistulas. Our findings support these findings. Saher et al. (2016) discovered a sensitivity of 92.94% and specificity of 91.76%, whereas Ashraf et al. (2017) reported a sensitivity of 96.2% and accuracy of 92.6%. It's possible that variations in MRI procedures or population features, such our cohort's greater prevalence of complicated fistulas, contributed to our somewhat lower sensitivity of 85.3%.[19,20,21] Our research demonstrated superior accuracy in females (89.0%) relative to males (85.9%), corroborating the findings of Irshad et al, who indicated a diagnostic accuracy of 93% in a predominantly male group (92% males).[22] This gender imbalance may be ascribed to physical differences or delayed presentation in males owing to social influences. Age-stratified analysis revealed no significant

[18]. Ommer A, Herold A, Berg E, Fürst A, Sailer M, Schiedeck T; German Society for General and Visceral Surgery. Cryptoglandular anal fistulas. Dtsch Arztebl Int. 2011;108(42):707-13.
[19]. Ashraf Y, Iqbal I, Khatoon S. Magnetic resonance imaging; the best imaging technique in detection of perianal fistulas with diagnostic accuracy. Professional Med J. 2017;24(4):560-4.
[20]. Saher I, Qamar MA, Zaman M. Diagnostic accuracy of magnetic resonance imaging in perianal fistula taking surgical findings as gold standard. Pak J Med Health Sci. 2016;10(3):939-41.
[21]. Ali H, Azmat U, Kumar M, Abid K. Diagnostic accuracy of magnetic resonance imaging in detection of perianal fistula keeping surgical findings as gold standard. Pak J Health Sci. 2022;3(07):1-5.
[22]. Irshad R, Isani A, Khan MR, Wahid G, Fahim S, Ahmed A, et al. Diagnostic accuracy of magnetic resonance imaging for perianal fistula tract taking operative findings as gold standard. Pak Armed Forces Med J. 2025;75(S1):S16-9.

differences, affirming the trustworthiness of MRI across age groups, consistent with Ahmed et al.[23] The positive predictive value (PPV) of 87.7% and the negative predictive value (NPV) of 86.7% in our study were similar to those documented previously. The marginally reduced NPV in our study may result from an increased incidence of false negatives in intricate fistulas with hidden tracts. The high specificity of MRI (88.9%) is essential in preventing unnecessary procedures, especially in resource-constrained environments such as Sindh, where postoperative sequelae, such as fecal incontinence, pose significant concerns. Furthermore, our results endorse the utilization of MRI for preoperative planning, as highlighted.[22,24,25]

Strengths and Limitations

This study exhibits several significant strengths that augment the validity and clinical usefulness of its findings. The substantial sample size (n=226) markedly enhances the statistical power of the research and augments the generalizability of the findings to analogous patient populations. In diagnostic accuracy investigations, sufficient sample numbers are essential for dependable estimations of sensitivity, specificity, and predictive values. Secondly, employing a sole radiologist for MRI interpretation reduces inter-observer variability, hence maintaining uniformity in the evaluation of fistula characteristics. This method diminishes diagnostic inconsistencies that may occur with several evaluators. Third, the study utilized surgical findings as the gold standard, offering a reliable benchmark for assessing MRI's diagnostic efficacy. Surgical confirmation is considered the most precise technique for fistula evaluation, providing

[23]. Ahmed A, Tamkeen N, Khan MR, Wahid G, Fahim S, Badshah U, et al. Diagnostic accuracy of magnetic resonance imaging in evaluation of perianal fistula keeping surgical finding as gold standard. Med Forum. 2023;34(4):19-21.
[24]. Ishfaq S, Qamar MA, Zaman M, Makki MU, Wahid G, Fahim S. Diagnostic accuracy of magnetic resonance imaging in perianal fistula taking surgical findings as gold standard. Pak J Med Health Sci. 2016;10(3):939-41.
[25]. Minhas S, Raja R, Khaliq M, Mahmood H, Raza SM, Hanif H. Diagnostic accuracy of magnetic resonance imaging in detecting and grading perianal fistulas. Rawal Med J. 2023;48(3):647-50.

substantial validity to our comparisons. This study provides local population data from Sindh, Pakistan, filling a significant gap in the literature. Considering that diagnostic resources, patient demographics, and illness trends in this region may diverge from those in Western studies, our findings offer significant insights for physicians operating in similar resource-constrained environments.

Notwithstanding its merits, this study possesses numerous drawbacks that necessitate attention. Initially, as a single-center investigation, the results may lack full generalizability to other areas or healthcare environments. Divergences in MRI protocols, radiologist proficiency, and patient demographics among various institutions may affect diagnostic precision. Secondly, the implementation of successive sampling presents the risk of selection bias, as the study cohort may not accurately reflect the wider community of patients with perianal fistulas. For example, patients with unusual presentations or those who refused surgery may have been inadequately represented. Third, the study did not evaluate MRI's capacity to categorize fistulas as simple or complex, a crucial element in surgical planning and prognosis. Integrating standardized classification systems (e.g., Parks or St. James's University Hospital criteria) in forthcoming investigations may yield enhanced understanding of MRI's clinical efficacy. Finally, the absence of long-term follow-up for false-negative cases indicates that certain missed diagnoses may have been neglected. Postponed surgical confirmation or spontaneous remission in these instances may influence the assessment of MRI's genuine negative rate. Future study addressing these limitations would enhance the role of MRI in the diagnosis and management of perianal fistulas.

CONCLUSIONS

This study confirms MRI as a reliable diagnostic tool for perianal fistulas in our group, exhibiting significant accuracy with 85.3% sensitivity and 88.9% specificity. The elevated positive (87.7%) and negative predictive values (86.7%) highlight the dependability of MRI ffor preoperative assessment, especially beneficial in resource-limited environments where surgical proficiency may be scarce. Our gender-stratified findings (89.0% accuracy in females compared to 85.9% in men) offer innovative perspectives for tailored diagnostic methodologies. These findings significantly support the integration of MRI into conventional clinical practice, while emphasizing the necessity for protocol consistency among regional institutions. Future study should explore cost-effective imaging procedures, AI-assisted interpretations, and correlations with long-term results to improve patient care pathways in developing healthcare systems.

REFERENCES

Medicina Moderna
ISSN 2360-2473 Volume 13, Issue 2, 4211-4259
Journal link: https://medicina-moderna.co29m/