

# Preoperative Assessment by MR Fistulogram in Patients with Perianal Fistula and Its Correlation with Operative Findings and Postoperative Outcome

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## ABSTRACT

### BACKGROUND

Inflammatory bowel disease causing inflammation, perianal abscess, or any situations like carcinoma or injury of anorectal region can produce fistulisation of anal area. A major advancement in imaging evaluation has been done by magnetic resonance imaging which can be a gold standard for perianal fistula. Magnetic resonance imaging has magnificent soft tissue delineation ability. It can take images in multiple planes. It can be operator independent with better field of view (FOV).

### METHODS

As a standard imaging approach at our institution (3T MRI machine) we used a T2 weighted (T2W) and T2FS sequences. As we know, the anal canal is tilted forward. We use a T2 weighted (T2W) single shot image in sagittal plane with midline coursing through the anal canal; then we defined the FOV and scan extent and take coronal and axial images particularly taking the point of view of the position of long axis of the anal canal. We include the whole of perineum and levator ani muscles for evaluation of the extent of disease into inferiorly to the gluteal folds and superiorly upwards above the levator ani muscles. Frequency selective fat suppressed T2 weighted (T2W) sequence gives good spatial resolution. It helps in better understanding of anatomy and pathology of tracks and fluid collections along the fistula which become hyper intense in T2W image.

### RESULTS

In this study, 50 patients were included of which 38 were males and 12 were females. 76 % were males and 24 % were females. In this study, perianal fistulas were classified as intersphincteric, transsphincteric and suprasphincteric. Out of 50 patients, 30 patients (60 %) had intersphincteric fistulas, 17 patients (34 %) had transsphincteric fistulas and 3 patients (6 %) had suprasphincteric fistulas. In this study, MR findings were correlated with OT findings. Out of 50 patients, 45 (90 %) patients had matched findings and 5 (10 %) patients had non-matched findings. The p-value is < 0.0001, which is significant.

### CONCLUSIONS

MR Fistulogram has become the recommended diagnostic method as it can depict perianal fistulas in soft tissues wonderfully. It shows the position of the fistula in anal region, especially in connection to sphincters of perianal area, and identifies internal and external orifices and branching of the fistula.

### KEYWORDS

Fistula-In Ano, MRI, Anal Sphincter

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## BACKGROUND

Perianal fistula is a difficult condition to treat. Overall about 1 to 2 per 10,000 population is the incidence of perianal fistula in the world. The male to female predominance is about 2 : 1.<sup>1,3</sup> The cryptoglandular hypothesis is a popular hypothesis which has been implicated to the cause of perianal fistula. It describes that some crypts known as anal crypts at the dentate line receives the drainage of infected anal glands and gives rise to anal fistula.<sup>3</sup> Initially they present as cryptoglandular perianal abscess. Out of which around 35 % of patients develop recurrent disease.<sup>2,4</sup>

There are some risk factors for the development of perianal fistula. It may be recurrent abscess and fistula formation. There are some related underlying causing inciting events. The causes are perianal abscess and various bowel pathology which causes inflammation (IBD). Crohn's disease patients are very much sufferers from perianal fistula, and these are quite common. It occurs in around 20 % of such patients.<sup>5,6</sup>

First of all a necessary step is to formulate a guideline and management protocol for the patients with perianal fistula. Not up to very soon imaging studies were included in the workup.<sup>3</sup> There are many imaging modalities that have been developed like traditional fistulogram, endoanal ultrasound, Computed tomography and Magnetic resonance imaging. Although they were used in a limited way but now a day's Magnetic resonance imaging is used extensively in perianal fistula.<sup>7</sup> A major advancement in imaging evaluation has been done by magnetic resonance imaging which can stand as gold standard for perianal fistula. Magnetic resonance imaging has magnificent soft tissue delineation ability. It can take images in multiple planes. It can operate independent of operator with better field of view.

As there are two different viewpoints existing between the radiologists and general surgeons two different classification systems of perianal fistula is present. In recent time we have seen the varieties of MRI picture of perianal fistula described in various textbooks and article. Anal canal extends from the ring of anorectal region to perineal skin. Demarcation of anatomical anal canal extends from skin of perineal region to dentate line. The circular upper border of puborectal muscle is called linea dentata. During rectal examination this part is digitally palpable. The dentate line is below the ring of anorectal region for approximately 1 - 1, 5 cm. Anal canal which is defined surgically extends for a length approximately 4 - 5 cm.

We know that the anal sphincter has 3 layers:

- Internal sphincter: It is the continuity of inner circular smooth muscle of rectum. It has no voluntary contractile power. It relaxes during defecation and contracts at rest.
- Intersphincteric space.
- External sphincter: It is of striated muscle and contract voluntarily. Three layers form the external sphincter and it works as single unit.

Levator ani and puborectal muscle are the continuation of these three layers when they extend upwards.

- As the internal sphincter gives the major share of the idle tonicity of anal canal, the continence to pass the

faeces is monitored by the two muscle complexes namely the internal and external sphincters.<sup>8</sup> Pathway for axial and circumferential spread of disease is provided by tissue interposed by the twin sphincters.<sup>8</sup> There is a space called ischioanal fossa. it is filled with fat. By penetrating the dual sphincters the disease enters into this space. Disruption of the levator plate might extend the disease between the ischioanal fossa situated superficially and space around rectum known as pararectal space in pelvis.

We wanted to determine the type of fistulous track (SJUH Grading), evaluate the involvement between the sphincter complex and fistulous track, determine the presence of any secondary fistulous tracks, determine the involvement of levator ani muscle and detect presence of any abscess.

## METHODS

### Inclusion Criteria

1. All patients diagnosed as perianal fistula.
2. All patients presenting with local pain and discharge through perianal region with a past history of perianal abscess.
3. All patients with recurrence of perianal fistula.
4. Patient who has given consent for this study.
5. No contraindication for MRI study.

### Exclusion Criteria

1. General contraindications for MRI (metallic implants in their body, foreign body in their eyes, pacemaker, pregnancy and claustrophobia).
2. Not given consent for this study.

### Data Collection and Interpretation

Statistical calculation to be performed on a PC using statistical package for the social sciences (SPSS) software, demographic data such as age, sex, address, height, weight, religion, socio-economic status, findings of MRI report.

### Laboratory Investigation

Urea, creatinine value, previous MRI report.

### Outcome Definition and Parameters

The proposed outcome of this study is to show the entire fistulous track, its relationship with the sphincter complex, any secondary extensions or abscess so as to achieve a more successful surgery.

To detect and classify the types of perianal fistula multiple MRI imaging sequences in variable planes has been used with varying level of success in the literature.<sup>12,13,11</sup> We can use both 1.5- and 3-T magnetic field strengths. The high

strength magnetic field provides increased signal to noise ratio in high Tesla machine. This can be used to achieve higher spatial resolution and / or shorten acquisition time.<sup>14</sup> As a standard imaging approach at our institution (3T MRI machine) we use a T2 weighted (T2W) and T2FS sequences.

As we know anal canal is tilted forward, we use a T2 weighted (T2W) single shot image in sagittal plane with midline coursing through the anal canal, then we define the FOV and scan extent and take coronal and axial images particularly taking the point of view of the position of long axis of the anal canal. We include the whole of perineum and levator ani muscles for evaluation of the extent of disease into inferiorly to the gluteal folds and superiorly upwards above the levator ani muscles. Frequency selective fat suppressed T2 weighted (T2W) sequence gives good spatial resolution. It helps better understanding of anatomy and pathology of tracks and fluid collections along the fistula which becomes hyper intense in T2 W image.

The Ideal image to anatomically describe the sphincter complex. Levator ani and ischiorectal fossa is an unenhanced T1 weighted image. The T2 weighted images can better evaluate and demonstrate the fistulous tract as the hyperintense fluid inside the tract act as a contrast to the hypointense fibrous wall of the fistula. The boundaries between internal and external sphincters are better shown and differentiated by T2 weighted images because sphincters and muscles have low signal intensity while active tracks and extensions have high signal intensity.<sup>15</sup>

On both T1 and T2 weighted images chronic fistulous tracts or scars demonstrate low signal intensity. Pus is present inside the abscess cavity which shows high signal intensity in T2 weighted images. On post contrast study taken in T1FS sequence the central part of the abscess cavity is hypo intense while the periphery shows ring enhancement. In post-surgical cases in T1W unenhanced image can show the haemorrhagic products which stands out as bright. This way it helps to differentiate with residual track.<sup>16,17</sup>

**Protocol**

Any localizer canal can be used that properly displays the anal. We use a Fiesta name provided in GE machine uses for a steady-state precession gradient-echo sequence (Siemens True Fisp).

SEQ	FOV	TR / TE	Slice Thickness	Matrix
Sag T2	24 x 24	3660 x 97.8	4.0 thick / 0.5 gap	320 x 256 / 3.00 NEX
Sag T2 FS	24 x 24	4520 x 99.3	4.0 thick / 0.5 gap	320 x 256 / 3.00 NEX
COR T2	20 X 20	4540 X 99.7	3.5 thick / 0.5 gap	320 X 256 / 3.00 NEX
COR T2 FS	20 x 20	4740 X 99.7	3.5 thick / 0.5 gap	320 x 256 / 4.00 NEX
AX T2 FS	20 x 20	5660 x 81.5	3.5 thick / 0.5 gap	320 x 256 / 4.00 NEX
AX T2	20 x 20	5760 x 88.7	3.5 thick / 0.5 gap	320 x 256 / 4.00 NEX
AX T1	20 X 20		3.5 thick / 0.5 gap	320 x 256 / 4.00 NEX

**Table 1. Standard Anal Fistula Imaging Protocol at Our Institution with a 3 TESLA MRI Machine**

**Statistical Analysis**

Total fifty (n = 50) cases were included in the study. We analysed the data statistically and for this reason data was put in a Microsoft excel page and then analysed by SPSS

24.0 and Graph Pad Prism version 5. For testing the significant difference Z-test (Standard Normal Deviate) was used. P-value ≤ 0.05 was considered for statistically significant.

**RESULTS**

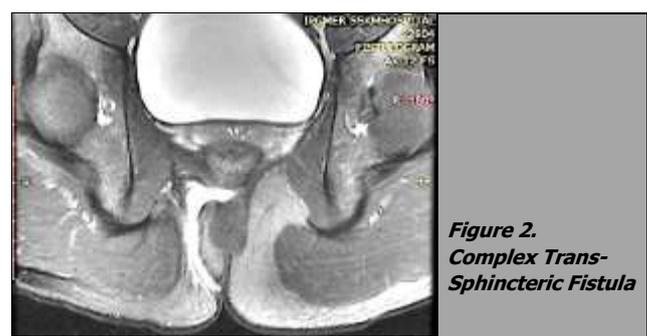
30 (60.0 %) patients had intersphincteric, 3 (6.0 %) patients had suprasphincteric, 17 (34.0 %) patients had transsphincteric. The Z-score is 2.6047. The p-value is 0.00932. The result is significant at p < 0.05. 46 (92.0 %) patients had no recurrence. The Z-score is 8.4. The p-value is < 0.0001. The result is significant at p < 0.05.

MRI Finding of Fistula	Frequency	Percent
Intersphincteric	30	60.0 %
Suprasphincteric	3	6.0 %
Transsphincteric	17	34.0 %
<b>Total</b>	<b>50</b>	<b>100.0 %</b>

**Table 2. Distribution of MRI Findings of Fistula**

Recurrence	Frequency	Percent
No	46	92.0 %
Yes	4	8.0 %
<b>Total</b>	<b>50</b>	<b>100.0 %</b>

**Table 3. Distribution of Recurrence**



**DISCUSSION**

Accurate preoperative assessment of perianal fistulous tract is the main purpose of the present study which to a large extent determines surgery effectiveness. In this study, 50 patients were included of which 38 were males and 12 were females. The prevalence was more in males than females. 76 % were males as compared to 24 % females. In this study, the perianal fistulas were classified into intersphincteric, transsphincteric and suprasphincteric. Out of 50 patients, 30 patients (60 %) had intersphincteric fistulas, 17 patients (34 %) had transsphincteric fistulas and 3 patients (6 %) had suprasphincteric.

They were further classified into simple and complex fistulous tracts. Among intersphincteric fistulas, 63.3 % were simple and 36.7 % were complex. Among transsphincteric fistulas, 35.3 % were simple and 64.7 % were complex. Among suprasphincteric fistulas, 33.3 % were simple and 66.7 % were complex.

In this study patients were divided into two groups based on involvement of levator ani muscle, presence of any secondary tract or ischiorectal abscess. 34 % of patients had secondary tracts, 18 % of patients had ischiorectal abscess, and 12 % of patients had levator ani involvement.

In this study, MR findings were correlated with OT findings. Out of 50 patients, 45 (90 %) patients had matched findings and 5 (10 %) patients had non-matched findings. The Z-score is 8. The p-value is < 0.0001. The result is significant.

In this study, the patients were followed up a period of 1 year to look for recurrence. Out of 50 patients, only 4 patients (8 %) had recurrence. The Z-score is 8.4. The p-value is < 0.0001. The result is significant.

We analysed the data statistically and for this reason data was put in a Microsoft excel page and then analysed by SPSS 24.0 and GraphPad Prism version 5. For testing the significant difference Z-test (Standard Normal Deviate) was used. The study is significant as the p value is < 0.05.

**CONCLUSIONS**

MR Fistulogram has become the recommended diagnostic method for accurately diagnosing and assessing perianal fistulas in soft tissues. It shows the precise location of a fistula in relation to the system of anal sphincters and identifies the internal and external orifices and branching of the fistula. It enables precise planning of the surgical treatment. It should be done in all patients with perianal fistulas to improve the operative outcome and to reduce recurrence.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

Financial or other competing interests: None.

Disclosure forms provided by the authors are available with the full text of this article at jebmh.com.

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