Print ISSN: 2321-6379
Online ISSN: 2321-595X
DOI: 10.17354/ijss/2016/456

Original Article

Evaluation of Perianal Fistulae using Magnetic Resonance Imaging

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Abstract

Introduction: Fistula is any abnormal passage/tract which connects two epithelial surfaces. Parks' perianal fistulae classification demonstrates the biggest practical significance and divides fistulae into: Inter-sphincteric, trans-sphincteric, supra-sphincteric, and extra-sphincteric. Etiology is mainly linked to the inflammation of anal glands with subsequent fistula formation. Other causes include Crohn's disease, tuberculosis, pelvic infections, pelvic malignant tumors, and with the radiotherapy.

Aim: We aim to evaluate the different types of fistulas according to Park's classification, study the imaging anatomy, assess the predisposing factors, and pre-operative magnetic resonance imaging (MRI).

Materials and Methods: We performed MR fistulography in 30 patients, with PHILLIPS MRI 1.5 T Achieva, after a detailed history. Statistical analysis used: Observational study.

Results: About 35% of patients belonged to the 51-60 years age group. Nearly 100% of afflicted patients were male. Around 54% of inter-sphincteric fistulae were seen (Park's classification). About 27% were associated with an ischiorectal abscess. Around 13% had recurrent fistulas. About 54% fistulous tracts had a complex course (branching or associated abscess). Probable independent predisposing factors seen were alcoholism, smoking, sedentary lifestyle, diabetes, spicy food, and irregular bowel habits.

Conclusion: Inter-sphincteric followed by trans-sphincteric are the most common types of fistulous tracts encountered, according to the Park's classification. MRI plays an important role in guiding surgical intervention. Most of the perianal fistulas are of idiopathic etiology; however, probable predisposing factors can be alcoholism, smoking, sedentary lifestyle, diabetes, spicy food, and irregular bowel habits.

Key words: Fistulography, Magnetic resonance imaging, Perianal

INTRODUCTION

A perianal fistula is an inflammatory condition that affects the region around the anal canal with a presence of a fistulous tract across the anal sphincters, usually caused by an abscess. Perianal fistula has a high tendency to recur because of undetected infection at surgery, causing significant morbidity, and often requires repeated surgical treatments.[1]

Access this article online

www.ijss-sn.com

Month of Submission : 06-2016
Month of Peer Review : 07-2016
Month of Acceptance : 08-2016
Month of Publishing : 08-2016

In most of the cases, the track of the fistula has a relatively straight course between the external orifice and the internal opening in the anal canal (usually a posterior crypt). There is also a group of fistulas with a complex, branched, and high course, especially in patients after previous surgeries or patients with infections such as tuberculosis and Crohn's disease.

Difficulties in the assessment of such tracts may lead to unsuccessful blind attempts at tract delineation during surgery. These attempts may be followed by formation of a false canal and orifice, and, in consequence, by

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unnecessarily extensive surgery. Blind surgery favors the formation of pathological granulation tissue-inflammatory foci, while a too aggressive or too conservative operation causes disease recurrence or development of complications such as anal sphincter injury and a fecal incontinence.[2]

Normal Magnetic Resonance Imaging (MRI) Anatomy of the Anal Sphincter

The external anal sphincter (a striated muscle) is clearly visualized on MRI. It is hypo-intense on T1-weighted (T1W), T2-weighted (T2W), and fat-suppressed T2W images, and is bordered laterally by the fat in the ischioanal fossa. The internal sphincter (a smooth muscle) is hypo-intense on T1W and T2W TSE images and is relatively hyper intense on PD images (Figures 1a and b, 2a-c). The coronal images depict the levatorani muscle (Figure 2d), the identification of which is important to distinguish supralevator from infralevator infections.

MATERIALS AND METHODS

Inclusion Criteria

1. All patients (indoor and OPD) with clinical suspicion of perianal fistulae referred for MRI, irrespective of age and sex.
2. Patients operated previously on the pelvis and presenting with a perianal opening, with or without discharge.

Exclusion Criteria

- Patients with metallic implants (cardiac pacemakers, cochlear implants, tissue expanders, ocular prostheses, dental implants, neurostimulators, bone growth stimulators, implantable cardiac defibrillators, implantable drug infusion pumps, etc.)
- Claustrophobic patients.

MRI Machine PHILLIPS 1.5 Tesla (Achieva) was used for scanning the patients.

Protocol

- Patient positioning: Supine.
- Type of coil: Torso-axial coil.

MRI Sequences

- Axial T1 TSE
- Axial T2 TSE
- Axial T2 fat sat
- Coronal T2 TSE
- Coronal T2 fat sat
- Coronal PD SPAIR.

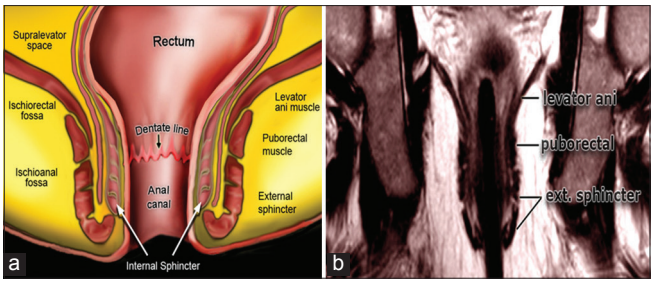

Figure 1: (a and b) Normal anatomy of the anal sphincter

Sagittal T2 TSE

- Sagittal T2 fat sat
- Contrast study was not done.

Technique

We performed MRI fistulogram in 30 patients and 23 controls from July 2015 to January 2016. To achieve the correct orientation, a sagittal fast spin-echo T2W sequence should be performed initially, providing an overview of the pelvis and showing the extent and axis of the anal canal. The correct orientation of the anal canal for MRI can be derived from this sequence, providing truly axial and coronal images along the long axis of the anal canal and enabling correct assessment of perianal fistulas. The levator plate and the entire perineum should be included to identify areas of sepsis and infected tracks that may lead to recurrence. Axial and coronal images are oriented perpendicular or parallel (in the case of the latter) to the long axis of the anal canal. The planes used are obliquely axial and obliquely coronal relative to the pelvis, but these planes are truly orthogonal and parallel relative to the anal canal and thus suitable for correct evaluation of perianal fistulas.

- Slice thickness: 3 mm
- Slice interval: 1 mm
- Scan time: 30 min.

RESULTS

MRI scans were performed in 30 patients, with a clinical diagnosis of perianal fistula, out of which 4 patients had blind ending sinus tracts. Hence, the remaining 26 patients with a fistulous tract were considered in the study.

The most common age group involved in our study was the 51-60 years age group, with 9 patients out of 26 (35%) (Table 1).

In our study, all the patients with fistulas were males (100%) (Table 2). The most common type of fistula seen was the inter-sphincteric type of fistula, seen in 14 patients out of

26 (54%) (Table 3, Figure 3a and b). Associated ischiorectal abscess was seen in 7 out of 26 patients (27%), out of which 5 were associated with trans-sphincteric fistulas out of 7 patients (71%) (Figure 4a and b). The remaining two ischiorectal abscess was associated with an intersphincteric fistula (Table 4).

Fistulous tracts crossing over to the opposite side were seen in 6 patients giving the appearance of horse-shoe fistulas, out of which 5 were trans-sphincteric type of fistulas (83%), and all the 6 horse-shoe fistulas were infralevator, with none seen above the level of levatorani muscles (Table 4 and Figure 5).

About 3 patients were previously operated for fistulas, following which they had a recurrence on the same side, two of which were single fistulous tracts with branching (complex), and 1 single, linear, non-branching tract. Of the recurrent fistulas, 2 were inter-sphincteric type of fistulas and 1 was extra-sphincteric (Park's classification).

Table 1: Age wise distribution of fistulas

Age group (in years)	Number of patients
11-20	1
21-30	7
31-40	4
41-50	3
51-60	9
61-70	2

Table 2: Sex wise distribution of cases

Gender	Number of patients
Male	26
Female	0

Table 3: Type of fistulas (Park's classification)

Type of fistula (Park's classification)	Number of fistulas
Intersphincteric	14
Transsphincteric	13
Extrasphincteric	0
Suprasphincteric	0

Table 4: Complex fistulas

A. Type of fistula	Deviation from linear fistulous tracts
I. Horse-shoe fistula	
Intersphincteric	1
Transsphincteric	5
II. Abscess formation	
Intersphincteric	2
Transsphincteric	5
III. Branching/ramifications	
Intersphincteric	4
Transsphincteric	4

Out of the 26 patients, 14 were complex fistulas (associated with abscess or branching tracts) (54%), 12 were simple fistulas (46%) (Figures 6a-d). About 1 patient had extrapulmonary tuberculosis and showed multiple perianal fistulas. Nearly 16 patients from our study population were alcoholics, 19 were chronic smokers, 16 people led a sedentary lifestyle with reduced physical activity, 9 were diabetics, 23patients diet consisted of spicy food, and 17 patients had irregular bowel habits. To determine the association, we performed MRI fistulography in 23 controls, of which, 6 were alcoholics, 10 chronic smokers, 7 led a sedentary lifestyle, 14 were diabetics, 3 persons diet consisted of spicy food, and 7 had irregular bowel habits (Table 5).

All the patients were operated with the post-operative period being uneventful over a 6 month follow-up.

DISCUSSION

This is an observational study evaluating various types of perianal fistulas using MRI, studying the normal imaging anatomy of the perianal region, emphasizing the value of pre-operative MRI, and assessing the probable predisposing factors for perianal fistulas.

Perianal fistulas constitute a heterogenic group of pathologies of the terminal part of the gastrointestinal tract and perineal area, jointly termed as anorectal malformations.[3] These are canals filled with granulation tissue and surrounded by thick fibrous tissue. Most of the fistulas are of glandular origin – cryptogenic – and a relatively straight tract starting in the perianal area, with the internal orifice in the anal canal, at the level of the crypt. The portals of infection may include anal fissure, post-operative wounds, anal injuries, and neoplasms of that area.[1,4] More prone to complications are patients on immunosuppression, HIV-infected.[5-7]

Initial diagnostics of perianal fistula is based on history-taking and physical examination which should include a detailed anal inspection with a rectal examination. This allows for a correct diagnosis in 48% of cases.[8] Frequently, the internal orifice is narrowed, small, or periodically closed. If the internal orifice with an infected inter-sphincteric gland is not removed, and if all additional canals of the fistula are not found and properly drained or also removed, then the probability of recurrence is high.[1]

Fistulography is the most traditional of the radiologic techniques. It is also the most unreliable and difficult to interpret as the sphincter complex is not visualized and the position of the levator sling has to be inferred. Moreover,

secondary fistulous tracts often fail to fill with contrast material. Furthermore, the level of the internal opening in the anal canal is difficult to visualize because of the absence of precise anatomic landmarks.

Anal endosonography, while promising much, has also proved inferior to expert clinical assessment. The sphincter mechanism and inter-sphincteric space are usually well visualized with endosonography, but the external sphincter can be difficult to visualize in some individuals. In addition, infection cannot be distinguished from fibrosis with this technique, and insufficient depth penetration can result in failure to identify secondary ramifications and more distant sepsis.

Computed tomography is performed with rectally and IV administered contrast media. The attenuation values for the sphincters, levatorani, fibrotic fistulous tracts, and active fistulas are so similar that it is difficult to characterize these structures accurately, unless the track contains gas or leaked contrast material.

The MRI appearance of this condition shows greater concordance with surgical findings than does any other imaging modality. MRI in the axial and coronal planes demonstrates fistulous tracks in relation to the sphincter complex, ischiorectal fossa, and levator plane. Imaging in the sagittal and oblique planes is helpful in selected cases (e.g., Anovaginal or presacral disease).[9]

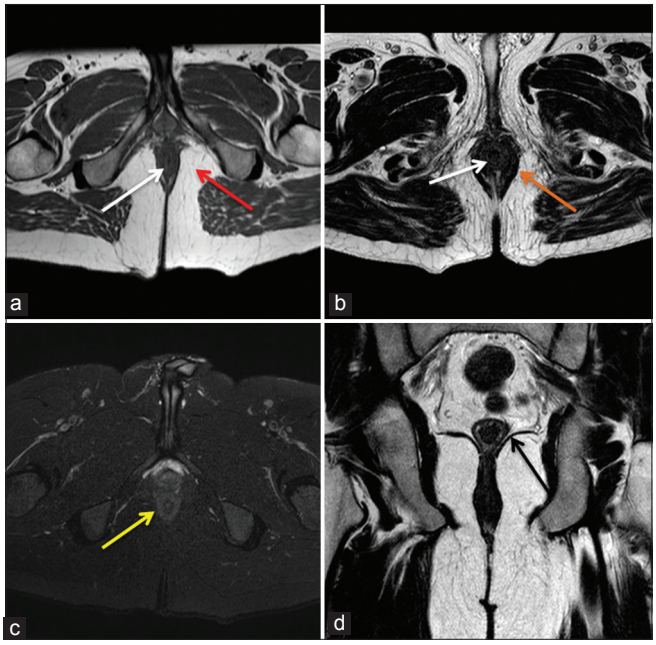

Figure 2: (a) Axial T1-weighted image shows the normal hypointense internal anal sphincter (white arrow), and the ischiorectal fossa (red arrow). (b) Axial T2-weighted (T2W) image shows the normal hypointense external (orange arrow) and internal anal sphincters (White arrow). (c) Axial proton density image shows the hyperintense normal internal sphincter (yellow arrow). (d) Coronal T2W image shows the normal levator ani muscle (black arrow)

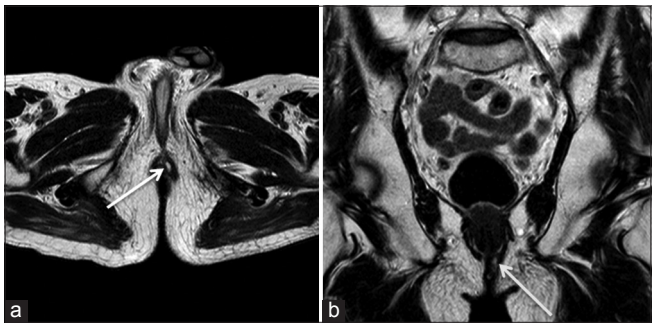

Figure 3: (a) Axial T2-weighted (T2W) showing an intersphincteric hyperintense tract between the two anal sphincters on left side (white arrow). (b) Coronal T2W showing an intersphincteric infralevator hyperintense tract on left side (yellow arrow)

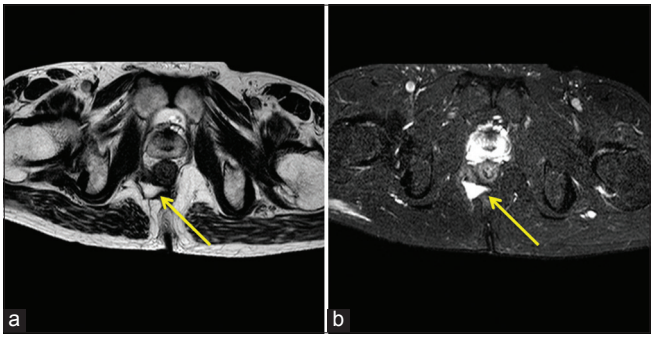

Figure 4: (a and b) Axial T2-weighted and axial proton density images shows a hyperintense fluid collection in right ischiorectal fossa communicating with a trans-sphincteric hyperintense fistulous tract (yellow arrow)

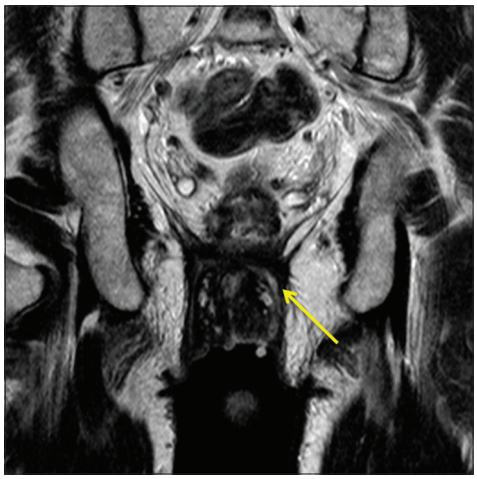

Figure 5: Coronal T2-weighted image shows a hyperintense trans-sphincteric tract, with its external opening in left perianal region, extending in left perianal region and crossing midline in infralevator region to the right side (yellow arrow)

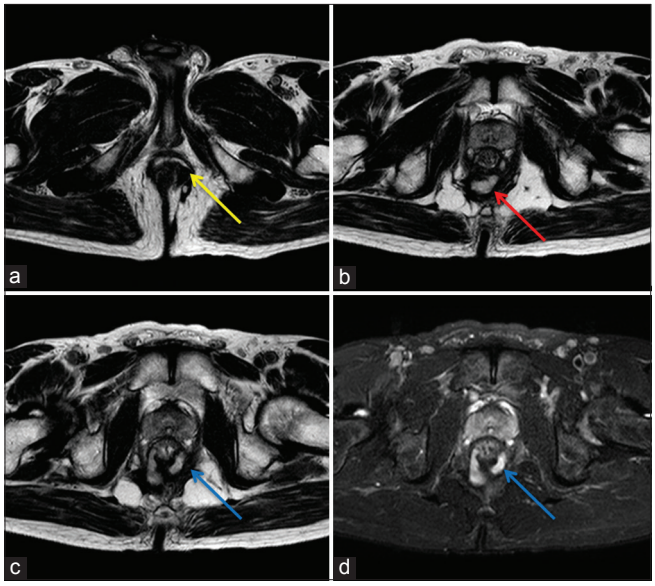

Figure 6: (a) Axial T2-weighted (T2W) image showing a hyperintense trans-sphincteric tract on left side (yellow arrow). (b) Axial T2W image showing the trans-sphincteric perianal fistuous tract now in the inter-sphincteric plane (red arrow). (c and d) Axial T2W and axial proton density images respectively shows the fistulous tract giving off branches in the inter-sphincteric plane, with separate internal openings at 3'O clock and 9'O clock on right and left side respectively(blue arrows)

Table 5: Assessment of predisposing factors in cases and controls

Predisposing factors	Cases	Controls
Alcoholism		
Alcoholics	16	6
Non-alcoholics	10	17
Smoking		
Smokers	19	10
Non-smokers	7	13
Sedentary lifestyle		
Sedentary lifestyle	16	7
Active lifestyle	10	16
Diabetes		
Diabetics	9	15
Non-diabetics	17	8
Diet		
Spicy food	23	20
Non-spicy food	3	3
Irregular bowel habits		
Irregular bowel habits	17	7
Regular bowel habits	9	16

Cases: Patients having perianal fistulas. Controls: Patients not having perianal fistulas.

Table 6: Association between predisposing factors and fistula formation

Predisposing factor	Chi-square value	*P* value
Alcohol	6.200	0.01
Smoking	4.426	0.03
Sedentary lifestyle	4.740	0.02
Diabetes	4.570	0.03
Diet	0.020	0.60
Irregular bowel habits	5.965	0.01

The anal canal extends from the levator ani muscle cranially to the anal verge caudally and is surrounded by the internal and external anal sphincters.[10] The dentate line is an important landmark, as being the site of opening of the anal glands; it is considered the initial site of infection which initiates the fistula formation.[11]

In our study, the most common type of fistula encountered according to Park's classification was inter-sphincterицfistula, followed by trans-sphincteric fistula. These fistulas were classified into simple and complex types, depending on the presence of inter-sphincteric branching and associated ischiorectal abscess formation. Complex fistulas outnumbered simple ones in our study.

All three patients having undergone surgery for previous perianal fistula, developed recurrent fistulous tract on the same side. Sangwan *et al*.[12] proved that the recurrence rate in patients after surgery due to a simple perianal fistula was about 6.5%.

Five patients had more than one fistulous tract (and external opening), with one of them being a confirmed case of extra-pulmonary tuberculosis.

MRI can detect fistulous extension with good localization in relation to surgically constant anatomical landmarks, especially in coronal sequences. The most important anatomical points for the surgeon were internal opening location which was described in clock orientation-external sphincter, course of the tract in relation to the sphincters and levator ani muscle. Pre-operative characterization of the anatomical course of the fistula and all associated infection is crucial[8] and MRI helps to limit the recurrence and/or incontinence after surgery. This can be explained as it helps to avoid unnecessary wide exploratory dissection through the sphincter. While direct non imaging guided dissection may enforce the surgeon to do generous trans-sphincteric or supralevator dissection for detailed exploration, which is incriminated for postoperative incontinence. Moreover, the high possibility of missing other pathological contents, like the commonly reported side branches, horse-shoe extension, and abscesses, is the main causative etiology of postoperative recurrence.[10]

Khera *et al*.[2] performed contrast-enhanced studies for delineating abscess formation. In our study population, abscess formation was well delineated in 7 patients (without contrast study), on T2 SPAIR sequence, and was confirmed surgically.

Independent probable predisposing factors such as alcohol, smoking, diabetes, sedentary lifestyle, and irregular bowel habits had a significant association in the causation of perianal fistulas (Table 6).

CONCLUSION

- Inter-sphincteric fistula with ramifications in its course is the most common type of perianal fistula.
- Complications are more often associated with a trans-sphincteric fistula.
- Extra-sphincteric and supra-sphincteric type of fistulas are very rare.
- MRI guides surgical management.
- Fat suppression T2 sequences were found to efficiently delineate perianal abscess formation, in a non-enhanced study.
- Patients dietary habits did not have a statistically significant association in the causation of perianal fistulas.

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How to cite this article: Jadhav A, Rote-Kaginalkar V, Badarkhe-Patil P, Mhaske C. Evaluation of Perianal Fistulae using Magnetic Resonance Imaging. Int J Sci Stud 2016;4(5):181-186.

Source of Support: Nil, **Conflict of Interest:** None declared.