

Role of MRI in the Preoperative Evaluation and Characterisation of Perianal Fistulas: A Prospective Observational Study

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ABSTRACT

Introduction: A perianal fistula is an inflammatory disorder that frequently requires surgical interventions. Magnetic Resonance Imaging (MRI) is an exceptional technique for soft-tissue characterisation; recent advancements in imaging perianal fistulas with MR fistulography establish MRI as the gold-standard imaging modality. MRI helps detect the primary tract and reveals secondary fistulous tracts and their consequences, such as abscesses.

Aim: To classify perianal fistulas using the St. James's University Hospital (SJUH) grading and Park's classification, and compare MRI findings with intraoperative surgical findings.

Materials and Methods: A prospective observational study was conducted at the Department of Radiodiagnosis at Dr PSIMS and RF Chinnaoutpally, Vijayawada, Andhra Pradesh, India, from December 2022 to December 2025. It included 50 patients who underwent an MRI fistulogram. At the study Institution, T2-weighted (T2W) and T2 fat-suppressed (T2FS) sequences were utilised as the standard imaging protocol on a 1.5 T Philips MRI machine. The variables assessed in the study were primarily presented using descriptive statistics as frequencies (n) and percentages

(%). Diagnostic performance was evaluated using sensitivity, specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV), and p-values to determine statistical significance.

Results: A total of 50 patients with clinically suspected perianal fistula were evaluated. The study population age ranged from 18 to 66 years, with a mean age of 43±12 years. Sociodemographically, males predominated with 38 (76%) and females were 12 (24%); most patients were young to middle-aged adults. On MRI, intersphincteric fistula was the most common according to Park's classification, seen in 29 (58%) cases, followed by transsphincteric in 15 (30%) and suprasphincteric in 2 (4%); no extrasphincteric fistulae were seen, and 4 (8%) were MRI-negative. Based on SJUH classification, Grade-I was the most frequent with 19 (38%), followed by Grade 2 and 3 each 10 (20%), Grade 4 5 (10%), and Grade 5 2 (4%); 4 (8%) showed no MRI findings. MRI shows strong concordance with surgical findings, with 46 (92%) concordance, showing sensitivity 95.8%, specificity 100%, PPV 100%, and NPV 50%.

Conclusion: MRI demonstrated excellent diagnostic performance with high sensitivity and specificity, and showed a strong association with intraoperative findings.

Keywords: Intersphincteric, Magnetic resonance imaging fistulogram, Perianal fistulas, Transsphincteric

INTRODUCTION

Anorectal fistulas are chronic inflammatory tracts connecting the anal canal to the perineal skin. They occur more commonly in middle-aged men, with a male-to-female ratio of approximately 2:1 and an annual incidence of about 10 cases per 100,000 population [1]. The incidence of fistula-in-ano varied among the different populations in the European Union (EU). In the four countries examined, it ranged from 1.04 per 10,000/year in Spain to 2.32 per 10,000/year in Italy. A statistical comparison of rates from the different countries studied gives a confidence interval from 1.20 up to 2.80 [2].

Traditionally, fistulograms were used for imaging anorectal fistulas by injecting water-soluble contrast through the external opening. However, this technique has limitations, including incomplete visualisation due to obstruction by pus or debris and inability to delineate sphincter anatomy [1,3]. Transrectal ultrasonography provides better assessment of fistulous tracts and their relation to the anal sphincter complex, but its utility is limited by operator dependency, restricted field of view, and lack of coronal imaging [1].

The MRI is currently regarded as the imaging modality of choice for evaluating perianal fistulae due to its high soft-tissue contrast and multiplanar capability. MRI enables accurate delineation of the primary tract, internal opening, and secondary extensions, thereby

facilitating appropriate surgical planning and reducing recurrence rates, particularly in complex and recurrent cases [4].

Thus, the present study aimed to identify and classify perianal fistulas on MRI using established classification systems (e.g., the Parks classification), evaluate the diagnostic accuracy of MRI by comparing its findings with surgical findings, and detect secondary tracts, extensions, and associated abscesses.

MATERIALS AND METHODS

The present study was a prospective observational study conducted in the Department of Radiodiagnosis, Dr PSIMS and RF, Chinnaoutpally, Vijayawada, Andhra Pradesh, India, from December 2022 to December 2025, after obtaining Institutional Ethics Committee (IEC) approval (IEC No: F223/22, dated 12th October 2022). Informed consent was obtained from all participants prior to inclusion in the study. The study included a total sample size of 50 patients, and all eligible cases of clinically suspected perianal fistula presenting to the Department of Radiodiagnosis during the study period were included.

Inclusion and Exclusion criteria: Patients included were those diagnosed clinically with perianal fistula, including recurrent cases, who consented to participation and had no contraindications to MRI. Patients with MRI contraindications such as metallic implants, foreign bodies, pacemakers, or claustrophobia, as well as those who did not provide consent, were excluded from the study.

Study Procedure

Demographic variables including age and sex were recorded, along with detailed MRI fistulogram findings such as internal and external openings, type of fistula, presence of abscesses, and secondary tracts. Intraoperative findings were collected from operative notes. MRI was performed on a 1.5-T Philips scanner using standard T2-weighted and T2 fat-suppressed sequences.

Park's classification is the predominant surgical system for categorising the four types of perianal fistulas: intersphincteric fistula, transsphincteric fistula, suprasphincteric fistula, and extrasphincteric fistula [5].

The St. James University Classification grades fistulas into five groups [6]:

- Grade 1- Simple linear intersphincteric tract without any collection or extension;
- Grade 2- Intersphincteric tract with intersphincteric abscess or secondary extension;
- Grade 3- Transsphincteric tract without any collection or extension;
- Grade 4- Transsphincteric tract with abscess or secondary track within the ischiorectal fossa;
- Grade 5- Tract with supralelevator and translevator extension.

MRI was performed using a 1.5-Tesla Philips scanner with the patient in the prone position and a body surface (phased-array) coil placed over the pelvis. Multiplanar T1-weighted (T1W), T2-weighted (T2W), and fat-suppressed T2-weighted (T2FS) sequences were acquired in the axial and coronal planes, aligned with the long axis of the anal canal. The field of view included the anal canal, levator ani muscles, and perineum to assess disease extent. T2W and T2FS sequences were used to delineate fistulous tracts and collections, which appear hyperintense, while fibrotic walls appear hypointense. T1W images aided in anatomical assessment and detection of haemorrhage. Intravenous gadopentetate dimeglumine (0.1 mmol/kg) was administered, and post-contrast T1 fat-suppressed images demonstrated rim enhancement of abscesses and active tracts. Chronic tracts and scars showed low signal intensity on both T1W and T2W images. MR Images were interpreted by a radiologist with at least five years of experience. MRI findings were compared with intraoperative surgical findings, which served as the reference standard.

STATISTICAL ANALYSIS

Statistical analysis was performed using IBM Statistical Package for the Social Sciences (SPSS) version 31.0 (IBM Corp., Armonk, NY, USA). Sensitivity, specificity, PPV, and NPV were calculated using 2×2 contingency table analysis, and the association between MRI and operative findings was assessed using the Chi-square test.

RESULTS

The study population age ranged from 18 to 66 years, with a mean age of 43±12 years. The study population demonstrated a male predominance, 38 (76%) compared with females 12 (24%) [Table/Fig-1].

Gender	Number of patients n (%)
Male	38 (76)
Female	12 (24)
Total	50 (100)

[Table/Fig-1]: Gender distribution.

Based on Park's classification, the most common fistula type was intersphincteric in 29 (58%), followed by transsphincteric 15 (30%) and suprasphincteric fistulae 2 (4%). No extrasphincteric fistulae were identified on MRI. MRI was negative in 4 patients (8%) [Table/Fig-2].

According to the SJUH classification, the distribution was as follows: Grade 1 19 (38%), Grade 2 10 (20%), Grade 3 10 (20%), Grade 4 five cases (10%), and Grade 5 2 (4%). MRI was negative in four cases (8%) [Table/Fig-3].

Park's classification	Number of patients n (%)
Intersphincteric	29 (58)
Transsphincteric	15 (30)
Suprasphincteric	2 (4)
Extrasphincteric	0 (0)
MRI no findings	4 (8)

[Table/Fig-2]: Based on Park's classification.

SJUH classification	Number of patients n (%)
Grade 1	19 (38)
Grade 2	10 (20)
Grade 3	10 (20)
Grade 4	5 (10)
Grade 5	2 (4)
MRI no findings	4 (8)

[Table/Fig-3]: Based on St. James University classification.

Secondary tracts were identified among 15 patients (30%). Complex fistulae, defined by multiple tracts and/or multiple internal or external openings with or without associated abscesses, were present in 24 patients (48%).

Associated Findings

A total of 10 patients (20%) had intersphincteric collections, most of which drained into the internal anal sphincter. Ischioanal or ischiorectal abscesses were identified in 5 patients (10%). Horseshoe extensions were seen in 2 patients (4%).

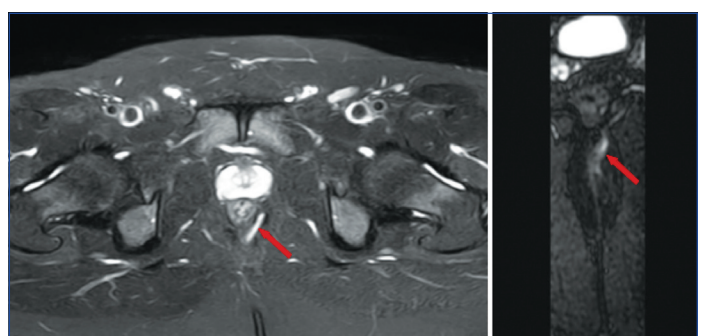
Concordant results were observed in 46 patients (92%), and discordant results in four patients (8%). MRI showed a statistically significant association with operative findings using Pearson's Chi-square test, $\chi^2(1) = 23.96$, $p < 0.0001$.

Among the four MRI-negative cases, surgical exploration identified intersphincteric fistulas in two patients. The remaining two patients showed no evidence of perianal fistula at surgery; instead one was diagnosed with a pilonidal sinus and the other with hidradenitis suppurativa.

The MRI showed excellent sensitivity (95.8%) and specificity (100%) for detection and classification of perianal fistulae, with a PPV of 100% and a NPV of 50% [Table/Fig-4]. The association between MRI and operative findings was statistically significant ($p < 0.0001$). The representative MRI images are shown in [Table/Fig-5-12].

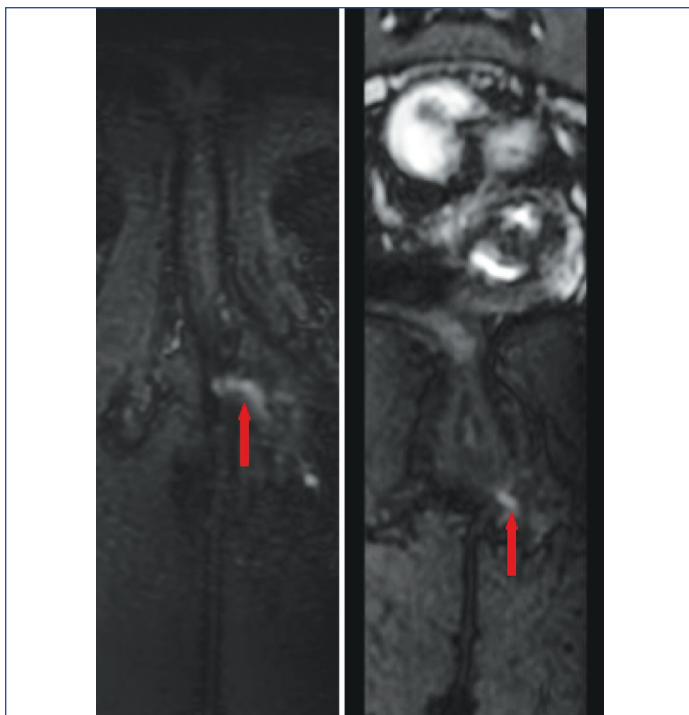
Variables	Findings
Sensitivity	95.8%
Specificity	100%
PPV	100%
NPV	50%

[Table/Fig-4]: Diagnostic performance of MRI in the detection and classification of perianal fistula (sensitivity, specificity, PPV, and NPV)..

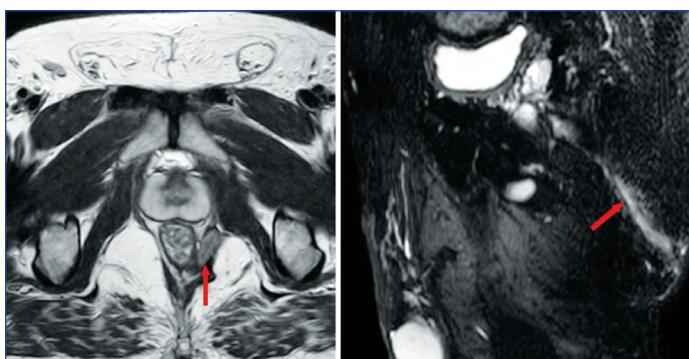


[Table/Fig-5]: T2 SPAIR Axial and T2 SPIR Coronal Images Showing Intersphincteric Fistula in Ano.

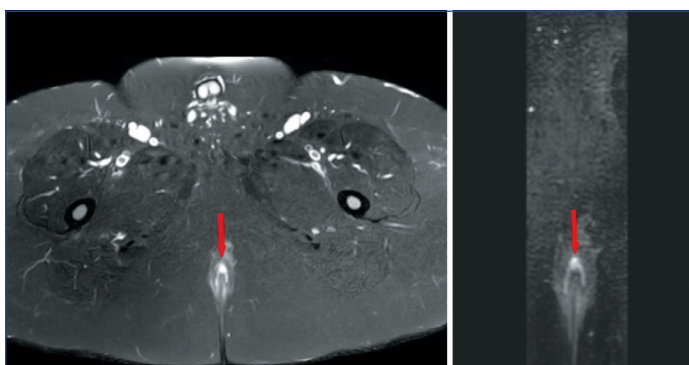
SPAIR: Spectral attenuated inversion recovery; SPIR: Spectral presaturation with inversion recovery



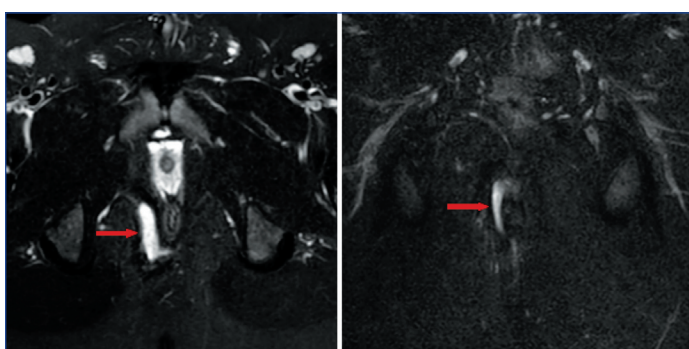
[Table/Fig-6]: Axial and Coronal T2 SPIR images showing transsphincteric fistula.



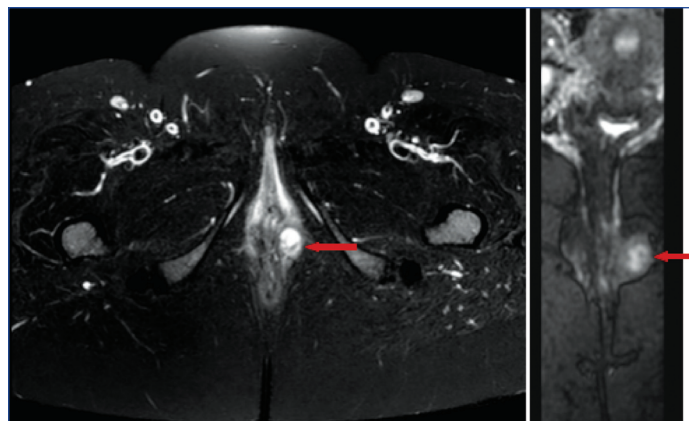
[Table/Fig-7]: T2 Axial and T2 SPIR sagittal images showing transsphincteric fistula with abscess.



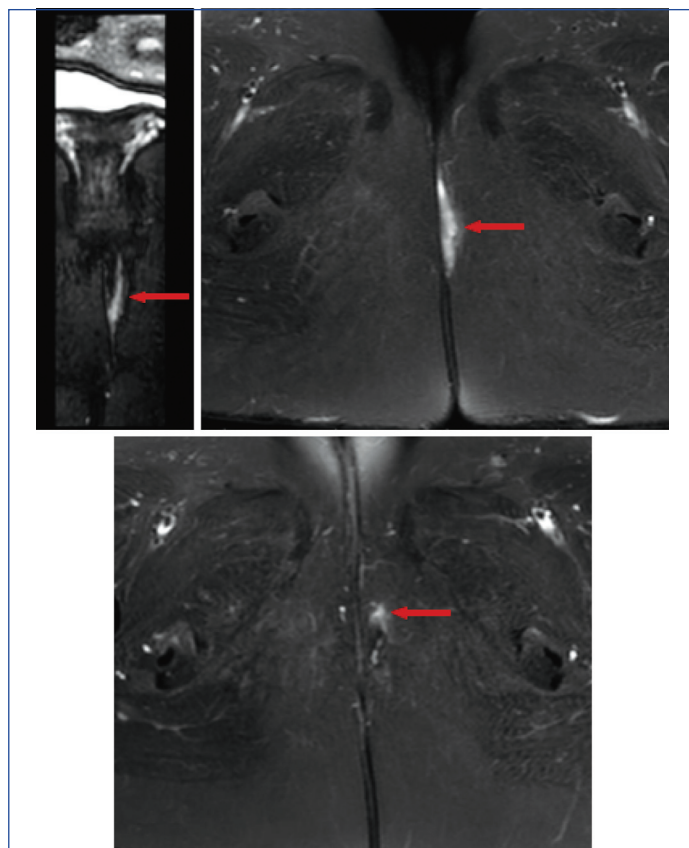
[Table/Fig-8]: T2 SPAIR Axial and T2 STIR Coronal Images Showing Horseshoe Intersphincteric Fistula.



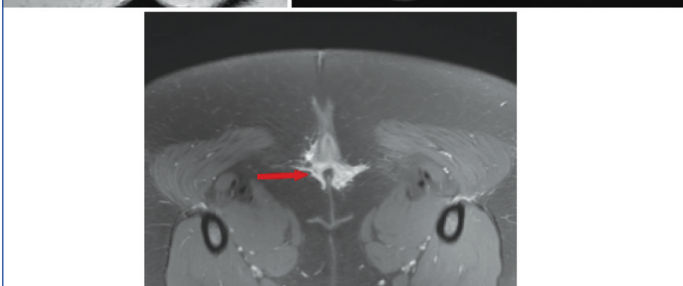
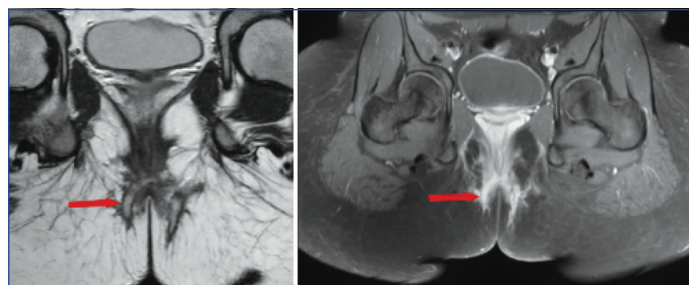
[Table/Fig-9]: T2 SPAIR Axial and Coronal Images Showing Transsphincteric Fistula With Abscess.



[Table/Fig-10]: T2 SPAIR Axial and T2 SPIR Coronal Images Showing Perianal Fistula With Ischioanal Abscess.



[Table/Fig-11]: T2 SPIR Coronal and T2 SPAIR Axial Images Showing Fistulous Tracts With Branches In Inferior Aspect of Left Interogluteal Cleft.



[Table/Fig-12]: T2 Coronal, T1 Post Contrast Coronal and Axial Images Showing Fistula in Horseshoe Manner.

DISCUSSION

In the present study, MRI demonstrated high diagnostic performance in the preoperative evaluation of perianal fistulas, with an overall concordance of 92% between radiological and surgical findings. MRI showed a sensitivity of 95.8% and a specificity of 100%, indicating excellent ability to correctly identify both the presence and extent of fistulous disease. These findings are comparable to the results reported by Kummari S et al., in which MRI achieved a sensitivity of 95.8% and a specificity of 100% for delineating anorectal fistulas, with a near-perfect PPV and a relatively lower NPV, attributable to a small number of false-negative cases [1].

A retrospective study included 62 patients with perianal fistulas evaluated using MRI with surgical correlation. MRI showed 100% sensitivity and specificity for detecting secondary tracts and horseshoe fistulas. For abscess detection, MRI demonstrated 100% sensitivity and 85.7% specificity [7].

The present study had 76% (38) males and 24% (12) females. A study by Singh K et al., in 2014 revealed that, out of 50 patients, 45 (90%) were male and 5 (10%) were female [8].

Most intersphincteric collections drained into the internal anal sphincter. Intersphincteric collections were observed in 10 of 50 patients (20% of the sample). A study conducted by El Essawy MTA involving 56 patients revealed that 20 (35.7%) had concomitant abscesses, corroborating our findings [9].

A study by Singh K et al., revealed that out of 50 patients examined, 16 (32%) exhibited secondary tracts [8]. Secondary tracts were found in 15 (30%) of the patients in the present study.

Regarding the horseshoe-shaped extensions, 2 cases (4%) out of 50 patients exhibited such formations. This was akin to a study conducted by El Essawy MTA in 2013, which identified horseshoe extensions in 5 (8.9%) cases [9]. A study conducted by Singh K et al., revealed that 8 (16%) of the 50 patients presented with a horseshoe abscess of various types [8].

Overall, the findings of the present study were consistent with existing literature supporting MRI as the gold-standard modality

for preoperative evaluation and classification of perianal fistulae.

Limitation(s)

The present study had certain limitations, including a relatively small sample size and a single-centre design, which may limit generalisability. A key limitation of the current study was the absence of postoperative follow-up of patients to evaluate for recurrence.

CONCLUSION(S)

Although a small proportion of cases showed discordance between MRI and surgical findings, overall agreement was high, confirming MRI as an essential tool in the comprehensive assessment of perianal fistula. Thus, MRI should be considered the imaging modality of choice in the preoperative workup of patients with suspected or clinically complex perianal fistula.

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