THE DIAGNOSTIC VALUE OF MRI IN PRE-OPERATIVE ASSESSMENT OF PERIANAL FISTULA IN ISLAMABAD-PAKISTAN: A RETROSPECTIVE, OBSERVATIONAL STUDY

Aneeza Iqbal[1], Umair Ajmal[2], Amena Irfan Shami[3], Ayesha Munir[4], Wasim Ahmad[*5]

[1,2,3,4]*Department of Radiology, Advanced International Hospital, Islamabad-Pakistan*
[*5]*Department of Allied Health Sciences, SHS, Peshawar-KP*

[*5]**vazim4847@gmail.com**

Corresponding Author: *
Dr. Wasim Ahmad

Abstract

Background: *A perianal fistula is an abnormal tunnel connecting the anus's inner lining to the surrounding skin, often causing significant discomfort and reducing quality of life. Picture a straight, inflamed, and scarred passage from the skin to the lower anus. In cases involving prior surgery or Crohn's disease, the fistula may become complex, branching deeper into the body.*

Objective: *To investigate the accuracy of MRI (magnetic resonance imaging) in the pre-op valuation of perianal fistulas recognizing the importance of precise anatomical mapping for successful surgical management in this regional setting.*

Methodology: *A retrospective observational study was conducted on 140 patients diagnosed with perianal fistula between August 2024 and December 2024. Patient demographics, clinical presentation, and MRI findings were analyzed. Fistula classification was based on the St. James University Hospital system.*

Results: *The mean age of the participants was 40 years. Inter-sphincteric fistulas were the most common (64.28%), followed by trans-sphincteric (31.42%). We frequently observed intricate fistulas, **often accompanied by** additional pathways, pus-filled pockets, **and** horseshoe-shaped extensions. MRI accurately recognized internal openings, tract lengths, and spatial relationships to anal sphincters. The most common location for the internal opening was the 6 o'clock position.*

Conclusion: *Pre-op MRI stands out as an indispensable tool for the precise diagnosis of perianal fistula anatomy. By offering detailed insights into the complexity and spatial relationships of the fistula, MRI significantly enhances surgical planning. This detailed information is crucial, as it has the potential to reduce postoperative recurrence rates, ultimately leading to better outcomes for patients.*

INTRODUCTION

A perianal fistula is an unnatural passageway that links the inner lining of the anus to the skin around it[1]. Patients with this condition often experience considerable discomfort and annoyance, which can significantly reduce their quality of life. Imagine a straight tunnel that starts on the skin and ends inside the lower anus. That's essentially a fistula, and it's usually lined with reddened and scarred matter. But if

previous surgery or Crohn's disease is a factor, this tunnel can get much more complicated, branching off and reaching deeper into the body.[2]

The rate of perianal fistula is estimated to be around 1 to 2 cases per 10,000 individuals, with men being more likely to develop this condition than women. The peak age for this occurrence is between the third and fourth decades of life. The majority of perianal fistulas are primary and arise from an infection of the anal glands situated in the middle portion of the anus – a theory known as the "cryptoglandular hypothesis[3]. In some cases, these anal glands penetrate the internal sphincter and settle in the space between the two sphincters. Infection of these glands can sometimes result in abscess formation, which may burst open into the inter-sphincteric space, downward, or outward into the ischiorectal fossa through the external sphincter, creating a fistulous tract.

Perianal fistulas can be caused by secondary factors such as Crohn's disease, tuberculosis, injuries, pelvic infections, pelvic cancer, and radiation therapy. While surgery is the definitive treatment for perianal and anal fistulas, there is a significant risk of recurrence. Successful surgical management of anal fistulas depends on accurately determining the path of the primary fistulous tract and identifying any secondary extensions or abscesses before surgery.[4]

If the secondary extension of the fistulous tract is not identified during surgery, it can lead to recurrence. Magnetic resonance imaging (MRI), with its excellent soft tissue contrast and ability to view images from multiple angles, allows the identification of the fistulous tract, as well as any associated secondary tracts or abscesses. MRI provides detailed information about the anatomical connection between the fistulous tract and the sphincter complex, enabling the surgeon to select the optimal surgical approach to prevent disease recurrence and avoid potential complications such as faecal incontinence.

For perianal fistulas, pre-op MRI valuation surpasses endoanal ultrasonography by providing a broader perspective. This enables a complete understanding of intricate fistula anatomy, addressing the boundaries of preceding imaging modes. MRI correctly typifies the main fistula region, pinpoints the interior opening, and clearly defines the full scope of the tract and abscess formation, all vital elements for surgical strategy.

By clearly illustrating the connection between the anal sphincters and the fistulous tract, this information serves as a crucial guide for the surgeon. It helps them plan the surgery to reduce the risk of recurrence and protect the patient's continence.

Our objective was to determine the effectiveness of MRI in diagnosing perianal fistulas prior to surgery. Specifically, we intended to correlate MRI results with intraoperative findings for different fistula classifications and types, and to assess how well preoperative MRI can predict postoperative recurrence during the follow-up period.

2. MATERIALS & METHOD

2.1. Study Design & Setting:

This retrospective observational study was performed at the Department of radiology, Advanced diagnostic center Islamabad from August 2024 to December 2024. The IRB of the institution approved the study. The study focused on 140 patients diagnosed with perianal fistula. Patients were selected following an established inclusion/exclusion guideline. Patients were not included if their fistulas were linked to malicious anorectal conditions, Crohn's disease, TB or past radiation therapy. We also excluded congenital fistulas and anyone who couldn't undergo an MRI due to issues or severe claustrophobia.

2.2. Data Acquisition:

Medical records were reviewed for all patients included in the study. After a thorough examination, the number and location of fistulas were noted. MRI scans were performed following safety guidelines. Patients were placed on their back for the scan. The fistula was categorized using the St. James University Hospital classification system. MRI scans included various sequences to assess different tissues. Two experienced radiologists analysed the scans and agreed on the findings. Patients underwent surgery after 3 weeks of MRI scan to treat the fistulas, and the results of the surgery were compared to the MRI findings.

2.3. Statistical Analysis:

Statistical analysis was performed using SPSS version 24.0 to determine if there were any relationships between the MRI findings and the surgical results. Descriptive statistics were used to summarize demographic, clinical, and radiological data,

including means and standard deviations for continuous variables (e.g., age and tract length) and frequencies with percentages for categorical variables (e.g., gender, fistula classification, and complexity). Diagnostic performance metrics for MRI, such as sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), positive likelihood ratio (PLR), negative likelihood ratio (NLR), and overall diagnostic accuracy, were calculated using surgical findings as the gold standard. These metrics were derived from 2x2 contingency tables for binary outcomes (e.g., detection of primary tracts, secondary tracts, and internal openings). 95% confidence intervals (CIs) for proportions were estimated using the Wilson score method to account for sample size and provide reliable interval estimates, particularly for proportions near 0 or 1. Associations between categorical variables, such as MRI and surgical classifications (e.g., St. James grades and Park's types), were assessed using chi-square tests or Fisher's exact tests where cell counts were low (<5). Pearson's correlation coefficient was employed to evaluate the strength and direction of linear relationships between MRI and surgical findings, with Spearman's rank correlation used for ordinal data like fistula grades. All statistical tests were two-tailed, and a p-value ≤0.05 was considered indicative of statistical significance. No adjustments for multiple comparisons were applied due to the exploratory nature of the analyses.

male, primarily in their mid-38. The most common symptoms reported were fever, continued pain, and discharge from the fistula. Park's classification system categorized the majority of cases 64.28% as inter-sphincteric fistulas, followed by trans-sphincteric (31.42), extra-sphincteric (0.21), and supra-sphincteric (0.21). Fifty-three of the 90 inter-sphincteric fistulas were classified as simple, each presenting with a solitary fistulous tract. The residual 37 subjects had complicated structure comprising horseshoe formations, inter-sphincteric abscesses and secondary branch tracts. Twenty-four of the 44 trans-sphincteric fistulas were simple, each characterized by a single principal zone. The other 20 subjects displayed changeable degrees of complexity, comprising secondary branch tracts and ischioanal abscesses. The St. James's University Hospital classification indicated that the "Grade I fistulas" were found most frequently, with a decreasing prevalence observed through Grades II, III, IV, and V. Recurrences after surgery were seen in 39 of the 140 cases. Fifty-two patients had detectable internal openings, most frequently at the "6 o'clock position". The length of the tracts was measured along the coronal plane, from the internal to the external opening. The longest tract was 7.8cm, and the shortest was 1.2cm. The average length was 3.7cm with a standard deviation of 2.44cm. The results are displayed in table 1.

3. RESULTS

A total of 140 patients enrolled in the study. The mean age of the patients was recorded as 40 years (range 20-65). Most of the participants (n=106) were

Table 1: Comparison of Clinical Symptoms and Radiological Findings

Parameters	Subcategory	N (140)	%
Age (years)	Below 40	98	70.00
	Above 40	42	30.00
Gender	Male	106	75.71

	Female	34	24.28
Clinical Profile	Fever	16	11.42
	Pain	140	100.00
	Discharge	94	67.14
Complexity	Simple	78	55.71
	Complicated	62	44.28
Grading St. James	Grade I	50	35.71
	Grade II	36	25.71
	Grade III	28	20.00
	Grade IV	20	14.28
	Grade V	6	4.28
Park's Classification	Inter-sphincteric	90	64.28
	Trans-sphincteric	44	31.42
	Extra-sphincteric	3	0.21
	Supra-sphincteric	3	0.21
Internal Opening Detection	Anterior	32	22.85
	Posterior	88	62.85
	Not visible	20	14.28
Components of Fistulas	Branched tract	42	30.00
	Single tract	73	52.14

Abscess	16	11.42
Horseshoe	6	4.28
Supralevator extension	3	2.14

MRI accurately identified the primary tract in 108 of 140 patients with perianal fistula. Incorrect diagnoses was seen in four cases. MRI showed strong performance in detecting the primary tract, with a sensitivity of 96.10% and an overall accuracy of 95.80%. However, its specificity was 0% due to the study only including patients with perianal fistulas, and the positive predictive value was 94.40%. MRI proved highly effective in identifying secondary tracts, accurately detecting 41 of the 46 found during surgery in patients with an identified internal opening. This demonstrates its high specificity, sensitivity and diagnostic accuracy. MRI proved highly effective in identifying internal openings, correctly detecting 99 out of 110 cases during surgery. This demonstrates its strong performance, with a sensitivity of 96.0%, a specificity of 98.42%, and an overall diagnostic accuracy of 95.80%. PPV was recorded as 96.0. NPV as 93.80, PLR as 32.78 and NLR as 1.00 respectively. The results can be seen in table 2.

Table 2: MRI Accuracy Compared to Surgical Findings

Stats	Primary Tract		Secondary Tract	
	Value %	CI 95%	Value %	CI 95%
Sensitivity	96.10	90.23	96.0	70.24
Specificity	0.00	0.00	98.42	82.11
Positive PV	94.40	94.12	96.0	71.40
Negative PV	0.00	0.00	93.80	80.24
Positive LR	-	-	32.78	6.46
Negative LR	-	-	1.00	1.08
Diagnostic Accuracy	95.80	87.24	95.80	86.90

MRI and surgical diagnoses of perianal fistula grades were significantly related (p≤0.01). While overall agreement was high (92-96%), there were some differences. MRI missed secondary trans-sphincteric tracts in three cases, underestimating severity. While MRI misclassified a single branched tract as Grade III (instead of Grade IV), its accuracy was very high for Grades I and II, suggesting it performs exceptionally well with less complex fistulas. Therefore, MRI is a valued instrument for pre-op valuation of perianal

fistulas, though careful clarification and an understanding of its limitations remain crucial. MRI demonstrated a strong correlation (p=0.001) with surgical findings, particularly in its ability to precisely classify fistulas using the Park system by accurately identifying their position relative to the sphincter. Furthermore, MRI achieved perfect accuracy (100%) in identifying horseshoe components and abscesses. Interestingly, all spotted horseshoe components were connected to inter-sphincteric fistulas, while all

ischioanal abscesses were associated with trans-sphincteric tracts (Table 3). A one-year follow-up of 140 surgical patients evaluated the efficiency/efficacy of pre-operative MRI in expecting fistula reappearance. Remarkably, only three of these 140 cases showed recurrence within six months, indicating positive outcomes for the remaining 137 subjects. Among the three recurrences, two involved complex fistulas featuring multiple tracts and one was attributed to Crohn's disease. (Table 3)

Table 3: Comparison of Surgical Observations and MRI Findings

Variables	Subcategory	Findings MRI	Findings Surgery	Matching Rate %	P Value
Grading St. James	Grade I	50	50	100.00	0.001
	Grade II	36	33	91.66	
	Grade III	28	26	92.85	
	Grade IV	20	21	95.45	
	Grade V	6	6	100.00	
Fistula Type	Inter-sphincteric	90	88	97.77	0.004
	Trans-sphincteric	44	44	100.00	
	Extra-sphincteric	3	3	100.00	
	Supra-sphincteric	3	3	100.00	

4. DISCUSSION

Imaging techniques are essential for examining the structure and extent of fistulas, pinpointing their openings, tracing the main tunnel and its offshoots, and detecting related tissue damage and inflammation[2]. This study looked back at 140 patients in a row who were thought to have perianal fistulas and had MRIs before surgery. The number of patients was similar to earlier studies [5,6].

A total of 140 patients participated in the study. The mean age of the patients was recorded as 40 years (range 20-65). This aligns with findings from other studies [5,7,8]. The report showed that more men had fistulas than women, which is consistent with the results of Singh and colleague's research[10].

Perianal fistulas were grouped into four main types based on how they went around the external anal sphincter: inter-sphincteric, trans-sphincteric, supra-sphincteric, and extra-sphincteric[11]. Moreover, fistulas underwent classification into subcutaneous and superficial types. In this study, majority of cases (64.28%) were diagnosed with inter-sphincteric fistulas, followed by trans-sphincteric (31.42), extra-sphincteric (0.21), and supra-sphincteric (0.21). Our

results are like those of other researchers whose study showed a distribution of 63% inter-sphincteric, 29% trans-sphincteric, 5% supra-sphincteric, and 3% extra-sphincteric fistula cases. Additionally, our findings are supported by several other research studies[13,14].

"St. James University Hospital" classified cases using "Park's surgical system", referencing both sagittal and coronal MRI images. Fistulas were categorized into five grades: simple linear inter-sphincteric (grade I), inter-sphincteric with abscess or secondary tunnels (grade II), trans-sphincteric (grade III), trans-sphincteric with abscess or secondary tunnels (grade IV), and supra-sphincteric and trans-levator disease (grade V)[15].

Our study found that grade I fistulas were the most prevalent, then grades II, III, IV, and V. These results are consistent with a previous study[16], which additionally recognized grade I fistulas as the most frequently occurring type. However, our findings deviate from the studies in which, the researchers observed a greater frequency of Grade IV fistulas, presenting with distribution orders of IV > I > II > III > V and IV = III > I > II > V, respectively.[17,18]

Our analysis focused on the prevalence of different fistula elements, including abscesses, horseshoe formations and secondary tracts. Specifically, secondary branch tracts were observed in 42 instances, a result that mirrors the findings reported by other studies. Abscesses were diagnosed when fluid assemblies exceeded 10mm in thickness, whereas fistula tracts were defined as fluid-filled tubular structures under 10 mm, consistent with previously accepted criteria.[5,19] In our study, inter-sphincteric abscesses appeared in 11.42% of cases, which is quite similar to the 16% abscess rate found earlier. We also saw horseshoe-shaped extensions in 4.28% of cases, a figure consistent with the 9% pervasiveness noted in an earlier study.[8]

We observed that **simple fistulas** accounted for 78% of the cases in our study. The remaining 62% were classified as **complex**, exhibiting features like branch tracts, abscesses, or a horseshoe shape. These figures are consistent with the findings of a study in which, the researchers identified 61% simple and 39% complex fistulas in their report [20].

Internal openings were detected in 52 patients, with the 6 o'clock position. The length of the tracts was measured along the coronal plane, from the internal to the external opening. The longest tract was 7.8cm, and the shortest was 1.2cm. The average length was 3.7cm with a standard deviation of 2.44cm. the results are consistent with the findings of other researchers.[21,22]

Consistent with prior studies, our findings underscore MRI's high diagnostic accuracy. Earlier researchers testified MRI sensitivity and specificity of 93.5% and 94.5%, respectively, in identifying secondary tracts during surgical evaluations. Furthermore, the researchers noted similar "sensitivity and perfect specificity" for MRI in detecting these anomalies [23,24].

5. CONCLUSION

Preoperative MRI emerges as a critical instrument for accurately delineating the intricate anatomy of perianal fistulas. By providing comprehensive visualization of the fistula's complexity, extent, and spatial relationships with surrounding structures, MRI plays a pivotal role in optimizing surgical planning. This precise preoperative assessment is vital for minimizing the risk of postoperative recurrence, thereby improving patient outcomes and enhancing long-term recovery prospects.

6. Conflict of Interest
None declared.

7. Funding Source
No funding was received for this research.

8. REFERENCES:

Domínguez A, Pitrella A, Noceti M. Perianal fistulas: magnetic resonance characterization. Rev Argent Radiol. 2017;81(2):129-34.

Quang NN. Research on clinical and subclinical characteristics and evaluation of surgical results for the treatment of recurrent anal fistula. Journal of Clinical Medicine of Hue Central Hospital. 2023(85):11-7.

Vo DT, Nguyen TT, Nguyen NH, Nguyen LT, Nguyen TT, Phan CC. Preoperative magnetic resonance imaging of anal fistulas with scrotal extension: a retrospective study. Frontiers in Surgery. 2023 Jul 20;10:1224931.

Madany AH, Murad AF, Hamdy A. Imaging of peri-anal sepsis. Aswan University Medical Journal. 2022 Dec 31;2(2):58-80.

Duong TT, Binh DD, Linh TT, An HH, Head of NV. The results are far from sphincter fistula surgery to treat anal fistula. Journal of 108-Clinical Medicine and Phamarcy. 2021 Apr 1.

Branch X. A Single-surgeon Experience of Treating Anal Fistulas Using the Ligation of the Intersphincteric Fistula Tract (LIFT) Procedure: Comparison between the Past and the Present. J Soc Colon Rectal Surgeon (Taiwan). 2022;33:137-44.

Trinh PT, Thao NT, Tri NH, Duc PM. Evaluation of the visual characteristics of magnetic resonance in the diagnosis of complex anal fistula according to the St James classification. Journal of Clinical Medicine of Hue Central Hospital. 2025 Apr 18; 17(3):78-84.

Alaat El Essawy MT. Magnetic resonance imaging in assessment of anorectal fistulae and its role in management. J Gastroint Dig Syst. 2013; 3(3):139.

Bartlett DJ, Nehra A, Fletcher JG, Ehman EC. MR Imaging of Perianal Fistulas: A Review of Fundamentals, Complications, and Post-Therapy Imaging. Radiologic Clinics. 2025 Jan 8.

Chauhan NS, Sood D, Shukla A. Magnetic resonance imaging (MRI) characterization of perianal fistulous disease in a rural based tertiary hospital of North India. Polish journal of radiology. 2016; 81:611.

Sharma A, Yadav P, Sahu M, Verma A. Current imaging techniques for evaluation of fistula in ano: a review. Egyptian Journal of Radiology and Nuclear Medicine. 2020 Dec;51:1-8.

Darwish HS, Zaytoun HA, Kamel HA, Qamar SR. Magnetic resonanceimaging evaluation of perianal fistulas. Egypt J RadiolNucl Med 2013; 44:747-54

Brillantino A, Iacobellis F, Reginelli A, Monaco L, Sodano B, Tufano G, Tufano A, Maglio M, De Palma M, Di Martino N, Renzi A. Preoperative assessment of simple and complex anorectal fistulas: Tridimensional endoanal ultrasound? Magnetic resonance? Both?. La radiologia medica. 2019 May 1;124:339-49.

Varsamis N, Kosmidis C, Chatzimavroudis G, Apostolidou Kiouti F, Efthymiadis C, Lalas V, Mystakidou CM, Sevva C, Papadopoulos K, Anthimidis G, Koulouris C. Preoperative assessment of perianal fistulas with combined magnetic resonance and tridimensional endoanal ultrasound: a prospective study. Diagnostics. 2023 Sep 3;13(17):2851.

Sudoł-Szopińska I, Garg P, Mellgren A, Spinelli A, Breukink S, Iacobellis F, Kołodziejczak M, Ciesielski P, Jenssen C, Santoro GA, SMART Collaborative Group. Structured magnetic resonance imaging and endoanal ultrasound anal fistulas reporting template (SMART): An interdisciplinary Delphi consensus. World Journal of Gastrointestinal Surgery. 2024 Oct 27;16(10):3288.

Amjad MF, Muhammad an. perianal fistula; evaluation of the perianal fistula by mri: our experience. Professional Med J 2015;22(8): 1012-1019.

Wu SZ. Surgeon oriented reporting template for magnetic resonance imaging and endoanal ultrasound of anal fistulas enhances surgical decision-making. World Journal of Radiology. 2024 Dec 28;16(12):712.

Vinh TV, Ai DQ. RESULTS OF SURGICAL TREATMENT OF PATIENTS WITH HIGH ANAL FISTULA AT VIET DUC FRIENDSHIP HOSPITAL. Vietnam Medical Journal. 2024 Oct 17; 543(2).

Ahmad A, Roplekar S, Podlasek A. Can Short Tau Inversion Recovery (STIR) Imaging Be Used as a Stand-Alone Sequence To Assess a Perianal Fistulous Tract on MRI? A Retrospective Cohort Study Comparing STIR and T1-Post Contrast Imaging. Cureus. 2024 Jan 17;16(1).

Brillantino A, Iacobellis F, Marano L, Renzi A, Talento P, Brusciano L, Gambardella C, Favetta U, Di Visconte MS, Monaco L, Grillo M. Validation of a novel imaging-guided and anatomy-based classification system for anorectal fistulas: a retrospective clinical evaluation study. Annals of Coloproctology. 2025 Mar 14.

Panda SK, Panigrahi M. A study on magnetic resonance imaging fistulogram evaluation of perianal discharge in an indian population. Asian J Pharm Clin Res. 2018 ;11(5):284-9.

Gurung G. 3T MR imaging evaluation of perianal fistulas: an initial experience in Nepal. J. Soc. Surg. Nepal .2016 ;19(1):25-30.

Emile SH, Khan SM, Adejumo A, Koroye O. Ligation of intersphincteric fistula tract (LIFT) in treatment of anal fistula: An updated systematic review, meta-analysis, and meta-regression of the predictors of failure. Surgery. 2020 Feb 1;167(2):484-92.

Amato A, Bottini C, De Nardi P, Giamundo P, Lauretta A, Realis Luc A, Piloni V. Evaluation and management of perianal abscess and anal fistula: SICCR position statement. Techniques in Coloproctology. 2020 Feb;24:127-43..