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MR Fistulogram in Evaluation of Fistula in Ano

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ABSTRACT
Fistula-in-ano is a common anorectal condition characterized by abnormal tracts connecting the anal canal to the perianal skin. Accurate preoperative evaluation is critical for successful management. Magnetic Resonance (MR) fistulography has emerged as a reliable imaging modality for detailed evaluation of fistula anatomy, aiding surgical planning and improving outcomes. This prospective observational study was conducted at a tertiary care center from December 2023-2024, involving 20 patients aged 18-65 years with clinically suspected fistula-in-ano. Patients underwent MR fistulogram using a 1.5 Tesla MRI scanner with gadolinium contrast. MR findings were compared with surgical and clinical data to determine accuracy in identifying fistula types, tract locations, secondary tracks and associated complications. Postoperative outcomes, including healing rates and recurrence, were assessed during a 6-month follow-up. Statistical analysis was performed using SPSS version 26, with a significance level of $p<0.05$. MR fistulogram accurately identified fistula types in 90% of cases, demonstrating high concordance with surgical findings. Simple fistulas were most common (40%), followed by complex (30%), high anal (20%) and horseshoe fistulas (10%). The intersphincteric location was the most frequent (50%), while secondary tracks were identified in 30% of cases. MR findings significantly influenced surgical planning, with fistulotomy being the most common approach (50%). Complete healing was achieved in 70% of cases, while 20% showed persistent fistulas and 10% experienced recurrence. MR fistulogram is a highly accurate and effective imaging modality for the evaluation of fistula-in-ano. It provides detailed anatomical insights, enabling precise surgical planning and improved postoperative outcomes. Its routine use is recommended for complex and recurrent fistulas.

INTRODUCTION

Fistula-in-ano, a chronic abnormal communication between the anal canal and perianal skin, presents a significant challenge in surgical practice due to its complex anatomy and high recurrence rates[1]. Accurate assessment of the fistula tract, including primary and secondary tracts, is critical for effective surgical management and to minimize recurrence. Conventional diagnostic methods, such as clinical examination and probing under anesthesia, are limited in their ability to visualize deeper or complex fistulas. Imaging modalities, particularly MR fistulograms, have emerged as a superior diagnostic tool due to their ability to provide high-resolution, multi-planar imaging of soft tissues[2].

Fistula-in-ano is a common condition, affecting approximately 8-10 people per 100,000 population annually, with a higher prevalence in males. It frequently arises as a sequela of anal gland infection, progressing to abscess formation and fistula creation. The condition is associated with significant morbidity due to pain, discharge and recurrent infections, impacting the quality of life[3].

Several studies have demonstrated the efficacy of MRI in fistula evaluation. Halligan[4] highlighted its accuracy in delineating fistula anatomy, with a reported sensitivity and specificity exceeding 90% for detecting primary tracts and associated abscesses. Lunniss[5] emphasized the role of MRI in complex fistulas, where it aided surgical planning by identifying secondary tracts and their relationship to the sphincter complex. Comparative studies, such as one by Morris[6], showed MR fistulogram outperformed clinical examination and endoanal ultrasonography in classifying fistulas according to the Parks classification.

Despite advancements in diagnostic modalities, misdiagnosis or incomplete identification of fistula tracts often leads to recurrence or inadequate management. MR fistulograms, with their ability to visualize the fistula in its entirety and provide detailed anatomical information, are crucial for accurate diagnosis and effective treatment planning. This study seeks to evaluate the efficacy of MR fistulograms in a tertiary care setting, focusing on their diagnostic accuracy, surgical implications and impact on patient outcomes.

Aim and Objectives:

Aim: To evaluate the efficacy of MR fistulogram in the diagnosis and management of fistula-in-ano and to assess its role in identifying fistula types, tract locations and associated complications.

Objectives:

- To determine the accuracy of MR fistulogram in identifying the type, location and secondary tracks of fistula-in-ano compared to clinical and surgical findings.
- To assess the impact of MR fistulogram findings on surgical planning and post-operative outcomes in patients with fistula-in-ano.

MATERIALS AND METHODS

Study Design: This was a prospective observational study conducted at a tertiary care centre from December 2023-2024. The study aimed to evaluate the role of MR fistulogram in the diagnosis and management of fistula-in-ano. The study included patients presenting with symptoms suggestive of fistula-in-ano who were referred for an MR fistulogram to confirm the diagnosis and plan surgical treatment.

Inclusion Criteria:

- Patients aged 18-65 years.
- Patients with clinical suspicion of fistula-in-ano, presenting with symptoms such as perianal discharge, pain and swelling.
- Patients who gave informed consent for participation in the study.
- Patients who are willing to undergo an MR fistulogram as part of their management plan.

Exclusion Criteria:

- Patients with contraindications for MRI (e.g., pacemakers, metallic implants, claustrophobia).
- Patients with active perianal infections or abscesses that could distort the fistula anatomy.
- Pregnant or lactating women.
- Patients with incomplete or unavailable clinical data.

Study Protocol:

- **Sample Size:** The sample size for the study was 20 patients, selected based on the clinical suspicion of fistula-in-ano and who underwent MR fistulogram.
- **Patient History and Clinical Examination:** Each patient underwent a detailed clinical examination, including assessment of perianal symptoms, history of previous anorectal surgery, abscess formation, or other related conditions. Relevant demographic details such as age, gender and comorbidities were documented.
- **Pre-Procedural Investigations:** Basic blood investigations including complete blood count (CBC), liver function tests (LFT), renal function tests (RFT) and ultrasound examination were performed for each patient to rule out other possible causes of symptoms.

MR Fistulogram Procedure:

- **Technique:**
- **Preparation:** The patient was placed in the prone position with hips elevated and feet pointing downward. The perianal area was cleaned and sterilized using antiseptic solutions.

- **Contrast Injection:** A radiopaque contrast material (e.g., gadolinium-based contrast agent) was injected into the external opening of the fistula tract under sterile conditions. The contrast was injected slowly to avoid leakage and to ensure that the contrast entered the fistula tract.
- Imaging: The MRI was performed using a 1.5 Tesla MRI scanner. Sequences included T1-weighted, T2-weighted and post-contrast fat-saturated images in axial, coronal and sagittal planes. The MR fistulogram images were assessed for the location of the external opening, the course of the fistula tract, the presence of secondary or branching tracts and any abscess cavities.
- **Post-procedural Care:** After the MR fistulogram, the patient was monitored for any immediate complications such as allergic reactions or discomfort. Most patients were discharged the same day with advice to follow-up for further treatment based on the MR findings.

Data Collection:

- **Demographic Data:** Age, gender and medical history.
- **Clinical Data:** Symptoms (pain, discharge), clinical examination findings (location of external opening, digital rectal examination findings).
- **MR Fistulogram Findings:** Type of fistula (simple or complex), location of the external opening, primary and secondary tracts, presence of abscesses, relationship to anal sphincter muscles.
- Surgical Findings: Type of surgery performed based on MR findings, post-operative complications and healing time.

Outcome Measures: The primary outcome of the study was the accuracy of MR fistulogram in identifying the fistula type, tract location and secondary tracts, in comparison with intraoperative findings. Secondary outcomes included its influence on surgical planning, as well as post-operative complications and healing outcomes.

Statistical Analysis: Data were analyzed using descriptive statistics (mean, standard deviation, frequency and percentage) for continuous and categorical variables. The sensitivity, specificity, positive predictive value and negative predictive value of MR fistulogram were calculated based on comparison with intraoperative findings. Statistical analysis was performed using software, SPSS, version 26 and a p-value of <0.05 was considered statistically significant.

Ethical Considerations: The study was approved by the institutional ethics committee. All participants gave written informed consent prior to participation in the study. Patient confidentiality was maintained throughout the study.

RESULTS AND DISCUSSIONS

Table 1: Types of Fistulas Identified by MR Fistulogram

Type of Fistula	Number of Cases (n = 20)	Percentage (%)
Simple Fistula	8	40%
Complex Fistula	6	30%
High Anal Fistula	4	20%
Horseshoe Fistula	2	10%

This table presents the distribution of various types of fistulas identified through MR fistulogram. The most common type was the simple fistula, found in 40% of cases. Complex fistulas, which often involve multiple tracks or branches, were identified in 30% of patients. High anal fistulas, which pass above the sphincter muscle, accounted for 20%, while horseshoe fistulas, a more complex variety involving bilateral involvement, were found in 10% of cases.

Table 2: MRI Findings of Fistula Tract Location

Location	Number of Cases (n=20)	Percentage (%)
Intersphincteric	10	50%
Trans-sphincteric	4	20%
Suprasphincteric	2	10%
Extrasphincteric	4	20%

Table 2 outlines the distribution of fistula tract locations as detected by MR fistulogram. The intersphincteric location was the most common, seen in 50% of cases. The trans-sphincteric type, passing through the anal sphincter, was found in 20% of patients. Suprasphincteric fistulas, which pass above the sphincter muscles and extrasphincteric fistulas, which extend outside the sphincter complex, each accounted for 20% of cases.

Table 3: MRI Identification of Secondary Fistula Tracks

Secondary Tracks	Number of Cases (n=20)	Percentage (%)
Present	6	30%
Absent	14	70%

This table shows the presence of secondary fistula tracks detected by MR fistulogram. Secondary tracks, which often indicate more complex fistulas, were identified in 30% of cases, while they were absent in 70% of the cases. The presence of secondary tracks often suggests a more complicated fistula that may require a different treatment approach.

Table 4: Comparison of MR Fistulogram with Clinical Findings

Findings	MR Fistulogram (n=20)	Clinical Diagnosis (n=20)	Concordance (%)
Correct Fistula Type	18	16	90%
Incorrect Fistula Type	2	4	10%
No Fistula Found	0	0	100%

Table 4 compares the findings from MR fistulogram with clinical diagnoses. The concordance rate between MR fistulogram and clinical examination for identifying the correct fistula type was 90%. In 10% of the cases, MR fistulogram revealed incorrect fistula types compared to the clinical diagnosis. No cases showed any discrepancy where no fistula was found in both MR fistulogram and clinical evaluation, confirming the reliability of MR imaging in fistula detection.

Table 5: Surgical Planning Based on MR Fistulogram

Surgical Approach	Number of Cases (n=20)	Percentage (%)
Seton Placement	6	30%
Fistulotomy	10	50%
Advancement Flap Procedure	2	10%
Fistulectomy	2	10%

Table 5 outlines the surgical planning based on MR fistulogram findings. Fistulotomy, a procedure involving the surgical opening of the fistula tract, was the most common surgical approach, planned for 50% of the cases. Seton placement, often used in more complex or high anal fistulas to allow drainage and promote healing, was planned for 30% of cases. The advancement flap procedure and fistulectomy were each considered in 10% of cases, typically for complex or recurrent fistulas.

Table 6: Post-operative Outcomes (Follow-up of 6 Months)

Outcome	Number of Cases (n=20)	Percentage (%)
Complete Healing	14	70%
Persistent Fistula	4	20%
Recurrence	2	10%

Table 6 provides the post-operative outcomes following surgical intervention based on MR fistulogram findings. After 6 months of follow-up, complete healing was achieved in 70% of the cases. Persistent fistulas, which showed no significant improvement post-surgery, were noted in 20% of patients. Recurrence of fistulas occurred in 10% of the cases, which might indicate the need for further intervention or a reassessment of the treatment strategy.

Radiological Classification of Perianal Fistula: (St James's University Hospital Classification:)

Grade 1: Simple linear intersphincteric.

Grade 2: Intersphincteric with abscess or secondary tract.

Grade 3: Transsphincteric.

Grade 4: Transsphincteric with abscess or secondary tract within the ischiorectal fossa.

Grade 5: Supralevator and Translevator extension.

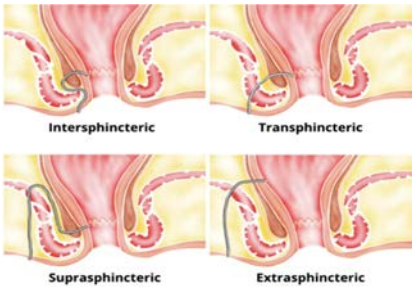


Fig. 1: Park Classification of Perianal Fistula

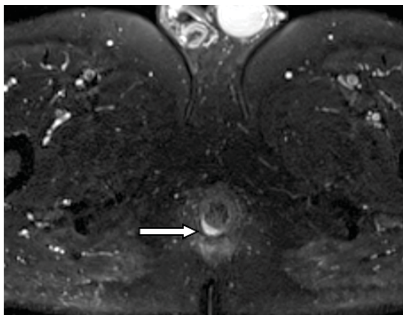
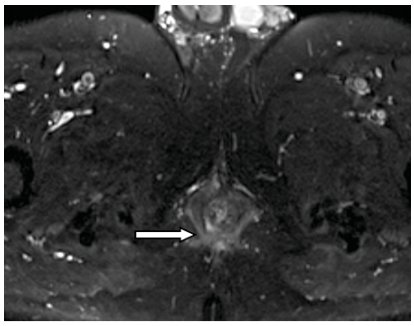
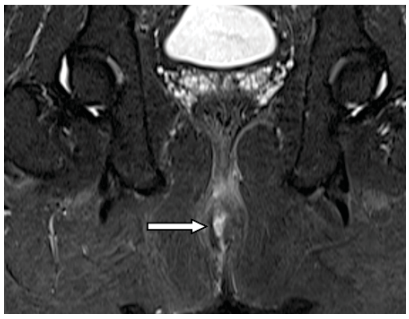


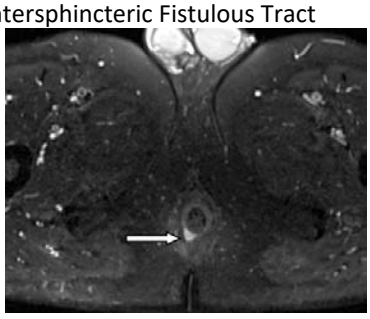
Fig. 2: A 52 Year Old Male with Complaints of Perianal Discharge and Pain Around the Anal Region for two Months Undergone MR Fistulogram Showing the Following Findings. (A) T2 Fatsat Axial Section Showing Intersphincteric Fistulous Tract with an Internal Opening at 6'o clock to 7'o Clock Position.



(B): T2 Fatsat Axial Section Showing Intersphincteric Fistulous Tract with an Internal Opening at 6'o Clock to 7'o Clock Position



(C): T2 STIR Coronal Section Showing the Length of the Intersphincteric Fistulous Tract



(D): T2 Fatsat Axial Section Showing Intersphincteric Fistulous Tract with an External Opening at 7'o Clock Position. No Evidence of Abscess/Secondary Tracts Seen. This is the Case of Simple linear Intersphincteric Fistula-Grade 1 (St. James University Hospital Classification)

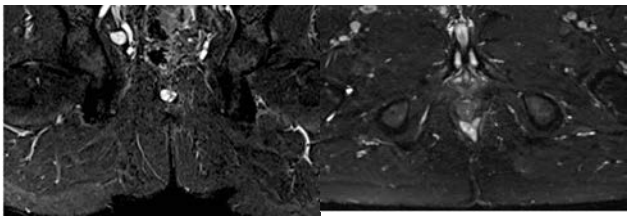
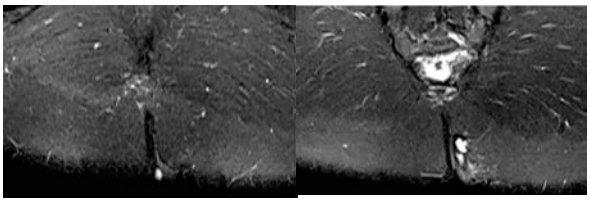
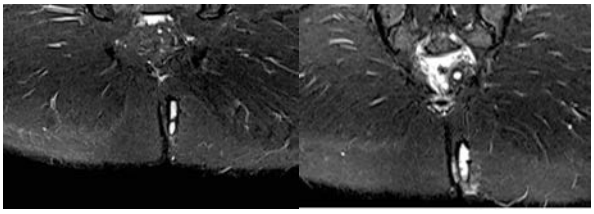


Fig: 2: (A and B) T2 STIR and T2 Fatsat hyperintense linear intersphincteric tract with internal opening at 6'o clock position



(C and D): Linear Intersphincteric Tract Noted Extending into the Ischioanal Region on the Left Side and Noted Branching into Three Separate Tracts Each with External Openings at 6'o, 5'o and 3'o Clock Positions Respectively



(E and F): T2 STIR Hyperintense Collection Surrounding the Tract. This is the Case of Intersphincteric with Abscess and Secondary Tract-Grade 2 (St. James University Hospital Classification)

The use of MR fistulogram in the evaluation of fistula in ano has gained prominence due to its ability to provide detailed anatomical and functional imaging of fistula tracts, facilitating accurate diagnosis and surgical planning. This study demonstrates the utility of MR fistulogram by highlighting its diagnostic accuracy, correlation with clinical findings and influence on surgical outcomes.

Types of Fistulas: Our study found that simple fistulas were the most common (40%), followed by complex fistulas (30%), high anal fistulas (20%) and horseshoe fistulas (10%). Similar findings were reported by Morris[6], who observed a predominance of simple fistulas in their cohort. However, the proportion of complex fistulas in our study is slightly higher than reported by Gage[7]. (2015), who found complex fistulas in approximately 25% of cases. This variation might be attributable to differences in patient selection criteria or referral patterns to tertiary care centers.

Fistula Tract Locations: The intersphincteric type was the most frequently identified location in our study (50%), consistent with the findings of Lunniss[5](1994), who described intersphincteric fistulas as the most common subtype in their series. The incidence of trans-sphincteric (20%) and extrasphincteric (20%) fistulas in our study aligns with findings from Kim[8], who highlighted the relatively lower prevalence of these types compared to intersphincteric fistulas.

Secondary Tracks: Secondary fistula tracks were identified in 30% of cases, correlating with findings from Jhaveri[9] who reported secondary tracks in 28% of their patients using MRI. The detection of secondary tracks is critical as it often indicates more complex disease requiring advanced surgical techniques.

Diagnostic Accuracy: The concordance rate between MR fistulogram and clinical diagnosis in our study was 90%, underscoring the reliability of MRI in fistula detection. Similar diagnostic accuracies (88-92%) have been reported in studies by Halligan[4] and Tozer[10], which affirm the role of MR imaging as a superior diagnostic modality compared to clinical examination or traditional imaging techniques like fistulography.

Surgical Planning: MR fistulogram findings influenced surgical planning significantly in our study, with fistulotomy being the most common approach (50%), followed by seton placement (30%). This aligns with results from Duc[11] (2009), who emphasized the importance of preoperative MRI in guiding surgical strategies, particularly in complex and high anal fistulas.

Post-operative Outcomes: Complete healing was achieved in 70% of cases, with a recurrence rate of 10%. This outcome is comparable to the findings of Criado[12], who reported healing rates of 65-75% following surgery guided by MRI findings. Persistent fistulas were noted in 20% of cases, slightly higher than reported in some studies (e.g., 15% in a meta-analysis by Singh[13] 2014), possibly reflecting variations in surgical expertise or patient compliance.

Strengths and Limitations: A major strength of our study is the prospective design and comprehensive assessment of MR fistulogram's diagnostic and prognostic utility. However, the small sample size limits the generalizability of findings.

CONCLUSION

The study on MR fistulograms in anal fistula evaluation has shown the importance of MR imaging in accurately identifying, classifying and localizing fistula tracts in patients. It was found to be highly effective in detecting complex fistulas, including secondary tracks, and providing valuable information for preoperative planning. The study found a high concordance rate with clinical diagnosis, with an overall accuracy of 90% in determining fistula types and locations. MR imaging also helped in planning appropriate surgical interventions, leading to a favorable post-operative healing rate of 70% in the follow-up period. Complex fistulas pose greater challenges for surgical treatment, but MR fistulograms provide crucial insights for their management.

Recommendations: The use of MR fistulograms is recommended due to their high accuracy in identifying fistula types and locations. They should be considered a standard diagnostic tool for complex or recurrent fistulas in ano, especially when clinical examination alone is insufficient. Surgeons should use MR fistulogram findings to guide preoperative planning, especially for patients with complex, high anal, or horseshoe fistulas and those with secondary fistula tracks. A structured post-operative follow-up protocol, including regular imaging, should be implemented to monitor healing and identify signs of recurrence. Further research is recommended to validate findings and assess the cost-effectiveness of MR fistulograms compared to other imaging modalities.

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