

# MRI in the Workup of Patients with Perianal Fistulas

Dr. Jay Hapani<sup>1</sup>, Dr. Kartik Nookala<sup>2</sup>, Dr. Hiral Hapani<sup>3</sup>, Dr. Anjana Trivedi<sup>4</sup>

<sup>1</sup>Assistant Professor, Department of Radiology, Pandit Deendayal Upadhyay Government Medical College & Civil hospital, Rajkot, Gujarat, India

<sup>2</sup>Resident Doctor, Department of Radiology, Pandit Deendayal Upadhyay Government Medical College & Civil hospital, Rajkot, Gujarat, India

<sup>3</sup>Associate Professor, Department of Radiology, Pandit Deendayal Upadhyay Government Medical College & Civil hospital, Rajkot, Gujarat, India

<sup>4</sup>Professor and head of Department, Department of Radiology, Pandit Deendayal Upadhyay Government Medical College & Civil hospital, Rajkot, Gujarat, India

**Abstract:** *Fistula - in - ano or anorectal fistula is an abnormal tract that often develops from the anal canal to the perianal region. Fistula - in - ano is annoying problem because of high recurrence rates and severe unexpected complications postoperatively. Surgery is considered the treatment of choice aiming to avoid recurrence and preserve anal sphincter function. The risk of recurrence increases if surgeons fail to recognize and remove radically a fistula and its associated elements during corrective surgery, especially internal openings and secondary tracts. Accordingly, a precise and comprehensive preoperative assessment of fistulous tract is a pivotal diagnostic strategy and contributes significantly to the success rate of surgery. Before the era of magnetic resonance imaging (MRI), fistulography was used to evaluate fistula - in - ano. However, this technique has a low diagnostic accuracy (~18%), and inability to visualize secondary tracts, and the sphincter complex due to its suboptimal contrast opacification. As a result, fistulograms are not able to provide information about the relationship between fistula tracts and anal sphincters. Magnetic resonance imaging (MRI) has been considered the gold standard procedure for assessment of perianal fistula as it provides the surgeon with an accurate roadmap to select the best surgical approach, determines the extent of sphincter division, and estimates the risk of postoperative incontinence. Conclusion: MRI fistulography is an excellent guide for diagnosis, surgical intervention and has emerged as an imaging modality of choice.*

**Keywords:** MRI, Ano - rectal fistulas, Perianal fistulae, Preoperative assessment, surgical management

## 1. Introduction

Most of the perianal fistulas are idiopathic, which represent the chronic phase of intramuscular anal gland sepsis. It is known as cryptoglandular hypothesis (1). Other causes include inflammatory conditions - like Crohn's disease, tuberculosis, diverticulitis, pelvic infection, ano - rectum cancer, iatrogenic, radiation, and trauma during childbirth. As most of the glands are subepithelial, some may terminate in the intersphincteric space, close to the external sphincter. Primary pathology starts with obstruction of a superficial anal gland, leads to secondary abscess formation, and most likely to discharge into the anal canal. The cryptoglandular hypothesis cannot explain the formation of fistulas in inflammatory processes like Crohn's disease. They lead to the formation of an abscess within the pelvis that can track down and reach the skin through the ischioanal fossa, leading to extrasphincteric fistula formation. It doesn't involve the internal or external anal sphincters (2). Imaging includes conventional fistulography, endoanal ultrasonography, CT fistulogram, and MR Fistulogram (3). However, endoanal ultrasonography is the first imaging modality to describe the anal canal and sphincter complex's anatomy and their relationship with fistulous tracts. The disadvantages are it is inconvenient with the procedure, operator dependent, and provides a limited field of view.

MRI plays a superior role over endoanal ultrasonography and clinical digital rectal examination, providing additional

diagnostic information, especially in the complicated disease (4) like fistulas associated with Crohn's disease, which are recurrent because of multiple branching tracts. Missed secondary tracts are often the common cause of recurrence (5). However, with more advancement, comes greater responsibility. With the availability of advanced technology, there are not only more choices and better performance but also greater expectations. The availability of these options, each with its own pros and cons, has made it necessary to identify the best modality in general and for each patient so as to be able to answer important questions the presence or absence of fistula, its course and relations, exact location of the internal opening, associated inflammatory conditions like abscesses or collections, and any other relevant information that can help in patient management.

It is the duty of the radiologist to choose the imaging modality which would give the maximum relevant information in any given case, to choose the most cost - effective imaging modality, and to always comply with the principle of As Low as Reasonably Achievable (ALARA) if the workup of a patient requires exposure to radiation. Patients should not be subjected to unnecessary investigations which do not provide much diagnostic information. In case of MRI, every radiologist must be familiar with its role in evaluating perianal fistulas, and its strength and limitations as compared to other methods.

## Anatomy of anal region

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Interpretation of perianal fistula requires adequate knowledge of the pelvic anatomy and the sphincter complex (6). Anal canal is a cylindrical tube measuring about 3cms (6). The anal complex, the inner layer is the internal/inner anal sphincter which is involuntary composed of smooth muscle and the external/outer anal sphincter is composed of voluntary striated muscle. Internal sphincter is responsible for 85% and an external sphincter is responsible for 15% of their resting tones and thus, disruption of the external anal sphincter lead to loss of continence. Inter - sphincteric space/plane separates internal and external anal sphincters. The junction between the columnar epithelium and the

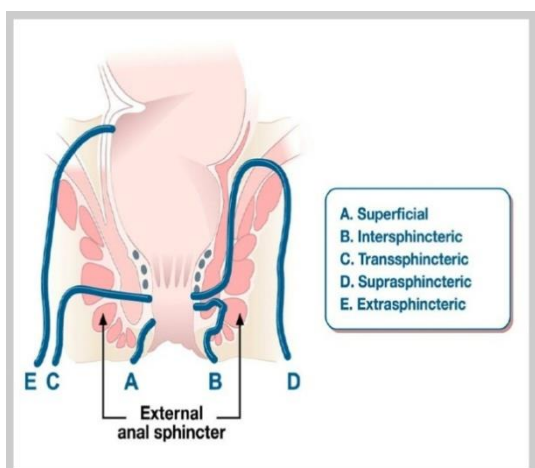
squamous epithelium where anal glands open is the important landmark called as dentate line. It may become the source of infection to start the fistula formation (7).

**Most commonly used classification systems for perianal fistula**

- 1) Parks classification: Parks and colleagues (1976) (8) it is based on the external sphincter as a reference point. It was developed primarily for surgical of 400 patients of the department of surgery in St. Mark's Hospital in London. This classification system was useful for operated patients. Four categories of perianal fistulas were described.

**Table 1**

Parks classification of perianal fistula	
Fistula type	Description
Intersphincteric	Confined to intersphincteric plane, does not cross external sphincter or levator muscles
Transsphincteric	Tract passes radially through external sphincter
Suprasphincteric	Tract passes upward within intersphincteric plane over puborectalis muscles and descends through levator muscles, ischiorectal fossa
Extrasphincteric	Fistula's course is completely outside external sphincter



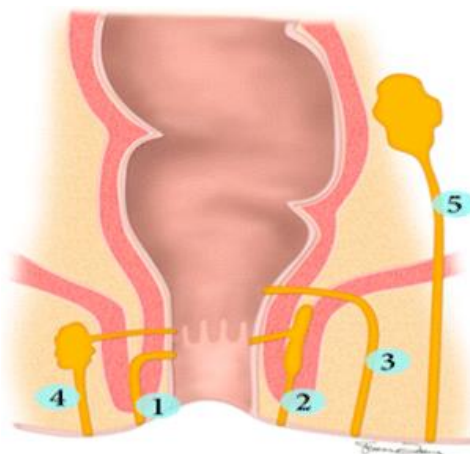
**Diagram 1:** Schematic representation of type of fistula

- Intersphincteric Fistula (8): It is the commonest type of fistula. These are seen in the intersphincteric plane, runs along the longitudinal muscle. They do not cross the external anal sphincter (Diagram - 1).
  - Transsphincteric perianal fistula (8): It runs within the intersphincteric space crossing the external anal sphincter with internal opening in the anal canal. The most important difference between the transsphincteric fistula and extrasphincteric fistula is site of internal opening. Transsphincteric fistulous tract enters the anal canal. Extrasphincteric fistulous tract enters rectum directly coursing along the ischioanal fossa (Diagram - 1).
  - Suprasphincteric perianal fistula (8): It courses upwards over the top of puborectalis muscle in the intersphincteric plane then descends within ischiorectal fossa (Diagram - 1).
  - Extrasphincteric perianal fistula (8): It tract travels within the ischiorectal fossa, pierces levator muscle and enters into a rectum, no anal canal sepsis (Diagram - 1).
- 2) Saint James's University hospital classification: John Morris and colleagues (9) presented the MRI based classification system. This classification system describes the primary fistula, its secondary extensions,

and associated abscesses (Diagram 2). Five grades of perianal fistula described based on the anatomy seen on MR imaging.

**Table 2**

ST. JAMES'S UNIVERSITY HOPITAL MRI CLASSIFICATION SYSTEM <sup>9</sup>	
Grade	Description
0	Normal appearance
1	Simple linear intersphincteric fistula
2	Intersphincteric fistula with a secondary fistulous tract/ an abscess
3	Transsphincteric fistula
4	Transsphincteric fistula with abscess or secondary tract within the ischioanal or ischiorectal fossa
5	Supralelevator and translevator disease



**Diagram 2:** Showing perianal fistulous tract according to St James University hospital classification.

**2. Material and Methods**

This retrospective prospective study was conducted from August 2022 to October 2023 in the Department of Radiodiagnosis and Imaging, Department of Radiology, Pandit Deendayal Upadhyay Government Medical College

& Civil hospital, Rajkot, Gujarat, India. This study was approved by the institutional ethics committee. A total of 100 patients were assessed in the study and diagnosed as perianal fistula clinically.

**Inclusion Criteria**

- 1) Patients clinically diagnosed as having perianal fistulae referred for Magnetic Resonance Imaging by the surgical and gastroenterology Department (correlation with surgical finding whenever possible).
- 2) Both male and female patients are included in the study.
- 3) All age groups included.

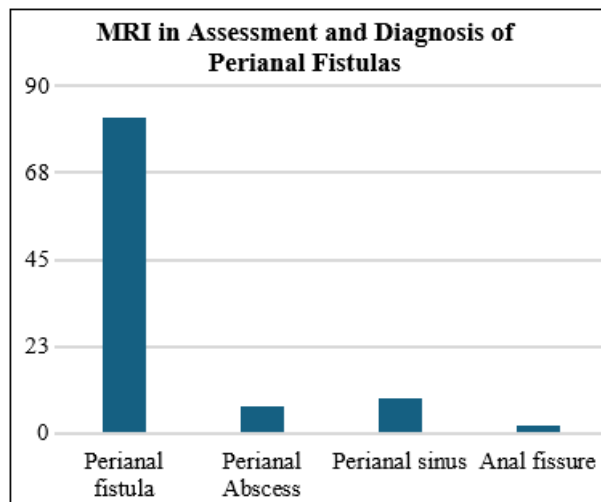
**Exclusion Criteria**

- 1) Patients with intracranial aneurysm clips or intraorbital metal fragments and any electrically, magnetically or mechanically activated implants (including cardiac pacemakers, bio stimulators, neurostimulators, cochlear implants, and hearing aids).
- 2) Patients with claustrophobia.
- 3) Postoperative patients.
- 4) Pregnant patients.

All participants were briefed adequately in the local language, and their written informed, voluntary consent was obtained. All the enrolled subjects were subjected to a careful history, general physical examination. Patients suffering from the perianal fistula referred to the Department of the radio - diagnosis were included in the study. Patients who underwent an MRI fistulogram with the clinical history of discharging sinus from the perianal region are studied. MRI was done on a 1.5T Siemens magnetom sempra using pelvic phased - array torso coil. MRI - protocol: Axial, coronal T1W images, T2W images of the pelvis were acquired in axial, sagittal, coronal planes, and STIR axial, coronal images were obtained using 512 × 256 matrix, 24 cm FOV, 4 mm slice thickness, 3 mm interslice gap, and 2 NEX. Statistical Analysis: All this consolidated data was analyzed using SPSS software. The chi - square test was used to compare the differences. The p - value of <0.05 was taken to be statistically significant.

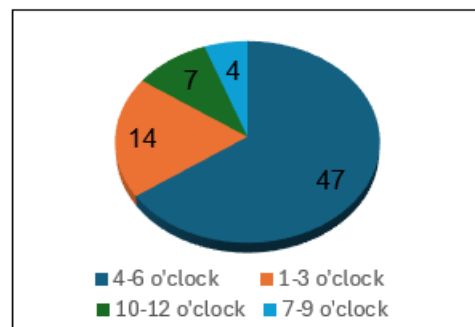
**3. Results**

Our study comprised of 100 patients with ages ranging from 20 to 69 years with a mean age of 40 years. There were 67 males and 33 females. Of all 100 cases, 82 patients were with perianal fistula, 9 cases were with perianal sinus, and 7 were with perianal abscess, and 2 cases were of anal fissure (Figure 1). Based on external opening, a single external opening is found in 78 patients and multiple external openings in 13 patients. Based on the internal opening, a single internal opening is found in 72 patients and multiple internal openings in 10 patients.

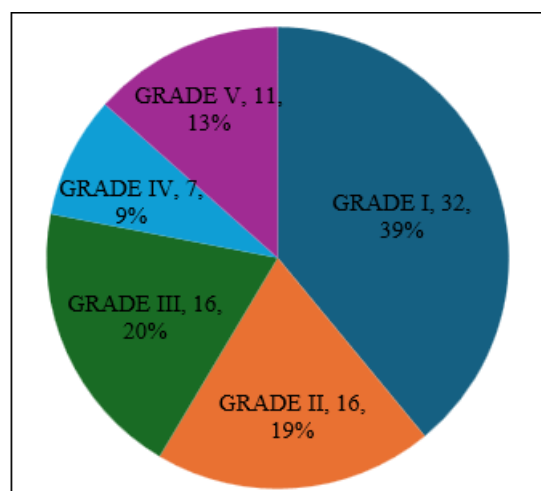


**Figure 1:** Characterizations of Patient as per perianal disease

Based on the clock position of single internal opening (n - 72), 14 patients belong to 1 - 3 o'clock position, 47 patients belong to 4 - 6 o'clock, 4 patient belong to 7 - 9 o'clock position, and 7 patients belong to 10 - 12 o'clock position.



**Figure 2:** Patient's characterizations based on clock position of internal opening.



**Figure 3:** St. James' university hospital classification

Based on St. James' university hospital classification, Grade - I Fistula is seen in 32 patients, Grade - II in 16 patients, Grade - III in 16 patients, Grade - IV in 7 patients, GRADE - V in 11 patients. According to park's classification, intersphincteric fistula is seen in 48 patients, the transphincteric type is seen in 22 cases, suprasphincteric

type is seen in 12 patients, and zero cases of extrasphincteric type.

#### 4. Discussion

In this retrospective - prospective study we evaluated the efficacy of MRI in patients with the perianal disease, which helps to identify the fistulous tracts, secondary ramifications, and the fistula's relationship with the sphincter complex.

A total of 100 cases of the perianal disease were evaluated in this study. Perianal pain with discharge were the most common complaints with which the patients presented in this study. The detection of the secondary ramifications is necessary to eradicate the perianal disease, as it is the most common cause of recurrence. In the study of all the cases, 28 patients had secondary tracts. The abscesses were seen in 26 cases (26%).

A study by Lunnisset al7 has a concordance rate of 86% - 88% between MRI and surgical findings. According to St. James university hospital classification, Varghese et al8, among 100 cases of perianal fistulae, 49 cases were of Grade I, 28 cases of Grade II, 11 cases were of Grade IV, 7 cases were Grade III and 5 cases were Grade V.

According to Khan S etal9, of 18 cases, 9 belong to Grade - I, 3 cases belong to Grade - II, 2 cases belong to Grade III, 3 belong to Grade - IV, and 1 case to Grade - V.

A study done by John Morris, et al. in 2000, intersphincteric fistula is the most common type of fistula. Another study by Hoda salah Darwish, et al. involved a sample size of 35 patients with 38 fistulous tracts. Out of those 38 fistulous tracts, 24 (63%) were intersphincteric fistulae, 11 (29%) were transsphincteric fistulae and 2 (5%) were suprasphincteric.

Our study showed 48 (58.5%) were intersphincteric fistulae followed by 28 (34.1%) were transsphincteric followed by 12 (14.6%) which were suprasphincteric suggesting intersphincteric fistula being the commonest fistula type.

In our study, the most common type of fistula is Grade - I (32 cases), followed by Grade II (16 cases) and Grade III (16 cases), Grade V (11 cases) and Grade IV (7 cases).

In our study we found that the commonest internal opening location was at 6 o' clock position. A study by Rania E. Mohamed, et al. in 2013 [38] revealed that the commonest internal opening location was at 6 o' clock position, which is similar to our study.

As St James University Hospital classification was based on MRI findings, the grading of perianal fistulas was significantly associated with therapeutic outcome. Grades 1 and 2 were associated with satisfactory outcome (no further surgery is needed), whereas grades 3 to 5 were associated with poor outcomes (further surgery is needed).

Approximately 5% of the perianal fistulas have branched and complex course crossing the puborectalis muscle above. Sometimes internal sphincter and anal mucosa were not clearly distinguished on MRI; therefore, the internal opening

site was inferred by the proximity of the tract within the intersphincteric space.

#### 5. Conclusion

It is important to correctly depict fistulous tract anatomy preoperatively to avoid recurrence.

MRI fistulography is an excellent guide for diagnosis, surgical intervention and has emerged as an imaging modality of choice.

All MRI sequences showed findings significantly similar to the surgical findings, however most superior MRI sequences were T2W and T2 STIR images. St James university hospital classification employs simple anatomical discriminator.

MRI is better in detecting thin side branches and fistula morphology as acquisition is done in thin slice and multiplanar capability.

MRI fistulography is excellent modality to diagnose various types of perianal fistulas, their extent, to detect precise location and number of internal openings and fistulous tracts, which is incredible roadmap for surgical planning.

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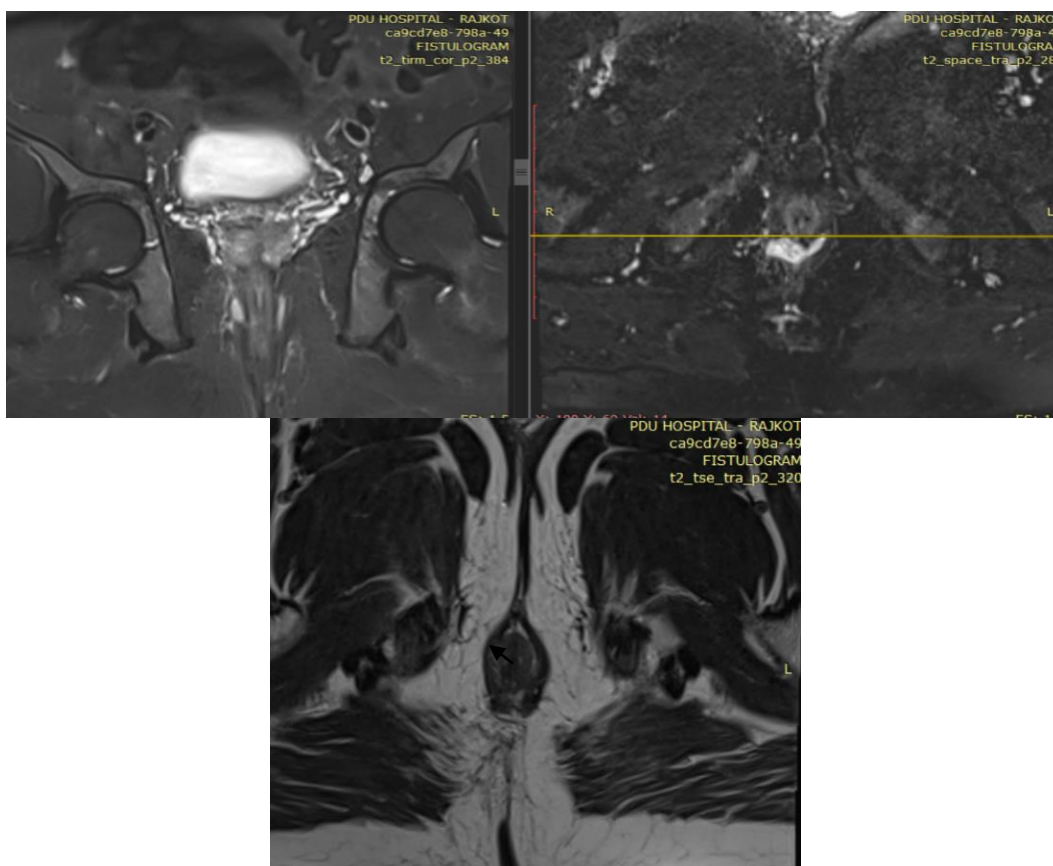


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Series 1

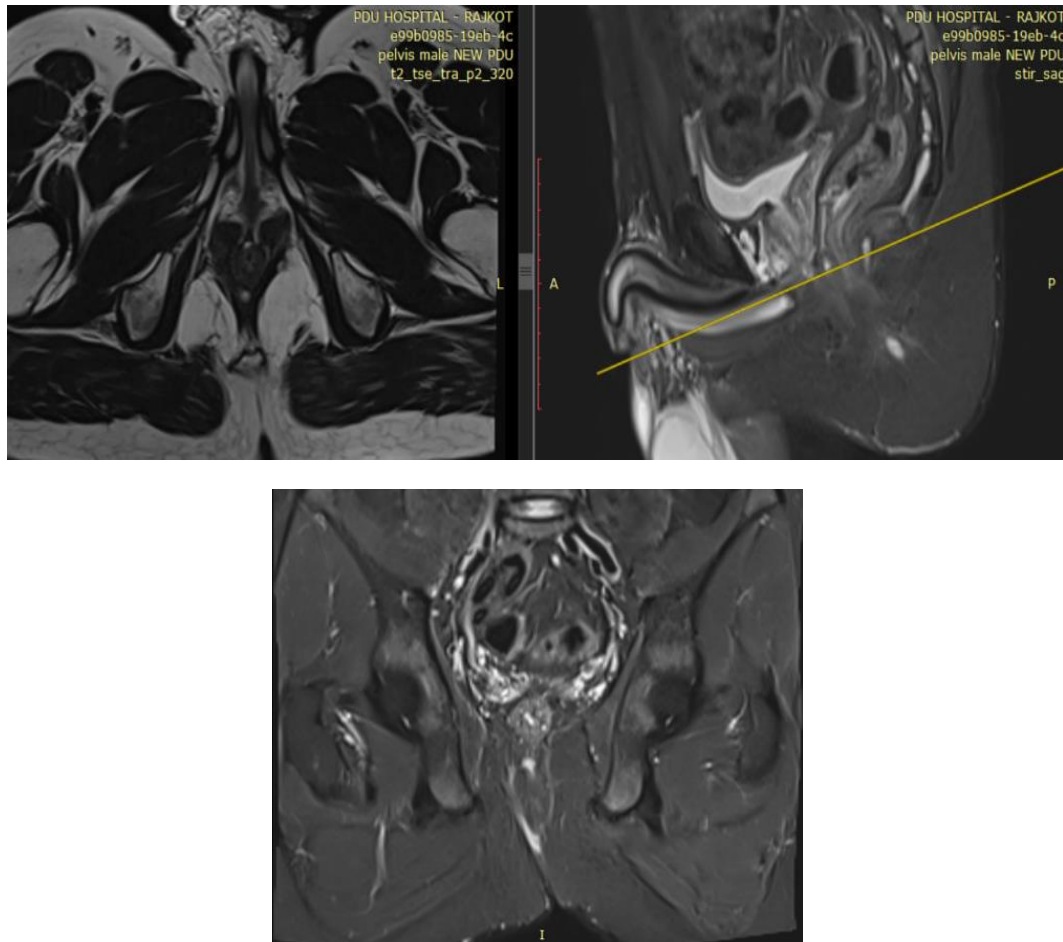
GRADE I	32
GRADE II	16
GRADE III	16
GRADE IV	7
GRADE V	11

**Figure 1: Grade I simple linear inter - sphincteric fistulous tract with internal opening at 6’0 clock position and external opening at 7’0 clock position.**

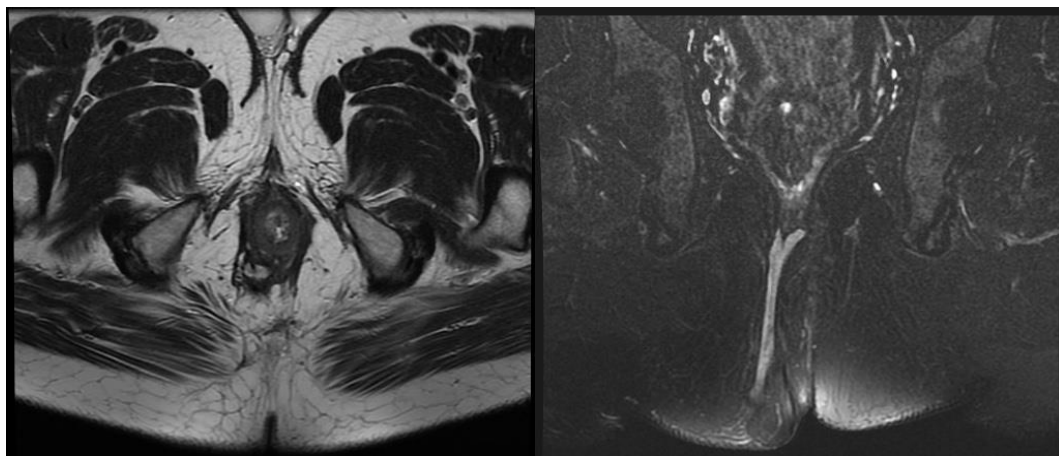


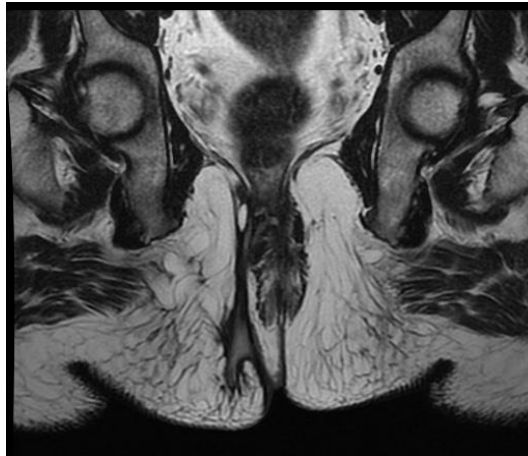
**Figure 2: Two small collections noted in inter - sphincteric plane, one in right and one in left with evidence of communicating with each other in retro anal region forming a horse shoe abscess. A linear T2W hyper intense tract is noted extending from**

left inter - sphincteric collection, along the inter - sphincteric plane and opening at natal cleft - **Grade II intersphincteric fistulous tract with horse shoes abscess.**

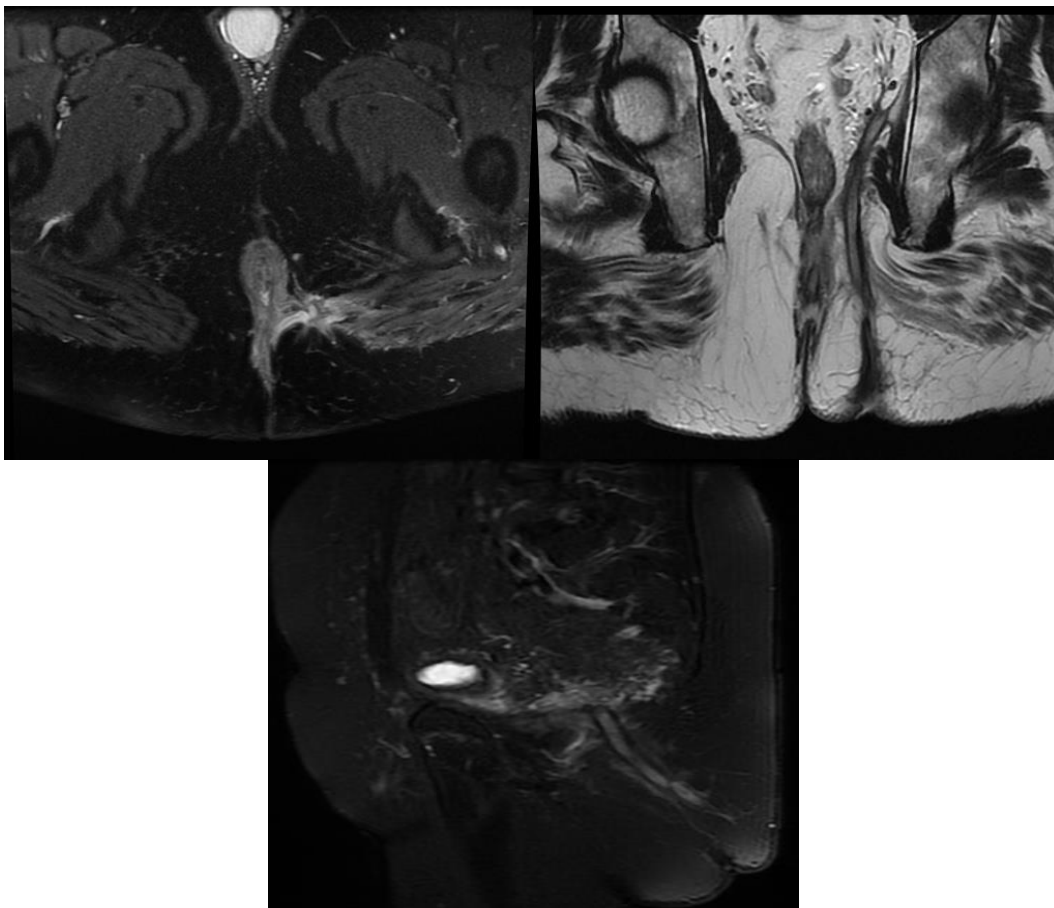


**Figure 3:** A linear T2/STIR hyperintense tract noted which extends superiorly and anteriorly towards right ischioanal fossa. The tract then continues posteriorly and towards midline, to end in inter sphincteric space at 6 o'clock position with an internal opening at 6o'clock location - **Grade III trans - sphincteric simple linear fistulous tract without any secondary tracts/ramifications/local collection.**





**Figure 4:** A linear T2/STIR hyperintense tract noted which extends superiorly and anteriorly within right ischioanal fossa. The tract then continues posteriorly and towards midline, to end in perineum. Ramifications/secondary tracts noted one near external opening and another one where the tract is piercing the external anal sphincter - **Grade IV trans - sphincteric fistulous tract with two secondary tracts.**



**Figure 5:** A linear T2/STIR hyperintense tract noted in left ischioanal fossa with multiple ramifications with evidence of supralevator extension - **Grade V (supra levator extension).**