Section: Radiology

Original Research Article

ROLE OF MR FISTULOGRAM IN PREOPERATIVE ASSESSMENT OF ANORECTAL FSTULAS ITS CORRELATION WITH INTRAOPERATIVE FINDINGS.

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ABSTRACT

Background: The aim is to evaluate the role of MR FISTULOGRAM in preoperative evaluation of anorectal fistulas.

Materials and Methods: This study included 50 patients who underwent MR fistulography followed by surgery within a period of 22 months from January 2021 to October 2022.

Results: In the present study, Out of these 43 patients were males and 7 were females. Age of presentation ranged from 19-65 years with majority peaking between 30 50 years of age. The most common type of fistula was intersphincterictype. Trans sphincteric type of fistula was 2nd most common. The most common location of external opening was found between 4 and 6'o clock position. The internal opening was most commonly found at 6'o clock position. Based on St Jame,s University Hospital Classification, grade I perianal fistulas were most common followed by grade IV. Complications due to perianal fistulas was most commonly seen in age group between 30-50 years. In our study, 17 out of 50 patients (34%) were diagnosed to have secondary tracts. Abscesses were detected in 6 patients. Out of these, 5 patients had perianal abscess and, one patient had ischiorectal abscess. In all those 50 patients who were followed for surgical details, the per operative findings correlated precisely with the MRI findings. Surgical and MRI findings were statistically significant in our study with a p value of 0.04. Grade 3 and 4 fistulas showed discrepancies in identification of tracks.2 ot of 17 patients in whom MRI showed secondary tracks did not agree with surgical findings.

Conclusion: MR imaging has major role in preoperative assessment of anorectal fistulas. MRI provides finer anatomic details of fistula and also identifies secondary tracks and abscesses. It is a rapid, well-tolerated, and accurate technique with low interobserver variability.

Keywords: MRI Imaging, Anorectal fistula, intersphincterictype, ischiorectal abscess.

INTRODUCTION

An abnormal connection between two structures or organs, or between an organ and the surface of the body, is known as a fistula. Anal canal and perineum skin are abnormally connected in this condition. It occurs in roughly 0.01% of cases. Perianal fistula is a rare condition, yet a serious gastrointestinal disorder that causes significant morbidity. It affects roughly 10 out of every 100,000 people, and the majority of those affected are men.[1,2] Affected individuals are frequently young males. Goods all and Parks made the first contributions to the research of perianal fistulas.[3,4] Perianal fistulas are also linked to inflammatory bowel disease and tuberculosis. Anorectal fistulas can be Inter-sphincteric, trans-sphincteric, extra-sphincteric, or supra-sphincteric. Identification and treatment of anorectal fistulas require a thorough understanding of anorectal anatomy, as indadequateexicision lead to frequent recurrences and overexcision leads to fecal incontinence.[5] The classification systems employed

include those of Park's and St. James University Hospital, with the latter providing more information about perianal fistulas. MRI helps in identification of primary and secondary tracks, as well as complications such as abscesses and hence assisting the surgeons to plan appropriate treatment strategy.[6]

Aims and Objectives

- To evaluate the role of MR FISTULOGRAM in preoperative evaluation of anorectal fistulas. • To clearly delineate the fistulous tracks, internal openings and the association of perianal fistulas with anal sphincter complex.
- To identify the secondary tracks and other complications like horseshoe track and abscesses and to grade the fistulas according to St. James University Hospital Classification.
- To correlate MR findings with intra operative details.

MATERIALS AND METHODS

From January 2021 to October 2022, around 50 patients who were diagnosed to have perianal fistula clinically and referred for MR fistulogram to the Department of Radiology, Kurnool Medical College Hospital, Kurnool were included in the study.

Design: Hospital based prospective observational study.

Setting: Department of Radio Diagnosis in collaboration with department of General Surgery.

Inclusion Criteria

All patients with active perianal discharge referred for MR fistulography to Department of Radiology, Kurnool medical college are included in this study.

Exclusion criteria:

1. Patients with comorbid pathologies that make them unfit for surgery are excluded from this study.
2. Patients with cardiac pacemakers, new implants, clips within the body and other contraindications of MR imaging to be excluded.

Study methodology: Patients suffering from anorectal fistulas who were referred to the Department of Radio Diagnosis are included in this study. After informed consent from the patients, they were subjected to MR fistulogram using 1.5- Tesla unit system. Different MRI sequences like oblique axial and coronal T1W FSE, T2W FSE, fat suppressed oblique axial and coronal T1 and T2W FSE, DWI and ADC images were used.

MRI sequences	**Non contrast scans**		**Non Contrast fat Suppresed Scans**		
	T1 W FSE	**T2 WFSE**	**FS T1 W FSE**	**STIR**	**DWI**
Imaging plane	Axial and coronal	Sagittal axial coronal	Axial and Coronal	Sagittal axial Coronal	Axial
TR/TE (m sec)	583/10	4662/90	2500/65	2500/65	2805/70
Fov	200*200	200*180	200*181	200*181	375*306
Section thickness (mm)	4mm	4mm	4mm	4mm	4mm
Matrix	200*155	192*162	200*155	200*166	128*145

The following were assessed: type of fistula, position of internal opening, grading of fistula by St. James's University Hospital MRI Classification and the accuracy of MRI findings was correlated with intra operative findings.

Type of study: Prospective observational study.

Statistical analysis: MRI findings are placed into one of the four caterogories after surgical excision, with per operative surgical findings being the gold standard.

1. True positive:
MRI findings of internal openings/lateral ramificatins confirmed with peroperative surgical findings.

2. TRUE negative:
MRI of no internal openings/lateral ramifications, confirmed with peroperative surgical findings.

3. False positive:
MRI findings of internal openings/lateral ramifications, but surgical findings negative.

4. False negative:
MRI findings of no internal openings/lateral ramifications, but surgical findings positive. Based on the above category, sensitivity, specificity, Positive Predictive Value, Negative Predictive Value are calculated to assess the reliability of the MRI results.

1. **Sensitivity:** The sensitivity of MRI is defined as the ability of the MRI to detect correctly fistulous tract/lateral ramifications/internal openings. It is determined by the equation:True positive/(true positive+true negative) X100%
2. **Specificity:** Specificity of MRI is defied as the ability of MRI to correctly exclude a fistulous tract/ lateral ramification/ internal openings.
3. **It is calculated by the equation:** True negative/ (true negative+false positive) X100%
4. **Positive predicitive value (PPV):** It correlates a positive result of MRI with surgical findings. It is calculated by the equation: True positive/(true positive+ false positive) X100%.
5. **Negative predictive value(NPV):** It correlates a negative result on MRI with the surgical findings. It is calculated by the equation: True negative/ (True negative+ false negative) X 100%

Raw data were entered into a Microsoft Excel Spreadsheet and analyzed using standard stastistical software IBM SPSS statistical package version 26.0.Sensitivity, Specificity,positive predictive value and negative predictive value of MRI in identifying internal opening,abscess, secondary tracks, supralevator extension are assessed. Cohen's Kappa coefficient is used to analyze the agreement between MRI and surgical findings. Intraoperative findings

are considered as the diagnostic standard of reference for all the cases.

RESULTS

This study included 50 patients who presented with perianal pain, s welling, pus and blood-stained discharge to dept of general surgery, Kurnool medical college, and was clinically diagnosed as fistula in ano and referred for MRI fistulogram to Department of radiology. All the patients underwent surgery and the operative details were compared with the preoperative MRI findings. The results showed that among the 50 patients involved in our study group, 10 patients were below the age of 30 years (20%), 15 patients were between 31-40 years (30%), 15 patients were in the age group between 41-50 years (30%), and 6 patients were in age group between 51-60 years (12%). Only 4 patients were above the age of 60 years (8%).

Table 1: Age Wise Distribution of population.

Age	No of Patients	Percent
<30	10	20.0
31-40	15	30.0
41-50	15	30.0
51-60	6	12.0
>60	4	8.0
Total	50	100.0

Table 2: Gender Wise Distribution of Population.

Gender	No of Patients	Percent
F	7	14.0
M	43	86.0
Total	50	100.0

Table 3: Comorbid Wise Distribution of Population

Combird	No of Patients	Paercent
Recurrent fistula in ano	1	2.0
No	48	96.0
Yes	1	2.0
Total	50	100.0

Table 4: Demonstrating the number of external openings(single/multiple).

External opening	No of Patients	Percentage
Single	44	88%
Multiple	6	12%

In the remaining 6 patients with multiple external openings, the location of the external openings was found at perianal, perineal, and in gluteal region. Among the total 44 involved in our study with single external opening, the location of the external opening was found most commonly between 4-6'o clock location which was found in 19 patients (38%). The 2nd most common location being7-9'o clock position which was seen in 14 patients (28%), followed by 1-3'o clock position demonstrated in 9 patients (18%) and then between 10-12'o clock seen in 2 patients (4%).

Table 5: External Opening Wise Distribution of Population

Single External opening(N=50)		
Clock Position	**No of Patients**	**Percent**
10-30	9	18.0
40-60	19	38.0
70-90	14	28.0
100-120	2	4.0
Multiplex	6	12.0
Total	50	100.0

Table 6: Internal opening Wise Distribution of Population

Int Clock Position	No of patients	Percent
10-30	11	22.0
40-60	26	32.0
70-90	5	10.0
100-120	6	12.0
Missing	2	4.0
Total	50	100.0

In our study of 50 patients, abscesses were detected in 6 patients (12%), the rest 44 patients do not demonstrate any abscess in perianal or in ischiorectal region. On correlation with surgical findings, allthese 6 patients were found to have abscess thus achieving a sensitivity and specificity of 100% and 100% respectively

Table 7: ABSCESS Wise Distribution of Population

Abscess	No of Patients	Percent	Concordance
Absent	44	88.0	
Present	6	12.0	Sensitivity-80% Specificity-100%

Out of N=50 Table 7 represents that 88% of the population represents abscess absent group, 12% of the population represents Present group with 80% sensitivity ,100% specificity Among them, 5 patients had abscess in intersphincteric space(83%),in remaing 1 patient abscess was located in ischiorectal fossa(17%)and horse shoe abscess was not identified in our study group.T2 FS and DWI images are the most sensitive for identifying abscess and was seen in all 6 patients with abscess and helped in demonstrating the location and extent of abscess

Table 8: Types of abscess Wise Distribution of Population

Types of Abscess	No of Patients	Percent
Horeshoe	0	0.0
Simple Abscess	5	83.0
IN IRF	1	17.0
Total	6	100.0

In our current Table 8: St JAMES GRADING Wise Distribution of Population

St James Grade	No of Patients	Percent
I	24	48.0
II	4	8.0
III	7	14.0
IV	14	28.0
V	1	2.0
Total	50	100.0

In our study, there was significant correlation between the fistulous tracts identified on MRI and the surgical findings. Fistulotomy is the preferred method of management in our institution. And for patients with abscess, abscess drainage is done. Out of 50 patients MRI findings were correlated in 46 patients (92%), and 4 patients (8%) did not show correlation. P value is 0.04 showing significance of the study.

Table 9: Correlations during surgery Wise Distribution of Population

Correlation During Surgery	No of Patients	Percent
NO	4	8.0
YES	46	92.0
Total	50	100.0
P Value- 0.04		
Significant		

Table 10: secondary tracks

Sec. Tracks	No of Patients	No of Patients based on surgery findings	MRI-Surgery Concordance
No	33	35	
Yes	17	15	Sensitivity-100% Specificity-94%

Table 11: Park's Classification

Type of Fistula	No of patients	Percent
Intersphincteric	28	56.0
Transphincteric	21	42.0
Superasphinicteric	1	2.0
Extrasphincteric	0	0.0

On correlating the St Jame's University Hospital MRI grading with the sex distribution, it was found that among males, the most common grades were grade I and IV which was seen in 20 patients and 13 patients respectively. Among females, the most common grades were grade I and II which were recorded in 4 patients and 2 patients respectively. This correlation was insignificant with p value of 0.51.

Table 12: St James grading in relations with Sex

St James Grade	Sex	
	Female	Male
I	4	20
II	0	4
III	2	5

IV	1	13
V	0	1
Total	7	43
KRUSKAL WALLIS TEST		
P-value-0.511		
Not Significant		

Also in our study, when the age group of patients was correlated with the grading of fistula, it was observed that the grade II,III,V fistulas are common in age more than 60 years. Also grade I and IV fistulas were common in age group of 30-50 years, which signifies that complications were more common in middle and elderly age groups.

Table 13: St James grading in relations with Age

St James Grade	Age Distribution (In years)				
	<30	31-40	41-50	51-60	>60
I	6	8	8	3	24
II	0	1	1	1	5
III	1	3	1	2	7
IV	3	3	5	1	16
V	0	0	0	0	2
Total	10	15	15	7	54

Table 14: Sensitivity and specificity

	Sensitivity	Specificity	PPV	NPV	Kappa Coefficient
Loaction of Internal opening	100%	100%	100%	100%	1
Abscess	100%	100%	100%	100%	0.8
Secondary tacks	100%	100%	100%	100%	1
Supralevator extension	100%	100%	100%	100%	1

Similar to our study, Maier et al showed in his study that MRI achieved a 84% sensitivity for identification of perianal fistulas and abscesses. However, his study gave 15% false positive results which was not seen in our study. In our study, when the fistulas were graded according to St James University Hospital Classification based on MRI imaging findings and correlated with surgical findings, the MR imaging based grading of fistulas correlated accurately for grades I, II, V. It was found that 23 patients were identified gradeI,4 patients with grade II, and 1 patient with grade V fistulas intraoperatively. It was also found that in our study among 13 patients who were graded as type IV based on MR findings, only 10 patients had this type of fistula intraoperatively. The remaining 3 patients were categorised into grade III type as secondary extension tracks were not identified intraoperatively. And among 7 patients who were graded as type III, only 6 patients had this type of fistula. The remaining one patient has secondary extension tracts which were missed on MRI, but were noted intraoperatively. The sensitivity and specificity of MRI for grade III, IV fistulas were 95% and 100%, 85% and for other grades, the sensitivity and specificity were 100% and 100%. Out of patients in whom MRI showed secondary tracks did not agree with surgical findings. This false positive was due to confusion between neural and vascular elements within the ischio-anal fossa. MRI is effective in imaging primary tracts of intersphincteric fistulas but some of the false positives in detection of secondary tracts contributes to reduced specificity for MRI in grade IV fistulas.

Table 14: MRI grading and surgical concordance

ST James Grade	No of Patients Graded as per MRI	No of patients not operated	No. of patients Not operated	MRI-Surgical Concordance
I	23	23		Sensitivity -100% Specificity -100%
II	4	4		Sensitivity -100% Specificity -100%
III	7	6		Sensitivity -95% Specificity -100%
IV	13	10		Sensitivity -85% Specificity -100%
V	1	1		Sensitivity -100% Specificity -100%

In all those 50 patients who were followed for surgical details,the per operative findings correlated precisely with the MRI findings for grades I, II,V. MRI findings and intraoperative details was statistically significant in our study with a p value of 0.04. Also, MRI results were in substantial agreement with the surgical findings.

DISCUSSION

The anal glands are 6-10 branched glandular structures lined by stratified columnar epithelum. Anal glands provide a free communication in between the anal canal and the intersphincteric space, thereby allowing the disease process to extend into

the intersphincteric plane. From here, the disease can track in any direction. Due to chronic phase of intramuscular anal gland sepsis, which constitutes the cryptoglandular hypothesis, perianal fistulas are formed. Although perianal fistulas are uncommon in routine surgical practice, few of them are usually chronic and recurrent in nature. The complications of fistula-in-ano are most commonly seen in complex and supralevator fistulas which include abscess formation, formation of secondary tracts and perianal sepsis. Abscess usually develops adjacent to the course of fistulous tracts. Characteristically, the abscesses of intersphincteric fistulas are perianal or encysted within the intersphincteric space. Trans sphincteric fistulas are associated with development of abscess in ischiorectal fossa. If abscess extends into both ischiorectal and ischioanalfossae, then horseshoe abscess is formed. Without using preoperative imaging, in the previous era, surgeons operated on perianal fistula. The surgical strategy was established by clinical findings derived from a combination of digital rectal examination, proctosigmoidoscopy, and surgical explorationconducted under anaesthesia with or without probing, prior to the use of MR imaging for the classification of perianal fistulas. The primary objectives of performing an imaging study is to evaluate the following- 1) To determine the relationship of fistulous tract to the sphincter complex. 2) To establish the involvemet of sphincters, and if involved, whether the fistulous track traverses both internal and external anal sphincters (transsphincteric type) or only the internal sphincter (intersphincteric type). 3) To identify any secondary fistulous tracts that arise from the primary tract and the sites of abscesses. Failure to identify secondary fistulous tracks and sites of abscess formation preoperatively may lead to the recurrence of the disease and treatment failure. Secondary tracts or lateral ramifications may be found within the intersphincteric plane or ischiorectal fossa, or supralevator space. Horseshoe abscess extends across midline to bilateral ishiorectal fossa. So, a detailed preoperative evaluation of fistula in ano is necessary. In order to prevent the injury to the external anal sphincter, which results in fecal incontinence, it is necessary to delineate the relationship of the sphincter complex with the fistulous tracts. There are various imaging modalities in evaluation of perianal fistula. These include X-ray fistulography, endoanal or transrectal ultrasonography, CT fistulography, and MR fistulogram, which have been in practice for the last few decades to assist the surgeons in accurate diagnosis of fistula in ano. Now-a-days preoperative MRI of perianal and anal fistulas is gaining popularity, as it combines diagnostic abilities of X-ray fistulography, endoanal sonography and computed tomography in a single examination. MRI provides the surgeon all the information they need and helps in preoperative surgical planning. MRI has superior soft-tissue contrast and provides finer anatomic details of fistulous tracks and also identifies their secondary tracks and abscesses. Accurate delineation of perianal fistulous track and grading them accordingly is necessary to ensure a favourable surgical outcome. Other advantanges include not an operator dependent machine –like EUS. The added benefit of MR imaging is in the evaluation of complex fistulas, where the radiologist can inform the referring surgeon of disease extension to the supralevator and translevator that may require expert surgical management. Prior to surgery, performing an MRI provides therapeutic benefits in the treatment of chronic and recurrent perianal fistulas, including lower recurrence rates. In a study done in 16 patients, the MR imaging findings were compared with the clinical examination findings done under local anesthesia, it was said that the course and the type of perianal fistula was better delineated by MRI. In our current study, out of total 50 patients, approximately 86% of study were males (43patients). And the remaining 14% were females (7 patients). The majority % of them were within the age group of 30-50 years. This was in correlation with Halligan et al, who stated that the disease predominantly occurs in young adults, and men are more commonly affected. Out of the total 50 patients, intersphincteric type was most common when compared to other types. Trans sphincteric type was 2nd most common and suprasphincteric type was uncommon, where no cases of extrasphincteric type were recorded in our study. Similar to our study, Parks et al. demonstrated in their study that intersphincteric type of fistula was more common when compared to other types. Also, our study was in accordance with Morris et al., who, in their study, mentioned that intersphincteric type is most commonly seen with an incidence of about 70%, while trans sphincteric fistulas remains 2nd most common which accounted for approximately 20% of the total. In our current study, most of the patients had a single external opening. Multiple external openings population. were demonstrated in only 12 % of study The most common location of external opening was found between 4 and 6'o clock position.

Most of the patients have single internal opening, and only 2 patients (4%) had multiple openings. The internal opening was most commonly found at 6'o clock position. Rania EM et al, in their study found 6'o clock loaction of internal opening as most common and seen in 50% of study group.(47) In our study, we graded perianal fistulas into 5 categories based on St Jame's University Hospital classification. Our study demonstrated that grade I perianal fistulas were most common and seen in approximately 48% of study population(24 patients) followed by grade IV type fistulas which was seen in 28% of study group (14 patients). Similar to our study, Rania et al, in his study mentioned that grade I fistulas are more common, seen in 37.5% of study population followed by type IV seen in 20.8%.

On correlating St Jame's University Hospital Grading with the sex of the patients under study, it was found that among both males and females,

intersphincteric fistulas are the commonest followed by trans sphincteric type. In our study, it was observed that inter sphincteric and trans sphincteric fistulas are common in the age group of 30-50 years. Extrasphincteric fistulas secondary to other etiologies are common in age group above 40 years. On correlating the St Jame's University Hospital MRI grading with the sex distribution, it was found that among males, the most common grades were grade I and IV. Among females, the most common grades were grade I and III. However, H AI P Baddar et al, in his study found that type II fistulas were more common, while Naglaa D et al, demonstrated in his study that grade III and IV are most common when compared to other types of fistulas.

In our study,17 out of 50 patients were diagnosed to have secondary tracts. Identification of all these tracts is essential for complete eradication of the disease. Incomplete excision leads to increased recurrenc e rates resulting in significant morbidity.

Complications due to perianal fistulas such as secondary tracks, abscess, perianal sepsis was most commonly seen in age group between 30-50 years. Hence, accurate identification of location and extent of the disease is necessary to prevent recurrence. In our study group of 50 patients, abscesses were detected in 6 patients. Out of these, 5 patients had perianal abscess (83%) in remaining 1 patient abscess was located in ischiorectal fossa (17%) and horse shoe abscess was not identified in our study group

T2 FS images are most sensitive for identifying abscess and was seen in all the 6 patients with abscess and helped in demonstrating the location and extent of the abscess. The result obtained in our study was in agreement with the study done by Lunniss et al which stated that 86- 88% accordance between MR imaging and surgical findings. In our study, there was a significant correlation between the fistulous tracts identified on MRI and the surgical findings. In all those 50 patients who were followed for surgical details, the per operative findings correlated precisely with the MRI findings for grades I, II, III and V. Surgical and MRI findings was statistically significant in our study with a p value of 0.04

Grade 3 and 4 fistulas showed discrepancies in the identification of tracts. 2 out of 17 patients in whom MRI showed secondary tracks did not agree with surgical findings.

Table 15: MRI GRADING AND SURGICAL CONCORDANCE

St James Grade	No. of Patients graded as per MRI	No. of Patients with Concordant Surgical findings	No of Patients not operated	MRI-Surgical Concordance
I	23	23		Sensitivity-100% Specificity-100%
II	4	4		Sensitivity-100% Specificity-100%
III	7	6		Sensitivity-95% Specificity-100%
IV	13	10		Sensitivity-85% Specificity-100%
V	1	1		Sensitivity-100% Specificity-100%

These false positives can be due to confusion between neural and vascular elements within the ischio-anal fossa. False-positives for secondary tracks may be due to one of the following reasons. • Inflamed fatty tissue may sometimes mimic as a fistula track. • Vascular structures can sometimes be prominent in the ischioanal fossa. • Hemorrhoids can appear as small submucosal fluid collections on MR images. • Old nonactive fibrotic tissue in the perianal region, which produces perianal pain, may simulate a recurrent fistula at MRI.

CONCLUSION

MR imaging has major role in preoperative assessment of anorectal fistulas. We routinely employ St. James University Hospital Classification, an MRI grading system for classifying anorectal fistulas which was validated by surgical exploration and long term clinical outcome. Perianal fistula may present with numerous complications like secondary tracks and abscess. Incomplete evaluation of these complications can result in residual and recurrent disease. By using St. James University MRI grading system, the radiologist can alert the referring clinician to the presence of complex disease that may require expert surgical management. This classification uses easily recognisable anatomical districtriminators on axial and coronal MR images for grading fistulas. Also, MRI provides finer anatomic details of fistula and also identifies secondary tracks and abscesses. It is a rapid, well-tolerated, and accurate technique with low interobserver variability. So, complete preoperative evaluation of perianal fistulas is warranted. On MRI, the disease is likely contained to the sphincter complex if the ischioanal and ischiorectal fossae remain unaltered at MR imaging (intersphinctericfistulization, grade 1 or 2). MRI satisfies all these needs of surgeons and helps in planning of surgery. Correct identification of perianal fistulae and proper grading of fistulae are necessary for ensuring optimum surgical outcome.

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