

Role of 3 Tesla MR Fistulogram in Evaluation of Perianal Fistulas

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Abstract

Background: An unusual association b/w two organs and structures in the body is called a fistula, it may be also formed between an organ & skin of the body. Perianal fistula is an infrequent but critical GIT condition that can cause substantial morbidity. It develops due to various reasons but usually as a result of anorectal abscess. Men have a higher prevalence than women. It is a connection due to septic ulceration/I&D which formed surrounding rectum & anus, characterized by the development of improper connection b/w rectum & anal canal, to that of skin present over the anus. There are different classifications for perianal fistulas. The Parks classification is used widely for surgical classification and distinguishing 4 types. Radiologists have devised a new grading system for perianal fistulae called the St James's University Hospital classification, which comprises five grades and is based on landmarks on the axial plane. It also includes abscesses and secondary extensions. Because they are based on anatomical features, they are simple to utilize. A perianal fistula can be evaluated using a variety of imaging techniques. X-ray fistulography, endoanal ultrasonography, CT fistulography, and MR fistulogram are some of the options. The MR Fistulogram is a required imaging modality for the identification of fistula in ano, and its multiplanar reconstruction has proven to be extremely useful in surgery for characterizing and classifying fistulas based on their relationship to the diaphragm of the pelvis and the anal sphincter. **Subjects and Methods:** Patients referred to the department of Radiodiagnosis at Narayana Medical College and Hospital in Nellore were the main source of data. There are 42 individuals in this hospital-based prospective research. This study was conducted over two years (i.e., from Jun 2019 to Jun 2021). The subjects who gave informed consent were studied on a 3 Tesla GE MRI Scanner (GE Discovery 750w). **Results:** Our research included 42 people who had clinical and investigative features that pointed to an anal fistula. With a male to female ratio of 3:2, the bulk of the patients were men. The majority of the people were in their 30s and 50s. Tuberculosis and Crohn's disease were found to be co-morbidities. The intersphincteric form of fistula was the most common among the 42 patients in the study, followed by the trans sphincteric type. When the fistulous tracts were examined in our investigation, the majority of the patients had only one external opening. In most of the cases the opening was between 4 and 6 o'clock. When examining the internal opening, the majority of patients had only one. The internal opening was most commonly found in the 4 to 6 o'clock position. The surgical findings matched the study's findings on the location of the openings. We used the St James's University Hospital Classification to categorise perianal fistulas in our investigation. Grade I fistulas were found to be the most common, followed by grade III fistulas. Abscesses were seen in 8 of 42 patients (19.05%) and secondary tracts in 12 of 42 (28.57 percent). In our study, there is a significant correlation (p-value 0.006) between the fistulous tracts identified on the 3 Tesla MR Fistulogram and the surgical findings. **Conclusion:** Perianal fistula is a rare problem that can become chronic and recurrent. There are several complications, such as tracks and an abscess. Inadequate assessment of these consequences can lead to recurrent and persistent illness. As a result, a thorough examination of perianal fistulas is required prior to surgery. In order to avoid injury to the external sphincter and subsequent faecal incontinence, it is also necessary to establish the sphincter's relationship with the fistulous pathways. The 3 Tesla MR Fistulogram meets all of these requirements for surgeons and aids in surgery. The 3 Tesla MR Fistulogram identifies secondary tracks and abscesses as well as providing detailed anatomic details of the fistula. It can also tell the difference between scar tissue and granulation tissue. We conclude that a 3 Tesla MR Fistulogram is the best way to assess anorectal fistulas prior to surgery.

Keywords: MR Fistulogram, Perianal fistulas.

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Email: t.prasannavaibhav5182@gmail.com

Received: 29 March 2022

Revised: 24 May 2022

Accepted: 03 June 2022

Published: 30 June 2022

Introduction

An unusual association b/w two organs and structures in the body is called a fistula, it may be also formed between an organ & skin of the body. Perianal fistula is an infrequent but critical GIT condition that can cause substantial morbidity. It develops due to various reasons but usually, as a result, of-anorectal abscess. Men have a higher prevalence than women. The most common occurrence is noted between 20 to 40 years of age. Management depends on controlling infection & maintaining normal faecal continence.^[1]

It is a connection due to septic ulceration/ I&D which formed surrounding rectum &anus, characterized by the development of improper connection b/w rectum & anal canal, to that of skin present over the anus. Normally, fistula in ano couldn't be resolved without surgery and it is, the only modality to treat anal fistula.^[2]

The anal canal serves as the continuation of the rectum to the end of the alimentary system, the anus. It has two sphincters; IAS & EAS. Distinction b/w IAS & EAS is marked by the pectinate line, a series of longitudinal folds called anal columns, consisting of columnar epithelium. The superior portion contains IAS, & inferior portion contains EAS.

IAS is Not under voluntary control and the function is dependent on integrity. Recto anal inhibitory reflex (RAIR), involves the reflexive relaxation of IAS in presence of rectal distension.

EAS is under voluntary control, it acts to keep orifice closed and relaxes upon defecation.^[3]

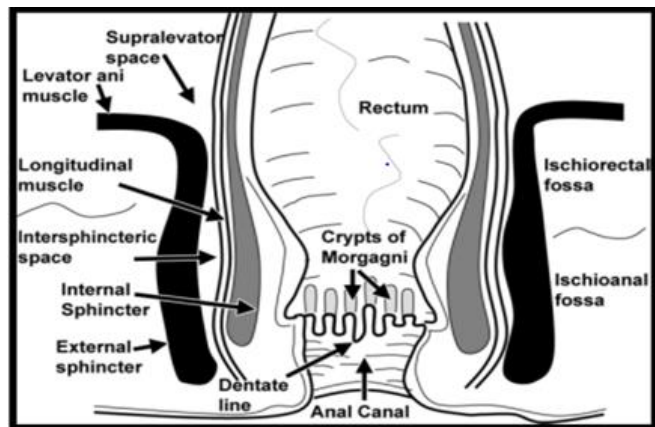


Figure 1: Relations of Anal Canal

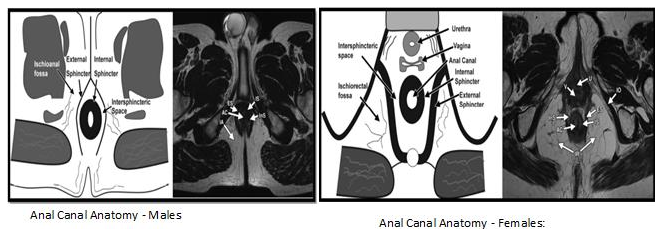


Figure 2: Anal Canal Anatomy

“AC = Anal canal, ES = external sphincter, InS = intersphincteric space, IO = internal obturator muscle, IR =

ischioanal fossa, IS = internal sphincter, U = urethra, V = vagina”.

The primary fistula opening, any accompanying tracts, and any secondary openings must all be removed during an anal fistula care procedure. The majority of anal fistulas are uncomplicated and can be treated with a fistulotomy, which has a low risk of recurrence and a low rate of morbidity.^[4]

Imaging In Perianal Fistulas

A perianal fistula can be imaged using a variety of methods. X-ray fistulography, endoanal ultrasonography, CT fistulography, and MR fistulogram are some of the options.

X-RAY FISTULOGRAPHY:

The classic imaging modality for defining the anatomy of fistulas was X-ray fistulography. An external fistulous opening is cannulated, and water-soluble contrast material is injected into the fistula. However, there are some drawbacks: 1) This primary tract may not be opacified by contrast and visible if it is clogged with pus and debris, 2) Secondary fistulous tracts may not be visible and the internal opening cannot be precisely determined, and 3) Sphincter muscle anatomy is not well defined, so the relationship between the tract, IAS/EAS, and levator ani is not revealed.

ENDOANAL ULTRASONOGRAPHY:

Endoanal ultrasonography is a relatively new technique. It has the benefit of providing a clearer picture of the tract and its relationship to the sphincter muscles. Operator dependence, a smaller FOV, and the lack of imaging in the coronal plane are all drawbacks. Its downsides include the inability to separate the infection from fibrosis, as well as the failure to discover secondary tracts and distant sepsis. High pathological lesions, such as suprasphincteric lesions, subcutaneous lesions, horseshoe type lesions, and minor extra branches, are not visible with EAUS. According to a research by Buchanan et al, MRI improves diagnosis accuracy by 10% when compared to endoanal ultrasonography. Endoanal ultrasonography and ultrasonography with contrast agents are becoming increasingly popular (eg. 3 percent hydrogen peroxide).

CT FISTULOGRAPHY:

Contrast medium can be delivered rectally or intravenously during CT fistulography. The attenuation values for sphincters, levator ani, fibrosed tracts, and active fistulas are nearly identical, making differentiation difficult.

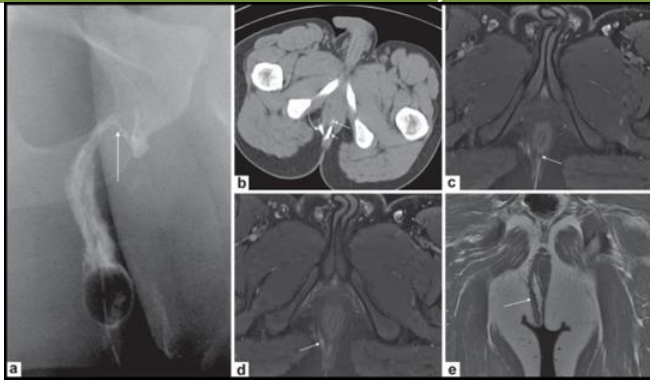


Figure 3: Combined trans and extra sphincteric fistula.

A traditional fistulogram (a) shows a large, well-defined fistula on the right side (arrow). Contrast in the rectum (long arrow) with two closely placed pathways, one near to the midline (short arrow) and the other lateral (curved arrow) to the right external sphincter on CT fistulogram (b) (extrasphincteric). The axial fat-saturated T2W images (c and d) reveal a trans sphincteric (arrow in c) and an extra sphincteric tract (arrow in d). The extrasphincteric tract's whole course is depicted in this T1W picture (e) (arrow).

MR IMAGING - PERIANAL FISTULAS:

The major goal of treatment is to eliminate infection while maintaining anal continence. To avoid a recurrence, the surgeon must understand the relationship between the tract and the anal sphincter muscles, as well as the proper delineation of secondary tracts. With the patient in the lithotomy posture, clock positions indicate the location and direction of fistulous tracts. The anterior perineum is represented by the 12'o clock position, natal cleft by the 6'o clock position, left lateral aspect by the 3'o clock position, and right lateral aspect by the 9'o clock position.

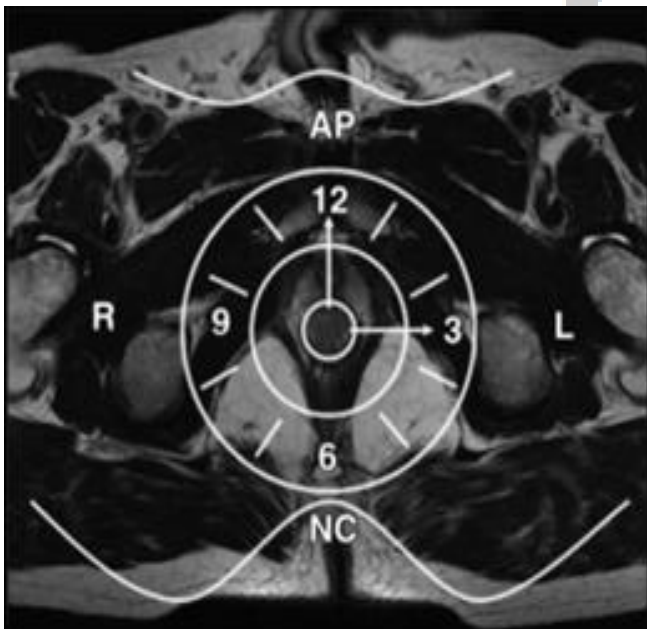


Figure 4: Anal clock

The 3 Tesla MR Fistulogram is a required imaging modality

for the identification of anal fistulas, and its multiplanar reconstruction has proven to be extremely useful in surgery to characterise and classify fistulas based on their relationship to the pelvic diaphragm and anal sphincter.^[3] The purpose of our current research is to determine the role of a 3 Tesla MR Fistulogram in detecting perianal fistulas, evaluating fistula tracts, internal apertures, and connecting MR findings with intraoperative findings.

Aims & Objectives

Our study's main goal is to see how useful a 3 Tesla MR Fistulogram is for assessing anorectal fistulas before surgery.

Identifying the fistula tracts, internal openings, and the interaction of the perianal fistula with the anal sphincter complex, as well as identifying secondary tracts and problems, and lastly matching MR findings with intraoperative findings are all objectives.

Subjects and Methods

Patients referred to the department of Radiodiagnosis at Narayana Medical College and Hospital in Nellore are the primary source of information. A total of 42 patients are included in this prospective hospital research.

Over the course of two years, this research was conducted (i.e., from Jun 2019 to Jun 2021)

Patients are chosen for the study based on their compliance with the following inclusion and exclusion criteria.

Inclusion Criteria

- Patients between the ages of 30 and 60
- Patients who presented with anorectal fistula.
- Written consent to participate in the study.

Exclusion Criteria

- Patients with a claustrophobic history
- Patients who have had metallic implants, cardiac pacemakers, or metallic foreign bodies in their bodies.
- Not willing to give consent.

On a 3 Tesla GE MRI Scanner, the participants who gave informed consent were studied (GE Discovery 750w). Oblique axial and coronal T1W FSE, T2W FSE, fat-suppressed oblique axial and coronal T1W FSE, T2W FSE, and fat-suppressed oblique axial and coronal T1W FSE, T2W FSE were among the MRI sequences used. On a separate GE AW volume sharing workstation, the acquired photos were evaluated.

Results

Between June 2019 and June 2021, 42 patients with clinical symptoms and investigations suggestive of anorectal fistula were enrolled in this study at Narayana Medical College, Nellore, Andhra Pradesh, a tertiary care hospital.

The incidence was high in males i.e., 26 (61.90%) and in females, it was low i.e., 16 (38.10%).

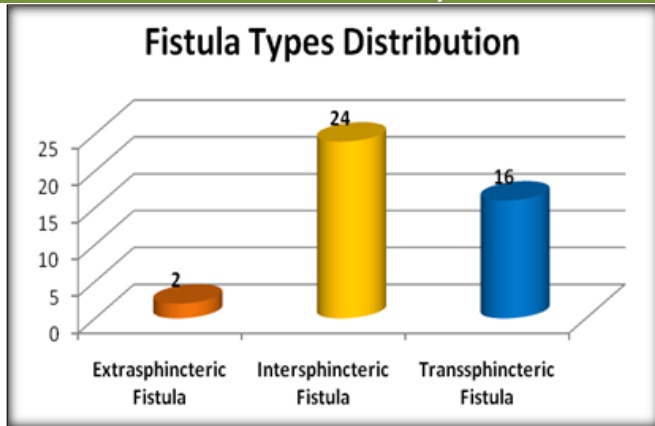


Figure 5: Fistula Types Distribution

The above figure shows the distribution of fistula types among the anorectal fistula subjects. The incidence of Intersphincteric fistula was observed in a high number of subjects i.e., 24 (57.14%) followed by Transsphincteric fistula in 16 (38.10%) subjects and Extrasphincteric fistula in 2 (4.76%) subjects.

The distribution of external opening among the subjects - The incidence of multiple external openings was observed in 8 (i.e., 19.05%) subjects and a single external opening was observed in 34 (i.e., 80.95%) subjects.

The incidence of 4 to 6'o clock position external openings is high i.e., in 20 (58.82%) subjects followed by 7 to 9, 10 to 12 and 1 to 3'o clock position.

Internal opening distribution in anorectal fistula patients. The incidence of multiple internal openings was observed in 6 (i.e., 14.29%) subjects and a single internal opening was observed in 33 (i.e., 78.57%) subjects and other openings in 3 (i.e., 7.14%) subjects.

The incidence of 4 to 6'o clock position internal openings is high i.e., in 14 (42.42%) subjects followed by 7 to 9, 1 to 3 and 10 to 12'o clock positions.

The incidence of secondary tracts was observed in 12 (i.e., 28.57%) subjects.

The incidence of abscesses was observed in 8 (i.e., 19.05%) subjects.

The incidence of tuberculosis was observed in 3 (i.e., 7.14%) subjects and Crohn's disease in 2 (i.e., 4.76%) subjects whereas no other co-morbidities were observed in the remaining subjects

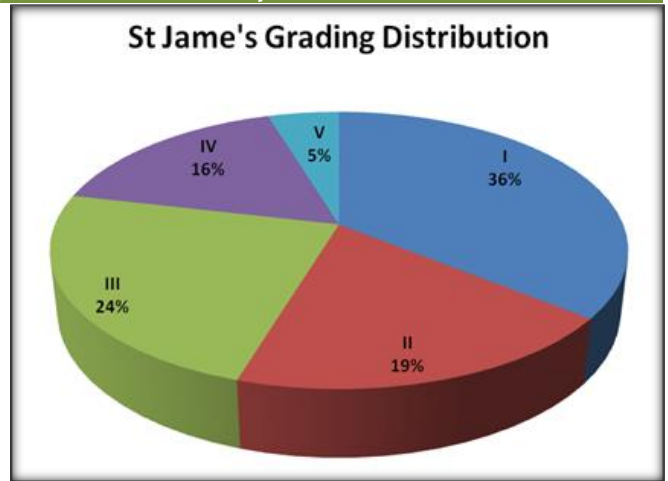


Figure 6: The St James's Grading Distribution

The above figure shows the distribution of St James's grading of anorectal fistula. The grade I fistula was observed high among the study subjects i.e., in 15 (35.71%) subjects followed by grade III in 10 (23.81%) subjects, grade II in 8 (19.05%) subjects, grade IV in 7 (16.67%) subjects and grade V in 2 (4.76%) subjects.

The findings observed in 3 Tesla MR Fistulogram were correlated well with intraoperative findings in 35 (i.e., 83.33%) subjects, particularly with Grade I, III and IV followed by Grade II and not correlated well with 4 (i.e., 9.52%) subjects. Other findings were observed in 3 (i.e., 7.14%) subjects.

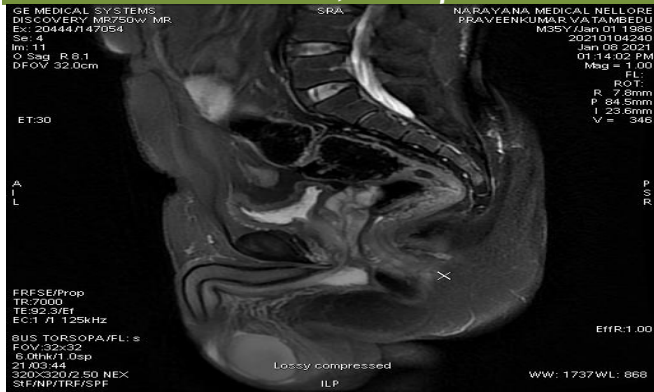
Representative Cases

St. James University Hospital Classification

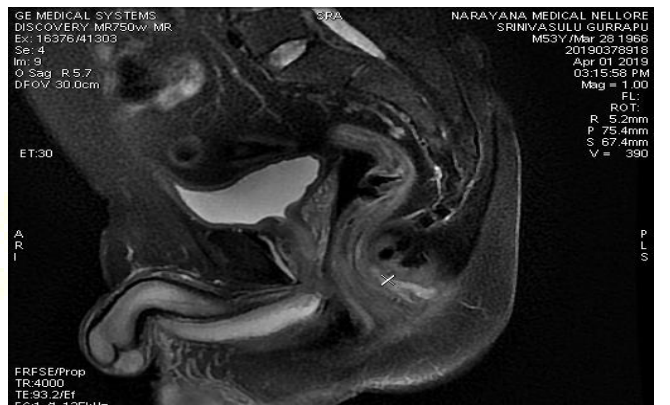
Grade 1: Simple Linear Intersphincteric Fistula



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Grade 2: Intersphincteric Fistula with Abscess

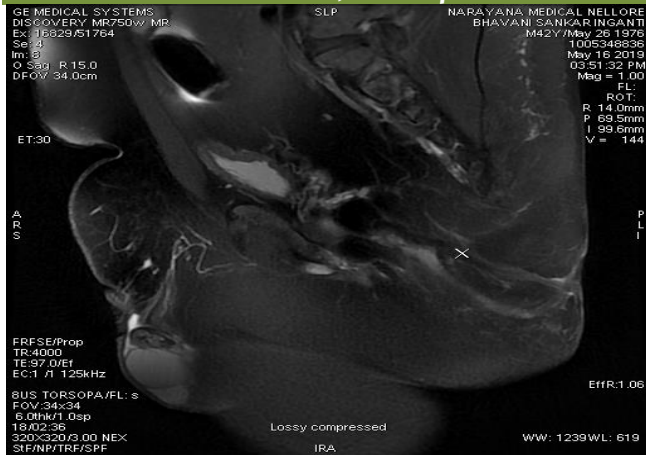


Grade 4: Transsphincteric Fistula with Abscess/ Secondary Track



Grade 3: Transsphincteric Fistula





Discussion

Perianal fistula is an infrequent but critical GIT condition that can cause substantial morbidity. It develops due to various reasons but usually, as a result of anorectal abscess. There are different classifications for perianal fistulas. The Parks classification is used widely for surgical classification and distinguishing 4 types.

Surgical classification:

The position of the fistula tract determines the type of anal fistula.

- Intersphincteric: 45% – “The fistula which is formed penetrates through IAS but spares external sphincter”
- Transsphincteric: 30% – Here fistula can pass through IAS & EAS.
- Suprasphincteric: 20% – Fistulas of this type can pass through the IAS and then enter superiorly in-plane between the sphincters to pass above the EAS before extending to the perineum. Horseshoe abscesses are included in this category.
- Extrasphincteric: 5% – It is extremely rare. It connects the rectum to the perineum and extends laterally to the IAS and EAS. Because the sphincter complex must be preserved, these fistulas are difficult to cure. (1).

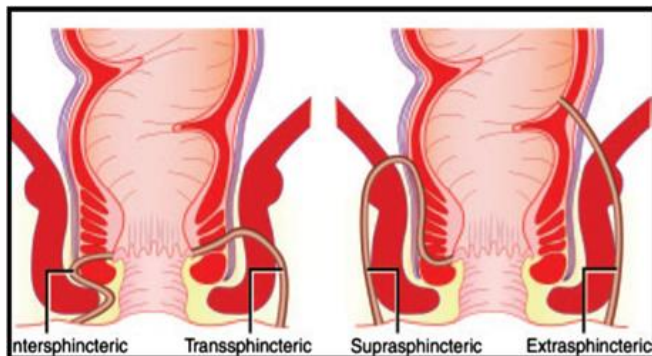


Figure 7: Surgical classification

Radiological classification

Radiologists have developed a new grading system for perianal fistulae called the St James's University Hospital classification, which is based on landmarks on the axial

plane and includes abscesses and secondary extensions to the grading system.

The St James University Hospital Classification, which comprises five classes, is based on MR imaging. Because they are based on anatomical features, they are simple to utilise. In classifying the types of fistulas, both primary and secondary fistulous tracts and abscesses are taken into account.

Grade 1 - Simple linear intersphincteric fistula

Illustration- coronal perianal area may be considered as grade 1 simple intersphincteric fistula, those started at anal canal, IAS is penetrated, & then upgraded along IS to skin.

“Axial T2-WI with FS show simple Is fistula which traverses IAS (arrow) & extends till skin without involving EAS or IR or IA spaces (asterisks)”. The fistulous tract is seen as increased signal intensity on T2-WI, which indicates active infection.

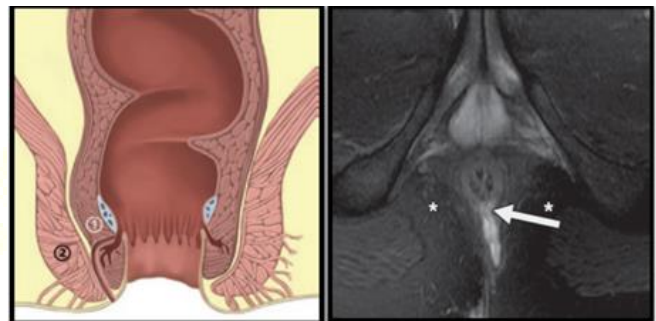


Figure 8: Simple linear intersphincteric fistula

Grade 2 - Intersphincteric with abscess or secondary tract

The external sphincter also defines these areas. Secondary fistulas that cross over to the other side (horseshoe type) might cause ramification in the ipsilateral intersphincteric plane. In the axial plane, a horseshoe fistula is better visible. T1W images show an increase in signal. They can be seen clearly with DCE-MR imaging.

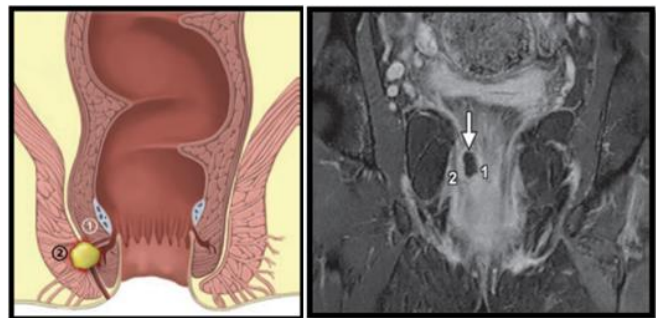


Figure 9: Intersphincteric with abscess or secondary tract

A grade 2 IS fistula that begins in the anal canal, perforates IAS (1), produces an abscess in the intersphincteric space, and then extends through the intersphincteric space to the skin is depicted in this coronal depiction of the perianal area. Beyond the external sphincter, the abscess and fistula tract do not extend (2).

Axial T2-WI with FS a grade 2 IS fistula is shown in this image.

Grade 3 - Transsphincteric fistula

The fistulous tract in this case pierces both layers of the sphincter and extends to the skin, passing through the ischioanal and ischioanal fossa. As a result, secondary oedema and hyperaemia may develop in these fossae. The enteric entry site, which corresponds to the location of the dentate line, is what distinguishes this form of fistula. Excision of this fistulous tract may result in faecal incontinence because it involves both sphincters.

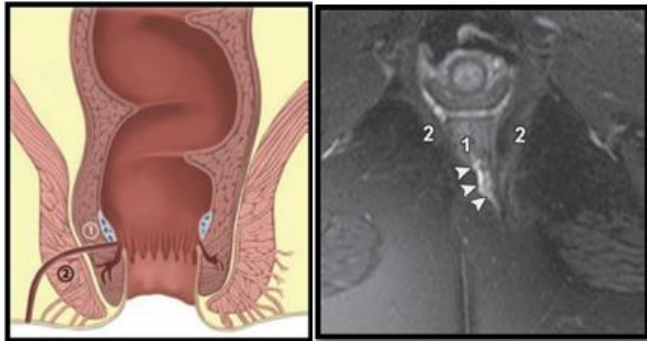


Figure 10: Transsphincteric fistula

[Figure 10] Illustrations showing grade 3 trans sphincteric fistula. Axial T2-weighted image showing grade 3 trans sphincteric fistula (arrowheads)

Grade 4 - Trans sphincteric with abscess or secondary tract within IR fossa.

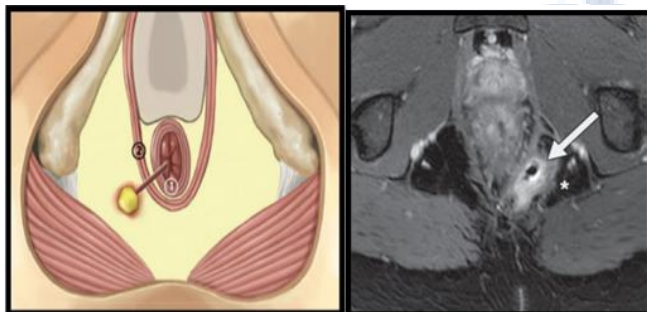


Figure 11: Trans sphincteric with abscess or secondary tract within IR fossa

Illustrations of Axial- perianal area depicting grade 4 trans sphincteric fistula

Axial T1-weighted image showing grade 4- trans sphincteric fistula. Abscess is visible with enhancement in the periphery and decreased signal in the center, indicating small gas foci.

Grade- 5: - Supralelevator & translevator extension.^[5]

Coronal- illustration - perianal area depicting grade 5 Supralelevator fistula.

Axial T2-weighted fat suppression (FS) images showing multiple secondary tracts (arrows) within ischioanal spaces (asterisks).

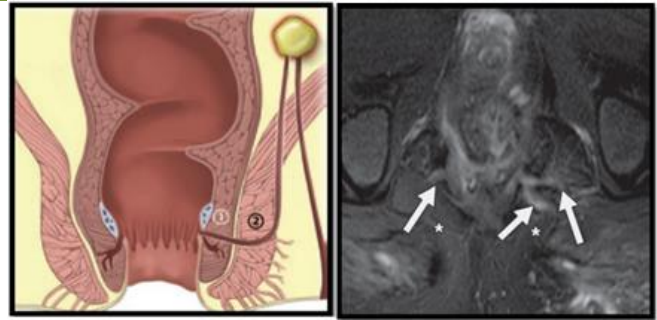


Figure 12: Supralelevator & translevator extension

Risk factors for Recurrence fistula are Broadly classified into Preoperative, Intraoperative and Postoperative factors. Preoperative factors include 1) Position of the tract -high trans-sphincteric, extrasphincteric, and suprasphincteric, 2) Curved fistula tracts (horseshoe and semi horseshoe fistulas), 3) Secondary extensions, 4) Secondary anal fistula to Crohn’ s disease, 5) DM, immunosuppressive drugs & Steroids and 6) Previous fistula surgery.

Intraoperative factors include 1) Wrong selection of the procedure, 2) Failure in identifying the internal opening, 3) Failure to remove primary tract completely

Postoperative factors include 1) Poor hygiene of the anal wound, 2) Persistence of preoperative factors.^[6]

In our study, 42 subjects were selected and studied.

According to the observed sex distribution among the anal fistula cases, the incidence was reported high in males i.e., 26 (61.9%) and in females, it was low i.e., 16 (38.1%).

As per our observations in the current study, the incidence was reported high in the age groups of 30 to 50 years.

As per the study conducted by Ramachandra M. L et. al,^[7] most common age of presentation was 31-40 years and more common in males than females (M: F = 2.3:1). These findings were well correlated with our study findings.

According to the observed co-morbidities distribution among the anal fistula cases, the incidence of Tuberculosis was reported in 3 (7.14%) subjects and Crohn’s reported in 2 (4.76%) subjects. No comorbidities were reported in 37 (88.10%) subjects.

As per the prospective study conducted by Daijiro Higashi et al,^[8] in treating anal fistula in individuals with Crohn’s Disease. The anal fistula was observed in Crohn’s disease subjects. These findings were well correlated with our study findings.

According to the observations in our study, the Incidence of Intersphincteric fistula was high i.e., in 24 (57.14%) subjects followed by Transsphincteric fistula in 16 (38.10%) subjects and Extrasphincteric fistula in 2 (4.76%) subjects.

According to the prospective study conducted by R. L. West M.D. et al,^[9] the presence of Intersphincteric fistula is observed in more number of patients which is correlated well with our study observations.

When the fistulous tracts were examined in our study, the majority of the patients (34 out of 42) had only one external opening (80.95 percent). Eight patients had multiple external openings.

Most commonly opening was noted between 4 and 6

o'clock. The most common external openings are at 4 to 6 o'clock, which occur in 20 (58.82 percent) of the patients, followed by 7 to 9, 10 to 12, and 1 to 3 o'clock.

When the internal opening was examined, it was found to be single in 78.57 percent of patients (33 out of 42), multiple in about 6 patients (14.29%), and other in three patients (7.14 percent). In 14 patients (42.42 percent), the internal opening was found in the 4 to 6 o'clock position, followed by 7 to 9 o'clock, 1 to 3 o'clock, and 9 to 12 o'clock positions. The surgical findings matched the study's findings on the location of the openings.

According to Kee Ho Song et al,^[10] review's of New Techniques for Treating an Anal Fistula. They discovered that single internal openings in fistula patients were more common than numerous openings, which matched our findings.

In our investigation, secondary tracts were found in 12 of 42 individuals (28.57%). For the disease to be completely eradicated, all of these tracts must be identified. Gadolinium contrast enhances active fistulous tracts, as previously stated. This aids in the accurate identification of fistulous tracts.

Abscesses were seen in 8 of the 42 participants in our study (19.05 percent).

We used the St James's University Hospital Classification to categorise perianal fistulas in our study. This demonstrated that grade I fistulas were the most common, with 15 patients having them (35.71 percent). Grade III fistulas, which were detected in ten individuals, are the second most prevalent form (23.81 percent). In eight patients, grade II fistulas were discovered (19.05 percent). Grade IV and V fistulas are relatively infrequent, occurring in just 7 (16.67%) and 2 (4.76%) of the patients, respectively.

A substantial correlation was found in our study between fistulous tracts identified on a 3 Tesla MR Fistulogram and surgical findings. In our hospital, fistulotomy is the primary way of care, and abscess draining is performed on patients with abscesses. Fistulotomy was performed in individuals whose MRI findings for grades 1, 3, and 4 matched well. There were differences in the identification of grade 5 and 2 fistulas. Abscess drainage was performed in three patients (7.14 percent), as evidenced by 3 Tesla MR Fistulogram results. The per operative findings for grades 1,3, and 4 corresponded precisely with the 3 Tesla MR Fistulogram findings in individuals who underwent surgery.

Yahya Baba et al., (2021) reviewed on Perianal fistula. The cryptoglandular hypothesis proposes that obstruction of the deep submucosal glands causes infection and abscess formation in the inter-sphincteric space, which then drains inferiorly between the sphincters and opens onto the skin surface, or, less commonly, erodes through both IAS and EAS into the ischioanal space, then onto the skin surface.^[5]

Annapura Patwari et al., (2020) has assessed Preoperative Assessment by MR Fistulogram and Correlated with operative Findings and Postoperative Outcome. Fistulas in the anal area can be caused by inflammatory bowel disease, perianal abscess, or any scenario involving malignancy or injury to the anorectal region. MRI has made a significant advancement in imaging evaluation and has the potential to

be the gold standard for perianal fistula.^[11]

Hesham Youssef Algazzar et al., (2019) had done a preoperative MRI of perianal fistula evaluation and its impact on surgical outcome. Preoperative MRI had sensitivity, specificity, and accuracy rates of 75 percent, 92 percent, and 84.6 percent, respectively, in predicting the degree of perianal illness. Surgical findings on the severity of PAF were shown to be highly linked with MRI findings. For fistula visualisation, DW-MRI had the highest sensitivity, specificity, and accuracy, with 100 percent specificity, as well as the maximum sensitivity, specificity, and accuracy for cavities larger than 3mm in diameter.^[12]

Ramachandra M. L. et. al., (2018) had evaluated a study in the management of anal fistula using various modalities. They examined several aspects of anal fistula treatment using various modalities such as fistulotomy, fistulectomy, setons, and lift operation, and also per operative complications, postoperative complications, and mean hospital stay. Males are more likely than females (M:F = 2.3:1) to present between the ages of 31 and 40. Patients undergoing fistulectomy are more likely to experience perioperative problems such as haemorrhage. Patients who underwent the LIFT surgery experienced no complications during their recovery. Patients receiving a setons surgery experience increased postoperative pain.^[7]

Dariusz Waniczek et. al., (2011) had done a study on the usefulness and assessment of preoperative MRI fistulography in individuals with perianal fistulas. The major goal of diagnostics is to make an accurate preoperative assessment of the perianal fistulous tract, which determines operation effectiveness to a great extent. Magnetic resonance imaging is one of the most useful diagnostic tools for perianal fistulas. They shared their experiences with MRI fistulography in the examination of difficult-to-diagnose and-treat perianal fistulas.^[13]

R. L. West M.D. et al., (2003) had assessed prospective comparison of Hydrogen Peroxide-Enhanced Three-Dimensional Endo anal USG & Endoanal MRI of Perianal Fistulas. The primary fistula tract was classified according to Parks (intersphincteric, transsphincteric, extrasphincteric, or suprasphincteric), horseshoe, or not classified; the presence of secondary tracts (circular or linear); and the position of an internal opening were also documented for each fistula.^[9]

Conclusion

Perianal fistula is an uncommon disease that can become chronic and recurrent. There are several complications, such as tracks and abscess. Inadequate assessment of these consequences can lead to recurrent and persistent illness. As a result, a thorough examination of perianal fistulas is required prior to surgery. In order to avoid harm to the external sphincter and subsequent faecal incontinence, it is also necessary to establish the sphincter's interaction with the fistulous pathways.

The 3 Tesla MR Fistulogram meets all of these requirements for surgeons and aids in surgery. It identifies secondary tracks and abscesses as well as providing detailed

anatomic details of the fistula. It can also tell the difference between scar tissue and granulation tissue. Therefore we conclude that a 3 Tesla MR Fistulogram is the best way to assess anorectal fistulas prior to surgery.

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How to cite this article: Vaibhav TP, Madhusudana Y, Manam G, Vedaraju KS. Role of 3 Tesla MR Fistulogram in Evaluation of Perianal Fistulas. *Asian J. Med. Radiol. Res*. 2022;10(1):38-46.

DOI: [dx.doi.org/10.47009/ajmrr.2022.10.1.8](https://doi.org/10.47009/ajmrr.2022.10.1.8)

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