

# Efficacy of MRI in the Diagnosis and Grading of Perianal Fistula with Surgical Staging and Correlation - A Cross Sectional Study in a Tertiary Hospital

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## ABSTRACT

### BACKGROUND

Perianal fistula is an inflammatory pathological condition affecting soft tissues around the anal canal causing morbidity and requires surgical management and often has high tendency for recurrence. MRI has high accuracy in its preoperative assessment owing to high soft tissue contrast and guides in localization of the fistula, internal opening, ramifications and any associated abscess. Hence MRI plays an important role in planning treatment strategy, which is based on the type of perianal fistula and the degree of the involvement of adjacent tissues. We wanted to detect primary fistulous tract, determine the periodicity as acute or chronic. establish the relation of fistulous tract to sphincter complex, determine the position of the internal opening of the fistulous tract in relation to the anal clock, detect any cranial extension of the tract above levator ani muscle, identify any secondary fistulous tracts, any abscess to avoid surgical failure and recurrence and correlate accuracy of MRI with surgical staging.

### METHODS

MRI Fistulography was done on 40 patients over a period of 12 months using 1.5 T AVANTO SIEMENS machine using T1, T2, STIR imaging in axial, coronal and sagittal views. MRI was found to have 97.29 % sensitivity, 66.66 % specificity, 94 % positive predictive value and 50 % negative predictive value and overall diagnostic accuracy is 95 %.

### RESULTS

In the present study, during a period of 12 months, 40 patients were evaluated with MR fistulography. It was found to be highly sensitive in identifying the internal opening of fistula and secondary tracts, abscess formation, supralelevator and horseshoe extension. Most common was grade II in 15 patients, followed by grade I in 9 patients, grade 3 in 6 patients and grade 4 in 6 patients and 4 patients had grade V and commonest internal opening was at 6 O' clock position. MRI findings were concordant with surgical findings in 36 patients, one patient with grade 1 was found to be grade 3 on surgery and 2 patients as grade 1 on MRI were found to be simple perianal sinuses on surgery and other one was only a fibrosed tract.

### CONCLUSIONS

MR Fistulography has emerged as an imaging technique of choice for preoperative evaluation of perianal fistula providing highly accurate rapid non-invasive means of performing pre-surgical assessment of fistula and is highly sensitive in the detection of primary tract, internal opening, secondary tract, abscess, and horseshoe extension along with its relation to pelvic structures and its complications on comparison with operative observations.

### KEYWORDS

MR Fistulography, T2W, STIR (Short-TI Inversion Recovery)

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## BACKGROUND

Anal canal is surrounded by internal and external anal sphincters and intersphincteric space. Demonstrating the relevant anatomy of anal region in appropriate planes is important in this study as radiological grading of perianal fistula is ultimately based on detailed anatomy. External sphincter, puborectalis, levator plate are of similar signal intensity to striated muscle anywhere in the body against low signal intensity of ischioanal and ischioanal fat on STIR. Internal sphincter is high signal intensity on both STIR and T2W. In between lie the intersphincteric plane.

External sphincter diverges laterally in superior sections. Below levator ani and lateral to external sphincter lies the ischioanal and ischioanal fossa which contains fat and so hypointense on STIR. Above levator ani lie the supralelevator space. Identification of all these structures on coronal plane is of prime importance and plays an important role in surgical management. Axial sections are important in identifying the relation of the tract to internal, external sphincter and intersphincteric plane. MR fistulography improves the diagnostic effectiveness in the detection of the primary fistulous tract and also determines its periodicity as acute or chronic, assessment of fistulous course, relation to the anal sphincters and identifies the internal opening in relation to the anal clock and external orifices as well as additional branches secondary fistulous tracts, abscess or horse shoe extension, also detects any cranial extension above the levator ani and hence allows precise planning for surgical management.<sup>1</sup>

Axial views help in predicting the internal opening of fistula in conjunction with Goodsalls rule. Parks et al.<sup>2</sup> Described the course and relationship of a perianal fistula to the sphincteric complex in coronal plane. In the present study we used ST James University classification<sup>3</sup> consists of 5 grades and related to Parks surgical classification to anatomy seen on MR in both axial and coronal planes. This has been showing to correlate better than initial surgical assessment with long term outcome<sup>4</sup> also proven surgically.<sup>5</sup>

Grading of fistulas is as follows- 1. Linear intersphincteric, 2. Intersphincteric with abscess, 3. Transsphincteric. 4. Transsphincteric with abscess or secondary tract in ischioanal fossa and 5. Supralelevator or translevator extension.

We wanted to detect primary fistulous tract, determine the periodicity as acute or chronic. establish the relation of fistulous tract to sphincter complex, determine the position of the internal opening of the fistulous tract in relation to the anal clock, detect any cranial extension of the tract above levator ani muscle, identify any secondary fistulous tracts, any abscess to avoid surgical failure and recurrence and correlate accuracy of MRI with surgical staging.

## METHODS

A cross sectional study was conducted among 40 patients referred from surgical out-patient department, OGH (Osmania General Hospital) over a period of 12 months from

April 2019 to April 2020. They were evaluated with MR fistulography in Department of Radiology. They had come with complaints of single or multiple discharging sinuses, recurrent perianal abscess or were clinically suspected cases in the age group of 20 to 50 years. No contrast was given in our study.

### Inclusion Criteria

Patients with age group of 20 to 50 yrs. with any of the following indications.

1. Patients with clinically suspected cases of fistula in ano.
2. Single or multiple discharging sinuses in the perianal region.
3. Recurrent perianal abscess for detection of undetected tracts.

### Exclusion Criteria

1. Patients with MRI incompatible devices or implants.
2. Patients with claustrophobia.
3. Under the age group of 20 yrs. and above 50 years.
4. Patients with profound septicaemia and unable to sleep in supine position.
5. Patients with life support system.

### Study Procedure

MRI performed using 1.5 T AVANTO SIEMENS Machine with phased array coil, sagittal scout section taken initially through anorectal region and coronal, sagittal and axial views extending from perianal region to above the level of levator ani muscle. Study does not require any preparation. Unenhanced T1W images provided excellent anatomy of the sphincter complex, levator ani and ischioanal fossa. T2W provide good contrast between the hyperintense fluid in the tract and the hypointense fibrous wall of the tract and clearly differentiates between internal and external sphincters.

The following were assessed for each of the MRI sequence.

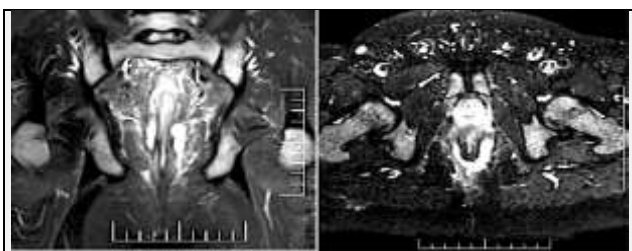
1. Site of the fistula
2. Location of the fistula and its internal opening
3. Presence or absence of sinus tracts.
4. Abscess or horse shoe tracts.
5. Cranial extension of the tract.

Anatomical classification of the fistula according to ST James Hospital on axial and coronal views are correlating with parks surgical classification. Location of internal opening done on axial images using anal clock with 12" o clock in anterior and 6 O' clock in posterior.<sup>6</sup>

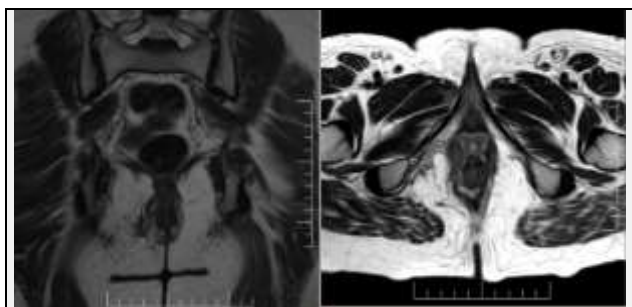
## RESULTS

In our study done on 40 patients most common age group was 21 to 30 yrs. i.e., 40 % and males were more common with incidence of 80 %. 25 (62.5 %) patients had recurrent perianal fistula. Recurrence was found in patients associated

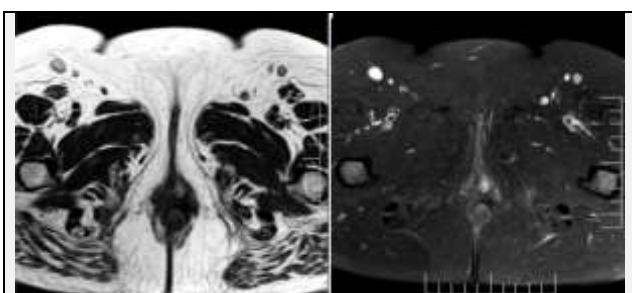
with diabetes, Crohn's and tuberculosis and also seen in patients with no associated risk factors in 64 %.



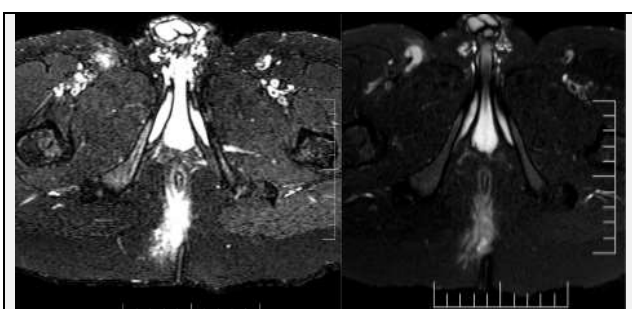
**Figure 1. Coronal and Axial STIR Images Show Bilateral Transsphincteric Fistulas with Horseshoe Collection in the Intersphincteric Plane**



**Figure 2. Coronal and Axial T2 Images Showing Transsphincteric fistula with internal opening at 6 O' Clock position**



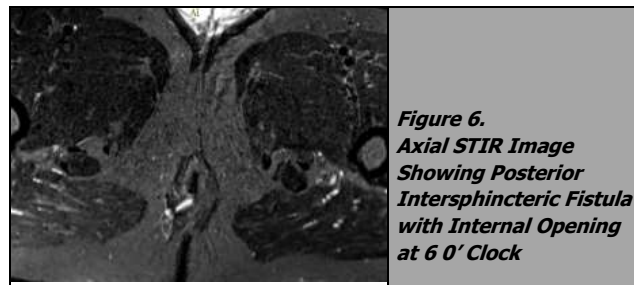
**Figure 3. Axial T1W and STIR Images Show Intersphincteric fistula with internal opening at 1 O' Clock position**



**Figure 4. T2 SPAIR and 3D SPAIR Images Shows Perianal Abscess with Transsphincteric Extension**



**Figure 5. STIR Axial image showing Anterior Intersphincteric fistula with Side Tracts**



**Figure 6. Axial STIR Image showing Posterior Intersphincteric fistula with internal opening at 6 O' Clock position**

Inter Sphincteric	24 (60 %)
Transsphincteric	12 (30 %)
Supra Sphincteric	2 (5 %)
Extra Sphincteric	2 (5 %)

**Table 1. Distribution of Fistula According to Park's Surgical Classification (n = 40) in Relation to MRI Coronal Anatomy**

Simple Linea Intersphincteric Fistula, Grade I	9 (22.5 %)
Complex Intersphincteric with Abscess, Grade II	15 (37.5 %)
Simple Transsphincteric, Grade III	6 (15 %)
Complex Transsphincteric with Abscess / Secondary Tract in Ischioanal or Ischioanal Fossa. Grade IV	6 (15 %)
Supra Levator / Extra Sphincteric, Grade V	4 (10 %)

**Table 2. St. James University Hospital Classification (n = 40)**

MRI Grading of the Fistula	Number of the Patients	Associated MRI Findings-				
		Non Branches	Branches	Horse Shoe Component	Abscess	Supra Levator Extension
1	9 (22.5 %)	9	0	0	0	0
2	15 (37.5 %)	0	15	4	8	0
3	6 (15 %)	6	0	0	0	0
4	6 (15 %)	2	4	4	6	0
5	4 (10 %)	2	2	0	3	4
<b>Total</b>	<b>40</b>	<b>19</b>	<b>21</b>	<b>8</b>	<b>17</b>	<b>4</b>

**Table 3. Grade of the Fistula and Associated MRI Findings**

Grade of the Fistula Based on MRI and Number of the Patients.	MRI Findings	Surgical Findings
Grade I (n = 9) Simple linear intersphincteric fistula	9 patients had simple linear intersphincteric fistula.	Surgical findings were same as MRI in 5 patients, one patient with grade 3 i.e. transsphincteric on surgery given as grade 1 on MRI and Other 3 patients graded as grade 1 on MRI but 2 had only perianal sinus on surgery and other one had fibrosed tract.
Grade II (n = 15) Intersphincteric with abscess / secondary tract.	Associated MRI findings: Abscess 8 Secondary tracks 15 Horse shoe 4	Abscess 8 2° tracks 15 Horse shoe 4
Grade III (n = 6) Transsphincteric	6 patients not associated with abscess or secondary tracts or horse shoe component.	All 6 showed Simple transsphincteric with no associated abscess or secondary tracts or horseshoe component. One patient graded as grade I on MRI has transsphincteric fistula on surgery.
Grade IV (n = 6) Transsphincteric fistula with abscess / secondary tracts and horseshoe extension.	Associated MRI findings: Abscess 6 Secondary tracks 4 Horse shoe 4	Abscess in 6 patients Secondary tracts in 2 patients and horse shoe component in 4 patients.
Grade V (n = 4) Supralelevator and translevator extension.	Associated MRI findings: Abscess 3 Secondary tracts 2	Showed supralelevator extension in 3 patients with abscess and secondary tracts.

**Table 4. Distribution of Study Subjects According to Each Grade at MRI and Associated Findings & Surgical Correlation**

	Surgery Positive	Surgery Negative	
MRI Positive	36 (TP) A	2 (FP) B	38
MRI Negative	01 (FN) C	1 (TN) D	02
	37	3	40

**Table 5. Validity of MRI in the Diagnosis of Perianal Fistula**

Sensitivity	Specificity	Positive PV	Negative PV
97.29 %	66.66 %	94 %	50 %

**Table 6. Sensitivity, Specificity, Positive and Negative Predictive Values in the Detection of Perianal Fistula**

In our study most common fistulas were intersphincteric (64 %) which were type I in parks classification and complex intersphincteric with abscess (37.5 %) i.e., grade II, according to St. James classification. Commonest internal opening was found at 6''0 clock position in 40 % of patients.

Associated abscess was found in 17 patients, as complex intersphincteric (8 patients), complex transsphincteric (6 patients), and supralelevator and extra-sphincteric (3 patients). Horseshoe component was found in 8 patients, 4 patients with grade II and other with grade IV.

Secondary tracts were found in 21 patients, out of which 10 patients had primary fistula with grade II and 11 patients had secondary tracts in recurrent fistulas, 5 in grade II, 4 in grade 4 and 2 in 5 respectively.

MR fistulography was found to have 97.29 % sensitivity, 66.66 % specificity, 94 % positive predictive value, 50 % negative predictive value, and overall diagnostic accuracy of 95 %.

## DISCUSSION

MR fistulography was performed on 40 patients who were referred from Surgical Department OGH for confirmation and grading of perianal fistulas. All patients suspected to have perianal fistula were subjected to MR fistulography and study done using 1.5 T SIEMENS with axial. Coronal and sagittal sections and they are classified based on PARKS and ST JAMES University Hospital classification.

Out of 40 patients 80 % are males and 20 % are females. More incidence in males is related to more number of anal glands and tend to be more complex as compared to females. Most common age group is 21 to 30 years.

In our study, majority are recurrent fistulas and MRI is helpful in better delineation of tracts in recurrent cases. Recurrence rate is high in cases with tuberculosis, diabetes and Crohn's disease, out of 24 cases 3 had diabetes, 2 had TB and 6 had Crohn's and others with no risk factors.

In study conducted by Beets Tanet et al<sup>7</sup> 12 out of 56 patients, Crohn's disease was found to be a risk factor.

It was observed that majority of cases were complex fistula. Grade II and above are classified as complex (77.5 %) because of presence of secondary tracts / abscess and involvement of planes other than intersphincteric plane.

In the study of Beet Tan et al<sup>7</sup> complex fistulas were 57 % and study done by Spencer et al<sup>4</sup> 40 % had complex fistulas.

Correct localization of internal opening is diagnosed by MR fistulography was confirmed with surgery in all patients and it was found to be 100 % sensitive. Comparative studies

done by Kulvindersingh et al<sup>8</sup> and Rania E Mohammed et al<sup>9</sup> found that MR fistulography as 95.87 % and 100 % sensitivity respectively.

Detection of primary tracts in present study in 16 cases found to be 100 % sensitive as compared to PG Barker et al<sup>10</sup> which was 86 % sensitive.

According to Beets Tan et al<sup>7</sup> preoperative MRI was 100 % accurate in detection of secondary tracts. In our study 25 patients had secondary tracts i.e., 62.5 % as compared to 39 % had secondary tracts in study done by Beets Tan et al and also observed that (13 patients) with secondary tracts were those who had recurrent fistulas and in study done by Muhammed Amjad et al<sup>11</sup> 11 out of 12 patients had secondary tracts.

Abscess and Horse shoe component were found in 17 and 8 patients.

Those cases who have supralelevator extension fall into grade IV or V and they have high surgical significance and complications. In our study 4 patients had grade IV and surgically proven. Out of 40 patients MR fistulography grading was found to be surgically correct in 36 patients, 2 cases as false positive where it was diagnosed as grade I on MRI and on surgery there was a only a perianal sinus tract and one patient as true negative as there was only a fibrosed linear tract on surgery and also on retrospective study of MRI.

One case was under graded where transsphincteric fistula was missed with MR fistulography and seen at surgery and graded as grade 1 on MRI and considered as False negative. According to DariuczWaniczek<sup>1</sup> in 2011 reported 6 transsphincteric fistulas out of 14 cases and surgical findings matched in 13 out of 14.

In our study Intersphincteric fistulas are common (24 patients) compared with Ataata et al Essaswamy<sup>12</sup> in 2013. Imaadur Rehman<sup>13</sup> reported MRI findings are concurrent with surgical findings in 10 out of 11 patients regarding type and extent of perianal fistulas.

## CONCLUSIONS

MR fistulography was performed in 40 patients referred from surgical department for preoperative evaluation of perianal fistulas. 80 % were males and 20 % were females. Majority are recurrent fistulas. Most common type was intersphincteric and according to ST James University were grade II. Most common site of internal opening as 6 O' Clock. MR fistulography has high sensitivity to identify internal opening, secondary tracts, abscess formation, horseshoe and supralelevator extension. Two cases were false positive, and were found to be only perianal abscesses on surgery and one case was false negative which was found to be grade III fistula on surgery and only graded as grade I on MR fistulography and one was true negative as it was only a fibrosed tract on surgery.

Thus, MR fistulography emerged as the imaging technique of choice for preoperative evaluation of perianal fistulas providing a highly accurate rapid and non-invasive means of performing pre-surgical assessment and guides in surgical management and thereby decreases the incidence

of recurrence. Also, side effects like faecal incontinence are avoided.

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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