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Role of Diagnostic Imaging Techniques in the Evaluation of Fistula-In-ANO.

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Aim -
To study the role of diagnostic imaging techniques in diagnosis and evaluation of peri-anal fistula and to correlate the imaging findings with surgical findings.
Methodology -
A cross-sectional study was conducted in GCS medical college, Ahmedabad which included 50 patients with clinical suspicion of peri-anal fistula. MRI was done using 1.5 tesla GE signa explorer machine including standard scan protocol over a period of 12 months from January 2023-December 2023.
Results –
Out of 50 cases with perianal discharge, pain, swelling & pruritus, we examined & diagnosed having perianal fistula, 45 patients were male, 5 were females, with majority (27 patients) belonged to 30-50 years age group, with intersphincteric being the most common type according to park's classification & grade 1 according to St. James classification.
Conclusion -*MR imaging is well tolerated, non-invasive, painless, not embarrassing and provides precise definition of the fistulous track, its relationship to pelvic structures, identification of secondary fistulas or abscesses, aids in appropriate surgical treatment, decreasing the incidence of recurrence and fecal incontinence, hence - modality of choice in evaluating perianal fistulas.*
Keywords - *Ano-rectal fistula, Inter-sphincteric, MRI, Trans-sphincteric*

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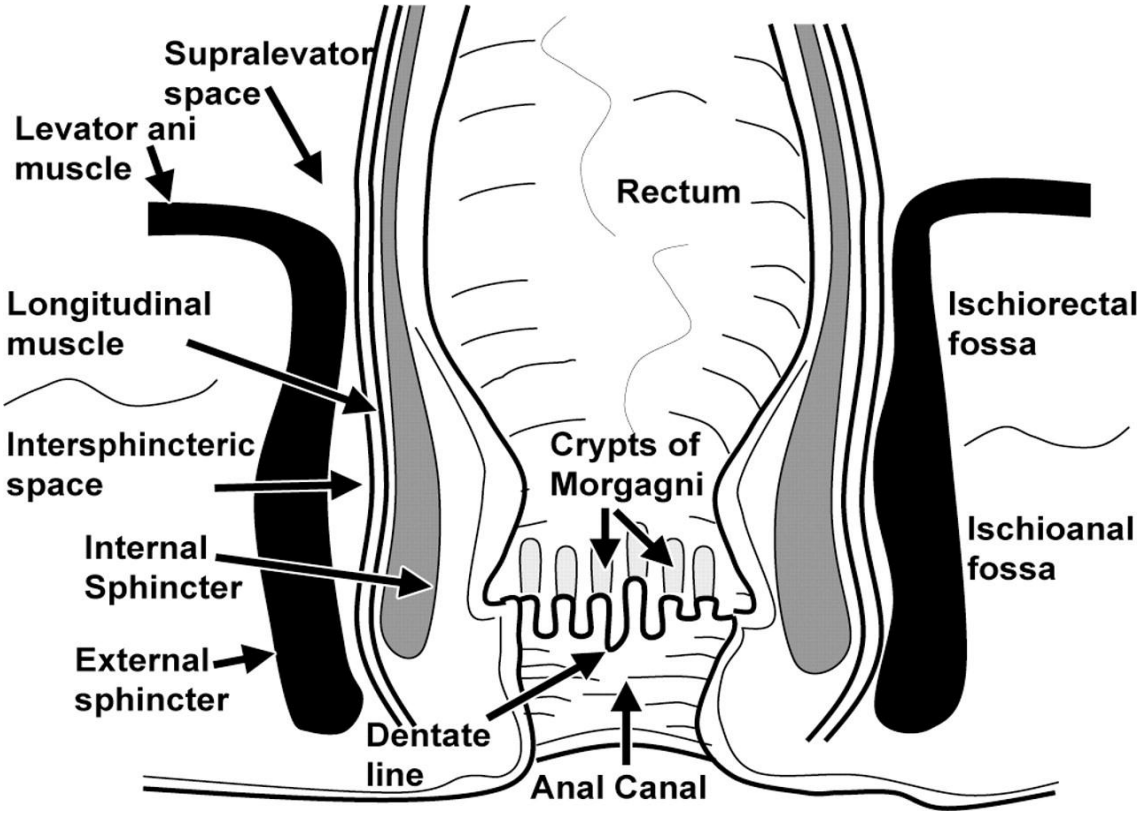
I. Introduction :

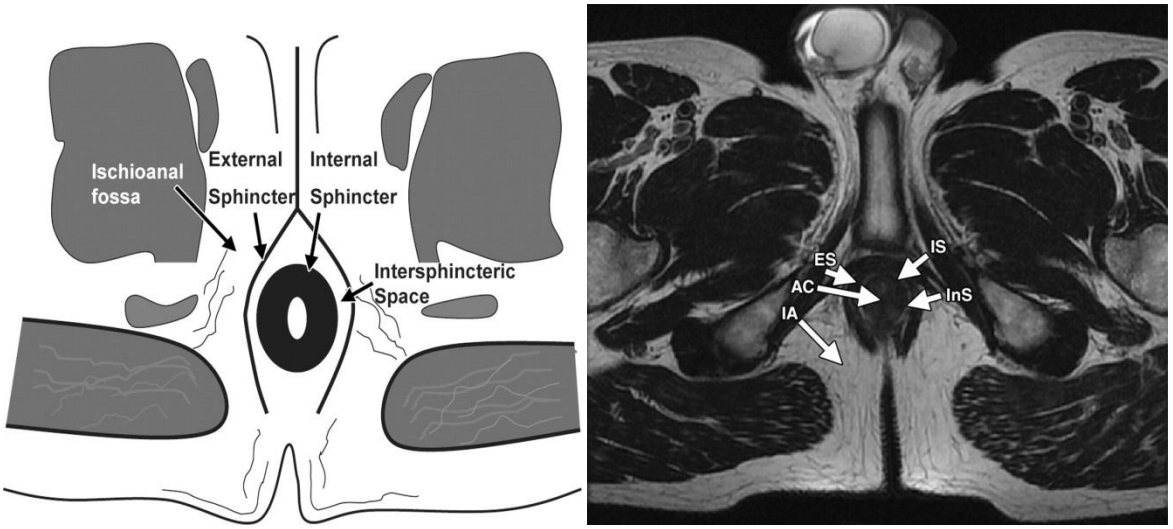
- A fistula in an abnormal connection between two epithelial lined structures or organs or between an organ and the surface of the body. [2]
- In perianal fistula, abnormal connection exists between epithelial lined surface of anal canal & perineum.
- Perianal fistulae can be primary or secondary to inflammatory bowel diseases- Crohn's disease, malignancy, previous surgery, etc
- Identification of secondary tracks and disease extension to perianal and supra-levator space that would otherwise remain undetected, is facilitated by MRI.

TECHNIQUES FOR IMAGING PERIANAL FISTULA

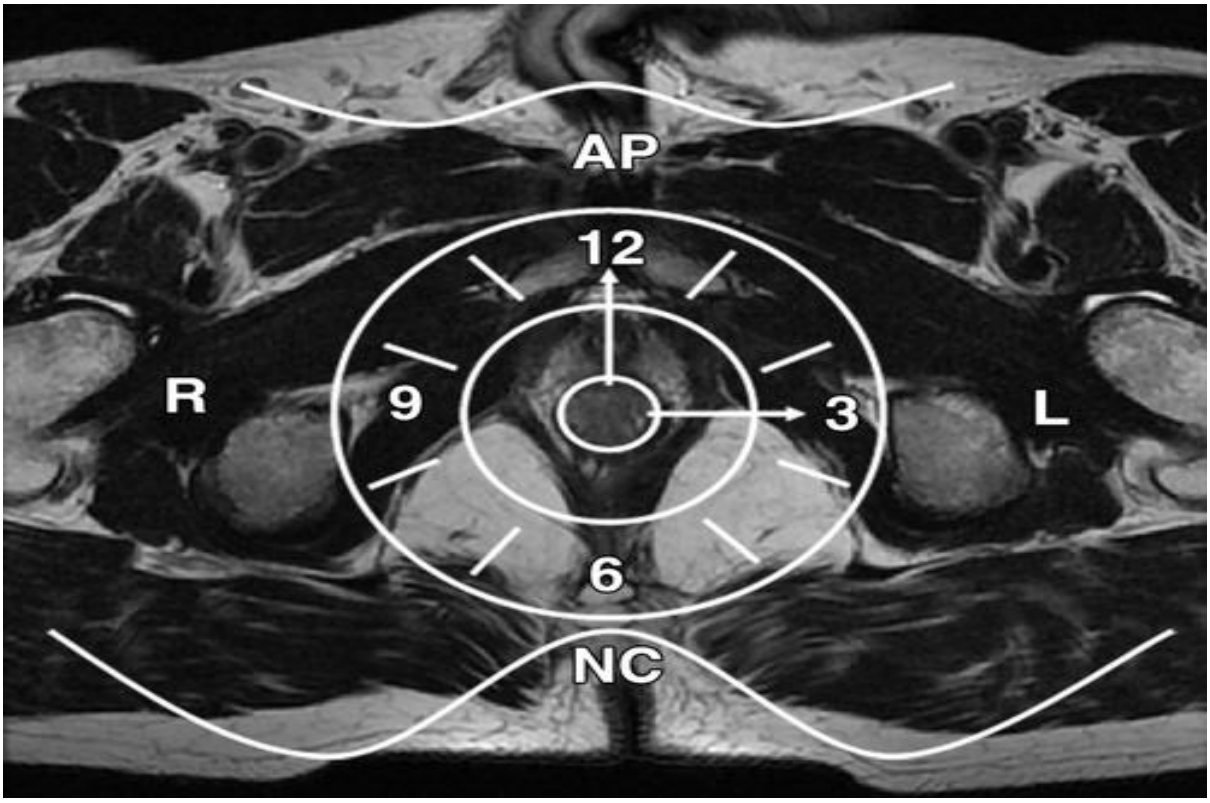
- Unenhanced T1W images provide an excellent anatomic overview of sphincter complex, levator plate and ischiorectal fossa. Fistulous tract and inflammation however appear as areas of low signal intensity and can not be distinguished from normal structures. However, T1W images are useful to discriminate between post-operative haemorrhage from residual tract, as the former will appear hyperintense on unenhanced T1W images.
- On T2W & STIR images, fistulous tract, inflammation & abscess appear as areas of high signal intensity & can clearly be distinguished from normal tissue, which appear hypointense. [3]



NORMAL ANATOMY OF ANAL CANAL IN CORONAL PLANE



ANATOMY OF PERINEAL MUSCLES ON MRI
(ES – External Sphincter, IS – Internal Sphincter, AC = Anal Canal, InS – InterSphincteric space, IA – Ischio-Anal fossa)

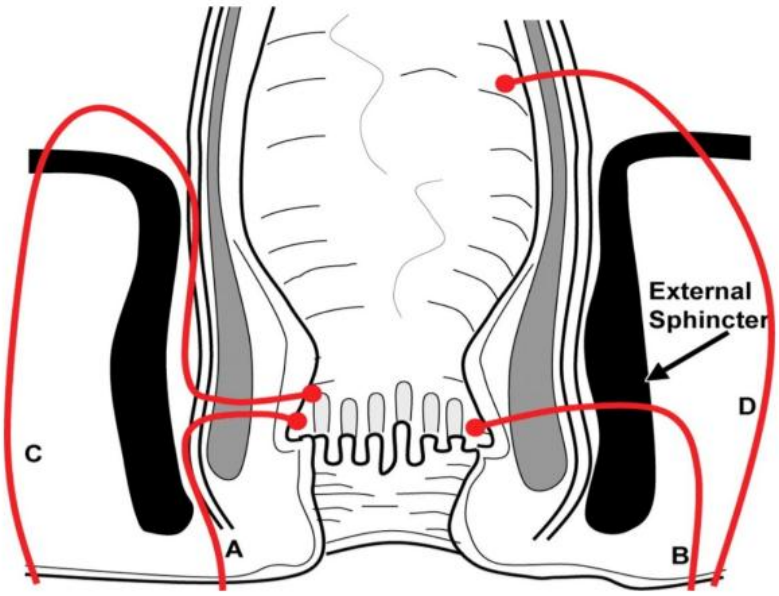


[*AP* = anterior perineum, *L* = left aspect of the anal canal, *NC* = natal cleft,
R = right aspect of the anal canal]

ANAL CLOCK

Axial T2-weighted MR image of the male perineum shows the anal clock diagram used to correctly locate anal fistulas with respect to the anal canal.

PARK'S CLASSIFICATION:



Drawing of the anal canal in the coronal plane shows the Parks classification of peri-anal fistulas:

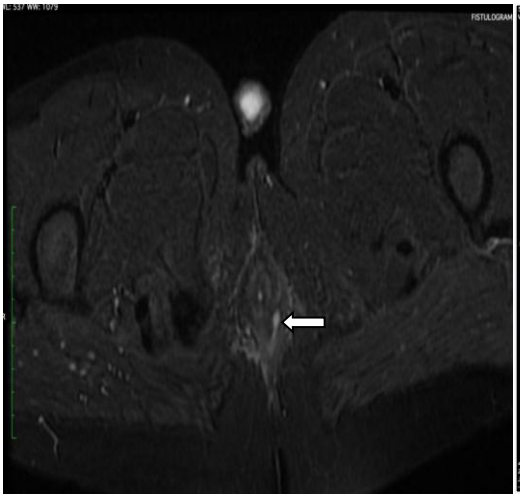
A = inter-sphincteric,
B = trans-sphincteric,
C = supra-sphincteric,
D = extra-sphincteric.

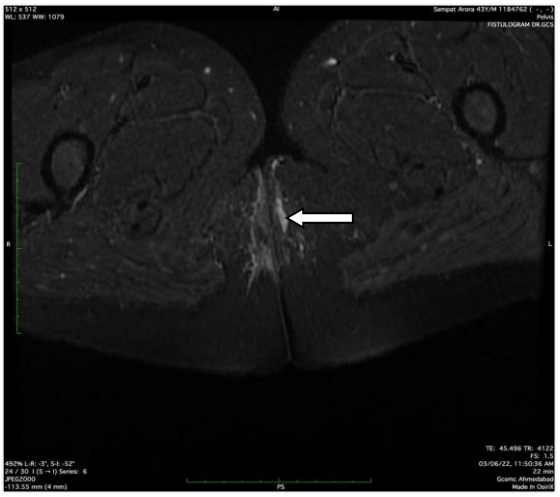
The external sphincter is the keystone of the Parks classification.

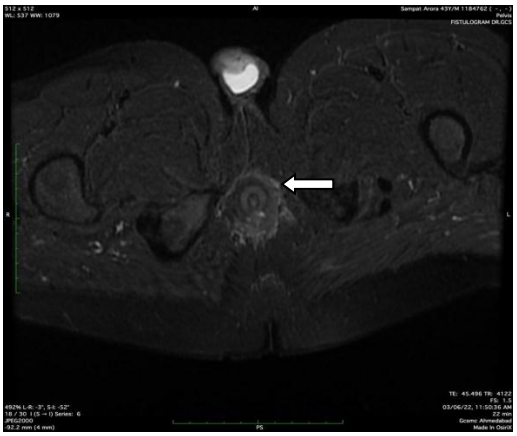
TYPES OF FISTULAE:

A. Intersphincteric fistula

AXIAL STIR IMAGES



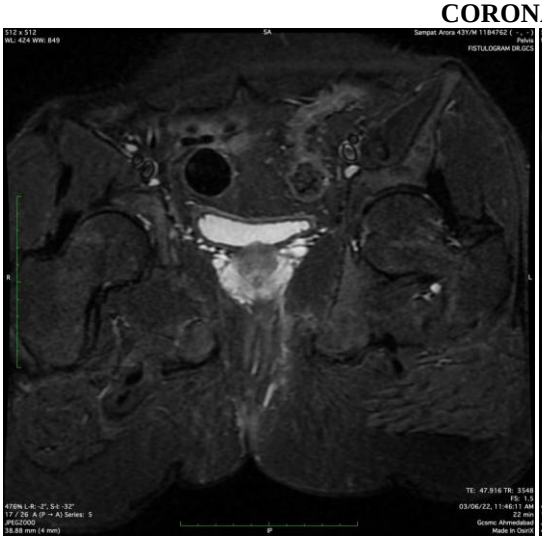


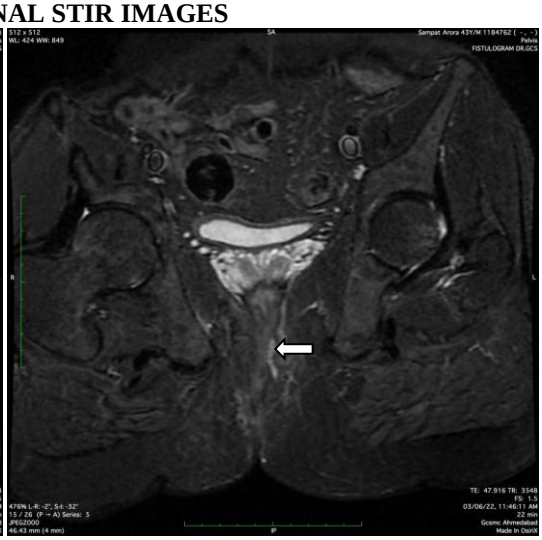


Linear STIR hyperintense curvilinear track extending superiorly into left ischioanal fossa, extends between the left internal and external sphincter in intersphincteric region, the internal opening into anal mucosa is noted at 5 o' clock position.

External opening - At skin of anterior aspect of natal cleft on left side.

CORONAL STIR IMAGES



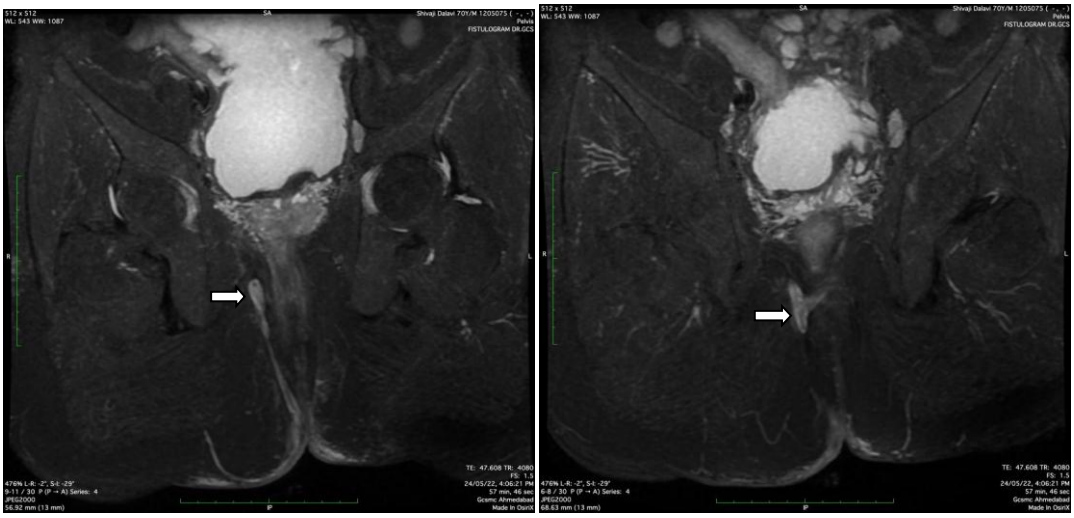


B. Trans-sphincteric fistula

AXIAL STIR IMAGES

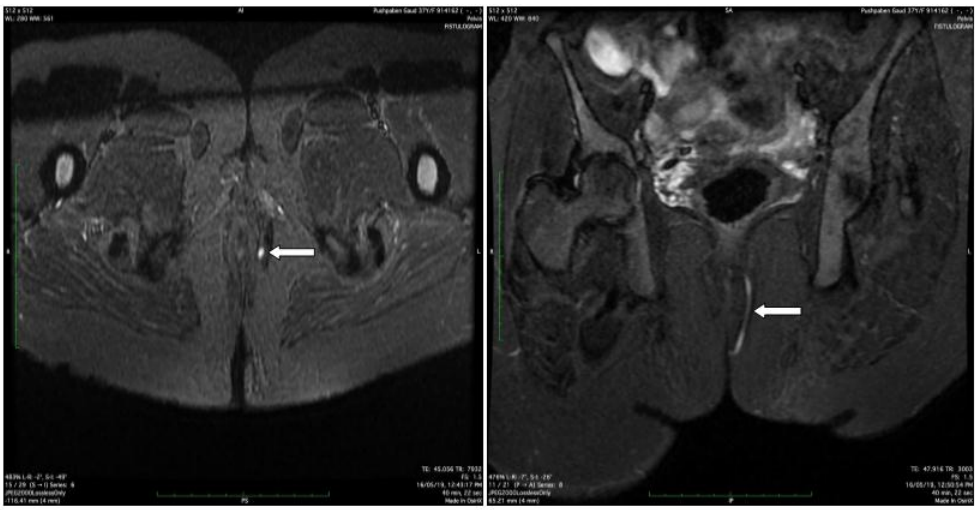
STIR hyperintense curvilinear track superiorly into right ischio-anal fossa with mildly enhancing pus collection and few ramifications in ischio-anal fossa. The tract is traversing external sphincter and extending into the inter-sphincteric region with a small pus collection and ramification noted in inter-sphincteric region.
Internal opening in the anal mucosa - is seen at 6 o'clock level on right side.
Large abscess in anterior aspect of perineal region.

CORONAL STIR IMAGES



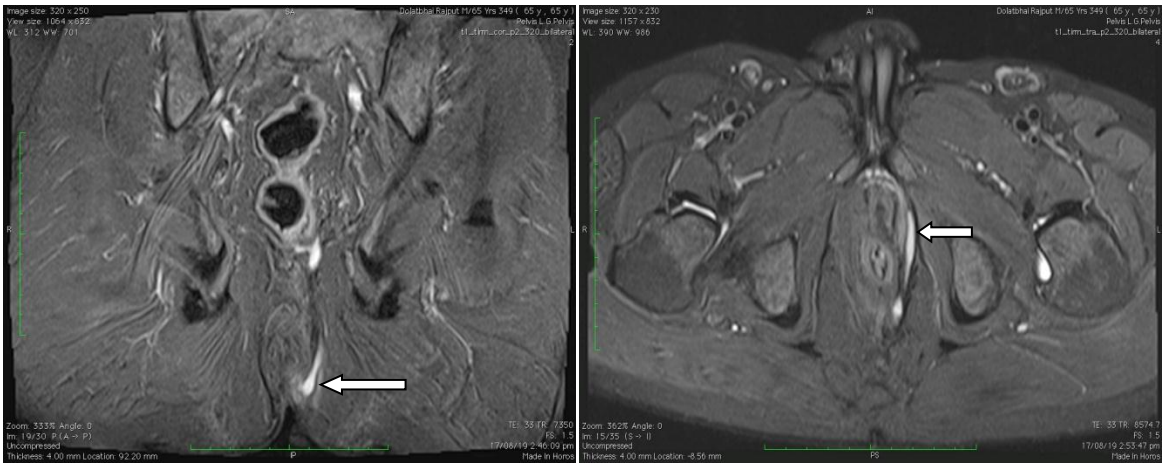
C. Suprasphincteric fistula

AXIAL AND CORONAL STIR IMAGES



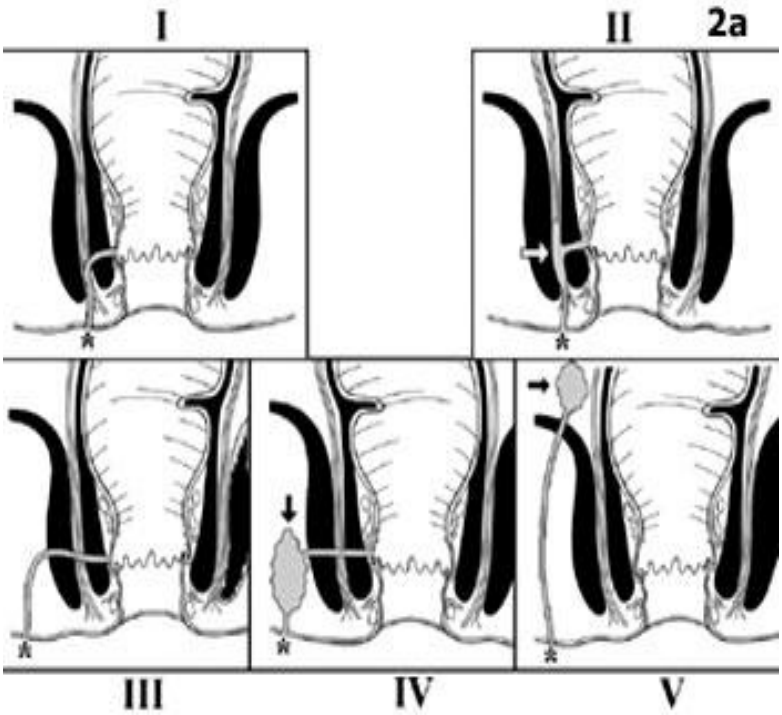
D. **Extrasphincteric fistula**

AXIAL AND CORONAL STIR IMAGES



A hyperintense tract in perirectal & perianal location on left side on T2W & fat suppressed images &hypointense on T1WI, extends from 1 to 6 o'clock position, communicating with lumen of rectum at 6 o'clock position. The tract descends downwards on left side with extrasphincteric course abutting levatorani muscle.

St. JAMES CLASSIFICATION:



GRADE I - Simple Intersphincteric fistula

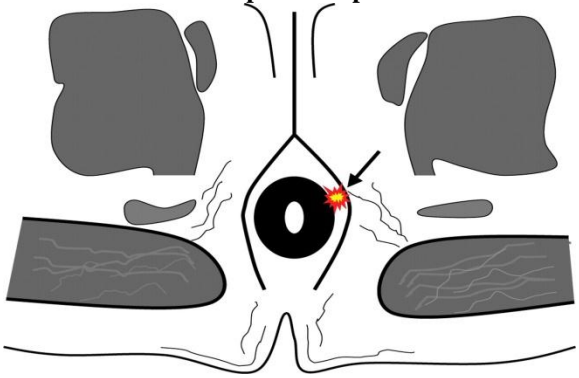
GRADE II - Intersphincteric fistula with abscess, secondary tracts

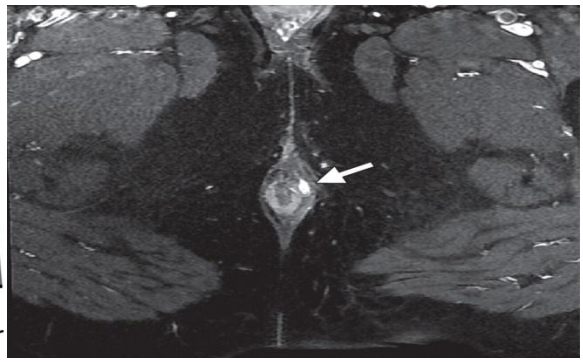
GRADE III - Simple Transsphincteric fistula

GRADE IV - Transsphincteric fistula with abscess, secondary tracts

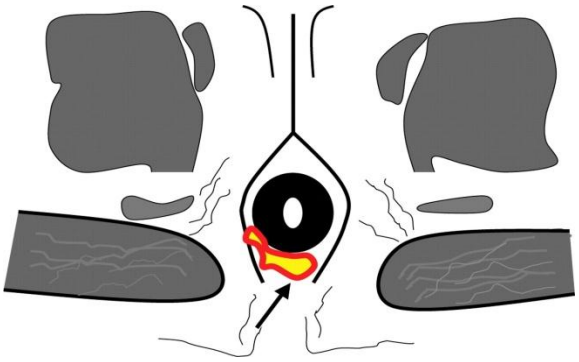
GRADE V – Supra or Extra sphincteric fistula.

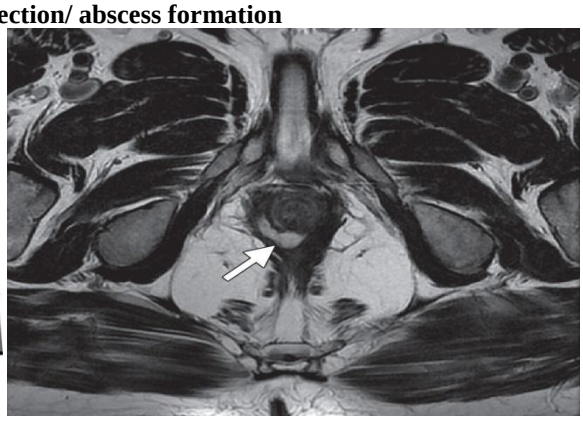
Grade I fistula - Simple intersphincteric fistula



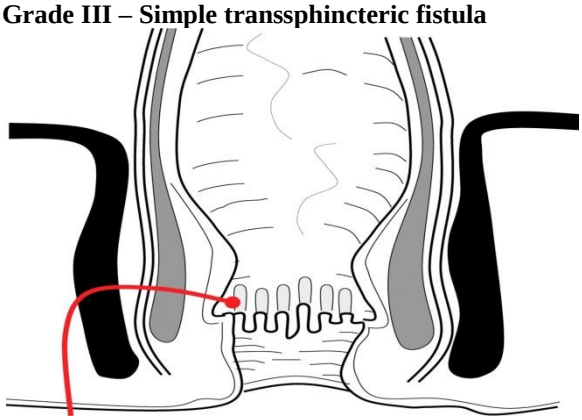


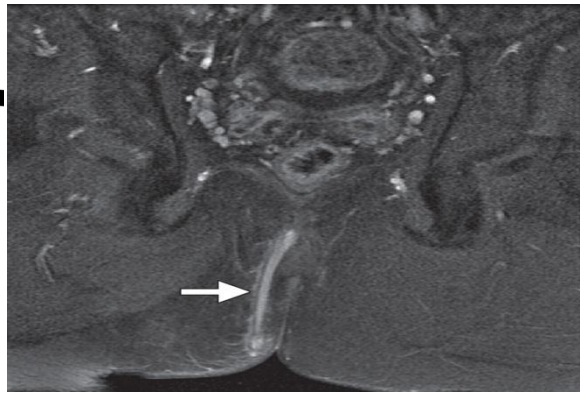
Grade II fistula – Intersphincteric fistula with collection/ abscess formation



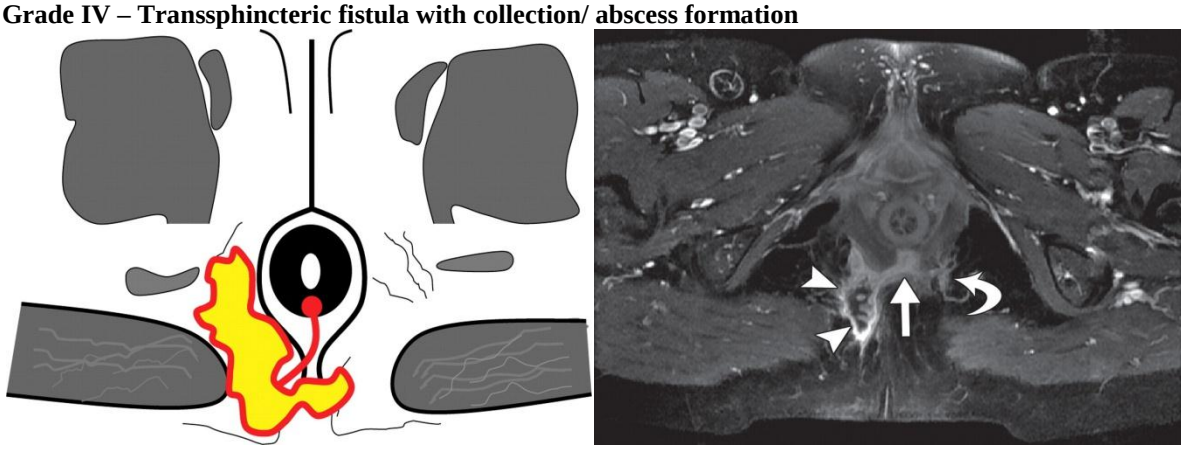


Grade III – Simple transsphincteric fistula

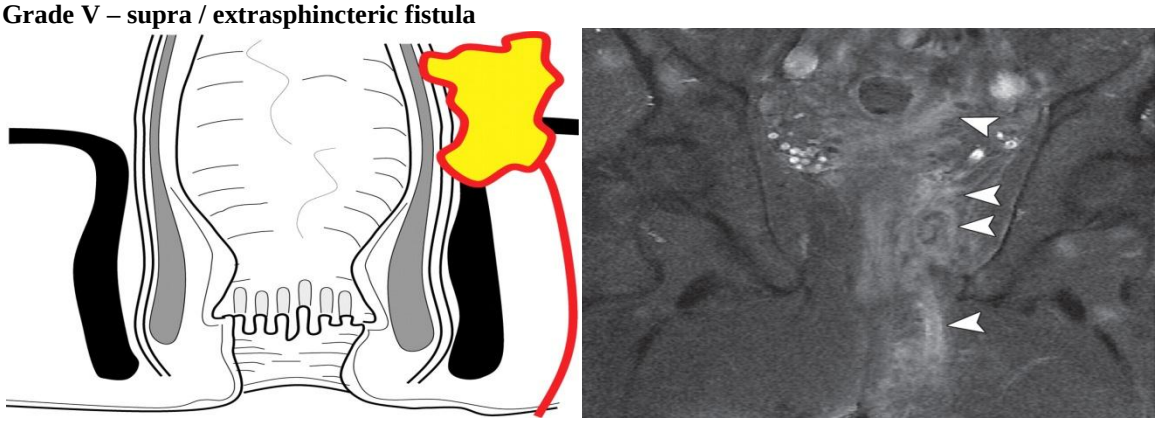




Grade IV – Transsphincteric fistula with collection/ abscess formation



Grade V – supra / extrasphincteric fistula



II. Material and Methods:-

A cross-sectional study was done on patients who were referred to radiology department with clinical suspicion of peri-anal fistula and MRI was performed using 1.5 Tesla Siemens MagnetomeEssenza machine.

Study population : 50 patients

Inclusion criteria : -

- All the cases with peri-anal fistula diagnosed in the Radio-diagnosis department of GCSMCH&RC.

Exclusion criteria : -

- Cases of peri-anal fistula diagnosed outside GCSMC&RC.
- Implanted electric and electronic devices are a strict contraindication to the magnetic resonance imaging, and in particular:
- heart pacemakers (especially older types)
- insulin pumps
- implanted hearing aids
- neurostimulators
- intracranial metal clips
- metallic bodies in the eye
- Metal hip replacements(old type), sutures or foreign bodies in other sites are relative contraindications to the MRI because they obscure the visualization of normal anatomy due to artifact effect.

III. Results:

In this study, there were 45 male patients and 5 female patients.
There was 1 patient below 20 years of age, 26 patients belonged to the age group 21-40 years, 19 patients from 41-60 years and 4 patients > 60 years.
The fistulous tract characteristics were observed as described below –

- 22 patients showed a linear tract, 23 patients had a curvilinear fistulous tract while 5 patients had a horse shoe shaped tract extending across midline to both sides.
- 21 patients had external openings of the tract with pus discharge on the right side of the gluteal cleft, 14 patients had an external opening on the left side of the gluteal cleft, 12 patients had an external opening in midline while 3 patients had more than one external openings on both sides of the gluteal cleft.
- 1 patient had an internal opening at 2 o'clock position according to anal clock, 2 patients at 5 o'clock position, 31 patients at 6 o'clock position, 4 patients at 7 o'clock position, 2 patients at 11 o'clock position, 8 patients at 12 o'clock position and 2 patients had more than one internal openings.
- 20 patients did not show any abscesses or secondary tracts, 18 patients showed secondary ramifications along the ischioanal fossa while 12 patients showed communicating collections alongwith secondary ramifications in the ischioanal fossa.

According to Park's classification, 23 patients had inter-sphincteric fistulas, 19 patients had trans-sphinteric fistulas, 6 patients had supra-sphincteric and 2 patients had extra-sphincteric fistulas. According to St. James classification, 12 patients had type - 1fistulas, 11 patients had type- 2 fistulas, 8 patients had type – 3 fistulas, 11 patients had type – 4 fistulas and 8 patients had extra-sphincteric fistulas.

CHART -1

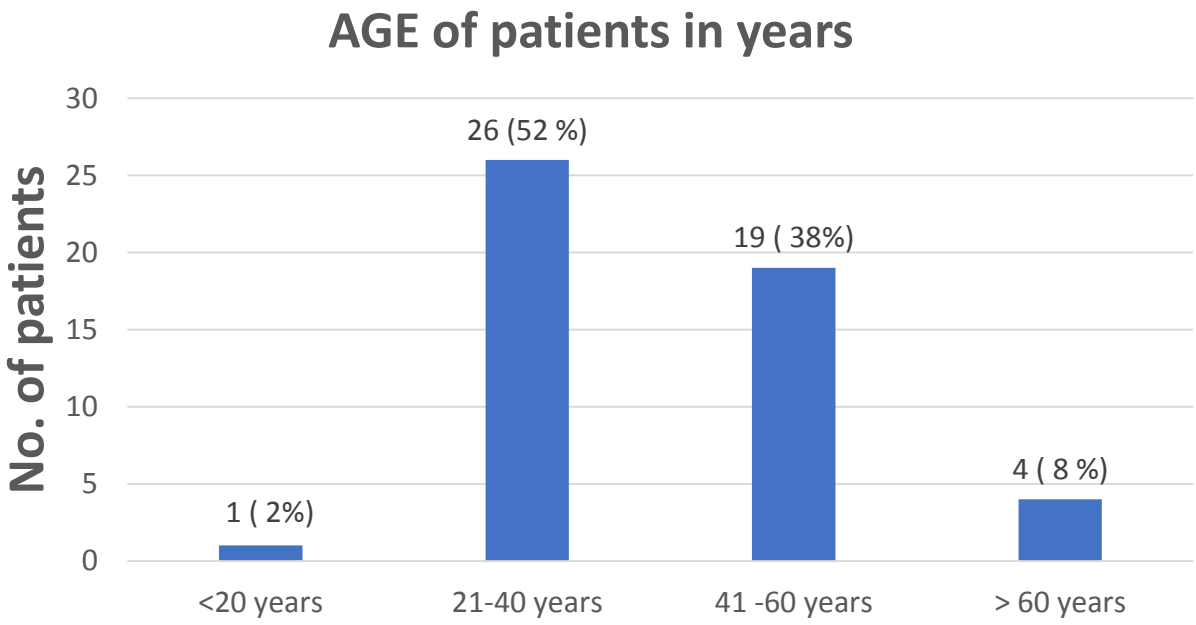


CHART -2

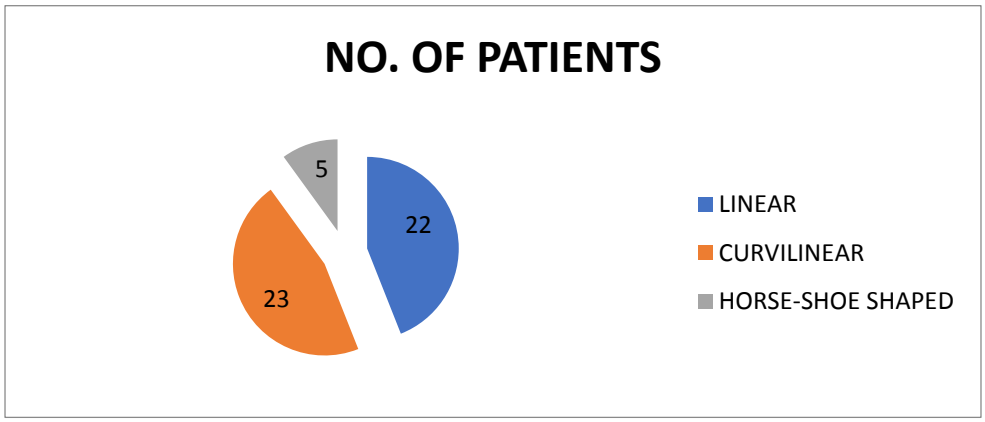


CHART -3

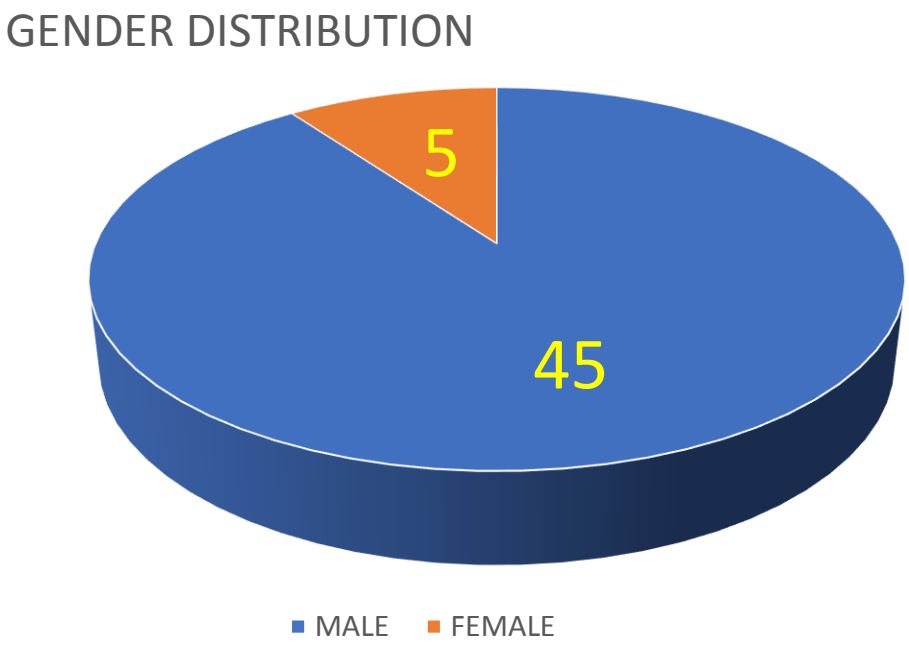


CHART -4

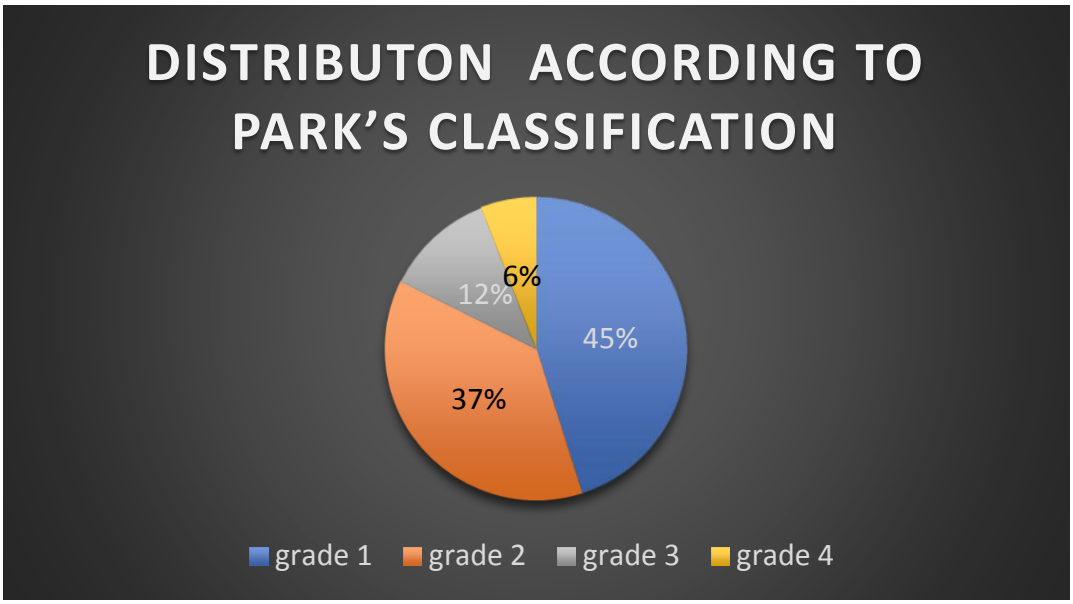


CHART -5

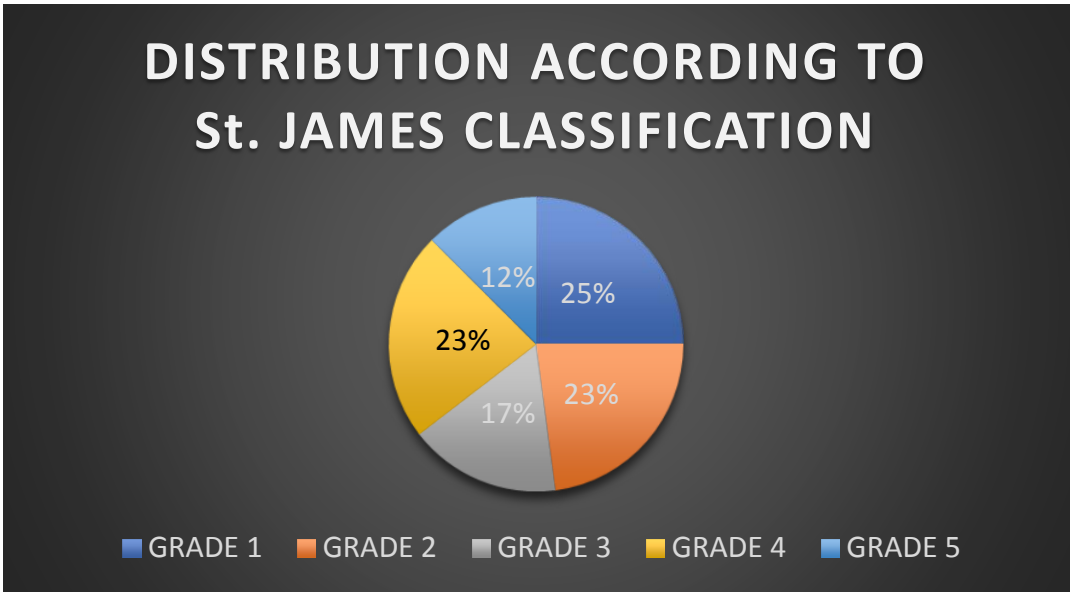


Table -1

TRACT CHARACTERISTICS	NO. OF PATIENTS	PERCENTAGE
No abscesses or secondary tracts	20	40
Ramifications	18	36
Abscesses + ramifications	12	24

Table - 2

EXTERNAL OPENING	NO. OF PATIENTS	PERCENTAGE
On right side of gluteal cleft	21	42
On left side of gluteal cleft	14	28
Midline	12	24
Multiple	3	6

Table - 3

INTERNAL OPENING	NO. OF PATIENTS	PERCENTAGE
2 o'clock position	1	2
5 o'clock position	2	4
6 o'clock position	31	62
7 o'clock position	4	8
11 o'clock position	2	4
12 o'clock position	8	16
Multiple internal openings	2	4

Discussion :

Our research reveals that perianal fistulas predominantly affect adult males, with a male to female ratio of 9:1 and an average age of onset at 40 years, consistent with findings from previous studies (Darwish et al.) [4].

Similar to Buchanan et al. [5] , our study observed that the majority of primary fistula tracts identified during surgery were inter-sphincteric (46%) and trans-sphincteric (38%) [6,9] Most patients in our cohort presented with a single primary tract, aligning with findings by Baik et al. [12].

MRI also demonstrated high accuracy rates (94% and 93%, respectively) in detecting primary tracts, as reported by Singh et al. [10] and Beets-Tan et al. [13]. These results support MRI as the preferred imaging modality for preoperative assessment of anal fistulas [7, 10, 11].

In our study, the precise localization of internal openings using MRI proved critical for surgical planning, particularly in distinguishing between inter-sphincteric and trans-sphincteric fistulas. MRI's ability to visualize the internal opening near the anal canal aids in determining the optimal treatment approach. Previous literature has highlighted the inflammatory nature of the inter-sphincteric space, often associated with the internal opening [8, 13].

We found that combining different MRI sequences and imaging planes, particularly axial and longitudinal (coronal and sagittal), provided comprehensive details necessary for evaluating perianal fistulas. Coronal images specifically highlighted the levator plane, aiding in distinguishing supralevator from infralevator infections.

The classification of perianal fistulas based on MRI findings is crucial for treatment planning and patient outcomes. [1] Simple fistulas, identifiable through MRI, may be managed with fistulotomy without compromising continence, whereas complex fistulas require more nuanced approaches to preserve continence. The St. James classification system used in our department facilitates accurate reporting and classification.

MRI's exceptional soft tissue contrast resolution and multiplanar capabilities make it indispensable for delineating perianal anatomy, including fistulous tracts, ramifications, and abscesses. This thorough preoperative assessment enables surgeons to select the most appropriate surgical intervention, thereby reducing recurrence rates significantly [12, 13] .

IV. CONCLUSION:

Our study emphasises upon MRI's role in precisely defining peri-anal fistulous tracts, assessing their relationship with pelvic structures, and identifying secondary abscesses. This detailed information guides effective surgical treatment, lowers recurrence rates, and minimizes adverse effects like fecal incontinence.

MRI's non-invasive nature and patient comfort make it the preferred imaging modality for evaluating perianal fistulas, emphasizing the importance of radiologists' familiarity with its anatomical and pathological features.

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