

Evaluation of Fistula in Ano MR Fistulography

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Abstract: ***Aim and Objectives:** MR findings are more closely associated with Per op findings with specificity of 100 % for all grades of Fistula other than G I with sensitivity of 66.67% and sensitivity of 100 %.:The objective of this study is to evaluate the accuracy of MRI findings of MR Fistulography in correlation with per-operative findings. **Materials and Methods:** MR imaging studies of MR Fistulography were performed in 60 clinically suspected patients using a 1.5T MR machine. Various sequences in coronal, sagittal and axial planes were obtained to evaluate the type of fistula, involvement of muscles and sphincter complexes, to locate the exact site of primary tracts, abscess, horse-shoe fistulas and internal opening. **Results:** MR findings are more closely associated with Per op findings with specificity of 100 % for all grades of Fistula other than G I with sensitivity of 66.67% and sensitivity of 100 %. **Conclusion:** High spatial resolution MR imaging with CP spine Array coil is accurate for the detection of Perianal fistulas. It shows the surgical anatomy and maps out the perianal fistulas accurately and provides additional information on secondary extensions in patients with complex fistulas.*

Keywords: MR Fistulography, Fistulo in Ano, STIR, T2 WI, T1 WI

1. Introduction

A fistula-in-ano is a chronic abnormal communication, usually lined to by granulation tissue, which runs outwards from the anorectal lumen to an external opening on the skin of the perineum

- 1) What is the relationship between the fistula and anal sphincter?
- 2) Are there secondary extensions from the primary tract

Over the years, many imaging modalities have been tried, to achieve those objectives. Most recently MR fistulography. Magnetic Resonance Imaging is a recently devised modality to study fistula in ano. Imaging is done in axial, coronal and sagittal planes using T1, T2 and STIR sequences. Various coils namely spine array, body array and special endorectal coils may be used.

The following study involves detailed evaluation of fistula in ano its complications and pelvic floor anatomy using MR Fistulography

Keywords: MRI, Fistulo –in –ano ,STIR

2. Aim and Objectives

To evaluate the accuracy of Magnetic resonance imaging and its use as a pre- operative evaluation modality for perianal fistulae.

- a) The primary Tract
- b) Secondary tract and its ramifications.
- c) Abscess

3. Review of Literature

Most widely accepted classification is by Park's, concluded that all fistula could be classified into four main groups, defined by the relationship of the primary tract to the external sphincter: Intersphincteric (45%), Trans -sphincteric (30%), suprasphincteric (30%) and Extrasphincteric (5%).

The imaging techniques described so far, that preoperative MR imaging helps surgeons to identify all secondary extension of a complex fistula. The largest additional value was used in the detection of supralelevator abscess and horse shoe fistulas, if not identified and properly treated may lead to recurrences. MR imaging of particular help in cases of high fistulas .Thus the present study was undertaken to analyze the accuracy, benefits and advantages of MR imaging in fistulae in ano.

Etiology and Pathogenesis of Fistula in Ano

The central concept of crypto glandular hypothesis

Inflammatory bowel diseases, Tuberculosis and Diabetes Mellitus are important aetiological causes. Complications of certain anal disorders may indirectly lead to formation of fistulas, such as fissure in ano, Hidradenitis suppurativa, haemorrhoids and certain post surgical condition such as sclerotherapy, sphincterotomy or closed haemorrhoidectomy. Pelvic sepsis, Anorectal malignancies, Perineal injuries, Anorectalagenesis are some of the rare causes.

Anatomy of the Sphincter Complex

It comprises of the internal and external sphincters .They can be thought of as two cylindrical tubes, one placed within the other.

- 1) Inner Tube: mucosa, sub mucosa, expanded circular muscles fibres (internal Sphincter), longitudinal muscle, which split caudally to form the fibro elastic raphe, and anal glands.
- 2) Outer Tube: external sphincter and puborectalis (which is deficient anteriorly)
- 3) Inter Sphincter space :

It is the longitudinal space between these two tubes. It is filled with loose areolar tissue, lymphatic and blood vessels.

Anatomy of the perianal and rectal regions, as seen on multiplanar cross sectional imaging by MRI. Axial and coronal scans are needed; axial scans best relates the primary

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tract to the sphincter complex and coronal scans best visualizes the levator plate to facilitate diagnosis of supralelevator sepsis. Sagittal sections may sometimes be useful to the surgeon for better surgical planning, especially if an ano vaginal tract is suspected.

The external sphincter, puborectalis and levator plate are of similar signal to striated muscle elsewhere in the body, standing out against low signal ischioanal and ischioanal fat on STIR sequences. In contrast, the internal sphincter returns high signal intensity on both STIR and T2 weighted scans, enabling it to be distinguished from the intersphincteric plane and external sphincter. Images obtained in the coronal planes shows the anal canal in longitudinal section as seen from a frontal projection. Further lateral to the internal sphincter is the external sphincter, having typical striated muscle intensity.

Management of Fistula in Ano:

St James's University Hospital MR Imaging Classification of Perianal Fistulas

Grade	Description
0	Normal Appearance
1	Simple linear intersphincteric fistula
2	Intersphincteric fistula with intersphincteric abscess or secondary fistulous track
3	Trans – Sphincteric fistula
4	Trans- sphincteric fistula with abscess or secondary track within the ischioanal or ischioanal fossa
5	Supralelevator and translevator disease
	Source – Modified from spencer et al

the park's surgical classification to anatomy seen at MR imaging in both axial and coronal planes. This classification deals not only with the demonstration of the primary fistulous tracks but also with secondary ramifications and associated abscesses.

4. Materials and Methods

A Prospective study of 60 patients with suspected fistula in ano, primary or recurrent, referred from the surgery outpatient department was done at Government mohan kumaramangalam Medical College, Salem between June 2016 to May 2018. All the 60 patients were subjected to MR Fistulography. MR Fistulography was performed using Philips 1.5 tesla, using Body Array coil.

METHOD

Patient was placed in supine position in the MR gantry.

MR Technique used

A Scout sagittal section was obtained through the anal canal region for planning of coronal and axial views.

- Coronal sections
- Axial Sections

These sections were taken from the perianal region to above the level of the levatorani muscle.

The sequences used were:

- Short Tau Inversion Recovery Sequence (STIR)
TR-2300 ms TE – 20ms
T1-150ms No.of Slices – 12-15
Slice thickness – 3mm FOV – 400mm
Axial – 7 min Coronal oblique -7min
- T2 weighted sequence
TR-4000 ms TE – 101ms
Averages -2 No.of Slices – 12-15
Slice thickness – 3mm FOV – 400mm
Axial – 5 min Coronal oblique -5min
- Optional sequences:
T1 weighted sequence

Inclusion Criteria

All the patients included in the study were referred from the surgery department with complaints of perianal discharging sinuses. Broadly, the patients included fell into the following criteria:

- Preoperative evaluation for proven fistula in ano
- Single / multiple discharging sinuses in the perianal region
- Recurrent fistulas and for detection of epithelialized tracts
- Recurrent perianal abscess for detection for undetected tracts

Exclusion Criteria

- Patients with MR incompatible devices or implants
- Patients on life support systems.
- Patients with profound septicaemia with inability to lie down in supine position.
- Patients with claustrophobia.

5. Data Analysis and Results

In the present investigation, the ability of MR and clinical methods in correctly predicting fistula grading with reference to more standard method (per-operative) is compared and analysed. Type of fistula and type of collections are compared between MR finding with per-operative findings. Internal opening of MR and clinical is again compared with standard methods. A total of 60 patients are selected. Accuracy is determined by sensitivity, specificity, PPV, NPV, false positive rate and false negative rate. The chi-square test is used to statistically analyse the accuracy. Association of mode of presentation with risk factors and type of fistula is carried out. If statistical significance is obtained for association, odds ratio is performed. The entire statistical work is carried out using statistical packages of social sciences (SPSS-21).

Table 1: Age Distributions

Age (in years)	Number	Percentage
≤ 20	02	4.9
21-30	13	19.7
31-40	20	34.4
41-50	16	26.2
51-60	05	8.2
> 60	04	6.6
Total	60	100

In Table – 1, age distribution of the patients is presented. The common age distribution is 31-40 years where 34.4% are observed and 41 to 50 years where 26.2% are observed. The mean age of the patients is 38.1 ± 11.6 years.

Table 2: Gender Distribution

Gender	Number	Percentage
Male	56	93.4
Female	4	6.6
Total	60	100

Gender distribution of the study patients is presented in Table – 2. The most of the patients are male (93.4%).

Table 3: Risk Factors

Risk Factors	Number	Percentage
None	40	66.6
T.B.	04	06.6
D.M.	15	25.0
Both	01	1.56
Total	60	100

The risk factors of the condition are presented in Table- - 3. The majority (66.6%) of the patient have no predisposed risk factors. About 25% have Diabetes mellitus and 6.6% have tuberculosis. Only 1.56% has both Diabetes Mellitus and Tuberculosis.

6. Discussion

MR Fistulography was performed on 60 patients who were referred by the department of surgery for the confirmation and grading of fistula in ano. Out of the 60 patients, 55 (90%) were male patients and 5 (9%) were female patients. Male: Female Ratio- 9:1.

Male preponderance may be related to an increased number of anal glands, which also tend to be more cystic and ramified when compared with women.

These patients were in the age groups ranging from 21 to 80 years. Out of the 61 patients, 21(34.4%) were in the group 31-40 years.

Broadly, the patients fell in to two groups, i.e., primary and recurrent patients in the primary group were those who had a fistula in ano for the first time and had never been operated for the same. Patients in the recurrent group were those fistulae have been operated upon at least once previously.

In our study, the majority of the patients (54.1%) had recurrent fistulas. This was probably due to the high incidence of recurrence of fistulae in ano and also the surgeon's need for better delineation of the tracts in recurrent cases.

Two risk groups were identified in our study of 61 patients. These were Tuberculosis and Diabetes Mellitus. In our study group, 11 patients were found to have Tuberculosis and 13 patients had D.M. Two of these patients have both TB and DM. In all 41% (n=25) had some associated risk factor. It was consecutively observed that out of the 25 (41%) Patients with recurrent fistula, 11(18.1%) had T.B. and

13(21.3%) had DM and 1(1.6%) had both. Totally 49 of the recurrent cases were found to have some associated risk factor which signified the influence of the risk factor on the morbidity of fistula in ano and especially its recurrence.

In the studies conducted by Beets – tan et al (12 of 56) and others, Crohn's disease, was found to be the major risk factor. The reason being, that these studies were conducted in the western countries. Crohn's disease, which is relatively uncommon in the Indian subcontinent, was not found to be a risk factor in any these patients.

After Subjecting the patients with suspected fistulae to MRFG each patient was evaluated by scrutinizing the coronal, axial and sagittal sections. According to the presence and position of the primary tracts, horseshoe tracts, secondary tracts, presence or absence of abscess collections and their locations, each fistula was graded according to the St.Jame's university hospital classification. The distribution of cases according to various MRI grades has been depicted in Table No: 7 with bar chart.

It was observed that the majority of cases i.e.86.9% had a complicated fistula. Grades II and above were designated as complicated because of the presence of secondary tracts or abscess collections and / or involvement of planes other than the intersphincteric plane. In the study conducted by Beets – Tan et al², the percentage of complex fistulas was 57% and in the study by spencer et al 40% of patients had complex fistulas.

It was felt that higher percentage of complex fistulas in our study was due to a general bias of the surgeons towards referring recurrent and suspected complex fistulas for MRFG, Probably because of the economic variations between the western countries and the Indian subcontinent. Also as our institute is a tertiary care centre, more number of complex and recurrent case tends to be referred.

Out of the 61 patients referred, the primary tract was seen in 58cases. The remaining three patients with clinically suspected fistulas were found to have superficial perianal abscess collections only.

One such patient was found in the study of 40 patients by Spencer et al

The detection and prevalence of the surgically relevant criteria have been separately dealt with. These include internal opening of the primary fistulous tract, secondary tract, horseshoe tracts, abscess collection, and supraleator extension.

The correct location of internal opening of the fistula, as diagnosed on MRFG and was later confirmed by surgery. However, the exact opening not seen in all the cases, it was inferred according to the course and plane of the primary tract.

An internal opening was considered as correctly identified when it was at the correct level in the anal canal and was within the correct quadrant.

Among the 58 patients diagnosed to have primary tracts by MRFG, the diagnosis for internal opening was found to match with the surgical report in 50 patients, out of 55 detected by surgery. This gave the sensitivity of 90.91% for detection of internal opening by MRFG, compared to 96% sensitivity obtained in the study by BEETS- Tan et al.

As regards the detection of primary tracts, we obtained a sensitivity of 8.5% and specificity of 100%, in comparison to a sensitivity of 100% and specificity of 86% in the study of Beets – Tan et al.

As the detection of secondary tracts has significant implications on the prognosis and outcome of surgery for fistulae in ano, their detection by MRFG is crucial.

If not identified and properly eradicated, these extensions and tracts may lead to recurrences. Results of the study by Lunnesset al suggested that MR imaging could depict more extensions than could conventional fistulography or surgical exploration. In the study by Beets- Tan et al, they concluded that pre operative MR imaging was 100% accurate in detection of secondary extensions.

Horseshoe tracts are also included in secondary tracts as they are ramifications from the primary tract. However, because the presence of horse dhoe tracts greatly alters the surgical approach and its outcome, they have been separately mentioned.

39.34% of the patients in our study were found to have secondary tracts out of which 50% had horse shoe tracts only and 100% had both horse shoe tracts and other secondary tracts. Comparatively in a study of 56 patients by Beets – Tan et al, 39% of the cases had horseshoe tracts.

It was also observed that the majority (50%) of the cases (Table 13, Fig 18 and 28) with horse shoe tracts were those who had recurrent fistulas. It was felt that horseshoe fistula were more common in recurrent cases.

On surgery, 100% concordance was recorded in detection of horse shoe tracts by MRFG. Out of the 12 cases with horseshoe tracts, only 4 (33.3%) cases were suspected on pre-operative clinical examinations, thus having sensitivity for detection of horseshoe tracts of only 28% clinically and compared to 100% by MRFG.

Abscess collections were found 47.5% of the cases evaluated (Table no 14, 15,16, and 17). The presence of collections was divided according to their location in relation to the various sphincter planes. These planes were intersphincteric, extraspincteric, and the supra levator planes. The detection of these collections, especially those present in multiple planes, has significant implications on the outcome of the surgery for complete eradications of the disease process. Three cases diagnosed with collection in the intersphincteric plane were found to be of lower grade on surgery. Both these cases happened to have recurrent fistulas. Thus the sensitivity for detection of abscess collection was found to be 100%.

The other most important additional finding for which MRFC was evaluated was for the detection of supralelevator collections or extensions. Those cases in which there is supralelevator collection or tract fall into the grade V. This has very high surgical significance, as it alters the surgical approach and it has serious implications on the outcome of the surgery.

On surgery, 10 patients detected by MRFG (Sensitivity of 100%) were found to have a supralelevator component of fistula / abscess collections. In comparison, 100% sensitivity for the detection of supralelevator collections was observed in the study by Beets Tan et al. Importantly no case with supralelevator extension was missed by MRFG. MRFG was thus found to be more sensitive than clinical grading for detection of supralelevator extensions.

Finally correlation between MRFC grading, clinical examination and surgical grading was done. The surgical finding (Grading) were considered as gold standard. The MRFG and its grades were explained to and discussed with the respective surgeons before the surgery. The MRFG findings were then confirmed on surgery.

In addition to the 10 cases with supralelevator components, four other cases were detected to have additional findings on MRFG, which significantly altered the surgical approach and final prognosis. Three of these patients were found to have abscess. In all these cases there, was no clinical suspicion of any additional findings. Therefore in at least 15% of the cases, additional information was provided by MRFG.

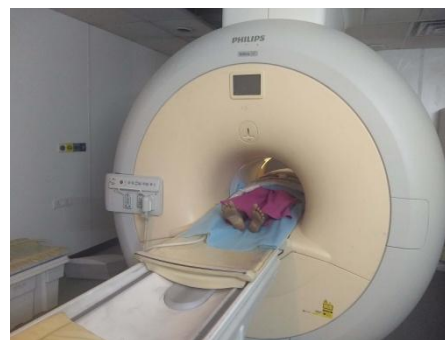


Figure 1: 1.5TESLAMRI



Figure 2: GR I Peri Anal Fistula



Figure 3: GR 2 Horse Shoe Perianal Fistula



Figure 4: GR 3 Perianal Fistula



Figure 5: GR 4 Perianal Fistula with Abscess

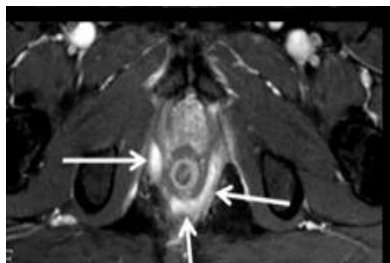


Figure 6: GR 5 Perianal Fistula

7. Summary

MR Fistulography were performed in 60 patients referred for preoperative evaluation of Fistula in ano from the department of Surgery Male to female ratio was 9:1. The patients belonged to age group ranging from 21 to 80 years.

Tuberculosis and Diabetes Mellitus were the two major associated risk factors and were found to be important contributory factors for recurrence of the lesion.

86.9% of the patients had a complicated fistula (i.e>- grade II)

MRFG was extremely useful in identifying the internal opening of the fistula (90.91% Sensitivity), presence of secondary and horseshoe tracts (100% Sensitivity), detecting abscess collections in multiple planes and in visualizing supralevator extensions of the lesion (100% sensitivity).

MRFC Significantly altered the surgical approach due to its ability to demonstrate clinically undetected abscess and

secondary tracts and acts as a road map for the surgeon before the operation. Therefore it acts as ideal modality for grading of fistula in ano.

8. Conclusion

High spatial resolution MR imaging with CP spine Array coil is accurate for the detection of Perianal fistulas. It shows the surgical anatomy and maps out the perianal fistulas accurately and provides additional information on secondary extensions in patients with complex fistulas.

The largest additional value from preoperative MRFG was obtained in patients with complex fistulas in patients with T.B. and D.M and in patients with recurrences. Our study showed that the surgical approach and procedure was drastically affected by MR findings of additional tracts and abscess.

Finally we conclude that High- spatial – resolution MR imaging fistulogram is rapid, well tolerated and accurate for detecting anal fistulas with excellent surgical correlation and is therefore an ideal and more accurate preoperative imaging modality for diagnosing and grading of Fistula in ano.

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