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Descriptive Cross-Sectional Study of Perianal Fistula Patients having Diabetes Mellitus as a Comorbidity by MRI Evaluation in Tertiary Care Hospital

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ABSTRACT

Background: This cross-sectional study at a tertiary care hospital in North Maharashtra investigates perianal fistulas in diabetes patients using MRI. It examines anatomical features and severity to understand how diabetes affects disease progression and evaluates the role of MRI fistulogram in these patients for optimal treatment insights.

Methods: The prospective study uses a 1.5 Tesla GE BRIVO 355 MRI machine to examine patients with perianal complaints. Imaging includes axial (T1, T2, STIR), coronal (T1, STIR), sagittal (T2, STIR), and post-contrast (T1 W FS) sequences with patients in a supine position. Gadolinium contrast is used as necessary, following written informed consent. Patients meeting inclusion criteria provide consent and undergo MRI, and data, including DICOM format images, are documented for analysis.

Results: Of the 76 patients, most were aged 31-40, with a higher prevalence in males. The most common symptom was perianal discharge. Diabetes mellitus was a notable comorbidity. Inter-sphincteric fistulas were the most common type. MRI sequence analysis showed heterogeneous imaging characteristics, highlighting the need for a multi-sequence approach. Gadolinium contrast was used in 31.58% of patients.

Conclusion: Comprehensive preoperative assessment, including an MRI fistulogram, is essential for planning perianal fistula treatment, especially with the high incidence of diabetes mellitus. A holistic patient management approach is crucial. Fistulotomy is the preferred intervention, particularly for trans-sphincteric fistulas or signs of infection, leading to a favorable prognosis with precise management protocols.

Key-words: Perianal fistulas, Fistulogram, Diabetes mellitus, Magnetic resonance imaging

INTRODUCTION

An anomalous connection between the anal canal and perineal skin characterizes a perianal fistula. While the etiology is often idiopathic, predisposing factors encompass Crohn's disease, pelvic infection, tuberculosis, diverticulitis, childbirth trauma, pelvic malignancies, and radiation therapy.[1] The cryptoglandular hypothesis posits that infection of an intersphincteric gland, resulting in an intersphincteric abscess, is the primary event in pathogenesis. This sequence may culminate in the development of a fistulous tract.[2] A comprehensive preoperative assessment, integrating MRI fistulogram and treatment strategizing, is essential for preventing complications in perianal fistulas.[4]

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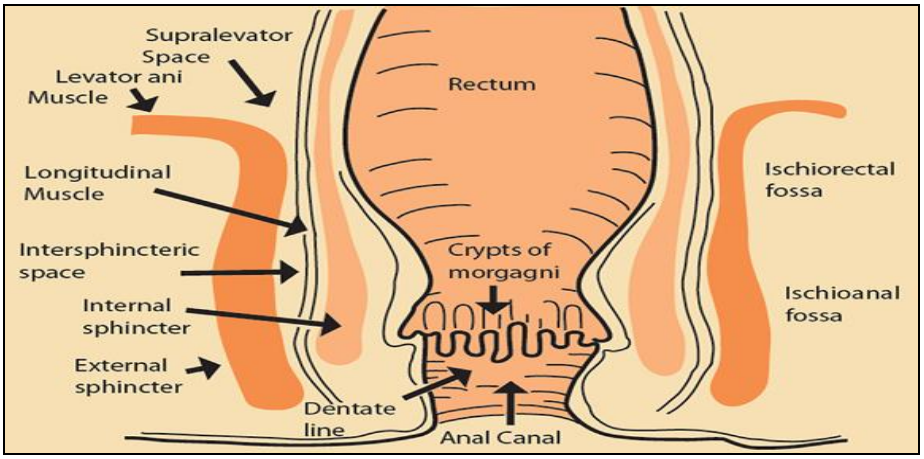

Fig. 1: Schematic diagram showing the anatomy of anal canal coronal planes [3]

A comprehensive preoperative assessment, integrating MRI fistulogram and treatment strategizing, is essential for preventing complications in perianal fistulas.[4] The preferred intervention, specifically for trans-sphincteric fistulas and cases with infection evidence or secondary tracts, is fistulotomy.[5] Adequate management ensures a favorable prognosis, emphasizing establishing precise management protocols. Patients with perianal fistula may manifest asymptomatically or exhibit localized pain and secretions.[6] The cryptoglandular theory posits that these fistulas originate from anal gland drainage occlusion, facilitating infection spread into the fatty areolar tissue with limited inherent resistance.[7] Surgery, contingent on fistula classification and pelvic structure involvement, predominantly addresses secondary tracts and abscesses in the surrounding tissues.[8]

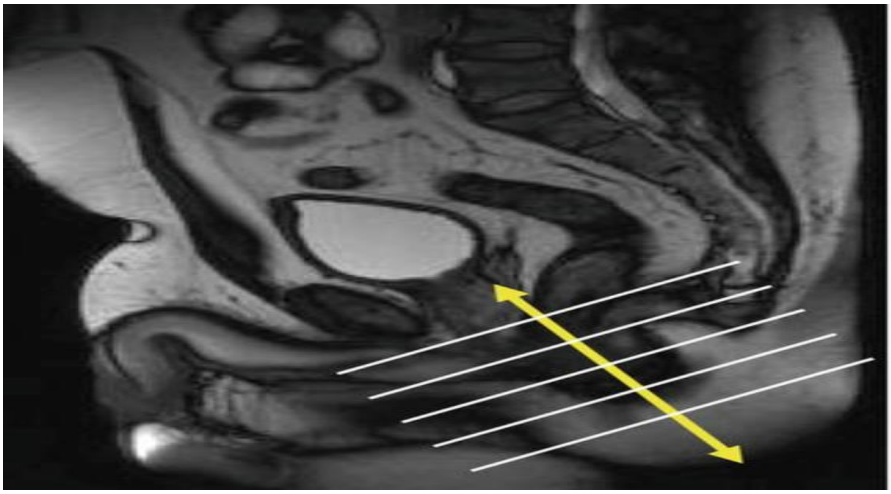

Fig. 2: MRI image of Perianal Fistula [3]

MRI fistulography serves as an invaluable diagnostic modality for precise localization of perianal fistulas to the anal sphincter.[9] It aids in identifying the internal orifice, delineating fistula branches, and effectively mapping purulent collections while assessing adjacent soft tissues.[10] MRI fistulography's sensitivity can be enhanced by administering a gadolinium-based contrast medium within the fistulous canal.[11] Surgical complications, ranging from faecal soiling to various degrees of incontinence and recurrent abscess and fistula formation, necessitate careful consideration.[12,13] Timely intervention by a skilled surgeon is pivotal for optimal outcomes, reducing morbidity and minimizing disability.

This study involves a comprehensive evaluation of the anatomical features, severity, and complications of perianal fistulas in individuals with diabetes, utilizing advanced MRI techniques. The results may contribute to a better understanding of the interplay between diabetes and perianal fistulas, aiding in management approaches.

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MATERIALS AND METHODS

Place of study- This study was conducted in September 2022 in the Department of Radiology, SMBT Institute of Medical Sciences & Research Centre, MUHS Nashik.

Study Population- Seventy-six patients with complaints of pain, swelling, and perianal discharge with Diabetic mellitus.

MRI Machine- Utilizing a 1.5 Tesla GE BRIVO 355 Magnetic Resonance Imaging machine.

Patient Positioning- Imaging was performed on patients in a supine position.

MRI Sequences

Axial Section: T1, T2, and STIR sequences
Coronal Section: T1 and STIR sequences
Sagittal Section: T2 and STIR sequences

Post-contrast- T1 W FS sequences (Gadolinium Contrast administered where necessary, with prior written informed consent).

Data Collection Procedure

Inclusion criteria- Perianal fistula patients with diabetes mellitus.

Exclusion criteria- Patients with cardiac pacemakers & implants.

Enrolment- Written informed consent obtained before enrollment.

Patient Briefing- Briefing on the procedure, emphasizing restricting body movements during the scan. A magnetic resonance imaging contrast study was performed if indicated, with prior written consent and relevant investigations, including renal function tests.

Data Collection- Patient data is collected and preserved as hard copies, integrated into the case record form.

Case Record Proforma- Using a standardized proforma to systematically record Magnetic Resonance Imaging findings.

DICOM Format- Magnetic Resonance Imaging images saved in DICOM format.

External Data Storage- All patient images are stored in an external drive for systematic archiving and future reference.

Statistical Analysis- Data was collected by using a structured proforma. Data was entered in an MS Excel sheet and analysed by using EPI INFO software. Qualitative data was expressed in terms of proportions.

RESULTS

This study detailed the demographic distribution among perianal fistula patients, categorizing them by age and gender. The findings revealed distinct patterns in the prevalence of perianal fistulas across different age brackets. Notably, the age group of 31-40 years exhibited the highest representation, comprising 38.15% of the total patient population. This age-specific breakdown and the corresponding distribution between male and female patients provide valuable epidemiological insights into the demographics of perianal fistula cases (Fig. 3).

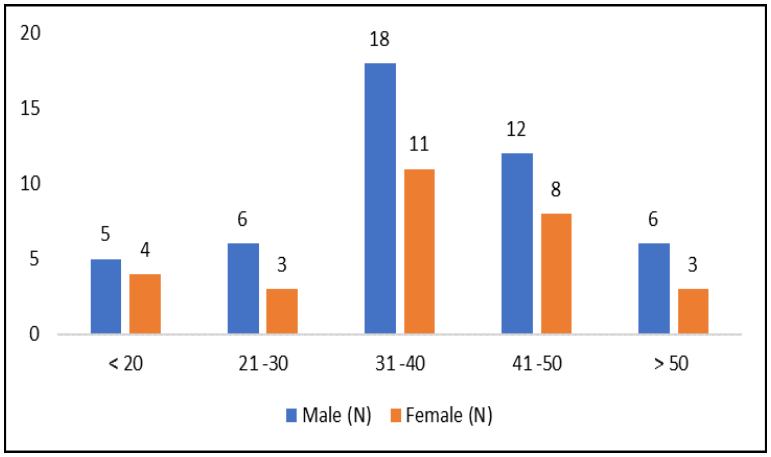

Fig. 3: Age & Gender distribution study of perianal fistula patients

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This study systematically investigated the clinical symptoms reported by patients with Perianal Fistulas, categorizing their complaints and quantifying the prevalence of each symptom. The results revealed that Perianal Discharge was the most frequently reported symptom, observed in 42.11% of the patients, suggesting its prominence in the clinical presentation of perianal fistulas. Perianal Discomfort and Perianal Itching were reported by 34.21% and 23.68% of the patients, respectively. These findings contribute to a comprehensive understanding of the symptomatology associated with perianal fistulas, aiding clinicians in recognizing and addressing the diverse clinical presentations of this condition (Fig. 4).

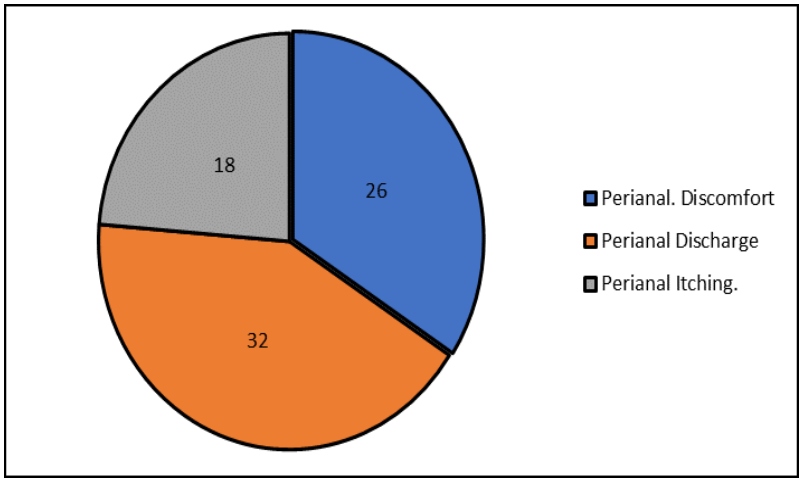

Fig. 4: Study of Clinical symptoms in perianal fistula patients

This study meticulously investigated the prevalence of comorbidities among patients diagnosed with perianal fistulas, shedding light on the intricate relationship between these conditions. The results disclosed a high prevalence of comorbidities within the patient cohort, with Diabetes Mellitus exhibiting the highest incidence at 100%. Remarkably, a substantial proportion of patients presented with multiple comorbidities, emphasizing the need for comprehensive clinical management strategies addressing the complex medical profiles of individuals with perianal fistulas. This study comprehensively examined the types of fistulas in patients diagnosed with perianal fistulas, categorizing them into distinct classifications based on their anatomical characteristics. The results revealed that Inter-sphincteric fistulas were the most prevalent, observed in 50.00% of the cases, followed by Trans-sphincteric fistulas at 39.47% and Supra-sphincteric fistulas at 10.53%. This anatomical categorization provides valuable insights into the distribution of perianal fistula types within the studied population (Fig. 5).

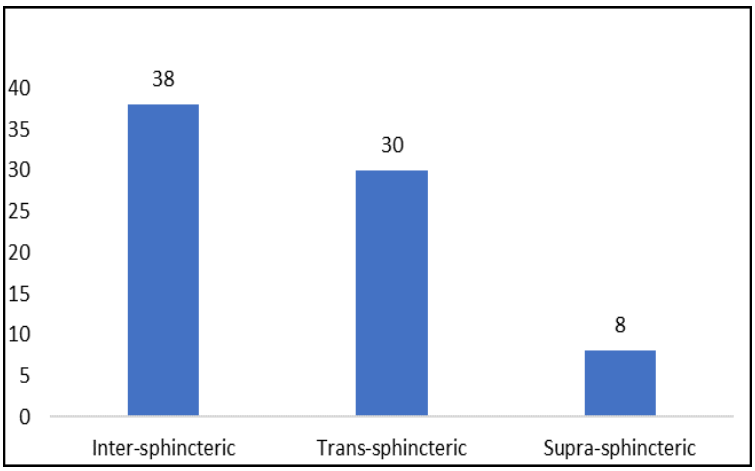

Fig. 5: Study of type of Fistula inpatient

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This study comprehensively analyzed magnetic resonance imaging (MRI) sequences in perianal fistula patients to discern the anatomical characteristics and variations in their presentation. The Axial T1 sequence demonstrated normal findings in 50 patients and abnormalities in 26 patients, constituting the complete cohort of 76 individuals. These findings, relative to the total patient count, provide valuable insights into the prevalence of abnormal findings in specific MRI sequences, aiding in the characterization and understanding of perianal fistulas. The study of Gadolinium Contrast Utilization in perianal fistula patient (Table 1).

Table 1: MRI Sequences Analysis of perianal fistula patients

	Normal (N)	Abnormal (N)	Total (N/%)
Axial T1	50	26	76
Axial T2	43	33	76
Axial STIR	47	29	76
Coronal T1	32	44	76
Coronal STIR	37	39	76
Sagittal T2	28	48	76
Sagittal STIR	35	41	76
Post-contrast T1 W FS	39	37	76

This study examined the utilization of gadolinium contrast in the imaging assessment of perianal fistula patients, aiming to discern the frequency of contrast administration within the patient cohort. The results demonstrated that gadolinium contrast was utilized in 31.58% of the cases (24 patients), while the remaining 68.42% (52 patients) did not receive gadolinium contrast during the imaging evaluation. This nuanced understanding of gadolinium contrast utilization contributes to refining imaging strategies (Fig. 6).

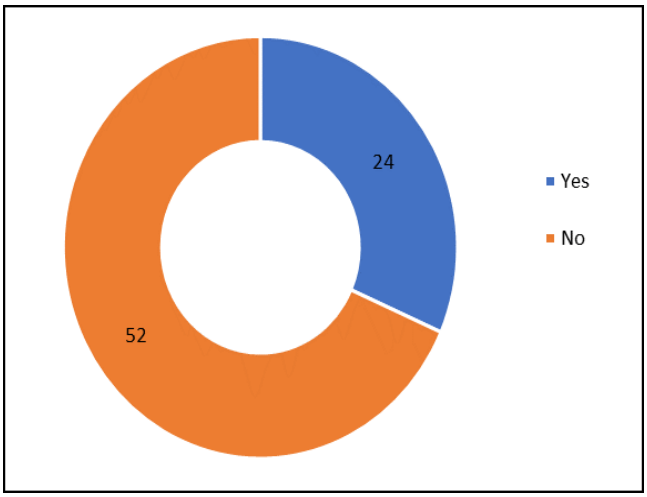

Fig. 6: Study of Gadolinium Contrast Utilization in perianal fistula patients

DISCUSSION

This comprehensive study aimed to provide a detailed analysis of various aspects of perianal fistulas, including demographic distribution, clinical symptoms, comorbiditi es, type of fistulas, MRI sequences, and gadolinium contrast utilization. The findings contribute valuable insights into perianal fistula patients' epidemiology, clinical presentation, and diagnostic approaches.

Anal fistulas cause significant morbidity, severely reducing the quality of life.[14] According to George *et al.* most perianal fistulas, approximately 90%, are nonspecific and result from infections of the anal glands.[15]

The age and gender distribution analysis revealed that individuals aged 31-40 years were most affected, comprising 38.15% of the total study population. This

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finding aligns with existing literature suggesting a preference for perianal fistulas in the third and fourth decades of life.[16] In the present study, gender distribution revealed a higher prevalence in males, with 47 males (61.84%) and 29 females (38.16%), suggesting a potential gender-based susceptibility. This aligns with Fahmy *et al.* who found that perianal fistulas are more common in young males, with a male-to-female ratio of 2:1, and 70% of patients were male.[17]

Perianal discharge was the most prevalent complaint at 42.11%, followed by perianal discomfort (34.21%) and perianal itching (23.68%). This highlights the diversity of symptomatology, emphasizing the need for a comprehensive clinical assessment to address the varied manifestations of perianal fistulas.

A substantial portion of perianal fistula patients presented with comorbidities, with 100% having diabetes mellitus, hypertension, dyslipidemia, coronary artery disease, chronic kidney disease, end-stage renal disease, and peripheral vascular disease also prevalent.

The anatomical classification of perianal fistulas based on type revealed that inter-sphincteric fistulas were the most common (50%), followed by trans-sphincteric (39.47%) and supra-sphincteric (10.53%) types. This classification provides valuable insights for tailoring surgical approaches and interventions according to the specific anatomical characteristics of the fistula. An identical study by Patil *et al.* stated that MRI is very useful when monitoring the healing of a perianal fistula.[17]

The detailed analysis of MRI sequences demonstrated variations in normal and abnormal findings across different imaging sequences. The Axial T1 sequence, primarily sensitive to tissue characteristics, revealed normal findings in 65.79% of cases, while the Axial T2 sequence, sensitive to fluid content, demonstrated normal findings in 56.58% of cases. The Short Tau Inversion Recovery (STIR) sequences, designed to highlight edema and inflammation, showed a predominant prevalence of normal findings (61.84% for Axial STIR and 48.68% for Coronal STIR. The Coronal T1 sequence, emphasizing tissue characteristics from a different perspective, exhibited a higher prevalence of abnormal findings (57.89%). The Sagittal T2 sequence, exploring a different orientation, unveiled a greater prevalence of abnormal findings (63.16%). The post-contrast T1 Weighted Fat Saturation sequence, which enhances certain tissue features, demonstrated a balanced distribution between normal and abnormal findings. These findings collectively emphasize the diverse nature of perianal fistula presentations, underscoring the need for a comprehensive multi-sequence MRI approach to capture the complexity of anatomical features. The study by Halligan *et al.* found that MRI is highly sensitive in detecting all types of perianal fistulas.[18] MRI has been shown to outperform other imaging modalities in assessing disease extent, with sensitivities and specificities for detecting fistulas and abscesses exceeding 90%.

The utilization of gadolinium contrast in imaging studies was explored, with 31.58% of patients receiving contrast and 68.42% undergoing imaging without contrast administration. The decision to administer gadolinium likely hinges on clinical indications, such as the need for enhanced visualization of certain tissues or suspected complications. The relatively lower percentage of gadolinium contrast utilization may underscore the efficacy of non-contrast MRI sequences in providing sufficient information for perianal fistula assessment. However, for cases where gadolinium was employed, the enhanced contrast may have facilitated a more detailed evaluation of specific features, potentially aiding in identifying complex anatomical structures or complications. The management of idiopathic (non-specific) perianal fistulas primarily involves a surgical intervention to remove the primary tract and drain all associated infection sites while aiming to preserve anal continence.[19]

Understanding the demographic patterns, clinical symptoms, comorbidities, and anatomical characteristics can aid healthcare professionals in interventions, optimizing diagnostic strategies, and implementing holistic care approaches. The study's emphasis on imaging techniques, including detailed MRI sequences and gadolinium contrast utilization, informs the diagnostic armamentarium, allowing for a more nuanced evaluation of perianal fistulas [20].

CONCLUSIONS

This study provides a comprehensive understanding of perianal fistulas, delving into epidemiology, clinical presentation, comorbidities, anatomical characteristics, and imaging features. The prevalence of diabetes underscores systemic impacts, emphasizing holistic

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patient management. A crucial preoperative assessment, including an MRI fistulogram, is vital for effective treatment planning and complication prevention. Fistulotomy emerges as the preferred therapeutic approach, especially for trans-sphincteric fistulas or indications of infection. These findings enhance diagnostic and therapeutic strategies, emphasizing individualized care. Valuable insights into demographic patterns, clinical symptoms, comorbidities, anatomical variations, and imaging characteristics offer a vital resource for healthcare professionals managing perianal fistulas.

CONTRIBUTION OF AUTHORS

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Materials- Dr Sujit Kandagatla
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Critical review- Dr Sushant Bhadane
Article editing- Dr Sujit Kandagatla
Final approval- Dr Sushant Bhadane

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