e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2023; 13 (6); 82-89

Original Research Article

To Compare the Efficacy of Fistulogram and Pre-Op MRI in the Evaluation of Anal Fistula and Compare it to the Per-Op (Intra Operative) Findings

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Received: 18-04-2023 / Revised: 14-05-2023 / Accepted: 15-06-2023
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Conflict of interest: Nil

Abstract:

Background: An abnormal cavity or tract between the perianal skin and the anal canal is known as an anal fistula. In order to properly manage them and drain any abscess, surgical therapy of anal fistulas necessitates the identification of the primary and secondary tracts' courses and their relationships with the sphincter musculature. Physical examinations by themselves are less effective than imaging methods at identifying these fistula characteristics, and recurrences are typically brought on by neglected or improperly managed infectious components. The best imaging technique for finding anal fistulas is magnetic resonance imaging (MRI), although there is disagreement over which patient groups should get preoperative MRIs. In the preoperative evaluation process, magnetic resonance imaging is significant. MRI aids in the detection of secondary infections, fistulous tracks, and the connection between a fistula and the anal sphincteric complex.

Aim: The aim of the study is to compare the efficacy of a fistulogram and pre-op MRI in the evaluation of anal fistula and compare it to the per-op findings.

Material and Method: This hospital-based prospective observational study was carried out in the General Surgery Department. One hundred instances in all were used for this investigation. This study includes patients with anorectal fistulas who were referred to the Department of Radio Diagnosis. With the patients' fully informed agreement, an MR fistulogram was performed on them using a 1.5-Tesla equipment. Different MRI sequences were employed, including fat-suppressed oblique axial and coronal T1 and T2W FSE, contrast-enhanced oblique axial, coronal, and sagittal FAT SAT T1W FSE images, and oblique axial and coronal T1W FSE. Following written informed consent, MR imaging was used to assess the patients.

Results: A referral for an MRI fistulogram was made for 100 individuals in total. They underwent surgery as a result, and the results of the operation were compared to those of the preoperative MRI. 75 out of 100 patients (75%) had a single internal opening, whereas 15 patients (15%) had several openings. In 32 cases (32%), the internal hole was most frequently

detected at 6 o'clock. With regard to the location of the openings, the operative findings and the study were in good agreement.

Conclusion: Despite being a rare condition, anal fistula can be persistent and recurrent. Numerous complications, including secondary tracks and abscess cavities, may manifest. There may be persistent and recurrent disease as a result of an inadequate assessment of these problems. Therefore, a thorough assessment of anal fistulas prior to surgery is necessary. Additionally, the interaction between the external sphincter and the fistulous pathways must be established in order to prevent damage to the sphincter and the subsequent fecal incontinence. All of these needs of surgeons are met by MRI, which also aids in surgical planning. The fistula's finer anatomical characteristics are shown by MRI, which also shows secondary tracks and abscesses.

Keywords: Anal Fistula, Preoperative MRI, Fistulogram and Examination Under Anesthesia tuberculosis

Introduction

An improper connection between two structures, organs, or between an organ and the surface of the body is known as a fistula. [1] The anal canal and the skin of the perineum are connected in an irregular way in this instance. It occurs in roughly 0.01% of cases. Anal fistula is an uncommon but serious gastrointestinal disorder that causes high morbidity. It affects roughly 10 out of every 100,000 people, and the majority of those affected are men. Affected young guys are frequently. Good Sall and Parks provided the initial contributions to the work on anal fistulas. Perianal fistulas are also linked to inflammatory bowel disease and tuberculosis. The external entrance(s), internal opening, main tract, lateral burrowings from the main tract, and the presence of additional disorders exacerbating the fistula are anal fistula characteristics that should be observed during physical examination. [2] Abscess formation is common because cryptoglandular infection is the primary cause of fistula-in-ano. The secret to a successful course of treatment is proper manipulation, including curettage and drainage of accessory tracts, abscess chambers, and blind sinuses. Imaging methods serve a crucial complementary role in recognizing these fistula symptoms when a physical examination alone may not be sufficient. [3]

The aberrant connection between the anal canal and one or more external holes in the perianal skin is represented by the anal fistula. It significantly lowers the patients' quality of life by causing them discomfort and annoyance. Perianal fistulas occur between one and two times per 10,000 people on average, with men predominating by about 2:1 over women. The third and fourth decades of life are when the incidence is highest. [4,5]

Anal fistulas can be identified by fistulography, computed tomography (CT), endoanal ultrasonography (EUS), and magnetic resonance imaging (MRI). [6] Due to fistulography's extremely low diagnostic accuracies, it has not become more popular. [7] The main factors reducing the usefulness of CT in the evaluation of anal fistulas are low soft tissue contrast and the requirement to cannulate the fistula to raise the contrast. [8] The first reports of MRI usage in anal fistulas date back to the early 1990s. [9] In that initial report, the MRI revealed 87.5% surgical concordance. MRI can distinguish between soft tissues, spot tracts outside the anal canal, and show pictures that are consistent with the surgically important plane. [10,11] The Association of

Coloproctology of Great Britain and Ireland identified magnetic resonance imaging (MRI) as an imaging method with good sensitivity and specificity for the diagnosis of the primary fistula tract and advised using this method for imaging assessment of complex or recurrent fistulas. [12]

Based on the type of anal fistula and the degree of involvement of the surrounding pelvic structures, MR imaging aids in the design of appropriate treatment techniques. Due to induration and inflammation in these patients, clinical examinations are frequently challenging. Poor surgical results were independently correlated with prior fistula surgery, the complexity of the fistula tract, inability to detect internal apertures, misdiagnosed primary tracts, and missed secondary tracts. [13]

Because different types of fistulous tracts require different treatments, classification of fistulas is crucial. [14] Maintenance of continence can be difficult in cases of greater or more complex fistulas. The only effective treatment for perianal and anal fistulas is surgery, however there is a high likelihood of recurrence. The correct preoperative diagnosis of the original fistulous track's course and the existence of any secondary extensions or abscesses is essential for the surgical therapy of anal fistulas. [15]

Material and Methods

This hospital-based prospective observational study was carried out in the General Surgery Department. One hundred instances in all were used for this investigation. This study includes patients with anorectal fistulas who were referred to the Department of Radio Diagnosis. With the patients' fully informed agreement, an MR fistulogram was performed on them using a 1.5-Tesla equipment. Different MRI sequences were employed, including fat-suppressed oblique axial and coronal T1 and T2W FSE, contrast-enhanced oblique axial, coronal, and sagittal FAT SAT T1W FSE images, and oblique axial and coronal T1W FSE. Gadolinium DTPA at a rate of 1 ml/s was the contrast medium employed. Sagittal pictures were captured at an angle parallel to the anal canal's long axis. It is taken that the oblique axial plane is parallel to the sagittal plane. Included were the levator ani and perineum muscles. Oblique axial T1-weighted FSE, oblique axial, oblique coronal, and sagittal T2-weighted FSE were the sequences employed. Additionally, fat-suppressed T2 weighted sequences like STIR pictures were captured. Additionally, a 3D T1 weighted gadolinium-enhanced fat-suppressed FSE was taken. Following written informed consent, MR imaging was used to assess the patients.

MRI Technique

Four different MRI scanners were used to assess the patients: Symphony TIM, Siemens; Signa HDxt, GE Medical Systems; Achieved Stream, Phillips Healthcare; and Ingenia, Phillips Healthcare. Of these, three were 1.5 Tesla (T) MRI scanners, while the fourth was a 3 T MRI scanner. To obtain images, pelvic phased array coils were employed. Patients were scanned while lying down. There was no specific rectal or oral contrast agent preparation for the bowel. An overview of the pelvis indicating the size and axis of the anal canal was obtained by the sagittal fast spin-echo (FSE) T2-weighted sequence, which was used to begin the MRI evaluation. The images that were taken after the injection of 0.1 mmol/kg of a gadolinium-based contrast agent were oblique axial and coronal fat-suppressed T2-weighted images, as well as oblique axial and coronal fat-suppressed T1-weighted images. With the right multiplanar prescription, axial and coronal oblique pictures of the anal canal were obtained, and these images were then perfectly aligned with the axis of the anal canal. Since these anatomical sites may also be impacted by the anal fistula's clinical history, the field of view of the magnetic

resonance scans comprised the levator ani muscles and supralevator planes.

MRI Assessment

Siemens Medical System's Magnetom Harmony 1.0 T unit system, equipped with a phased array coil, was used to do MR imaging. During image acquisition, the patients were laid out supine. The distal rectum, subcutaneous tissue, anal canal, sphincter muscles, ischiorectal fossa, levator muscle, and supralevator space were all expected to be included in the imaging volume. Multiplanar T1-weighted, T2-weighted, T2 Fat Saturated, and STIR (short tau inversion recovery) sequences were used for imaging. When compared to the sphincter complex in the anal and perianal region on T1W imaging, fistulas emerge as hypointense linear or curved tracts with high signal intensity on T2 fat suppressed/STIR images. In cases where an abscess was detected on non-contrast images, contrast-enhanced T1 fat-suppressed sequences were carried out. Internal anal aperture, tract course, and position (inter- or trans-sphincteric) were documented, as well as any subsidiary tracts or ramifications or abscess cavities along the tract, if any. A horseshoe fistula is one that crosses the midline and extends to the other side. Using the "anal clock," which places the anterior perineum at 12 o'clock, the natal cleft at 6, the left lateral aspect of the anal canal at 3 o'clock, and the right lateral aspect at 9 o'clock, it was possible to locate the internal opening on axial images.

Statistical Analysis

The sensitivity, specificity, positive predictive value, and negative predictive value of MRI in detecting internal openings were calculated. Cohen's Kappa coefficient was used to analyze the agreement between MRI and surgical findings based on the severity of perianal fistulas and the conditions associated with it. The diagnostic standard of reference was the operative findings.

Result: -

A total of 100 patients were referred for an MRI fistulogram They were followed up with surgery and the operative findings were correlated with the preoperative MRI findings.

Table1: Show the Age and Sex Distribution

Age (In Yrs.)	No of Patients	Percentage
<30	14	14%
31-40	35	35%
41-50	25	25%
51-60	16	16%
>60	10	10%
Sex	**No of Patients**	**Percentage**
Male	69	69%
Female	31	31%

Of the total 100 patients included in the study, 69 patients were males (69%). And 31 patients were females (31%). The age group of the patients included in the study ranged from 20 to 70 years. There were 14 patients below 30 years (14%). There were 35 patients in the age group of 31- 40 years (35%). There were 25 patients in the age group of 41- 50 years (25%). There were 16 patients in the age group of 51- 60 years (16%). There were 10 patients aged more than 60 years (10%).

Table2: Show the types of Internal Opening and their position

Internal Opening	No of Patients	Percentage
Single	75	75%
Multiple	15	15%
Others	10	10%
Single Internal Opening (N=75)		
Clock Position	**No. of Patient**	**Percentage**
1°-3°	20	26.67%
4°-6°	32	42.67%
7°-9°	15	20.00%
10°-12°	8	10.67%

When analyzing the internal opening, it was single in 75% of patients (75 out of 100) and multiple in about 15 patients (15%). Most commonly, the internal opening was found in a 4°-6° clock position in 32 patients (42.67%). The operative findings were well correlating with the study with regard to the site of the openings.

Table3: Show the Secondary Track

Secondary Track	No of Patients Based on MRI Findings	No of Patients Based on Surgical Findings
Present	17	20
Absent	33	30

In our study, 17 out of 100 patients had secondary tracts. identification of all these tracts is essential for the complete eradication of the disease. As already known, active fistulous tracts enhance well with gadolinium contrast.

Table4: Show the Abscesses and Their different Types

Abscesses	No patients based on MRI	Percentage
Present	31	31%
Absent	69	69%
Type of Abscess	**No of Patients**	**Percentage**
Horse Shoe Abscess	12	38.71%
Simple Abscess	15	48.39%
Abscess In IRF	4	12.90%

In our study, abscesses were identified in 31 out of 100 patients (31%). Among them, 15 patients had simple abscesses (48.39%), and 12 patients had horseshoe abscesses (38.71%). four patients had abscesses in the ischiorectal fossa. The contrast study revealed that all 31 patients showed contrast enhancement that helped in demonstrating the extent of the abscess. There was a significant correlation between the fistulous tracts identified on MRI and the surgical findings. A fistulotomy is the preferred method of management.

Discussion

In order to correctly manage the anal fistula and drain any existing abscess, surgical management of anal fistulas necessitates identification of the course of the primary and secondary tracts and their relationship with the sphincteric musculature. Physical examination alone might not be sufficient to distinguish between these characteristics, and recurrence is frequently caused by missing infective foci during the initial surgery. [16] The best imaging method for defining anal canal anatomy and anal fistulas is MRI. [17] Even for highly trained colorectal surgeons and radiologists,

diagnosing patients with fistula-in-ano is difficult. Due to induration and inflammation in patients with anal sepsis, clinical examinations can frequently be challenging.

The inter-sphincteric form of fistula predominated among the 100 patients in the study group, followed by the trans-sphincteric type. This was correlated with the results of the study done by **Parks et al.1976 [**18] who also reported the inter-sphincteric type of fistula to be the commonest in their study. The results were also consistent with the study done by **Morris et al.2000 [**19] who in their study mentioned that about 70% of all perianal fistulas were inter-sphincteric fistulas, while trans-sphincteric fistulas constituted 20% of the total.

In our study, 31 out of 60 individuals had abscesses found. There were 12 individuals with a horseshoe abscess and 15 patients with a simple abscess. An abscess in the ischiorectal fossa affected four patients. It is therefore possible to draw the conclusion that a contrast examination is essential required for evaluating the difficulties brought on by perianal fistulas. This is superior to the result given by **Maier et al. 2001 [**20] in a study that showed an 84% sensitivity of MRI for the identification of perianal fistulas and abscesses. In our analysis, the 15% false positive results from his study were deleted. The use of contrast-enhanced imaging may be responsible for the more favorable outcomes of our investigation. Consequently, even when there is no abscess or collection visible in the pre-contrast pictures, contrast-enhanced imaging should be regularly included in MRI protocols of anal fistula assessment. This was in correlation with the study done by **M.E. Agha et al.2013 [**21].

Garg et al.2017 [22] in a study evaluating MRI contribution to surgical management in 229 patients reported that MRI added significant information in patients with additional tracts, horseshoe tracts, supra levator extension, unsuspected abscesses, and multiple internal openings. Using these parameters, they concluded that MRI added significant information to 46.7% of the surgeries. In an article by **Beets-Tan et al.2001 [**23], when the researchers delivered MRI results to the surgeon just before his decision to conclude the surgery, the surgeon decided to continue the surgery in 21% (12/56) of the patients based on information obtained from the MRI.

Sangwan et al.1994 [24] proved that the recurrence rate in patients after surgery due to a simple perianal fistula was about 6.5%. Failure to locate the internal fistula opening was typically the cause of therapy failure, according to the authors. Other factors included the presence of a horseshoe fistula, additional canals not detected during inspections, erroneous assessment of the fistulous tract's course, and early wound closure during fistulotomy. A relatively smaller study of 40 patients by **Mullen et al.2011 [**25] has shown that in cases where it was able to correctly identify the anatomical detail of the fistula, establish the need for extended surgery, correlate with EUS(Examination Under Anesthesia) or rule out a suspected fistula, MRI positively contributed to the surgical management of the patient. They concluded that such a positive contribution of MRI could be as high as 85% if used in selected cases. The positive contribution of MRI to clinical assessment has also been shown in studies by **Chapple et al.2000 [**26] and **Spencer et al.1998 [**27], which demonstrated that compared with initial surgical exploration, MRI findings were a better predictor of both satisfactory surgery and the need for re-operation.

In another study by **Beets-Tan et al.2001 [**23], who compared the results of MRI with that intraoperative finding, the sensitivity and specificity were 100% and 86% respectively. For a horseshoe fistula sensitivity and specificity were 100% and 100% and for internal openings, 96% and 90% respectively. For the surgical therapy of anal fistulas, a preoperative physical

examination and surgical exploration are combined with preoperative MRI findings. For the first time in the literature, we evaluated and presented evidence of the enhanced utility of MRI for fistulas with external openings more than 2 cm away from the anal canal. Additionally, we discovered other advantageous MRI indications, such as complex and higher-grade fistulas. In cases of recurrence, MRI helps by establishing the architecture of the fistula as well as by seeing any potential sphincter damage. So, when anal fistulas are recurring, complex, high grade, or when the external opening is more than 2 cm from the anal canal, we recommend include MRI in the preoperative surgical assessment of the anal fistulas.

Extra-fine subtraction A novel diagnostic method for finding anal fistulas, MRI-Fistulography appears to be a significant addition to surgical exploration. It is well tolerated by patients and has a good acceptance rate among surgeons and gastroenterologists.

Conclusion:

Despite being a rare condition, anal fistula can be persistent and recurrent. Numerous complications, including secondary tracks and abscess cavities, may manifest. There may be persistent and recurrent disease as a result of an inadequate assessment of these problems. Therefore, a thorough assessment of anal fistulas prior to surgery is necessary. Additionally, the interaction between the external sphincter and the fistulous pathways must be established in order to prevent damage to the sphincter and the subsequent fecal incontinence. All of these needs of surgeons are met by MRI, which also aids in surgical planning. The fistula's finer anatomical characteristics are shown by MRI, which also shows secondary tracks and abscesses. A contrast-enhanced MRI can detect active track inflammation. Additionally, it can tell scar tissue from granulation tissue. The most effective and efficient sequence for imaging anal fistulas is 3D T1 FAT SAT. For the best surgical results, accurate anal fistula identification and fistula grading are essential.

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