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Original Article

Role of Magnetic Resonance Imaging in Evaluation of Perianal Fistula

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Abstract

Introduction: Perianal fistula is an abnormal infected tract that connects the internal opening in the anal canal to the external opening in the perianal skin. It is an important cause of significant patient morbidity related to the lower intestinal tract. Magnetic resonance imaging (MRI) is the imaging modality of choice in the pre-operative assessment of perianal fistulas due to its excellent soft tissue resolution to accurately demonstrate the anatomy of the perianal region and the relationship of the fistulous tracts to the pelvic diaphragm and the ischiorectal fossae.

Aims and Objectives: This study aims to assess the role of MRI in evaluation of perianal fistula and to correlate the imaging findings with post-surgical data.

Materials and Methods: In this prospective study, 50 patients of all age groups with perianal fistulas were evaluated by MRI in the Department of Radiodiagnosis, Gandhi Medical College and Hamidia Hospital over a period of 1 year. MRI was performed on 1.5 Tesla Hitachi ECHELON SMART - 523 MRI machine using the required protocol and sequences. Fistulas were classified according to St James's University Hospital MRI classification system and imaging findings were compared with post-surgical data.

Results: MRI could detect the presence of fistula in all 50 patients, indicating 100% sensitivity. Most patients (68%) had internal opening on the posterior aspect of anal canal. Active fistulous tract was seen in 43 patients (86%) and chronic fibrosed tracts in 7 patients (14%). The most common type according to MRI grading was Grade I (54%), followed by Grade II (30%), Grade III (8%), and Grade IV (6%), respectively. MRI correctly described the type of fistula in 96% of cases.

Conclusion: This study concludes that MRI proved as a valuable imaging modality in evaluation of perianal fistula and should always be performed in patients before surgery.

Key words: Grading, Magnetic resonance imaging, Perianal fistula

INTRODUCTION

Perianal fistula is an abnormal infected tract that is lined with granulation tissue and connects the internal opening in the anal canal to the external opening in the perianal skin. It is an important cause of significant patient morbidity related to the lower intestinal tract.

Perianal fistulas are suspected to arise from infected anal glands that open into the anal crypts, as proposed by cryptoglandular hypothesis.[1] Risk factors include Crohn's disease, tuberculosis, and trauma during childbirth, pelvic malignancy, and radiation therapy.

Anal canal consists of internal and external sphincters to control the anal tone. The internal sphincter is involuntary and consists of smooth muscle. The external sphincter is voluntary and is composed of striated muscle. It is continuous with the puborectalis and levator ani muscles superiorly.

Imaging has an important role in the pre-operative assessment of perianal fistulas; various imaging modalities include conventional fistulography, computed tomography, endoanal ultrasound, and magnetic resonance imaging (MRI). MRI is the imaging modality of choice due to its excellent soft tissue resolution to accurately demonstrate the anatomy of the perianal region and the relationship of the

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fistulous tracts to the pelvic diaphragm and the ischiorectal fossae [Figure 1]. Site and direction of the fistulous tracts are illustrated by "the anal clock." When the patient is in lithotomy position, 12 o'clock is the anterior perineum, at 6 o'clock is the natal cleft, 3 o'clock refers to the left lateral aspect, and 9 o'clock to the right lateral aspect of the anal canal, which exactly corresponds to the axial MR images.

The purpose of our study was to assess the role of MRI in various types of perianal fistulas and compare the imaging findings with post-surgical data.

MATERIALS AND METHODS

This prospective study of 50 patients was conducted in the Department of Radiodiagnosis in collaboration with the Department of Surgery, Gandhi Medical College and Hamidia Hospital, Bhopal. The study was undertaken over a period of 1 year after taking written informed consent and brief history from all patients.

Inclusion Criteria

The following criteria were included in the study:

1. Patients presenting with perianal discharge
2. Patients of all age groups and both sexes.

Exclusion Criteria

The following criteria were excluded from the study:

1. Patients with contraindication for MRI such as metallic implants, cardiac pacemakers, aneurysmal clips, and cochlear implants
2. Patients with claustrophobia and who refused to give consent.

All patients were clinically examined and MRI pelvis with perineal region was performed on 1.5 Tesla MRI Hitachi ECHELON SMART - 523 machine with the help of dedicated surface coil. Patients were asked to lie in a supine position and scanned using MRI fistulogram protocol. Since the anal canal is tilted obliquely forwards, the field of view and scan extent were defined using a sagittal T2W single-shot image with the centerline along with the anal canal. The sequences obtained were T2W fat suppression

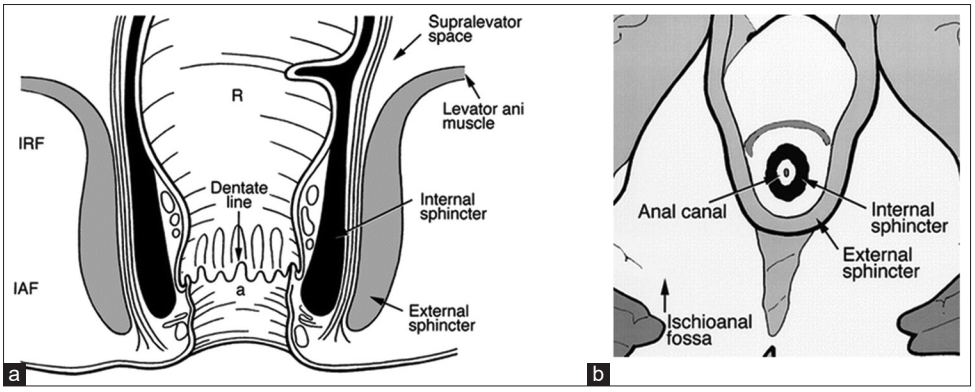

Figure 1: Schematic diagram in coronal (a) and axial plane (b) showing the anatomy of perianal region. a=anal canal, IAF=ischioanal fossa, IRF=ischiorectal fossa, R=rectum. (Source of image[1]=Reference no. 1, p. 3, Figure 2 and 3)

Table 1: Age distribution

Age groups (in years)	Number of cases	Percentage
1–10	1	2
11–20	4	8
21–30	11	22
31–40	18	36
41–50	9	18
51–60	6	12
61–70	1	2

Table 2: Gender distribution in patients with perianal fistula

Gender	Number of patients	Percentage
Male	37	74
Female	13	26

Table 3: Distribution of patients as per MRI grading of perianal fistula

MRI grade	Number of patients	Percentage
I	27	54
II	15	30
III	4	8
IV	3	6
V	0	0

MRI: Magnetic resonance imaging

Table 4: Distribution of patients as per internal anal canal opening

Internal opening	Number of patients	Percentage
Anterior	12	24
Posterior	38	76

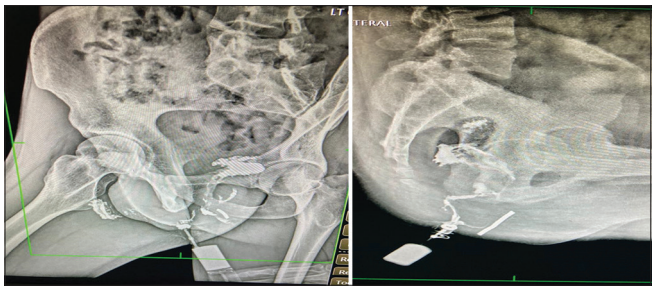

Figure 2: (a and b) Conventional fistulogram showing catheter introduced into the external opening with contrast extension in anal canal

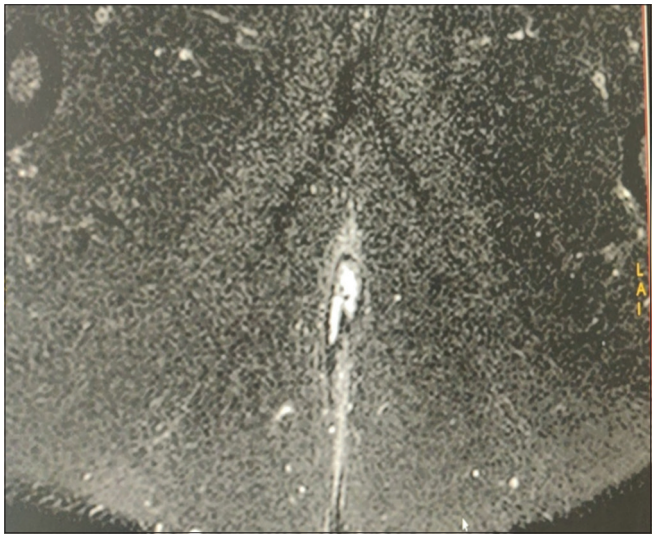

Figure 3: Case of intersphincteric fistula (magnetic resonance imaging Grade I) – axial T2 fat- saturated image showing internal opening on posterior aspect of anal canal

Table 5: Distribution of patients as per the number of internal anal canal openings

Number of internal openings	Number of patients	Percentage
Single	41	82
Multiple	9	18

sagittal and coronal oblique images (along with the long axis of anal canal), T2W axial, coronal oblique, and sagittal images, and T1W axial, sagittal, and coronal oblique images. As most patients had external opening, 5–10 ml of normal saline was introduced through it using a syringe and scan was taken subsequently. Contrast-enhanced T1W images were taken in selective patients to assess the degree of inflammation and differentiation of scarring and granulation tissue, especially in patients with pelvic surgery.

Scan images were subsequently analyzed and classified according to St James's University Hospital MR imaging classification system,[2] which is as follows:

- Grade I – Simple linear intersphincteric fistula

Figure 4: Coronal and axial images delineating fistulous tract traversing through external sphincter (magnetic resonance imaging Grade III), which appears iso- to hypointense on T1 (a) and hyperintense on T2 fat-sat images (b) and (c). (a) Coronal T1. (b) Coronal T2 fat-sat. (c) Axial T2 fat-sat

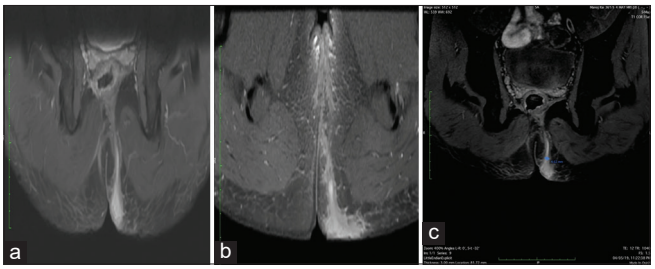

Figure 5: Series of images (a-c) showing case of active intersphincteric fistula with ramifications (magnetic resonance imaging Grade II). Fistula tract is showing enhancement in T1 post-contrast image (c). (a) T2 coronal fat-sat. (b) Axial T2 fat-sat. (c) Coronal T1 post-contrast fat-sat

- Grade II – Intersphincteric fistula with intersphincteric abscess or secondary fistulous track
- Grade III – Transsphincteric fistula
- Grade IV – Transsphincteric fistula with abscess or secondary track within the ischioanal or ischiorectal fossa
- Grade V – Supralevator and translevator disease.

Post-operative data of patients were collected and correlated with imaging findings.

RESULTS

- In our study of 50 cases with perianal fistulas, the most common age group affected was from 31–40 years (36%) with the mean age of 37.52 years [Table 1]
- There was a male predominance with 37 cases (74%) and females were 13 (26%) [Table 2]
- The most frequent clinical presentation was discharge seen in about 38 patients (76%), and rest 12 patients (24%) complained of pain in the perianal region
- Most common type, according to MRI grading, was Grade I (54%), followed by Grade II (30%), Grade III

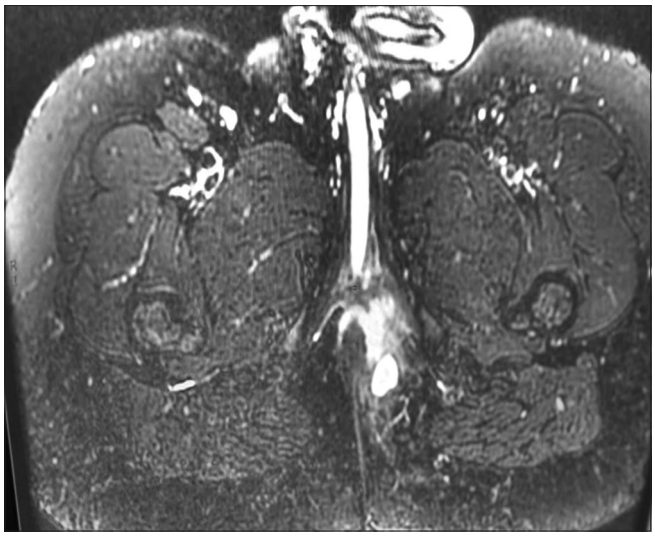

Figure 6: Axial T2 fat-sat image showing case of horseshoe type of fistula, tract is seen crossing from one side to another

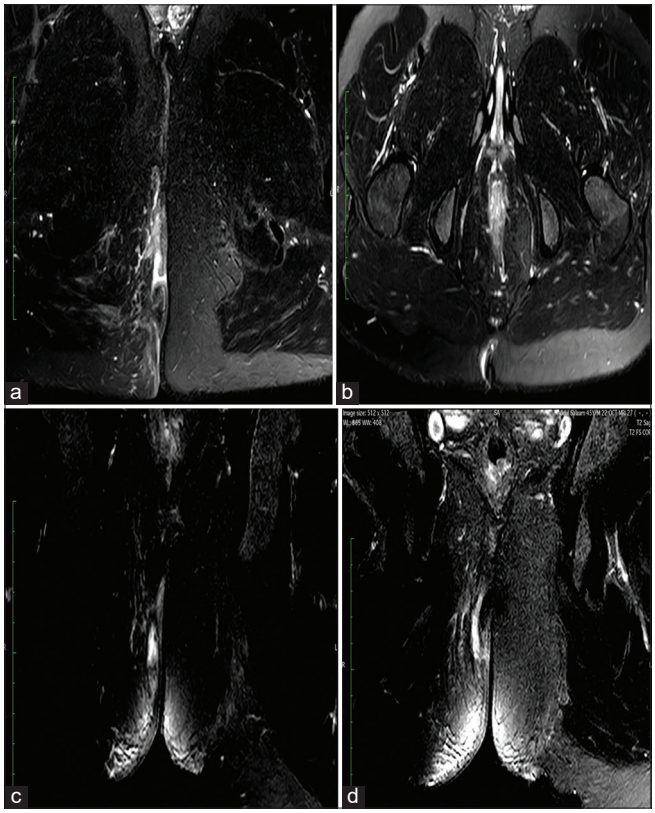

Figure 7: Series of T2 fat-sat axial and coronal images (a-d) showing case of intersphincteric fistula, magnetic resonance imaging Grade I

(8%), and Grade IV (6%), respectively. No case of Grade V was observed in our study [Table 3]

- Internal opening of fistula was commonly seen on the posterior aspect of anal canal in 76% of the cases [Table 4]
- Most of the cases (82%) had single internal opening into the anal canal [Table 5]

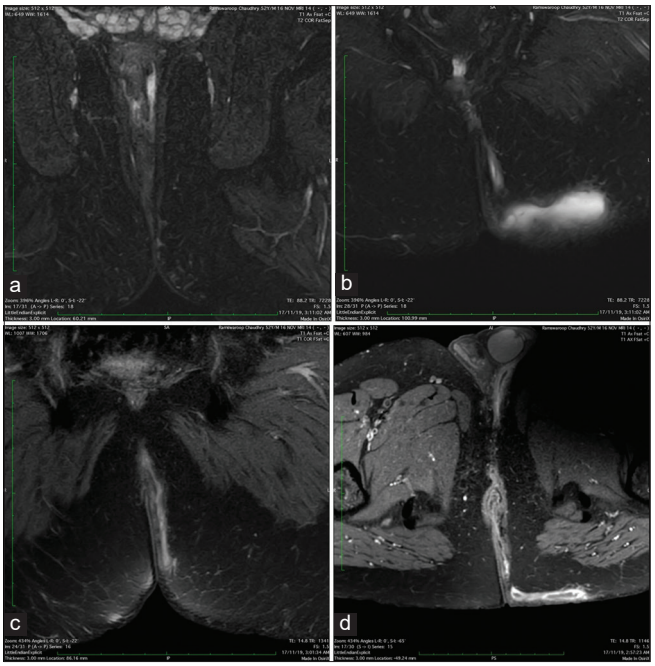

Figure 8: Series of images showing transsphincteric fistula (a) with abscess formation (b) and enhancement of the wall of the fistulous tract seen in post-contrast T1 fat-sat images (c and d), magnetic resonance imaging Grade IV. (a) T2 coronal fat-sat image at the level of anal sphincters. (b) T2 coronal fat-sat image at the level of gluteus muscles. (c) Coronal T1 post-contrast fat-sat image. (d) Axial T1 post-contrast fat-sat image

- Active fistulous tracts were seen in 43 patients (86%) and chronic fibrosed tracts in 7 patients (14%)
- In our study, MRI detected the presence of fistulous tract in all 50 patients, indicating 100% sensitivity; however, it could detect the correct type in 48 patients (96% of cases) when compared with post-surgical findings.

DISCUSSION

In our prospective study on 50 patients with perianal fistulas, we observed that middle-aged people were most commonly affected, with male-to-female ratio of 2.8:1. In the previous study done by Morris *et al.*,[1] the ratio was approximately 2:1, which was similar to our result. The reasons for this discrepancy are likely to be social or cultural rather than medical, as females tend to feel embarrassed about this disease and try to conceal it.

Before the advent of MRI, conventional fistulograms were used for the evaluation of perianal fistulas which involved cannulation of the external opening and injection of a water-soluble contrast into the external opening of fistula [Figure 2]. However, conventional fistulograms fail to delineate the sphincter complex and secondary tracks, so are of limited use.

On MRI, we observed that T1-weighted images without contrast enhancement were noted to provide a good

anatomical depiction of the levator ani, internal and external sphincters, and the ischioanal fossa.

Out of 50 patients, 12 patients (24%) had the internal opening anteriorly and 38 patients (76%) posteriorly [Figure 3]. This is similar with earlier studies done by Halligan and Stoker[3] which stated that fistulous tracts originating posterior to the transverse anal line are seen most frequently which may be due to the predominance of posterior anal gland infection.

Active fistulous tracts appeared hypointense on T1- and hyperintense on T2-weighted images (best visualized with fat saturation) relative to the muscle. Fluid within the lumen of the tract accounts for the T2-weighted hyperintensity [Figure 4]. Fistulous tracts were best visualized in fat-saturated T2-weighted sequences because fluid, granulation tissue, and pus appeared hyperintense against the low signal intensity of the suppressed fat, making them more conspicuous. Similar observations have been made in the previous studies[4] as well. Walls of the active tracts showed post-contrast enhancement [Figure 5]. Inactive tracts appeared hypointense on both T1- and T2-weighted images and lacked contrast enhancement, which is attributed to fibrotic changes and subsidence of surrounding inflammation.

In our study, active fistulous tracks were seen in 43 patients (86%) and chronic fibrosed tracts in 7 patients (14%). Secondary tracts/ramifications were seen in 18 cases (36%) which appeared hyperintense on T2/short inversion time inversion recovery (STIR) images and showed post-contrast enhancement. We encountered a case of horseshoe type of fistula, in which ramifications in intersphincteric fistula crossed from one side to the other [Figure 6].

Exact course relative to the sphincters, levator ani muscle, and overlying skin was reported, as it decides the post-surgical outcomes of the patients.

The incidence of intersphincteric (Grade I) fistulas was the highest in our study [Figure 7], accounting for 54% of cases. Morris *et al.*[1] and Parks *et al.*[5] also reported intersphincteric fistulas as the most common type in their studies.

Perianal abscesses along a fistula track were seen in 5 (10%) patients and typically had a central hyperintense signal on T2-weighted and STIR images corresponding to pus, with isointense signal in the wall [Figure 8]. The abscesses showed peripheral rim enhancement with hypo- or isointense contents on post-contrast T1-weighted images. Similar imaging findings were seen in the study done by Torkzad and Karlbom[6] and Mendoza *et al.*[7]

Surgical follow-up of all 50 patients was carried out. MRI could detect the presence of fistulous tract in all 50 cases. Thus, the sensitivity of MRI to detect the presence of fistula was 100%. MRI could detect the correct type in 48 patients (96% of cases). Two cases which were reported as intersphincteric fistula, turned out to be transsphincteric when correlated with surgical findings. Beckingham *et al.*[8] reported the sensitivity of 97% of MRI to detect perianal fistulas.

CONCLUSION

We diagnosed a wide spectrum of MR findings in patients with various types of perianal fistulas with higher sensitivity and accuracy when compared with post-surgical findings. MRI is the modality of choice for the evaluation of perianal fistulas, especially when surgical treatment is required, as it provides detailed information on the tract anatomy, its relationship to the sphincters and surrounding structures. It can also identify abscess formation and active infected tracts, which have profound impact on the subsequent clinical treatment.

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