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"MRI" A GOOD TOOL FOR EVALUATION OF PERIANAL FISTULAS"

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ABSTRACT:

OBJECTIVES: To determine the accuracy of pelvic MRI in identifying different types of anal fistulas, their anatomical relationship with surrounding structures and correlating with intraoperative findings. **MATERIALS AND METHODS:** A prospective study with 34 cases with complaints of chronic pain and discharge from the perianal region. The MRI findings are then correlated with the intraoperative findings and statistical analysis was done. **RESULTS:** Among 30 patients, in 1,only a blind ending sinus tract and in 2,sinus with internal abscess is noted. In the remaining 27 patients, obvious fistulas are demonstrated with internal opening at 5 & 6 O clock position in 16 patients(59%),at 12 O clock position in 8 (30%) and at other positions in the rest(11%) indicating posterior internal openings are more common than anterior.6 patients are with grade I (simple linear Intersphincteric fistula),3 with grade II(Intersphincteric fistula with abscess in 2 patients & with secondary ramification in 1),11 with grade III(transsphincteric fistula), 4 with grade IV(transsphincteric with abscess in 2 & with ramification in 2) and 3 with grade V(Intersphincteric with supralevator extension in 1 & transsphincteric with supralevator extension in 2). Correlating with intraoperative findings among the 27 patients, in 25, fistulous tract and its course are in correlation with MRI and in 2; internal opening is not adequately demonstrated. **CONCLUSION:** MRI is imperative in diagnosing fistulas, their course and relationship with surrounding structures thereby helping in planning proper surgical management thus decreasing the incidence of recurrence.

KEY WORDS: Fistula in Ano, MRI Pelvis, Grading of Fistula

Introduction

Perianal fistula can be due to inflammatory process around the anal canal, Crohns disease, malignancy and various others causes and poses significant morbidity to the patient. Because of its high tendency for recurrence repeated surgeries are done. Early detection helps to control the extension of track into supralevator region which if occurs will complicate the surgery and can cause anal incontinence which causes psychiatric disturbances and lifelong morbidity to patient.

Most patients who present with a perianal fistula are between 30 and 50 years age group. Perianal fistulae are rare in patients younger than 20 or older than 60 years. Men are 2 to 5 times more likely to develop a perianal fistula than women. This phenomenon is probably due to the fact that men possess more anal glands than women[1]. Sainio et al. report that the incidence of perianal fistulas is about 12.3 per 100.000 in men and 5 to 6 per

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100,000 in women[2]. According to the Dutch National Medical Registration (Prismant) in the year 2001, 2848 patients were treated in Dutch hospitals for perianal fistulas. Of these 2848 patients, 2024 (71 percent) were male [2].Because of increase in unhygienic environment and lack of proper hygienic measures even a small infection in perianal region leads to fistula that causes significant disturbance to the patient in doing his/her routine activities . If proper measures are not taken in the early stage it can extend rapidly into adjacent soft tissues, formation of abscess can occur and if it gets ruptured, it causes significant complications and morbidity to patient.

Previously most of the operations are done without any preoperative MRI depending based only on clinical history and conventional fistulogram. Information gained through conventional fistulogram is usually insufficient to know internal morphology of the fistula and operating the patient depending on this will create high chances for recurrence. Hence a preoperative MRI is very additive to normal conventional fistulogram in decreasing the chances of recurrence to the patient.

MRI provides more precise information on the anatomy of the anal canal, the anal sphincter complex and the relationship of the fistula to the pelvic floor structures and the plane of the levator ani muscle. MR imaging allows precise definition of the fistulous track and identification of secondary fistulas or abscesses. It provides accurate information for appropriate surgical treatment, decreasing the incidence of recurrence and allowing side effects such as fecal incontinence to be avoided[3].

Hence this study is done to show the role of preoperative MRI in evaluating perianal fistula in identifying the tract, its branches any associated abscess its relationship to surrounding structures and are compared with intraoperative findings and statistical analysis done.

Aim of the study: To determine the accuracy of pelvic MRI in identifying different types of anal fistulas, their anatomical relationship with surrounding structures and correlating MRI findings with intra operative findings, and to grade as per St James University hospital classification.

Materials&Methods

This was a prospective study with 34 cases with complaints of chronic pain and discharge from the perianal region. The MRI findings are then correlated with the intraoperative findings and statistical analysis was done. The conventional MRI scans were performed on a 3 TESLA whole body scanner (GE medical systems HDXT 750W) with 8US TORSOPA/FL: s coil and MRI pelvis was done.

Results

Among 34 patients 27 patients were male and 7patients were female. Thus, in our study fistulae are more commonly seen in males than in females. Among 34 patients, in 2 patients only a blind ending sinus tract is seen with no obvious internal fistula and in 3 patients, a sinus tract with internal abscess without any internal communication with the GIT are noted. In the remaining 29 patients obvious fistulas are demonstrated with internal opening into the anal canal or rectum. The internal opening into anal canal is located

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posteriorly in 20 patients and anteriorly in 9 patients irrespective of their external cutaneous openings. Thus in our study posterior internal openings are more predominant than anterior internal openings. The course of the fistula is Intersphincteric in 14 patients and trans-sphinteric in 15 patients. Intraoperative and MRI findings correlated in 28 patients but in one patient no obvious internal opening noted. It is probably because of healed or fibrosed tract by the time of operation. Based on this statistical data sensitivity, specificity, positive predictive value and negative predictive values of MRI are determined.

Sex	Patients	Percentage
Male	27	79 %
Female	7	21 %
Total	34	100 %

TABLE 1: SEX DISTRIBUTION OF CASES

Age group	Patients	Percentage
0 - 20	1	3
21 - 40	14	41.1 %
41 - 60	12	35.3 %
61 - 80	7	20.6 %
Total	34	100

TABLE 2: AGE DISTRIBUTION OF CASES

Internal opening	Patients	Percentage
Anterior	9	31 %
Posterior	20	69 %
Total	29	100 %

TABLE 3: POSITION OF INTERNAL OPENING

Clock	Patients	percentage
12 - 2 o ‘clock	5	17.9 %
3 - 5 o ‘clock	9	32.1 %
6 - 8 o ‘clock	10	35.7 %
9 - 11 o ‘clock	4	14.3 %
Total	28	100 %

TABLE 4: CLOCK POSITION OF INTERNAL OPENING

Abscess	Patients	Percentage
Present	10	29.5 %
Absent	24	70.5 %

TABLE 5 : ASSOCIATION WITH ABSCESS

Secondary tracks	Patients	Percentage
Present	6	17.6 %
Absent	28	82.4 %

TABLE 6: SECONDARY TRACKS ASSOCIATED WITH FISTULA

Grade	Description	MRI findings	Intra- op findings
1	Simple linear intersphincteric fistula	8	**8**
2	Intersphincteric fistula with abscess or secondary track	3(Fistula with abscess in 2 and fistula with secondary tract in 1)	**3**
3	Trans-sphincteric	11	**11**
4	Trans-sphincteric fistula with abscess or secondary track	4 (Fistula with abscess in 2 and fistula with secondary tract in 2)	**3**

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	within the ischiorectal fossa		
5	Supralevator and translevator disease	3 (intersphincteric with supralevator extension in 1 & transsphincteric with supralevator extension in 2).	**3**

TABLE 7: COMPARING MRI WITH INTRAOPERATIVE FINDINGS

TABLE 8: STATISTICAL ANALYSIS OF MRI FINDINGS

MRI findings	Sensitivity	Specificity	Positive predictive value	Negative predictive value
	100 %	83.4 %	96.6 %	100 %

Discussion:

Sex: In our study we have taken 34 patients who came with the complaints of discharge from the perineal region. Of these 27 patients (79 %) are male and 7 patients (21 %) are female which clearly indicates that it mostly seen in men than in women and is in concordance with the previous studies. Though among them in only 29 patients fistulas are seen and in rest 5 patients only sinus & sinus with abscess seen we included them in the study as if they were not treated they will mostly turn out into fistulae.

In study done by Hoda Salah Darwish et al.[4] where 35 cases with perianal fistula are included 4 (11%) were females and 31 (89%) were male subjects. In study done by Naglaa Daabis et al.[5] in 25 patients who came with the complaints of perianal sepsis 21 were males and 4 were females. In study done by H.A. Al-Khawari et al.[6] 33 MRI scans were performed in 26 patients for prospective evaluation of the presence of fistula-in-ano and perianal abscess of which 21 male, 5 female, age range 19–65 years. In study done by Nalan Yıldırım et al.[7] in 26 patients with perianal fistula MRI scans were performed in all of them, of which 15 were male and 11 were female. Sainio et al.[2] report that the incidence of perianal fistulas is about 12.3 per 100.000 in men and 5,6 per 100.000 in women.

Age distributions: Several studies done earlier states that perianal fistulae are common in young adults between 25 to 50 yrs which is in concordance with our study where majority of the patients are in between 21 - 40 yrs (41.1 %). Luciano Ferreira Drager et al[8] sudied retrospectively 241 cases of perianal fistula (172 men and 69 women) aging from 7 and 80 years old (average: 37,4 years), operated at the Hospital da Clínicas - UFMG, from 1977 to 1996 for perianal fistula. Large numbers of patients are in age group between 21 - 40 yrs (62 - 63 %).Even in our study most of the patients are age group 21 - 40 yrs. In study done by Imaad ur Rehman et al[9] 8 out of 11 patients are aged between 21 - 40 yrs (79 %) which is similar to our study.

Internal opening: The exact location of the internal opening can be difficult to define, whatever the imaging modality used. Two questions need to be answered. What is the radial site of the internal opening, and what is its level. The vast majority of anal fistulas open into the anal canal at the level of the dentate line, commensurate with the cryptoglandular

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hypothesis of fistula pathogenesis. Furthermore, previous studies done by Hoda Salah Darwish et al[4]., H.A. Al-Khawari et al.[6,] Dr. Muhammad Fahim Amjadet al.[10] ,and several other studies shown that most of the fistulas enter posteriorly, at the 6-o'clock position. Unfortunately, the dentate line cannot be identified as a discrete anatomic entity, even when endoanal receiver coils are used, but its general position can be estimated with sufficient precision for the imaging assessment to be worthwhile. In our study of the 29 cases we found in 20 patients the internal opening is posterior (69 %) and in 9 patients the internal opening is anterior (31 %). Thus our study states that posterior internal openings are more common than the anterior and is in concordance with previous studies.

Primary Tract: Active tracts are filled with pus and granulation tissue and, thus, appear as hyperintense longitudinal structures on T2-weighted or STIR images. Active tracts are often surrounded by hypointense fibrous walls, which can be relatively thick, especially in patients with recurrent disease and previous surgery [11].In our study among 29 patients in 14 patients the fistulae are intersphincteric and in 15 patients it is transsphincteric.

Extensions: The major advantage of MR imaging is the facility with which it can demonstrate extensions associated with a primary tract. Morphologically, extensions frequently take the form of complex tract systems, regions of which have often become dilated to create an abscess (although a precise radiologic distinction between abscess and a large tract remains elusive). Extensions appear as hyperintense regions on T2-weighted and STIR images and enhance if intravenous contrast material is used. Again, collateral inflammation can be present to a variable extent. The commonest type of extension is one that arises from the apex of a transsphincteric tract and extends into the roof of the ischioanal fossa. The major benefit of MR imaging findings is that they can alert the surgeon to extensions that would otherwise be missed. For example, extensions may be several centimeters from the primary tract, which makes them difficult to detect during clinical examination or EUA. This is especially the case when extensions are contralateral to the primary tract. It is also important to search for supralevator extensions, since these are not only difficult to detect but pose specific problems with regard to treatment. Horseshoe extensions spread across both sides of the internal opening and are recognized on MR images by their unique configuration; horseshoe extensions may be intersphincteric, ischioanal, or supralevator. Complex extensions are especially common in patients with recurrent fistula in ano or in those who have Crohn disease[12].

Effect of Preoperative MR on Surgery and Outcome: Over the past few years, imaging, notably MR, has revolutionized the treatment of patients with fistula in ano. This is because MR can be used to classify fistulas preoperatively with high accuracy while also alerting the surgeon to disease that would otherwise have been missed[13]. While there are reports of the technique dating from 1989, it was not until the description by Lunniss and co-workers that the true potential of MR imaging was fully appreciated. Lunniss et al[14] imaged 16 patients with cryptoglandular fistula in ano and compared the MR classifications they obtained with those from subsequent EUA. MR imaging proved correct in 14 (88%) cases, which immediately suggested that it was the most accurate preoperative assessment yet available. However, the remaining two patients, in whom MR suggested disease but EUA yielded normal findings, represented some months later with disease at the site initially indicated

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on MR images.

This led the authors to conclude that MR imaging "is the most accurate method for determining the presence and course of anal fistulae". This is in concordance with our study where sensitivity of identifying internal opening is 100 %. Spencer and colleagues[48] independently classified 37 patients into those with simple or those with complex fistulas on the basis of MR imaging and EUA and found that MR results were the better predictor of outcome, with positive and negative predictive values respectively, of 73% and 87% for MR and 57% and 64% for EUA. These results clearly implied that MR imaging and outcome were closely related and again raised the possibility that preoperative MR could help identify features that cause postoperative recurrence.PPV and NPV in our study is 97 % and 100 % respectively which is much more than the above study. Beets-Tan and colleagues[15] extended this hypothesis by investigating the therapeutic effect of preoperative MR imaging ; the MR imaging findings in 56 patients were revealed to the surgeon after he or she had completed an initial EUA . MR imaging provided important additional information that precipitated further surgery in 12 (21%) of 56 patients, predominantly in those with recurrent fistula or Crohn disease.

Buchanan and co-workers[16] hypothesized that the therapeutic influence and thus , beneficial effect of preoperative MR imaging would be greatest in patients with recurrent fistula , since these patients had the greatest chance of harboring occult infection , while such fistulas were also the most difficult to evaluate clinically . After an initial EUA, Buchanan et al revealed the findings of preoperative MR imaging to the surgeons for 71 patients with recurrent fistulas and left any further surgery to the discretion of the operating surgeon. They found that postoperative recurrence was only 16% for surgeons who always acted if MR findings suggested that areas of infection had been missed, whereas recurrence was 57% for those surgeons who instead always chose to ignore imaging results. Furthermore, in the 16 patients who needed further unplanned surgery, MR initially correctly predicted the site of this disease in all cases. Using a similar approach, Buchanan and colleagues also investigated the effect of preoperative MR imaging on clinical outcome in patients with fistula in ano at initial presentation and found that the scheduled surgical approach changed in 10% of this group. Ever since the results of Lunniss et al[14] suggested that EUA might be an imperfect reference standard with which to judge MR imaging, comparative studies have been plagued by the lack of a genuine reference standard. It is now well recognized that surgical findings at EUA are often incorrect. In particular, there are frequent false-negatives. In a recent comparative study of endosonography, MR imaging, and EUA in 34 patients with fistula due to Crohn disease.

Schwartz and co-workers[17] found that a combination of the results of at least two modalities was necessary to arrive at a correct classification. Indeed, it is well established that many false-negative surgical results will only reveal themselves during long term clinical follow-up, and at this point in time, comparative studies that ignore clinical outcome are likely to be seriously flawed. Charles et al.[18] stated that T2W images (TSE and fat-suppressed) provide a good contrast between the hyperintense fluid in the tract and the hypointense fibrous wall of the fistula, while providing a good delineation of the layers of the anal Sphincter. He also found gadolinium-enhanced T1W images are useful to

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differentiate a fluid-filled tract from an area of inflammation. This agrees with our study, axial T2W fat-suppressed images were the most useful for locating the fistulous tract.

In the study of Siddiqui et al.[19] who studied on comparing endoanal ultrasound with MRI for the assessment of idiopathic and Crohn's perianal fistulas , their results showed that combined sensitivity and specificity of magnetic resonance for perianal fistula detection were 95% and 95% while the sensitivity and specificity of MRI in the present study were 100% and 88%, respectively , the difference between the results was due to large number of cases in the study of Siddiqui as they did metaanalysis however in their conclusion they stated that large heterogenicity between results and specificity values are considered to be diagnostically poor .

Stoker et al.[17] stated that the internal opening was successfully depicted by FS-CE-T1WI and T2WI and STIR images were in agreement with the surgical findings . This agrees with our study and the location of the level of the internal opening is important since this will determine the extent of sphincter division during fistulotomy.

Accuracy: In general, the sensitivity, specificity, positive predictive value and negative predictive value figures for the detection of fistula tracks, abscesses, horseshoe fistulas, and internal openings are in agreement with those in other studies. Abscesses and horseshoe fistulas were identified with a high accuracy. Although the sensitivity for the detection of a primary track (100%) was high, the specificity (83%) was lower. 1 false-positive prediction of fistula track which is seen in MRI and not found at surgical exploration is probably because of healed or fibrosed track by the time of operation.

In retrospect analysis, the MR imaging appearance of a healed fibrotic track showed typical hyperintense signal previously because of fluid inside the fistula track .The internal fistula opening is not always directly visualized at MR imaging. The location of the internal opening often must be inferred from the course of the fistula track in the sphincter muscles. With this method, a high sensitivity was obtained at the expense of some false-positive predictions and therefore a lower specificity. Accuracy was lowest for the detection of the internal opening because of high interperson variability. The sensitivity and specificity figures must be interpreted with caution. Nearly all of the patients in our study had a fistula because they were selected for surgery only when there was a proved or strongly suspected fistula. Such selection bias leads to methodologic difficulties.

Awareness of the fact that patients will undergo surgery anyway and almost certainly have a fistula leads to over reading of the MR images. In the clinical setting of the current study, it was more important to indicate all possible tracks and extensions than to avoid a false-positive reading. This can produce a high sensitivity at the expense of a lower specificity. Another problem associated with the selection bias of this study was the difficulty in defining the exact number of true-negative results. Because many patients had bilateral extensions, the decision was made to analyze the accuracy not per patient but per side. The downside of this may be artificially elevated specificity figures. It becomes even more complicated when one realizes that the reference standard of surgery itself is not infallible and that MR imaging is sometimes more accurate than surgical exploration. In our opinion, one should therefore be cautious about attaching too much value to sensitivity and specificity figures.

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TABLE 9: COMPARISON OF MR FINDINGS AND INTRAOPERATIVE FINDINGS BETWEEN OUR STUDY AND N.DAABIS STUDY

N. Daabis et al. Study[5]			Our study	
Type of fistula	MRI findings	Surgical findings	MRI findings	Surgical findings
Grade 1	3	3	8	8
Grade 2	2	2	3	3
Grade 3	9	9	11	11
Grade 4	9	8	4	3
Grade 5	2	1	3	3

Inter observer and Intra observer Variability: For the detection of abscesses and horseshoe fistulas, there was good correlation between the radiologist, the radiology resident, and the surgeon and therefore little difference among the readers in providing important additional information. There was less agreement on the detection of primary tracks and internal openings and only moderate agreement on the fistula classification. Although classifying a fistula is important, it is more important to detect all secondary extensions, abscess and adjacent granulation tissue because these are easily overlooked at surgery. Intraobserver variability is mainly because of appearance of extension of tracks, its internal opening and course differently in different sequences. Hence using a standard sequence for imaging different areas is necessary like fat suppressed T2W images for studying the tracts, ramifications and abscess. All of these findings show that the results of our study are reproducible and can be generalized to other centers. Surgeons who treat these patients should familiarize themselves with reading pelvic MR images to obtain the maximum benefit from preoperative MR imaging.

Recommendations: MRI should be used as a first line imaging modality in the preoperative evaluation of Perianal Fisula as it can reliably diagnose fistulas and classify them, which helps in better management of patients. Complications such as recurrence and fecal incontinence can be prevented and also the need for second surgery can be decreased to a greater extent. Rapidly acquired, fat-suppressed Gd-enhanced images increase the conspicuity of the fistulous track with vivid enhancement, leading to better anatomic depiction of fistulae. Also the soft tissue and granulation tissue surrounding the tract in the ischeorectal and ischeo anal fossa, involvement of adjacent muscles is clearly depicted on post contrast study. Moreover, some researchers demonstrated that high-resolution subtraction MR-fistulography, which was composed of Gd-enhanced high resolution 3D gradient-echo sequence and image subtraction technique, was useful for the diagnosis of anal fistula. Use of intravenous contrast is not important in assessment of uncomplicated primary perianal fistulae and in patients with no history of previous surgery for anal fistula. Also in cases of risk of contrast allergy non-contrast MRI sequences can provide similar information so in such cases use of intravenous contrast may be safely omitted.

DWI has higher fistula/background contrast that was helpful to detect fistulae and follow their tracts on diffusion-weighted images. However, for preoperative planning it is

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also crucial to evaluate the course of the fistula with respect to adjacent structures. Therefore, high spatial resolution imaging would be required for anatomic orientation. In this regard, diffusion weighted imaging has a disadvantage, because the technique has inherent poor spatial resolution compared to spin-echo or gradient-echo sequences. Therefore, DWI only adds additional value to fat-suppressed T2- weighted imaging.

A recent development is use of dynamic contrast-enhanced MR imaging for determining the degree of activity in perianal Crohn disease. With this technique, 2D T1-weighted sequences are performed and time–signal intensity curves are obtained to determine whether a fistula is active by measuring the volume of enhancing pixels. It was concluded that dynamic contrast-enhanced MR imaging might be helpful in selecting a subpopulation of patients with perianal Crohn disease who should be monitored more closely for development of more extensive disease.

Conclusion: MRI is a useful procedure for successful management of perianal fistula by correct assessment of the extent of disease and relationship to sphincter complex, in the identification of secondary extensions, particularly horseshoe tracts and abscesses resulting in complete evaluation and highest possible diagnostic accuracy aiding successful surgical interventions thus reducing complications and recurrences. The combination between different sequences as T2 WI , STIR and Gd enhanced T1 fat saturated sequence in both coronal and axial planes provides most of the details necessary for accurate evaluation of perianal fistulae with the identification of active sepsis and abscesses associated with the fistula track . The largest additional value from preoperative MR imaging was obtained in patients with complex fistulas that were associated with Crohn disease and recurrences. High spatial- resolution MR imaging is therefore recommended in the preoperative work-up of patients with Crohn and recurrent anal fistulas.

Excellent agreement of preoperative MRI findings with operative findings was seen in our study. Our study supports that, MR imaging provides precise definition of the fistulous track, along with its relationship to pelvic structures and allows identification of secondary fistulas or abscesses. Accordingly, MR imaging provides accurate information for appropriate surgical treatment, decreasing the incidence of recurrence and allowing side effects such as fecal incontinence to be avoided. We found that MRI is well tolerated, non-invasive, painless and not embarrassing for the patient has made it the modality of choice in evaluating perianal fistulas. Radiologists should be familiar with the anatomic and pathologic findings of perianal fistulas and its classification.

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