ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 5, 2024

ROLE OF MAGNETIC RESONANCE IMAGING IN THE PREOPERATIVE EVALUATION OF PERIANAL FISTULA

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Abstract

Introduction: This study investigates the magnetic resonance imaging (MRI) characteristics of perianal fistulae, focusing on the preoperative MRI's clinical value and its implications for surgical planning. **Materials and methods:** The descriptive cross-sectional analysis included 50 patients, selected via convenience sampling, regardless of age or sex. Data collection utilized a structured proforma to capture socio-demographic details, clinical diagnosis, and MRI findings, including characteristics such as external and internal openings, track length, presence of abscesses, and classification based on St. James University Hospital grading. Data analysis was performed using SPSS software. **Results:** The participant's mean age was 45±12.9 years, ranging from 22 to 67 years, predominantly male (80%). MRI evaluations revealed 84% with a single external opening and 70% with a single internal opening. A minority displayed complex features, such as horseshoe ramifications (2%) or multiple secondary tracts (14%). Notably, 62% had no abscesses. According to the St. James University Hospital classification, 36% were classified as type 1 and 18% as type 2. Most internal and external openings were found at the 6 o'clock position (24%), with minimal supralevator extension detected (96%). **Conclusion:** MRI is invaluable for the comprehensive evaluation of perianal fistulae, offering detailed insights into the infection's extent and the fistula-anal sphincter complex relationship. This facilitates optimal surgical planning, reducing the risk of recurrence and promoting better patient outcomes.

Keywords: Perianal Fistula, Magnetic Resonance Imaging, Surgical Planning, Anal Sphincter, Fistula Classification.

Introduction

Fistulas, particularly those connecting the anal canal and the perineum skin in an abnormal manner, represent a significant clinical challenge due to their complex connections with surrounding anatomical structures. Anorectal fistulas, which can be categorized based on their relationship to the sphincteric muscles into intersphincteric, transsphincteric, extrasphincteric, and suprasphincteric types, underscore the necessity for an in-depth understanding of anorectal anatomy for effective diagnosis and management[1]. The etiology of these conditions is predominantly traced to the cryptoglandular hypothesis, which suggests

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 5, 2024

that impaired drainage of the anal glands leads to the development of perianal fistulas in approximately ninety percent of cases.

Despite being a non-malignant condition, anorectal fistulas impose a substantial burden on patients, presenting a constellation of symptoms that significantly impair quality of life. Moreover, the treatment of these fistulas poses a considerable challenge to clinicians, particularly due to their proximity to the anal sphincter complex. Traditional surgical approaches, such as incision and drainage, carry the risk of sphincter damage, potentially leading to anal incontinence. This risk highlights the importance of a meticulous preoperative assessment to map the fistula tract accurately, including the identification of internal openings, primary tracks, and any secondary extensions. Such an evaluation is crucial to balance the goals of infection eradication and continence preservation effectively.

Initial diagnosis of anorectal fistulas is often achievable through clinical examination, including the use of a proctoscope, adequate lighting, and digital rectal examination. However, achieving a definitive cure remains a formidable challenge for two primary reasons. Firstly, the disease's propensity for recurrence is partly due to its anatomical location. Secondly, the risk of recurrence or persistent disease is exacerbated by surgical mismanagement, inadequate postoperative care, or the oversight of tract extensions during the surgical intervention.

In recent years, the role of imaging in the assessment of perianal fistulas has evolved significantly. Previously considered of limited utility, advanced imaging techniques, especially Magnetic Resonance Imaging (MRI), have now been recognized for their potential to profoundly impact the management of these conditions[2]. MRI is particularly valued for its ability to delineate the intricate anatomy of the perianal region, identify abscesses, and trace diseased tracks that may not be apparent through clinical examination alone. Moreover, MRI provides clear visualization of the relationship between fistulae, the pelvic diaphragm, and the ischiorectal fossae, offering valuable insights into the surgical planning and anticipated outcomes[3-5]. Given the complexity of anorectal fistulas and the limitations of conventional diagnostic and therapeutic approaches, identifying the most common etiologies and optimizing treatment strategies are of paramount importance. In the contemporary clinical landscape, where efficiency and precision are crucial, the integration of MRI in the preoperative assessment of fistulas represents a significant advancement. By facilitating the identification of potential pathways and extensions, MRI plays a critical role in guiding surgical interventions, minimizing the risk of recurrence, and improving patient outcomes.

This study aims to elucidate the role of MRI in the diagnosis and classification of anorectal fistulas, highlighting its utility in enhancing the preoperative evaluation process. By examining the additional clinical value provided by MRI, we seek to underscore its benefits to surgeons in planning and executing treatment strategies for anorectal fistulas, thereby contributing to improved surgical outcomes and patient care.

Materials and Methods

The investigation was carried out at the Department of Radiodiagnosis, Sree Mookambika Institute of Medical Sciences, Kulasekharam, Tamil Nadu, spanning from October 2020 through May 2022, totaling approximately 18 months, by employing a comparative cross-sectional approach, this study comprised 50 individuals of various ages and genders. Individuals were selected from those referred to the radiology department for an

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 5, 2024

MR fistulogram, under the suspicion of perianal fistula. Inclusion was based on clinical indications for an MR fistulogram and adherence to the study's criteria.

Inclusion and Exclusion Criteria: The clinical indications for MR imaging of suspected perianal fistulas were included in the study. Patients with prior anorectal surgical history, presence of incompatible implanted devices (e.g., pacemakers, specific cerebral aneurysm clips), patients with an inability to receive intravenous contrast due to renal impairment, and patients with severe claustrophobia or non-cooperation were excluded from the study.

Data Collection Instruments and Procedures: Convenience sampling was utilized, including consenting participants who met the inclusion criteria. Data were collected using a meticulously structured proforma, capturing socio-demographic details, external and internal openings, track length, contrast enhancement, presence of abscess, and the St. James University Hospital Classification grading. This information was gathered through a structured questionnaire, detailed histories, clinical examinations, and MR fistulography using a 1.5T Siemens ESSENZA 16 channel system equipped with a 6-channel phased-array surface coil.

Study Protocol: Following the Institutional Research and Human Ethical Committee's approval, participants were thoroughly informed about the procedure before obtaining their consent. MR fistulography was then conducted, followed by an assessment and characterization of perianal fistulas.

Study Parameters and Techniques: Anal fistulas were MRI graded and characterized using a 1.5T Siemens ESSENZA system. The classification was based on the St. James's University Hospital system, ranging from Grade 1 (simple linear intersphincteric fistulas) to Grade 5 (supralevator and translevator disease).

Statistical Analysis: Data were digitized using Microsoft Office Excel 2019 and analyzed via SPSS 26.0 version, IBM Corp, Chicago, Illinois, USA. Prior to analysis, data underwent a cleaning process to identify and correct any discrepancies. Continuous variables were presented as mean ± standard deviation, while categorical data were described as frequencies and proportions. Fisher's exact test and the Chi-square test were applied to binary and categorical variables, respectively, determining statistical significance at a p-value of <0.05 with a 95% confidence interval.

Results

We evaluated the clinical and MRI findings of 50 patients diagnosed with anal fistula, encompassing a diverse range of age groups, genders, and anatomical manifestations of the condition. The demographic distribution revealed a predominance of males (80%, n=40) over females (20%, n=10), with the age of participants varying widely from 22 to 67 years. The mean age was calculated at 45 ± 12.9 years, highlighting a significant representation in the 46-55 age group (26%, n=13).

MRI evaluations played a crucial role in identifying the complexity and specifics of the anal fistulas. A striking 84% (n=42) of cases exhibited a single external opening, whereas the internal opening distribution was more varied. Approximately 70% (n=35) of patients had a single internal opening, with a minority exhibiting no (16%, n=8) or multiple internal openings (14%, n=7). This distribution underscores the heterogeneity in fistula anatomy and potentially influences the choice of surgical technique and prognosis.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 5, 2024

The presence of secondary tracts and horse shoe shaped ramifications further complicates the clinical scenario. Our study found that a small fraction (14%, n=7) of the cases had two secondary tracts, highlighting the complexity of some anal fistulas which may require more extensive surgical intervention. Interestingly, horse shoe shaped ramification was exceedingly rare, identified in only one case (2%), suggesting that while uncommon, its identification is crucial for guiding surgical planning to avoid recurrence.

The investigation into abscess presence revealed that a majority of the participants (62%, n=31) did not have an abscess, which might be indicative of either the timing of the MRI in the disease course or effective preliminary management of the abscesses before definitive fistula treatment. Evaluation based on the St. James grading system showed a distribution across the spectrum, with Grade I being the most prevalent (36%, n=18), followed by Grades IV (16%, n=8) and II (18%, n=9). This grading provides insight into the severity and potential complexity of managing these cases, with a significant portion presenting with characteristics that might complicate surgical intervention and healing.

Incidental findings on MRI, though not the primary focus of our study, shed light on the diversity of perianal pathology that can coexist with anal fistulas. Notably, 82% (n=41) of patients had no incidental findings, which may reflect the focused nature of MRI evaluation in this context. However, the presence of conditions such as epidermoid cysts, pilonidal sinus, and subcutaneous collections in a minority of cases underscores the need for comprehensive evaluation and management strategies that address all aspects of perianal disease.

The anatomical orientation of the fistulas, as delineated by the internal and external opening clock positions, provides essential information for surgical planning. The most common internal opening was at the 6 O'clock position (24%, n=12), followed by the 12 O'clock position (18%, n=9), indicating a predilection for these anatomical sites. Similar analysis of external openings revealed a preference for the 6 O'clock (24%, n=12) and 7 O'clock (16%, n=8) positions, further emphasizing the potential patterns in fistula formation and implications for surgical access and repair. The evaluation of supralevator extension, a critical factor in determining the approach and complexity of surgery, revealed that a vast majority (96%, n=48) of the fistulas did not exhibit this feature, potentially indicating a lesser degree of complexity in the majority of cases under study.

Discussion

The advent and evolution of radiological assessments for perirectal fistulae have marked significant strides in the diagnostic landscape, previously dominated by surgical examination under anesthesia (EUA). The reliance on probing the fistulous channel with a probe under general anesthesia has gradually given way to a multifaceted radiological evaluation approach. This shift underscores the limitations of historical diagnostic modalities, including the oldest radiographic technique, fistulography, which often resulted in ambiguous interpretations due to its inadequate representation of the fistulous system's anatomical complexities[6,7].

Computed Tomography (CT), despite its capacity to detect fistulous channels by introducing non-ionic water-soluble contrast material, falls short of providing a comprehensive examination of the fistulous system's main and subsidiary branches. This gap has been partially bridged by the advent of multidetector CT fistulography, which leverages

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 5, 2024

isotropic voxels and multiplanar imaging to enhance visualization. Nonetheless, the potential of this modality remains underexplored in the academic realm[7]. Magnetic Resonance Imaging (MRI) and Endorectal Ultrasonography (EUS) have emerged as the preferred methodologies for perirectal fistula evaluation, given their superior anatomical delineation capabilities. The pioneering work of Lunnis et al., spanning from 1992 to 1994, laid the groundwork for the precision of MRI in diagnosing and classifying perianal fistulae, demonstrating a significant concordance rate between MRI findings and surgical outcomes (86–88%)[8,9]. Despite EUS's exceptional spatial resolution, attributable to the probe's proximity to the rectal wall (10 MHZ), its invasive nature poses discomfort, rendering MRI a more favorable option for patients, particularly in visualizing intersphincteric abscesses and enhancing patient comfort[10].

The comparative studies by Hussain et al. and Spencer further validate the superior accuracy of MRI over EUS in fistula classification and detection, underscoring MRI's pivotal role in preoperative evaluation[11-13]. Yee et al.'s investigation, highlighting the limitations of native endoscopic ultrasound in detecting rectovaginal fistulae, reinforces the necessity for integrating advanced imaging techniques[14]. Algazzar et al.'s findings articulate the efficacy of MRI, particularly Diffusion-Weighted MRI (DW-MRI) combined with Short Tau Inversion Recovery (STIR) Weighted Imaging, in enhancing the diagnostic sensitivity and specificity for fistula activity and propagation[15]. The clinical implications of these advancements are profound, facilitating a more nuanced understanding of fistula anatomy, which is pivotal for surgical planning and minimizing recurrence risks.

Our analysis further delineates the anatomical characteristics of perirectal fistulae, revealing a predominance of single external openings and a notable variation in the internal openings' presentation, including rare instances of horseshoe-shaped ramifications and secondary tracts[16,17]. The classification of fistulae based on MRI findings, corroborated by surgical evidence, underscores the utility of MRI in the precise localization of internal openings and the assessment of complex fistulous systems, thereby influencing surgical strategy and outcomes[18]. The consistency of our findings with those of Mohamed et al., particularly in identifying the most frequent type of ano-rectal fistula and the prevalent location of internal openings, validates the instrumental role of MRI in pre-surgical evaluation. The integration of coronal and axial planes enhances the congruency between surgical and MRI findings, thereby optimizing treatment approaches[19].

Our study's comparative analysis with earlier works, such as those by Buchanan et al., reveals a shift in the prevalence of fistula types within our unique cohort of patients who underwent preoperative MRI[20]. This deviation underscores the critical role of MRI in the diagnostic process, offering insights into the primary tract's nature and aiding in the accurate classification of fistulae, which is paramount for determining the appropriate surgical intervention. Schwartz et al.'s recommendation for a combined diagnostic approach for patients with Crohn's disease highlights the complementary nature of EUS, EUA, and MRI in enhancing diagnostic accuracy and treatment efficacy[21]. The emphasis on precise appraisal of the position of internal apertures, facilitated by MRI, is critical for surgical success, illustrating the modality's capability to discern the intricate details of the fistulous system and its implications for therapeutic decision-making[22,23].

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 5, 2024

Conclusion

Magnetic Resonance Imaging (MRI) has markedly transformed the preoperative evaluation of perianal fistulas, especially in specialized centers. Utilizing the St James's University Hospital classification, which correlates MRI findings with long-term clinical outcomes and surgical insights, this imaging modality delineates the extent of disease involvement. Simple fistulas, confined to the sphincter complex and classified as grade 1 or 2, suggest a favorable prognosis with straightforward surgical interventions. Conversely, complex fistulas, extending into the ischiorectal fossa (grades 3 or 4), or translevator fistulas (grade 5) indicate more severe disease, potentially requiring advanced surgical techniques that may compromise continence or necessitate fecal diversion for healing. The precision of MRI in mapping the anatomy of the perianal region, including the anal-sphincter mechanism, fistula tracts, and their relationship to the pelvic diaphragm, is critical. This detailed anatomic understanding enables tailored surgical strategies, significantly reducing disease recurrence by accurately identifying infected tracks and abscesses.

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ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 5, 2024

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