

**Fistula in Ano: MRI and Post-Operative Findings Correlation****Palak Gandhi<sup>1</sup>, Arun Kumar Gaur<sup>2</sup>, Bhoomi Modi<sup>3</sup>**<sup>1</sup>Radiologist, Department of Radiology, B J Medical College, Gujarat University, Ahmedabad, Gujarat, India<sup>2</sup> Assistant professor, Department of Radiology, SSG Hospital, Govt. Medical College, Vadodara, Gujarat, India<sup>3</sup> Assistant Professor, Department of Radiology, B J Medical College, Gujarat University, Ahmedabad, Gujarat, India.

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Conflict of interest: Nil

**Abstract:****Objective:** To assess role of MRI in perianal fissure and fistula and to evaluate complications.**Materials and Methods:** Total 50 patients, who were clinically diagnosed as suffering from perianal fissure/fistula, were recruited. Each patient was studied in detail with relevant clinical history and Examination. MRI was performed on 1.5 T Philips scanner with patient in prone position using body coil, no special bowel preparation was used.**Results:** A total of 50 cases of perianal fissure/fistula, most patients were in age group of 31 to 50 years, 43 patients were males (86%) & 7 patients were females (14%). 3 cases (6%) had previous operative history for perianal fistula and shows recurrence. 36(72%) tracts were trans-sphincteric type followed by inter-sphincteric type (13, 26%) & 1 (2%) fistula was of supra-sphincteric type. grade IV fistulas were found in 19 cases (38%), grade III fistulas found in 17 cases (34%), grade I & grade II fistulas were found in 7 cases (14%) & 6 cases (12%) respectively & grade V fistulas in 1 patient (2%).

41 patients had single external opening while 7 patient had multiple external openings. One patient had sub mucosal fissure and one patient had only internal opening (sinus) disease.

44 patients had single internal opening while 4 patients had multiple internal openings. 3 patients had multiple (two) perianal fistula, 9 patients had complex fistula in form either multiple internal openings or multiple external openings. 38 patients had simple fistula. 40 tracts were low anal fistula while 10 tracts were high anal fistula-involving puborectalis sling and levator plate, about 17 fistulas showed abscess formation.

**Conclusion:** MRI is imaging modality of choice in preoperative evaluation of perianal fistulae, especially in complex and recurrent cases. MRI Fistulogram is recommended in recurrent and complex cases as a method of pre-operative evaluation, for surgical outcome and planning and hence to reduce recurrences.**Keywords** (perianal fistula, submucosal fissure, MRI fistulogram, abscess, sinus)

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**Introduction**

Word “fistula” has Latin origin which means pipe. It is defined as an abnormal track connecting two structures with at least

two openings and having epithelial lining. The term perianal fistula is defined as an abnormal epithelial lined connection

between mucosal surface of anal canal and perianal skin. It is male predominant disease and is associated with significant discomfort and morbidity [1]. It is common in young men and has a short course with higher recurrence rate which is due to missed infective focus that remains untreated. Most commonly unexploited or missed are the secondary extension of primary tracts [2]. Infective and inflammatory diseases like tuberculosis and inflammatory bowel disease are also associated with perianal fistulae [3,4].

Earlier, operative decisions were taken in clinical context and information derived by clinical examination, digital rectal examination (DRE), proctosigmoidoscopy and surgical exploration performed with probing and dye injection under anaesthesia. However, disadvantages included anaesthesia, discomfort, creating false tracts and extension of infection. These methods also failed in detecting chronic fibrotic tracts.

Various imaging modalities to diagnose perianal fistulae, are conventional radiography (X-ray fistulogram), computed tomography (CT) fistulogram, endoanal sonography, Transperineal sonography and MRI (Magnetic resonance imaging) fistulogram with or without intravenous contrast agent.

Conventional fistulogram was unreliable with lot of inter-observer variations and there was a lot of difficulty in interpretation because of lack of precise anatomic landmarks. Major drawbacks in interpretations are (a) Levator ani sling and fistula position (b) Level of internal opening of fistula (c) relationship and involvement of anal sphincters and (d) technique may fail in delineating secondary extension. The procedure itself had complication of flare up of infection by creation of false passages while cannulating and is a tedious procedure which causes lots of discomfort [5,6].

Trans perineal and endoanal sonography [7] with improved high resolution endocavitary phase array ultrasound probes show better relation of anal sphincter muscle with fistula and its disruption. It also allows dynamic assessment of sphincters and exact localisation of internal openings. Major disadvantages are limited field of view which fails in detecting deeper spread of infection and secondary ramification of primary tracts, highly operator dependent, lack of expertise, long learning curve and inter-observer variation, difficulty in interpreting 2D images by surgeons and not useful in patient with acute pain.

CT fistulogram [8] with or without contrast agent - sphincter muscles, levator ani, inflammatory tissue, active and fibrotic tracts all have near same CT attenuation and lack of soft tissue contrast makes it difficult in characterising these structures unless the tract contains gas or injected contrast material.

MRI has excellent soft tissue contrast. Its multi-planar capabilities and no radiation risk is evolving its role in management of perianal fistula [9]. The role of MRI is not in diagnosis as diagnosis is almost always clinical, but it is helpful for delineating accurately surgical anatomy, classification of fistula and its secondary ramification, complications, extensions (particularly horseshoe extensions) and small foci of infections. Thus, it helps in reducing the recurrence due to surgically missed infective foci. The technique is painless, hence well accepted by patients [10,11].

In the current scenario, MRI is imaging modality of choice for pre-operative evaluation of perianal fistula to help surgeon in planning and decreasing recurrence.

### Aims and Objectives

- To identify the fistulous tracts, internal openings, and the relationship of perianal fistulas with anal sphincter

complex and its classification into high versus low.

- To detect the secondary tracts, branches, ramifications, and other complications like horseshoe collection and ischioanal and ischiorectal abscesses.
- To grade the fistulas according to St. James University Hospital Classification (table 1) for universal acceptance.
- To evaluate role of contrast study in complex perianal fistula.

### Materials and Methods

**Place of Study:** Study was conducted in Department of Radiodiagnosis.

**Type of Study:** Observational study

**Study design:** Descriptive cross sectional

**Period of study:** June 2019 to October 2021.

**Sample size:** 50

**Source of sample-** Patient referred by department of surgery for evaluation of perianal fistula.

### Inclusion Criteria:

1. All patients clinically diagnosed to have perianal sinus, fistula and fissure referred to Radiology department.
2. Recurrent perianal fistula.

### Exclusion Criteria:

1. Proven cases of rectal and anal malignancy.
2. Contraindications to MRI: Ferromagnetic implant like pacemaker.
3. Claustrophobic patient
4. Patient not willing for participation in the study.

**Consent:** The procedure was explained to the patient and well-informed consent of all patient was obtained in all cases.

Appropriate pre procedural counselling was done to alleviate anxiety.

### Method of diagnosis:

MRI was performed on 1.5 T (Tesla) Philips scanner with patient in prone position using body coil (phase array coil). No special bowel preparation was used. A phased array body coil was placed on the pelvis. A localiser in three directions was taken in order to align the T2W TSE sequences axial oblique and coronal oblique to the anal canal. Field of view (FOV) included perineum and levator ani muscle. No respiratory compensation or respiratory trigger was used. 3D T2 VISTA volume sequence was used to define the internal opening which is occasionally missed on routine sequences due to inter-slice gap.

### Imaging Protocol: (table 2)

OBLIQUE AXIAL and CORONAL T1 TSE

OBLIQUE AXIAL and CORONAL T1 TSE FS

T2 TSE -COR/TRA/SAG OBLIQUES

T2 TSE FS- OBLIQUE COR/TRA

STIR/SPAIR CORONAL OBLIQUE

3D VISTA T2

T1 TSE FS(PC)-AXIAL WITH 3D RECONSTRUCTION, when needed.

Gadopentatedimeglumine 0.1 mmol/kg at a rate of 1 ml/ second was used as contrast administered intravenously manually through peripheral intravenous access. Contrast scan was done when complex fistula and abscess formation suspected on STIR images and not in all cases.

### Data Analysis:

Descriptive statistics like numbers and percentages were calculated with appropriate statistical test.

**Source of Funding:** None.

### Observation and Results

Observation of 50 cases of MRI fistulogram was done. They were followed

up to surgery and the operative findings were correlated with the preoperative MRI findings.

Most patients were in age group of 31 to 50 years (30 out of 50 patients 60%). The youngest patient was of 20 years of age and the eldest patient of 75 years of age.

Of the total 50 patients, 43 patients were males (86%) and 7 patients were females (14%)

Out of 50 patients, 3 cases (6%) had previous operative history for perianal fistula and shows recurrence. All three were of trans-sphincteric type. 2 out of 3 were Grade IV and 1 out of 3 was Grade III fistula according to St. James Hospital University Classification.

Out of 50 patients, 36(72%) tracts were trans-sphincteric type forming most common type followed by inter-sphincteric type (13, 26%). 1 fistula was of supra-sphincteric type. No extra-sphincteric fistula was found in our study of 50 patients.

All 50 perianal fistulas were classified based on St James's University Hospital Classification. This revealed that grade IV fistulas were the commonest which was found in 19 cases (38%) followed by grade III, grade I and grade II fistulas which were found in 17 cases (34%), 7 cases (14%) and 6 cases (12%) respectively. Grade V fistula is relatively uncommon and was found in 1 patient (2%). Out of 50 patients, 41 patients had single external opening while 7 patients had multiple external openings.

One patient had submucosal fissure and one patient had only internal opening (sinus) disease. Amongst perianal fistula and sinus disease with external opening, 15 had external opening at 5 o'clock position followed by 6 o'clock position.

Out of 50 patients in the study, 44 patients had single internal opening while 4 patients had multiple internal openings. Amongst perianal fistula and sinus disease with internal opening, 17 fistulae had internal opening at 6 o'clock position followed by 7 o'clock position.

Out of 50 patients, one patient had submucosal fissure while two patients had sinus disease. Out of remaining 47 patients, 9 patients had complex fistula in form either multiple internal openings or multiple external openings and 38 patients had simple fistula.

Amongst the 50 fistula tracts, 40 tracts were low anal fistula while 10 tracts were high anal fistula-involving puborectalis sling and levator plate. about 18 fistulas showed secondary tract which were confirmed on surgery while out of rest of the 32 cases with absent secondary ramification, six patients showed secondary tracts at surgery (fig.1).

In this study, about 17 fistulas showed abscess formation which were confirmed on surgery while out of rest, 33 were had no imaging findings of abscess formation. It showed total concordance with surgical findings (fig.1).

**Table 1: St. James Hospital University Classification of Grades of perianal fistula**

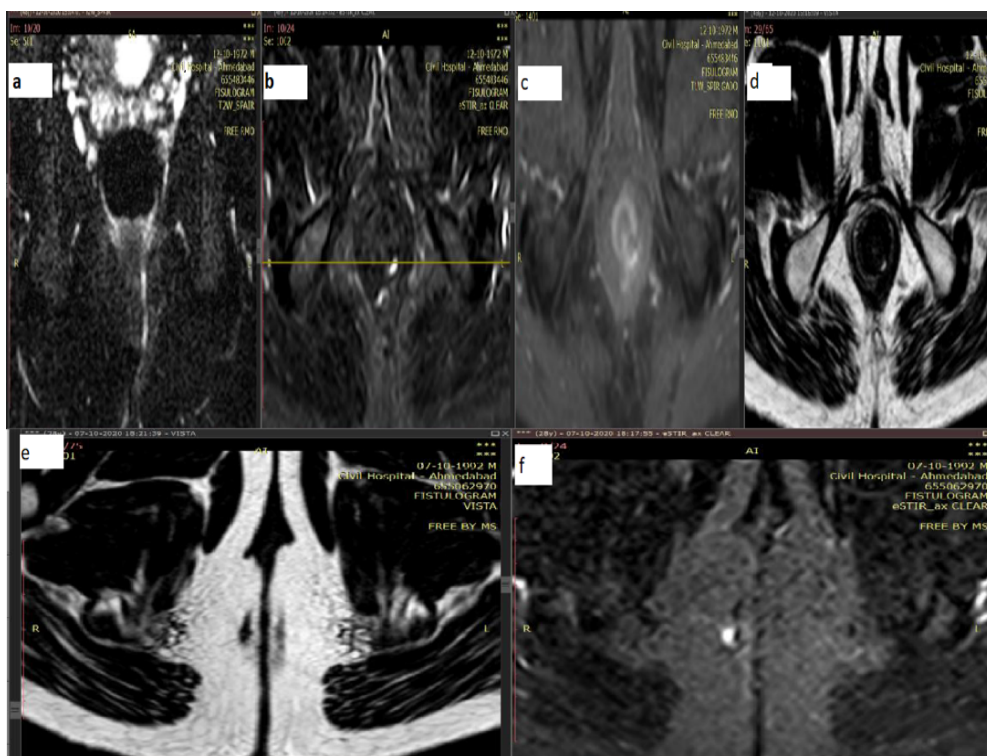
Grade I	<b>simple linear inter-sphincteric fistula</b>
Grade II	<b>inter-sphincteric fistula with an abscess or secondary track</b>
Grade III	<b>trans-sphincteric fistula</b>
Grade IV	<b>trans-sphincteric fistula with an abscess or secondary track in the ischiorectal or ischioanal fossa</b>
Grade V	<b>supralevator and translevator disease</b>

**Table 2: details of MRI sequences used**

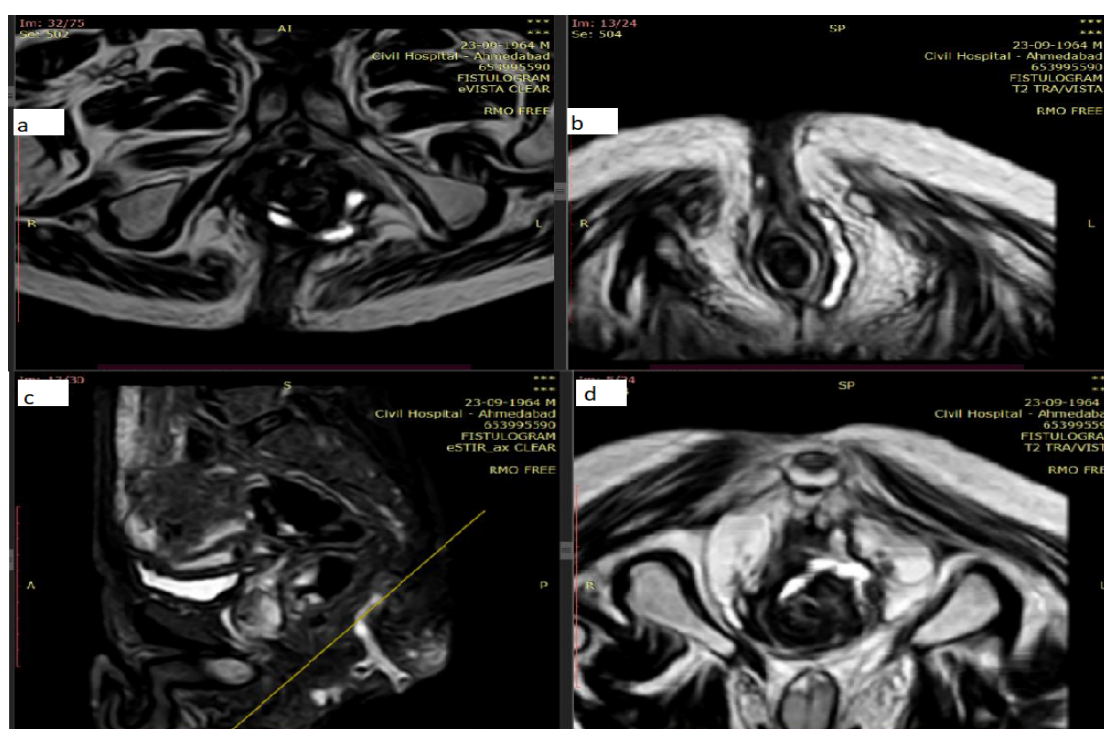
MRI sequences	Non contrast scans		Non-Contrast Fat Suppressed Scans		Contrast Enhanced Fat Suppressed Scans	3D VISTA
	T1 W TSE	T2 W TSE	FS T1 W TSE	FS T2 W TSE	FS T1 W TSE WITH 3D RECONSTRUCTION	WITH RECONSTRUCTION
Imaging plane	Axial and coronal	Sagittal axial coronal	Axial and coronal	Axial and coronal	Sagittal axial coronal	Axial
TR/ TE (m sec)	628/10	4900/75	766/11	6320/116	500/11	1500/275
FOV	220*220	220*220	220*220	220*220	220*220	220*250
SECTION THICKNESS (mm)	3.5 mm	3.5 mm	3.5 mm	3.5 mm	3.5 mm	1 mm
MATRIX	320*320	320*320	320*320	320*320	320*320	320*320

Secondary track	No of patients Based on MRI findings	No of patients based on surgical findings	MRI- surgery concordance
PRESENT	18	18	Sensitivity- 75% Specificity- 100%
ABSENT	32	26	
Abscesses	No of patients based on MRI	No of patients based on surgical findings	Concordance based on surgery
PRESENT	17	17	Sensitivity- 100%
ABSENT	33	33	Specificity- 100%

**Fig.1 (a) Sensitivity and specificity in identifying secondary track based on intra-operative correlation, (b) Sensitivity and specificity in identifying abscesses based on intra-operative correlation.**

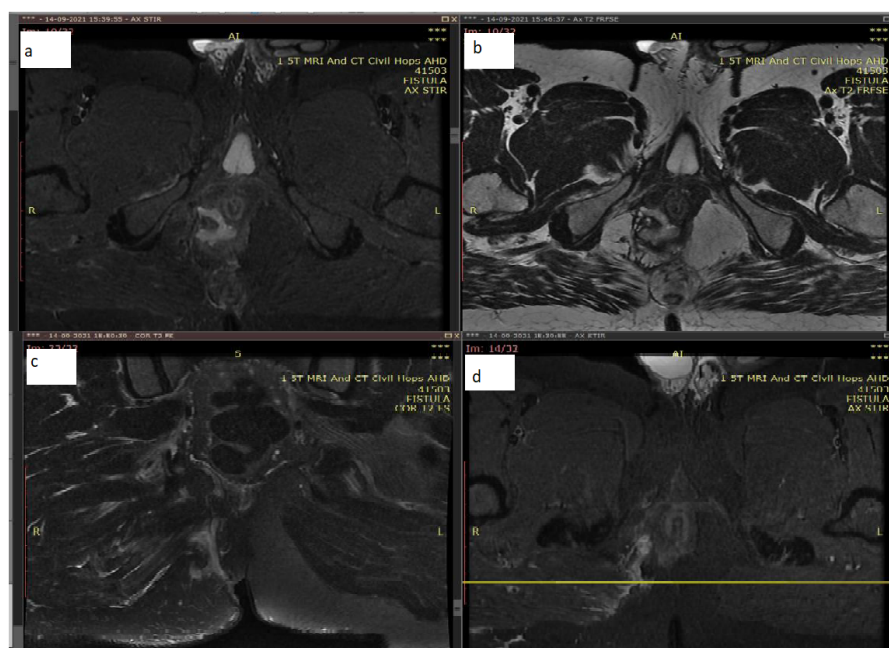


**Fig. 2** STIR images in Coronal and axial plane shows inter-sphincteric fistula at 5 o'clock position (a & b), (c) post contrast image shows enhancement indicative of active tract & (d) 3D VISTA clearly shows inter-sphincteric locations of the tract, (e & f) pre contrast coronal and postcontrast spir axial images show trans-sphincteric fistula at 10 o'clock position.

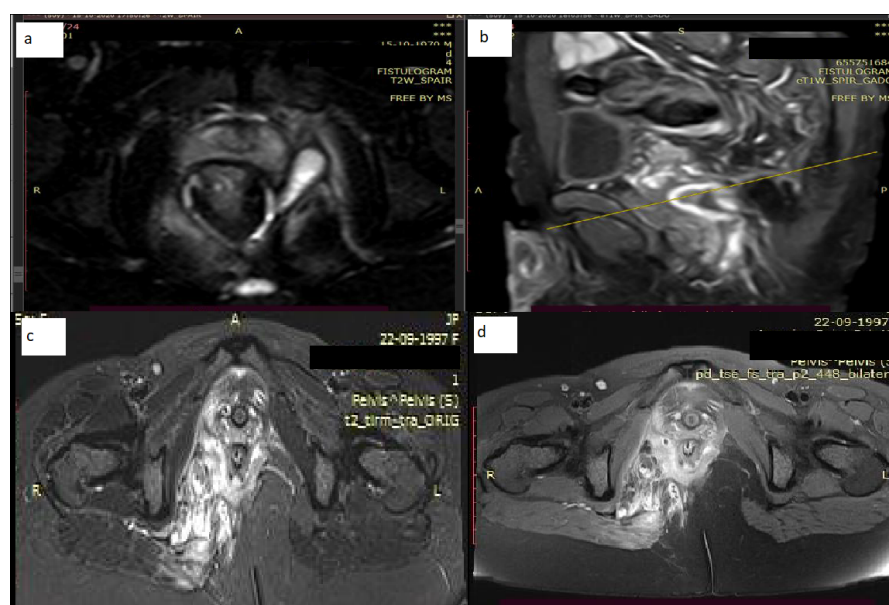


**Fig.3** 3D VISTA (a, b & d) & STIR (c) show transphincteric fistula 6 o'clock position with secondary tract extension into left ischioanal fat.





**Fig.4 STIR axial images show trans-sphincteric fistula at 6 to 7 o'clock with secondary ramifications at 9 o'clock position.**



**Fig.5 Axial T2 SPAIR (a) image shows hyperintense fistula at 3 o'clock extending above supralelevator as co-related to sagittal plane in (b), T2 FSE (c & d) axial images show abscess formation in ischioanal fossa in horseshoe shape with extensive p**

## Discussion

This study included 50 patients referred for MRI fistulography with clinical diagnosis of perianal fissure and fistula. The most common complaint was intermittent pus discharge from perianal region, associated with perianal itching and pain.

Patients were clinically examined in Surgery department and laboratory investigation were performed and were referred to Department of radiology for MRI fistulogram.

Out of 50 patients, 30(60%) belongs to age group of 31 to 50 years including both males and females. In a study of Manar T Alaati El Essawy [12] conducted in 2013, of

56 patients, mean age in the study was 39+-11, (Range included was between 14 to 56 years). In 2014, Kulvinder Singh et al. [13] observed that amongst 50 patients under study, mean age of presentation was 42 years. Result of present study with 50 patients was in concordance with previous studies observation.

Sex distribution of study participants in our study was predominantly male with 43 out of 50 patients (86%) and only 7 (14%) were females. Similar findings were found in study results of Kulvinder Singh et al. [13] in 2014 with 45 (90%) male patient and 5(10%) female patient in study of 50 patients.

Out of 50 patients, one patient had submucosal fissure, two patients had perianal sinus disease and 47 patients had perianal fistula. In a study conducted by Manar T Alaat Al Essawy [12] in 56 patients, only 1(1.8%) proved to be sinus disease. In retrospective study of 43 patient with clinical diagnosis of perianal fistula conducted by Pushpinder Singh Khara, Hesham Badwai, Ahmed Afifi, [14] 8 patient (18.6 %) had perianal sinus disease while rest 35 patients had perianal fistula.

St. James university Hospital Classification Grades distribution of 50 patients under study were evaluated, grade IV fistulas were the commonest which was found in 19 patients (38%) followed by grade III, I and II fistulas which was found in 17 patients (34%), 7 patients (14%) and 6 patients (12%) respectively. Grade V fistulas is relatively uncommon and was found in 1 patient (2%). In the study done by Ozdil Baskan et al. [15], out of the 136 patients, 70(51.5%) had grade I; 25(18.4 %) had grade II;16(11.76%) had grade III;17(12.3%) had grade IV and 2(1.5%) had grade V fistulae. In study done by Jaime de Miguel Criado et al. [16] on 178 patients which revealed 44 (24. 7%) patient had grade I fistula; 33(18.5%) had grade II; 43(24.2%) had grade III; 45(25.3%) had grade IV and 13(7.3%) had grade V fistulae. Thus, most common variety was

grade IV. results of our study were in concordance with past studies.

Hoda Salah Darwish et al. [17] conducted a study from 2012 to 2013 in 35 patients with total 38 fistulae while 13 patients had only perianal sinus disease. Out of total 38 fistulae in these 35 patients, 11(29%) were trans-sphincteric (fig.2), 24(63%) were inter-sphincteric (fig.2) and 2(5%) were supra-sphincteric and only 1 (3%) was extra-sphincteric fistula. Dariusz Waniczek et al. [18] conducted MRI fistulography study and compared with intraoperative conditions in 14 patients (11 male and 3 female) during period of 2005 to 2009, In his study, he classified according to Park's type [19], 5 (36%) inter-sphincteric, 6 (43%) trans-sphincteric, 1(7%) supra-sphincteric and 2 (14%) extra-sphincteric fistulae. Parks et al (1976) [19] who also reported intersphincteric type of fistula to be the commonest in their study. The study done by Morris et al. [5] who in their study mentioned that about 70% of all perianal fistulas were intersphincteric fistulas, while trans-sphincteric fistulas constituted 20% of the total.

In our study of 50 fistula, 13(26%) were inter-sphincteric type, 36(72%) were trans-sphincteric type and 1 was supra-sphincteric type. No case of extra-sphincteric type was seen in present study.

Our study had a greater number of Trans sphincteric fistula as it is a tertiary care centre and surgical department protocol is to get scan of suspected complex fistulae with multiple external openings or non-visualisation of internal opening. Thus, there is discordance in our study with other studies.

Out of 50 patients in the study, 41 patients had single external opening while 7 patients had multiple external openings. One patient had submucosal fissure and one patient had only internal opening (sinus) disease. Amongst perianal fistula and sinus disease with external opening, 15



fistulae had external opening at 5 o'clock position followed by 6 o'clock position.

Out of 50 patients in the study, 44 patients had single internal opening while 4 patients had multiple internal openings. One patient had submucosal fissure and one patient had only external opening (sinus) disease. Amongst perianal fistula and sinus disease with internal opening, 17 fistulae had internal opening at 6 o'clock position followed by 7 o'clock position. At times internal opening can be missed on T2 weighted images due to inter slice gap which can be overcome by three dimensional(3D) T2 weighted turbo spin echo (TSE) sequences. It can provide source data for post-processing reformation of images into any desired plane. Therefore, a single 3D T2 weighted sequence with post processing reformation of images in all the 3 planes can replace the 2D sequences in those planes.

Michael R Torkzad et al [20], studied 39 patients with perianal fistula and concluded 3D T1 weighted sequence were better in assessment of internal openings as compared to 2D T2 TSE. Similar results were noted in present study.

Secondary tracts are ramification or branches from the primary tract that may develop at any time and could be intersphincteric, ischioanal, or supralevator. Treatment differs so mentioning course of the secondary tract is important. Also missed secondary tracts during imaging and surgery are cause of recurrence. Thus, the importance of MR imaging in this context lies in its ability to demonstrate hidden areas of sepsis and secondary tract.

In this study of 50 patients, about 18 fistulas showed secondary tract (fig.3) which were confirmed on surgery while out of rest 32 with absent secondary ramification, 6 patients showed secondary tracts at surgery. On contrast study for the demonstration of secondary tracts, it was observed that all the 18 patients who had

secondary tracts, all of them showed contrast enhancement of secondary tracts. So, it could be concluded that contrast study is indispensable for management. This is in concordance with the study done by Dariusz et al. [19].

Contrast study revealed that 17 patients with abscess showed contrast enhancement that helped in demonstrating the extent of the abscess. This is superior to the result given by Maier et al in his study, who showed an 84% sensitivity of MRI for the identification of perianal fistulas and abscesses. The better results of our study may be attributed to the use of contrast enhanced imaging. So, contrast enhanced imaging should be routinely included in MRI protocols of anal fistula examination, even with no abscess or collection seen at the pre-contrast images.

In a study of 44 fistula in 35 patients with perianal fistula, Pushpinder Singh Khara, Hesham Badwai, Ahmed Afifi [15] found 27(61%) were simple fistula with no secondary extension or abscess formation. whereas 17(39%) showed complex fistulae (branching, abscess formation, inflammation in adjacent tissue) (fig.4).

Our study shows 64% as simple fistula with no secondary extension or abscess formation and approximately 36% patient had complex fistula i.e with secondary tracts and abscess formation or multiple internal or external openings. In a study conducted by Spencer et al. [21] in 42 patients, 22 out of 42(52.4%) revealed complex fistulae.

In our study, 3 patients (6%) showed horseshoe shaped extension (fig.5). This was similar to study conducted by Manar T Alaat El Essawy in 2013 [12], who analysed and reported 5(8.9%) cases as showing secondary extension in form of horseshoe shape. Another study of Kulvinder Singh et Al. [13] reported 8 cases (16%) out of 50 fistulas with horseshoe shaped abscess formation. [22]

Amongst the 50 fistula tracts, in 47 patients with perianal fistula 40 (80%) tracts were low anal fistula while 10(20%) tracts were high anal fistula-involving puborectalis sling and levator plate.

The height of internal anal opening from the anal verge and opening relative to sphincters are crucial for continence after surgery Higher the internal opening, more sphincter will be divided.

### Limitations:

- Study was done at tertiary health centre where maximum bulk of patient are referred patients.
- Secondly, Surgery department protocol in our hospital remains to get MRI fistulogram in case where internal opening is not clinically detected or multiple external openings-Suspecting complex fistula or high anal fistula and in recurrent cases.
- Contrast study was performed in only few patients with complex fistula.

### Conclusion

MRI is imaging modality of choice in preoperative evaluation of perianal fistulae, especially in complex and recurrent cases. Recurrence after surgery and loss of continence are most important complications of perianal surgery. MRI Fistulogram is recommended for better surgical outcome to reduce recurrences. STIR sequences with 3D VISTA T2 helps in identifying all fistula, internal openings, abscess formation and secondary ramifications in primary cases. Contrast study was found useful in cases of complex fistula for proper delineation of collections and activity of the tracts. Contrast study also plays important role in recurrent and post-operative cases. Classifying perianal fistula as high and low helps surgeon in planning management strategy to reduce risk of loss of continence.

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