



A COMPARATIVE STUDY OF CONVENTIONAL FISTULOGRAPHY AND MRI FISTULOGRAM IN PERIANAL REGION

Dr Shinde Aditya L*	MBBS, 3rd Year PG Resident, Department of Radiodiagnosis, Shri M P Shah Medical College and G.G. Hospital, Jamnagar - 361008. *Corresponding Author
Dr Chudasama Shilpa L	MD Radiology, Associate Professor, Department of Radiodiagnosis, Shri M P Shah Medical College and G.G. Hospital, Jamnagar - 361008.
Dr Hiral K. Pansuriya	MBBS, 3rd Year PG Resident, Department of Radiodiagnosis, Shri M P Shah Medical College and G.G. Hospital, Jamnagar - 361008.
Dr Ajith P MBBS	2nd Year PG Resident, Department of Radiodiagnosis, Shri M P Shah Medical College and G.G. Hospital, Jamnagar - 361008
Dr Nirbhay Virani	MBBS, 1st Year PG Resident, Department of Radiodiagnosis, Shri M P Shah Medical College and G.G. Hospital, Jamnagar - 361008

ABSTRACT

Background: Fistula could be between bowel and bowel, bowel and skin surface or mucosal surface, bowel with organs like urinary bladder, uterus and vagina. It could be between biliary tract and bowel. The term perianal fistula is defined as an abnormal epithelial lined connection between mucosal surface of anal canal and perianal skin. Its prevalence is about 0.01%. It is associated with significant discomfort and morbidity. It occurs in approximately 8.6 cases out of one lac people. It is a male predominant disease. **Aims & Objectives:** To identify the fistulous tracts, internal openings, and the relationship of perianal fistulas with anal sphincter complex. To evaluate role of contrast study in complex perianal fistula and its correlation with MR findings with intra operative findings **Methodology:** A prospective study was conducted among 50 patients of perianal fistula using various modalities like x-ray and MRI fistulogram for perianal discharge or swelling and correlates it clinically at department of Radiodiagnosis, tertiary care teaching hospital. Results were checked by two radiologists (PI and CO-PI) and final comparative data were prepared from x-ray fluorography and MRI fistulogram. **Result:** Of the total 50 patients included in the study, 39 patients were males (78%). And 11 patients were females (22%). One case was of perianal fissure. Three cases were of perianal sinus disease, Out of remaining 46 patients under study, most prevalent type of fistula was inter-sphincteric type which was seen in 30 (60%) of the patients. The operative findings were well correlating with the study with regard to the site of the openings. Identification of secondary tracts and abscess is essential for complete eradication of the disease. **Conclusion:** For perianal fistulas, MRI is a very reliable and efficient diagnostic modality as compared to X ray fistulography in detection of fistulous tract in cases of fistula in-ano / perianal fistula.

KEYWORDS : Fistula, Perianal region, Fistulogram, Fistulography, Prognosis.

INTRODUCTION

The term perianal fistula is defined as an abnormal epithelial lined connection between mucosal surface of anal canal and perianal skin. Its prevalence is about 0.01%. It is associated with significant discomfort and morbidity. It occurs in approximately 8.6 cases out of one lac people. It is a male predominant disease ⁽¹⁾. It is common in young men. It runs a short course. Recurrence rate is more. Recurrence is due to missed infective focus in surgical and radiological detection which 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).

Before the radiological advent, 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), CT fistulogram, endoanal sonography, Transperineal sonography and MRI fistulogram with or without intravenous contrast agent. Goodsall⁽⁵⁾ and Park⁽⁶⁾ have significant contribution in field of Perianal fistula.

Conventional fistulogram done on radiography film was used to delineate anatomy of fistulae. The procedure included cannulating external opening of fistulae. However, it was unreliable with lot of inter-observer variations. There was a lot of difficulty in interpretation because of lack of precise anatomic landmarks. Major drawback 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. Also, procedure itself is tedious and causes lots of discomfort ^(7,8).

Trans perineal and endoanal sonography ⁽⁹⁾ with improved high resolution endocavitary phase array ultrasound probes show better relation of anal sphincter muscle with fistula and its disruption. Technique is radiation free. It also allows dynamic assessment of sphincters. Endocavitary approach allows to exactly localise the 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, not useful in patient with acute pain.

With the advent of cross sectional imaging, CT fistulogram ⁽¹⁰⁾ with or without contrast agent was performed. However, 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.

Magnetic resonance imaging (MRI) has excellent soft tissue contrast. Its multi-planar capabilities and no radiation risk is evolving its role in management of perianal fistula ⁽¹¹⁾. The role of MRI is not in diagnosis as diagnosis is almost always clinical, but it is helpful for delineating accurately surgical anatomy, internal sphincter site, classification of its tract and secondary ramification in complex fistula, 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 radiation free and painless, hence well accepted by patients ^(12,13).

Aims & Objectives

To identify the fistulous tracts, internal openings, and the relationship of perianal fistulas with anal sphincter complex. To evaluate role of contrast study in complex perianal fistula and its correlation with MR findings with intra operative findings

Methodology

A prospective study was conducted among 50 patients of perianal fistula using various modalities like x-ray and MRI fistulogram for perianal discharge or swelling and correlates it clinically at department of Radiodiagnosis, tertiary care teaching hospital. Results were checked by two radiologists (PI and CO-PI) and final comparative data were prepared from x-ray fluorography and MRI fistulogram.

DESCRIPTION OF TOOLS:

Equipment:

- Conventional fistulography (Shimadzu-Flexavision)
- Magnetic resonance imaging fistulogram (Siemens 1.5 tesla MRI machine magnetom sepra)

All the patients included in this study were referred patients from surgery department of our hospital, then they were referred to Radiology department for conventional fistulography and MR Fistulogram.

Statistical Data Analysis

Data were entered in Microsoft excel sheet, tabulated and were analysed using IBM statistical package for the social sciences (SPSS) software. To describe the data descriptive statistics frequency analysis, percentage analysis, sensitivity, specificity, positive predictive value, negative predictive value was used. For all the tests, statistical significance is assumed when P value <0.05.

RESULTS



The mean age of study participants was 40.34 ± 12.23 years. Out of total, 16 cases were belonged to 31-40 years of age group followed by 14 cases belonged to 51-60 years of age group.[Figure 1]

Of total cases, 39(78%) were males and 11(22%) were females in the study. [Figure 2]

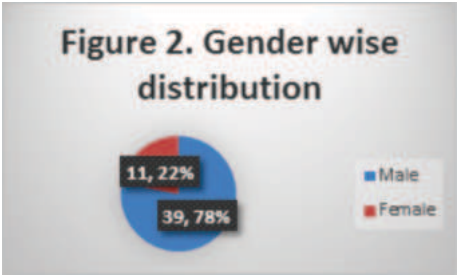


Table 1. Chief Complain Among Study Participants

Chief complain	Frequency	Percentages
Pain	8	16
Pus discharge	22	44
Swelling in anal region	20	40

Among the study participants, 22 cases had chief complained of pus discharge followed by 20 cases had complained of swelling in anal region and remaining 8 cases had complained of pain. [Table 1]

Table 2. Past History

Past History	Frequency	Percentages
Hemorrhoidectomy	10	20
Hypertension	6	12
Diabetes mellitus	5	10
I & D	5	10
Fistulectomy	4	8
None	20	40

Of total, 10 cases had past history of Hemorrhoidectomy, 5 cases had I & D and 4 cases had done Fistulectomy. [Table 2]

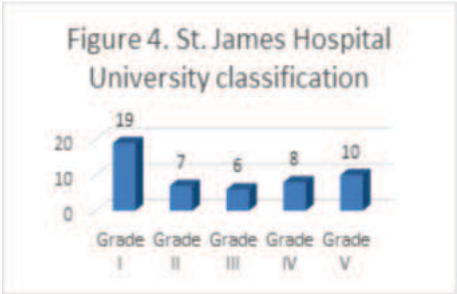


Among the study participants, 16% cases had addiction history of alcohol consumption, bidi smoking and tobacco chewing. [Figure 3]

Table 3. Management

Management	Frequency	Percentages
Conservative	4	8
Fistulectomy	27	54
Fistulectomy with I & D	3	6
Fistulectomy with Kshasutra	10	20
Fistulectomy with I & D with Kshasutra	2	4
Sinus tract excision	2	4
Laser fistulectomy	2	4

Majority of patients were managed by only fistulectomy while in 10 cases managed by fistulectomy with kshasutra. [Table 3]



Of total, 19 participants had grade I followed by 10 cases had Grade V as per St. James Hospital University classification during operative procedure. [Figure 4]

Table 4. Validity of MRI Findings

Validity	Percentages
Sensitivity	88%
Specificity	10.71%
PPV	89.1%
NPV	25.4%

Validity of MRI findings, sensitivity was 88%, specificity was 10.71%, PPV was 89.1% and NPV was 25.4% [Table 4]

Table 5: Comparative of Conventional Fistulography and MRI Fistulogram.

	Fistula present	Fistula absent	Total
Conventional Fistulography	5	1	6
MRI fistulogram	38	6	44
Total	43	7	50

Number :

Total	50
Diseased	42
Healthy	7
Positive tests	6
Negative tests	44
True tests	11
Wrong tests	39
Sensitivity	11.6%
Specificity	85.7%
Accuracy	22 %
Prevalence	30 %
Positive predictive values	83.3%
Negative predictive values	13.6%
Post-test disease probability	25.9%
Post-test health probability	69.4%
Positive likelihood ratio	0.814%

The study compared two diagnostic methods for detecting fistulas: conventional fistulography and MRI fistulogram. A total of 50 cases were examined, with 43 cases having fistula present and 7 cases having fistula absent. Conventional fistulography was used in 6 cases, detecting 5 cases with fistula present and 1 case with fistula absent. In contrast, MRI fistulogram was used more extensively, examining 44 cases and detecting 38 cases with fistula present and 6 cases with fistula absent.

The statistical analysis of these results reveals some interesting insights. The sensitivity of the test (likely referring to conventional fistulography) was relatively low at 11.6%, indicating a limited ability to correctly identify patients with fistula. However, the specificity was much higher at 85.7%, suggesting a better ability to correctly identify patients without fistula. The overall accuracy of the test was 22%, which is quite low, indicating that the test may not be very reliable for diagnosing fistulas. The prevalence of fistulas in the studied population was 30%. The positive predictive value was high at 83.3%, meaning that when the test gives a positive result, there's a good chance it's correct. However, the negative predictive value was low at 13.6%, suggesting that negative results are less reliable. The post-test disease probability was 25.9%, while the post-test health probability was 69.4%. Interestingly, both the positive and negative likelihood ratios were quite low (0.814% and 1.03% respectively), which suggests that the test may not be very effective at distinguishing between patients with and without fistulas. [Table 5]

Surgical management of anal fistulas requires determining the course of the primary and secondary tracts and their connection with the sphincteric musculature in order to appropriately manage the anal fistula and drain any existing abscess. Physical examination may not be enough to differentiate between these features on its own, and infective foci that were missed during the initial operation are often the source of recurrence. ^[14] MRI is the best imaging technique for identifying anal fistulas and the anatomy of the anal canal. ^[15] Diagnosing patients with fistula-in-Ano is challenging, even for highly skilled radiologists and colorectal surgeons. Because of the induration and clinical investigations can often reveal inflammation in anal sepsis patients.

In this study, the mean age of study participants was 40.34 ± 12.23 years. Out of total, 16 cases were belonged to 31-40 years of age group followed by 14 cases belonged to 51-60 years of age group. Of total cases, 39(78%) were males and 11(22%) were females in the study. In study of Kummari S et al, ^[16] Of the 48 participants, women made up just 29.2% and men 70.8%. Participants' ages ranged from 21 to 70 years. The mean age was 28.6 years of study participants. This findings were similar to our study.

Among the study participants, 22 cases had chief complained of pus discharge followed by 20 cases had complained of swelling in anal region and remaining 8 cases had complained of pain.

In present study, of total, 33(66%) cases had symptoms since less than 1 year, while remaining 17(34%) cases had symptoms from more than 1 year. In study of Waniczek D. et al. ^[17] observed that more than half patients were suffered from fistula more than 1 year duration.

Of total, 10 cases had past history of Hemorrhoidectomy, 5 cases had I & D and 4 cases had done Fistulectomy. Among the study participants, 16% cases had addiction history of alcohol consumption, bidi smoking and tobacco chewing. The two studies appear to support one another because Beets-Tan et al. discovered that Addiction was a risk factor in 12 of 56 patients with anal fistulas ^[18]. Furthermore, a study conducted by Khera PS et al. discovered that in three out of 35 cases with a primary or recurrent perianal fistula, in 34 cases hemorrhoids were present ^[19].

In current study, Of total, total 16 cases had external opening at 3 o'clock on local examination. Only 2 cases had 12 o'clock external opening on local examination. Of total, more than half of participants had intersphincteric opening of fistula was found on MRI examination. In study of Jadhav et al ^[20] observed that around 54% of inter-sphincteric Classification of perianal fistulas is also important because treatment differs between different.

In this research, majority of patients were managed by only fistulectomy while in 10 cases managed by fistulotomy with kshasutra. A study done Kumar et al observed that Fistulectomy is commonly performed i.e., in about 34 (78%) of cases and the operated wound is healed in a range of 2 weeks to 8 weeks with a mean duration 4 weeks. ^[21] Shruti et al observed that Fistulectomy and fistulotomy were performed in 39 subjects (78%) and 7 subjects (14%) respectively fistulectomy with primary closure was performed in 1 subject (2%), while seton placement was done in 2 persons (4%). ^[22]

In current study, Validity of MRI findings, sensitivity was 88%, specificity was 10.71%, PPV was 89.1% and NPV was 25.4%. 56 patients' pre-operative MR imaging of anal fistulas was examined by Kummari S et al ^[16] 100% and 97.06% were the detection rates for sensitivity and specificity

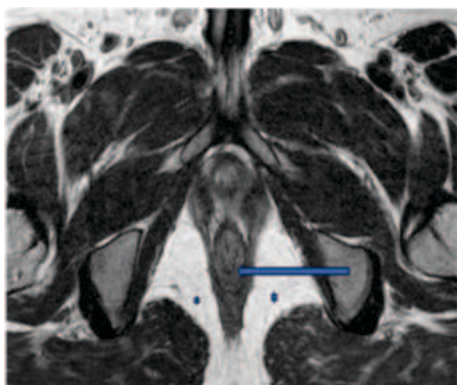
DISCUSSION

CONCLUSION

For perianal fistulas, MRI is a very reliable and efficient diagnostic modality as compared to X ray fistulography in detection of fistulous tract in cases of fistula in-ano / perianal fistula. By detecting secondary expansions such as abscesses and horseshoe tracts, MRI offers the most accurate diagnosis possible by providing a comprehensive evaluation, whereas X-ray fistulography is not as diagnostically accurate as MRI to detect tract and provides very little information about multiple tracts or abscess and has its limitations. Inter-sphincteric fistula with ramifications in its course is the most common type of perianal fistula. Complications are more often associated with a transsphincteric fistula. Extra-sphincteric and supra-sphincteric type of fistulas are very rare. Fat suppression T2 sequences were found to efficiently delineate perianal abscess formation, in a nonenhanced study.

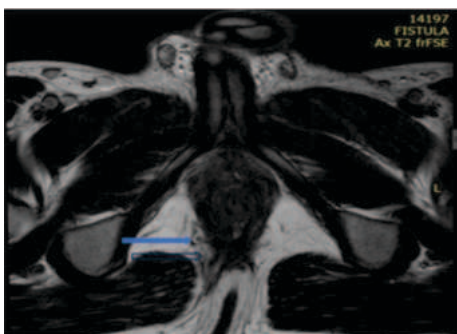
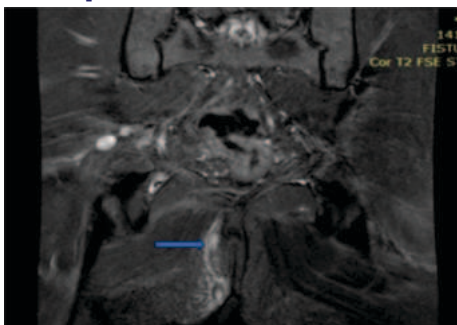
For the preoperative management and surgical planning of perianal fistulas, MRI can provide anatomical and pathological information. Nonetheless, the research suggests doing longer-term studies and a larger sample size to provide additional validity. A multicenter investigation would help provide a more thorough validation of the study's findings

Case 1: Simple Inter-sphincteric Fistula:



Axial T2-weighted images illustrate simple intersphincteric fistula that traverses internal anal sphincter (arrow) and then extends to skin without crossing the external anal sphincter or involving ischioanal or ischioanal spaces (asterisks).

Case 2: Transsphincteric Fistula:

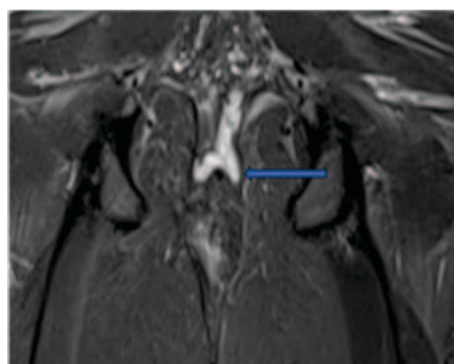
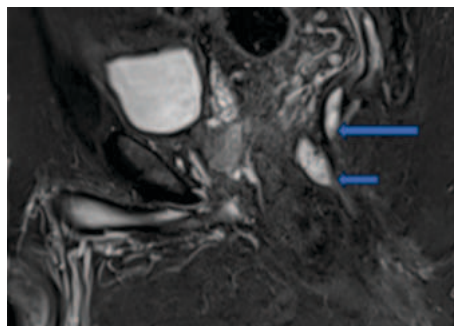


Coronal and Axial T2-weighted images fat suppression image illustrate hyperintense tract along transsphincteric region crossing both internal and external sphincter at 6 o'clock position with abscess formation along its route.

Case 3: Supra Sphincteric Fistula:

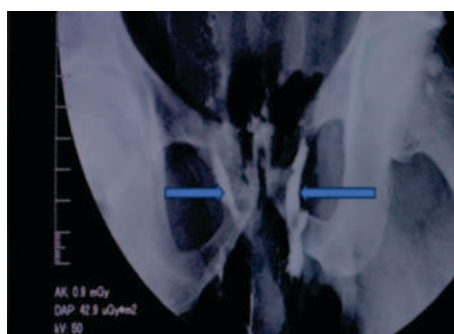


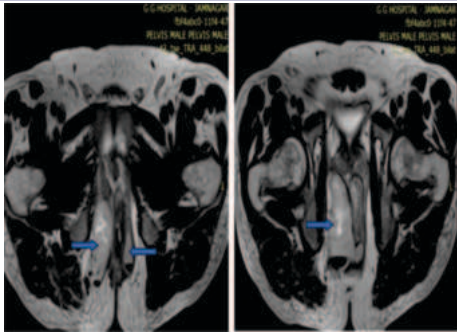
Linear radiopaque tract is noted extending supra-sphincteric and along presacral region. (conventional fistulography)



Sagittal and coronal T2-weighted images with fat suppression show primary fistula and multiple ramifications with depicts grade 5 supralevator fistula (arrowheads) consistent with active inflammation.

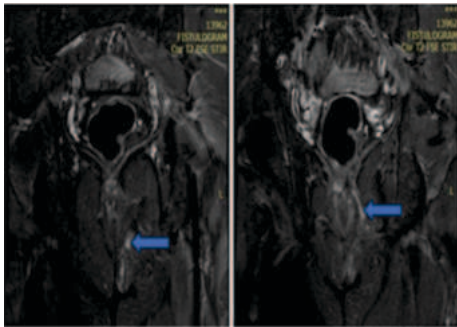
Case 4: Grade 4 Transsphincteric Fistula With Abscess Formation.





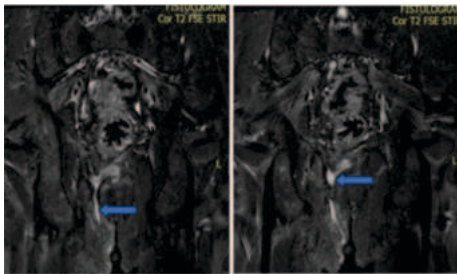
AXIAL T2-weighted images show primary two fistulous tract along bilateral ischioanal fossa and connecting to each other to form horseshoe type fistula. T2WI hyperintensity noted along right ischioanal region suggestive to be abscess formation.

Case 5: Extra Sphincteric Fistula:



Coronal T2-weighted images with fat suppression illustrates show primary fistulous tract in the left ischioanal fossa, the fistula runs through the levator ani and above the sphincter complex and extrasphincteric (arrowheads) consistent with active inflammation.

Case 6: Supra-sphincteric Fistula:



Coronal T2-weighted images with fat suppression illustrates show fistulous tract in the right ischioanal fossa, runs through the levator ani muscle and crossing both internal and external sphincter at 12 o'clock position.

REFERENCES

1. Sainio P. Fistula-in-ano in a defined population. Incidence and epidemiological aspects. *Ann Chir Gynaecol*. 1984; 73 (4):219-24.
2. Emile SH. Recurrent anal fistulas: When, why, and how to manage? *World J Clin Cases*. 2020 May 6;8(9):1586-1591. doi: 10.12998/wjcc.v8.i9.1586. PMID: 32432136; PMCID: PMC7211523.
3. Gupta PJ. Ano-perianal tuberculosis--solving a clinical dilemma. *Afr Health Sci*. 2005 Dec;5(4):345-7. doi: 10.5555/afhs.2005.5.4.345. PMID: 16615850; PMCID: PMC1831950.
4. Gold SL, Cohen-Mekelburg S, Schneider Y, Steinlauf A. Perianal Fistulas in Patients With Crohn's Disease, Part 1: Current Medical Management. *Gastroenterol Hepatol (N Y)*. 2018 Aug;14(8):470-481. PMID: 30302062; PMCID: PMC6170888.
5. Goodsall, D.H., Miles, W.E. David Henry Goodsall 1843-1906. *Dis Colon Rectum* 25, 262-278 (1982).
6. Parks AG, Gordon PH, Hardcastle JD. A classification of fistula-in- ano. *Br J Surg*. 1976 Jan; 63 (1):1-12.
7. Morris J, Spencer JA, Ambrose NS. MR imaging classification of perianal fistulas and its implications for patient management. *Radiographics*. 2000 May-Jun;20(3):623-35; discussion 635-7. doi:10.1148/ radiographics.20.3.g00mc15623. PMID: 10835116.

8. Weisman RI, Orsay CP, Pearl RK, Abcarian H. The role of fistulography in fistula-in-ano. Report of five cases. *Dis Colon Rectum*. 1991 Feb; 34 (2):181-4.
9. Engin G. Endosonographic imaging of anorectal diseases. *J Ultrasound Med*. 2006 Jan;25(1):57-73. doi: 10.7863/jum.2006.25.1.57. PMID: 16371556.
10. Liang C, Jiang W, Zhao B, Zhang Y, Du Y, Lu Y. CT imaging with fistulography for perianal fistula: does it really help the surgeon? *Clin Imaging*. 2013 Nov-Dec;37(6):1069-76. doi: 10.1016/j.clinimag.2013.04.014. Epub 2013 Aug 17. PMID: 23958432.
11. Buchanan GN, Halligan S, Williams AB, Cohen CR, Tarroni D, Phillips RK, et al. Magnetic resonance imaging for primary fistula in ano. *Br J Surg*. 2003 Jul; 90 (7):877-81.
12. Balci S, Onur MR, Karaosmanoğlu AD, Karçaaltınçaba M, Akata D, Konan A, Özmen MN. MRI evaluation of anal and perianal diseases. *Diagn Interv Radiol*. 2019 Jan;25(1):21-27.
13. George U, Sahota A, Rathore S. MRI in evaluation of perianal fistula. *J Med Imaging Radiat Oncol*. 2011 Aug;55(4):391-400. doi: 10.1111/j.1754-9485.2011.02268.x. PMID: 21843174.
14. Colon TSPTFAso, Surgeons R. Practice parameters for the treatment of fistula-in-ano. *Diseases of the Colon & Rectum* 1996; 39:1361-1372.
15. Maier AG, Funovics MA, Kreuzer SH, et al. Evaluation of perianal sepsis: comparison of anal endosonography and magnetic resonance imaging. *J MagnReson Imaging* 2001; 14:254-260.
16. Kummari S, Burra KG, Reddy VRK, Das S, Ramadugu R, Ramadugu S. The Role of Magnetic Resonance Imaging in Pre-operative Assessment of Anorectal Fistula With Surgical Correlation. *Cureus*. 2024 Jan 30;16(1):e53237. doi: 10.7759/cureus.53237. PMID: 38425597; PMCID: PMC10903756.
17. Waniczek D, Adamczyk T, Arendt J, Klucewska E, Kozinska- Marek E. Usefulness assessment of preoperative MRI fistulography in patients with perianal fistulas. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3389941/> *Polish Journal of Radiology*. 2011;76:40-44.
18. Beets-Tan RG, Beets GL, van der Hoop AG, Kessels AG, Vliegen RF, Baeten CG, van Engelshoven JM. Preoperative MR imaging of anal fistulas: does it really help the surgeon? *Gastrointestinal Imaging*. 2001;218:1.
19. Khara PS, Badawi HA, Afifi AH. MRI in perianal fistulae.. *Indian J Radiol Imaging*. 2010;20:53-57.
20. Jadhav A, Rote-Kaginalkar V, BadarkhePatil P, Mhaske C. Evaluation of Perianal Fistulae using Magnetic Resonance Imaging. *Int J Sci Stud* 2016;4:181-6.
21. Kumar VH, Chetan PR, Naveen PR. A clinicopathological study of fistula-in-ano. *Sch J App Med Sci*. 2015; 3(3F):1471-76. 14.
22. ShrutiYadu, AradhanaToppo. Clinical presentation and outcome of fistula in ano cases International Surgery Journal Yadu S et al. *IntSurg J*. 2018 Sep;5(9):3006-3010