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ORIGINAL ARTICLE

Magnetic Resonance Imaging (MRI) Evaluation of Perianal Fistula with Surgical Correlation

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ABSTRACT

Objective: This study's goal was evaluate the part magnetic resonance imaging plays in the identification and classification in perianal fistulas to contrast those results with those from surgery.

Study Design: Cross Sectional

Place & Duration: Study carried out between the periods of January 2022 to Aug 2022

Material & methods: This study was tested on 50 patients in the hospital. Patients who had undergone MRI pelvis with or without contrast study were counted in the current study. Patients who undergone surgery prior or had recurrent perianal illness were not included in the study. Short T1 inversion recovery, T2 weighted (T2W) sagittal, axial, and coronal MRI sequences (STIR), T1W axial, and coronal sequences, and T1W post contrast axial & coronal sequences were all evaluated.

Results Reflected: while evaluation by MRI, among 50 patients, 45 which is 90% were man and 5 which is 10% were female gender. In 45 (90%) of the 50 patients overall, postoperative results confirmed perianal fistula. A total of 5(10%) patients had perianal sinus only. The primary tract was found to have a sensitivity and specificity of 97.73% and 83.33%, respectively, whereas the abscess had a sensitivity and specificity of 88.89% and 95.12%. High sensitivity was also acknowledged for accurately locating the internal opening (95.45%), detecting the horseshoeing (90.91%), correctly identifying the secondary ramification (92.86%) with specificity (94.44%).

Conclusion: It is found that MRI demonstrated superior performance in evaluating perianal fistula with critical parameters (primary tract and its grading, internal opening, secondary ramification, abscess, horseshoeing). Pre-operative perianal fistula assessment should be correct to prevent problems and recurrence, which will decrease the need for additional surgeries.

Practical Implication: As a result of this study, unnecessary radiation and diagnostic time could be avoided in the preoperative assessment of PAF in ano using MRI. It would also help decrease complications and unnecessary surgeries.

Keywords: Magnetic Resonance Imaging and Perianal Fistula, perianal sinus, horseshoeing

INTRODUCTION

Perianal Fistula is famous for its reappearance because of it association concealed infection is a commonly encountered disease of middle-aged men.[1,2] One of the most difficult surgical conditions is perianal fistula. Perianal discharge is the most common cited complaint (65% of cases)[4]. Surgeons find it extremely tricky to preserve anal sphincter function and prevent anal incontinence, especially in the case of complicated perianal fistulas (high, Crohn diseases and low fistulas with impaired sphincters). So assessment of the anatomical relationship between the complex of anal sphincters and fistula permits clinicians to select the optimum surgical procedure, significantly lowering potential surgical adverse effects, such as fecal incontinence and recurrence of the disease.[3] A sinogram was the primary radiological inquiry prior to the invention of magnetic resonance imaging to evaluate the extension and communication to visceral areas (MRI). MRI due to its multiecho, multiplanar imaging and A complex incorporating a horseshoe can be accurately assessed with the aid of high soft tissue contrast resolution, secondary tracts and associated abscesses, educating the surgeon on the disease's complexity and giving a clear road map prior to surgery[5] Perianal fistulae have been divided into four kinds based on the direction and placement of the major tract by Parks et al.[7]. Figure 3[1] Intersphincteric which (incidence 60% to 70%); while the infection originates in the anal gland & progresses to intersphincter plane, which is situated sphincters, either internal and external. Fistula is formed when it ruptures onto the skin[2]. 20–30% of incidences were transsphincteric. This condition develops the external sphincter, the ischioanal fossa, and finally the perianal skin are all affected by an intersphincteric infection. (Uncommon) Suprasphincteric these fistulae penetrate ischioanal fossa inferiorly after extending To ascend above the levator plane, move superiorly in the intersphincteric plane.[4] Extrasphincteric (uncommon): These are caused by the levator plate becoming infected with main pelvic diseases like radiation proctitis, diverticulitis, and Crohn's disease. Morris et al. divided fistula-in-ano into five classes using MRI features.[6] the ST. JAMES University and hospital (SJUH) grouping and classification means categorization system (shown in figure-4) ***Grade No. 1***: An Intersphineteric Fistula that is straightforward and linear without involving the ischeoorectal or ischeoanal fossa. Grade-2: an external sphincter-bound abscess or secondary tract around an intersphincteric fistula. Grade-3: A transphincteric-fistula that eventually extends into the skin, internal and external sphincters. Grade 4: An abscess in the ischiorectal or ischioanal fossa along with a trans-sphincteric fistula. Grade-5: Levator ani muscle-above perianal fistulous illness. Extrasphincteric and supra-sphincteric fistula are included in this. In the current study, we want to highlight the MRI study by linking it to the surgical results[8].

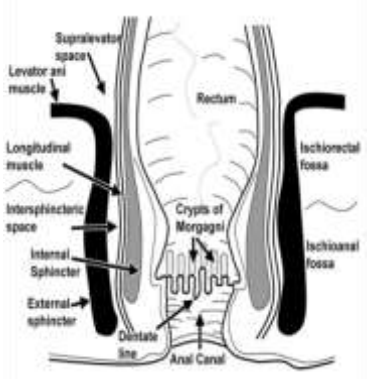


Figure 1: Coronal image of the pertinent anorectum

Figure 2: Axial anatomy of perianal region showing anatomy for MRI ES: external anal-sphincter, IS : internal anal evaluation of perianal fistulas. sphincter InS: intersphincteric space , AC : anal canal , IA :ischoanal fossa

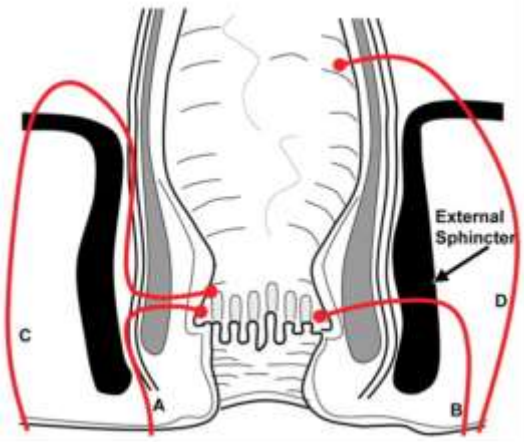


Figure 3. Parks classification, The Parks classification of perianal fistulas is depicted in a drawing of the anal canal in the coronal plane. Intersphincteric, transsphincteric, suprasphincteric, and extrasphincteric are denoted by letters A through D. The foundation of the Parks classification is the external sphincter.[9]

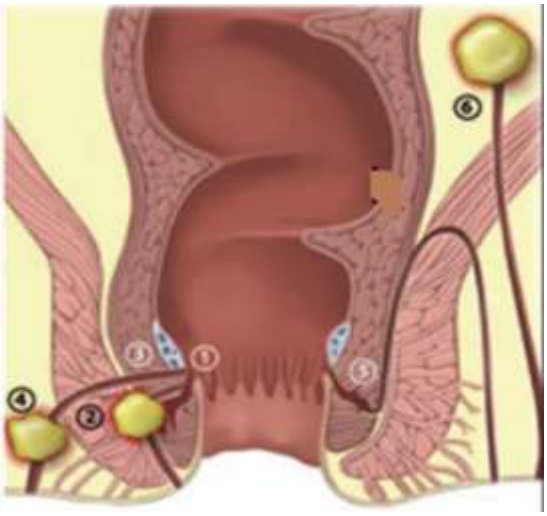


Figure 4: classification of perianal fistula types by St. Jame

MATERIAL AND METHODS

This Study of Population comprised on 50 patients. These patients were studied for during 6 months (between January 2022 and June 2022) prospectively. Every patient who got an MRI contrast after complaining of a discharge from the perianal sinus and the study was done on a 1.5 – Tesla MRI Involved in the investigation was with a body coil. Siemens (1.5T field strength) MRI equipment was used.. The sequences assessed were:. Coronal short T1 inversion recovery (STIR); Axial STIR; Axial T1W; Coronal T1W Sagittal; Axial, Coronal T1W, T2W followed by post contrast(Gadolinium) axial and coronal T1W. The SJUH and Park's categorization was used to categorise the fistulas. Both the coronal and axial planes were discovered to be crucial in the MRI protocol for a thorough evaluation. Coronal planes The levator ani and puborectalis muscles were described in detail in Figure 1, and the inter-sphincteric region was clearly visible in the axial planes. Picture 2. With the use of MRI observations, surgical exploration was carried out in each patient, and the postoperative findings were used to examine the imaging data. The locations of the internal and external apertures, as well as their precise levels in the rectum and anal canal, were documented. The major tract & its path to the anal-sphincter were used to pinpoint the external opening. The anal canal's internal opening, if any, was observed.

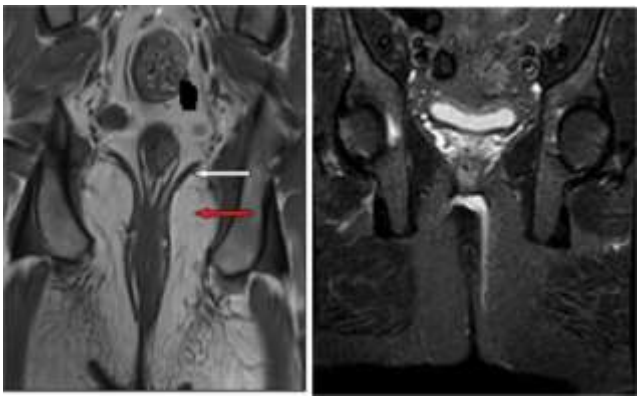


Figure 5. This image demonstrates that the levatorani muscle (white arrow), the ischioanal fossa (red arrow), and the ischiorectal fossa (blue arrow) are better visualized on coronal T1-weighted sequences.
Figure 6. T2-weighted images were used to detect active illness because of the fluid-filled fistulas that look hyperintense in this sequence.

Figure 7: STIR axial image arrow showing track of high signal intensity Communicating with anal canal at 6'O clock position Intersphincteric fistula (PARK classification GRADE I)

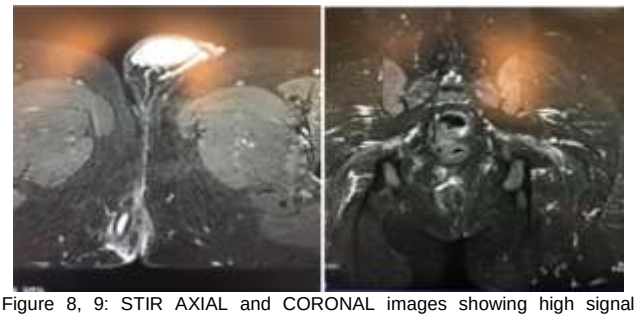


Figure 8, 9: STIR AXIAL and CORONAL images showing high signal intensity track in right ischioanal fossa that is communicating with external anal sphincter at 12'O clock position. (high anal fistula , PARK CLASSIFICATION GRADE IV)

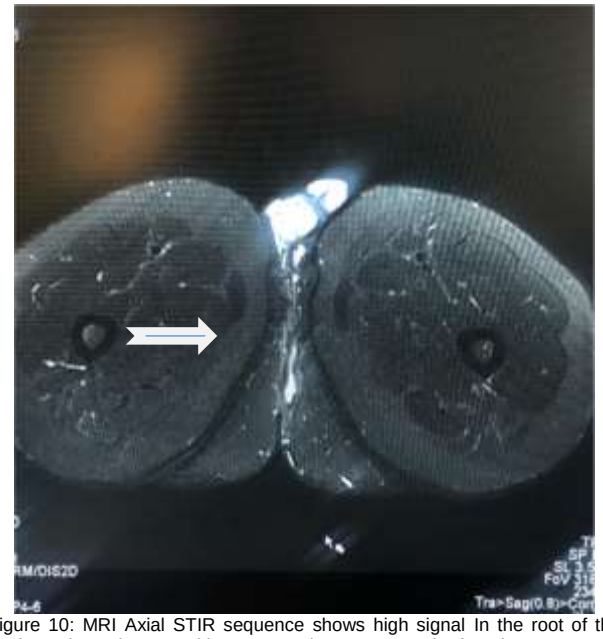


Figure 10: MRI Axial STIR sequence shows high signal In the root of the penis, an intensity tract with an external entrance can be found.

Data Analysis: the results of imaging on T2W/STIR Using the Chi-square test, Surgical results were compared between TSE fat saturated and postcontrast T1W TSE fat saturated sequences in relation to the accurate diagnosis of internal opening, horseshoeing, secondary ramification, and abscess.

RESULTS

The 50 patients had a 9:1 male to female ratio tested, with five patients (10%) and forty-five patients (90%) being women. Patients' The participants' ages ranged from 18 to 80, with a mean age of 41.90 12.88. Age groups 41 to 60 years had the highest disease incidence in this study, followed by groups 21 to 40 years (Bar Graph 1). Out of 50 patients, perianal fistulae were discovered postoperatively in 45 cases (90%) and in 5 patients (10%), who had sinus tracts. Three of the five sinuses were straightforward passages, while two had branches. Of these 45 individuals, 43 (95%) two (3%) had fistulous connection with the anal canal had extra sphincteric fistulas tracking down from pelvic abscesses (Type-5 SJUH & Type-4 Parks classifications). 12 fistulas (27.0%) were connected to secondary branches, while 33 (73.3%) were basic, non-branching fistulas. 10 (23.2%) were connected to horseshoe branching, while 8 (18.6%) were connected to abscess formation. (table -2). There were 45 cases of anorectal fistulas according to the SJUH classification, of which 15 (34%) were type-I, 10 (23%) were type-II, 13 (29%) were type-III, 5 (11%) were type-IV, and 2 (3%) type-v. (Table 1).

Table 1: Rate of occurrence of cases according to the SJUH Classification

SJUH Classification	No. of Patients (%)
Type I	15(33.3%)
Type II	10(22.2%)
Type-III	13(28.8%)
Type IV	5 (11.1%)
Type V	2 (4.4%)
Total	45(100%)

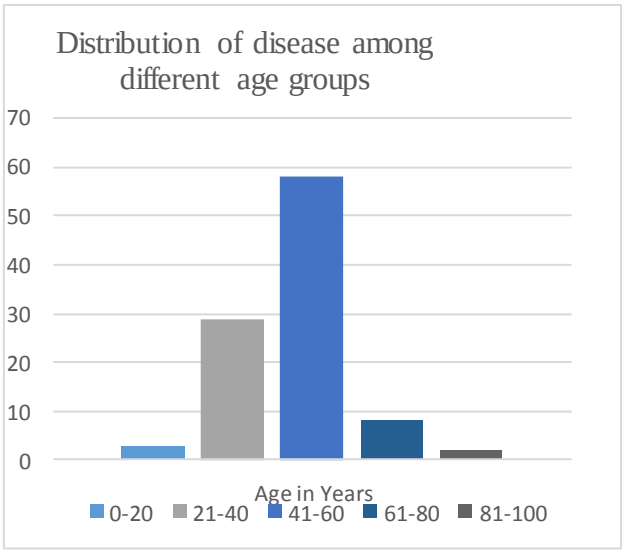
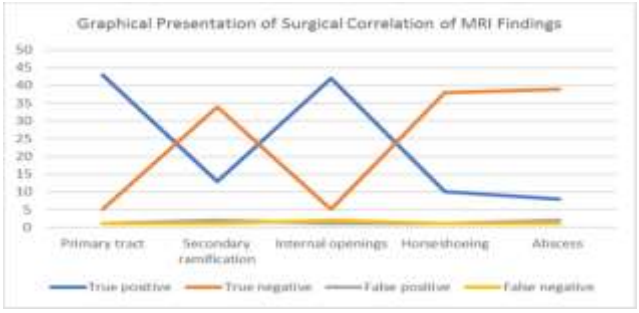


Figure 1: Distribution of disease among different age groups

Table 2 : Comparison of Surgical findings and MRI findings

MRI Findings	True positive	True negative	False positive	False negative
Primary tract	43	5	1	1
Secondary ramification	13	34	2	1
Internal openings	42	5	1	2
Horseshoeing	10	38	1	1
Abscess	8	39	2	1

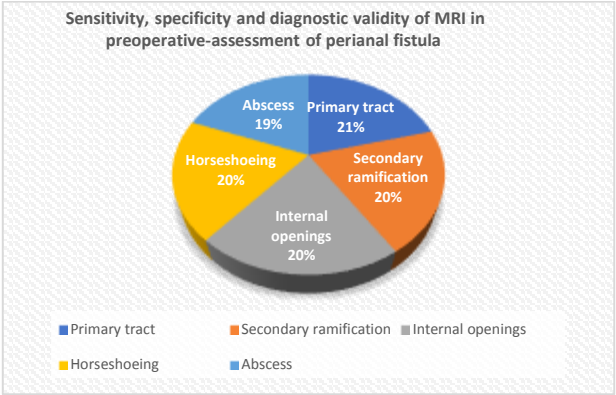


Next aim of this study is to inspect that Evaluation of perianal fistulae using magnetic resonance imaging (MRI) and surgical correlation how MRI findings is correlated through surgical.

A Graphical Responsiveness Examination has the goal to decide the ideal arrangement's aversion to specific changes that might happen in the information of Primary tract, Secondary ramification, internal openings, horseshoeing and abscess. There are two normal changes that happened in this study. To begin with, the Goal Capability correlational Changes, where a coefficient of the issue's capability is modified.

Table 3: Diagnostic Accuracy of MRI Findings in Preoperative Assessment of Perianal Fistula

Variables	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Diagnostic accuracy
Primary tract	97.73%	83.33%	97.73%	83.33	96%
Secondary ramification	92.86%	94.44%	86.67%	97.14%	94%
Internal openings	95.45%	83.33%	97.67%	71.43%	94%
Horseshoeing	90.91%	97.44%	90.91%	97.44%	96%
Abscess	88.89%	95.12%	80%	97.5%	94%



DISCUSSION

Koelbel et-al conducted the initial study on use of MRI in diagnosis fistula-in-ano, several investigations have since been conducted and are still being conducted. The MRI sequences used in our investigation were T1 axial and coronal, STIR axial and sagittal, and T2 axial and coronal, and T1 coronal and axial post contrast. The assessment of perianal illness by Ultrasonography, computed tomography, and traditional fistulography has proven less accurate[11]. The study's of 50 cases, 45 had perianal fistulas that were discovered after surgery, and the other five did not (5 sinuses only). Only 43 instances could be accurately detected and classified by MRI. We discovered that MRI is 97.73% sensitive, 83.33% specific, and has a 97.73% positive predictive value for detecting and grading main tract cancer. According to Lunniss et al., the rates for sensitivity and specificity were 86% and 88%, respectively[22,23]. In our investigation, we assumed that any fluid signal with a thickness greater than 10 mm was an abscess, and any signal with a thickness less than 10 mm was a fistula.[12,13]. In 8 cases, MRI accurately detected abscesses and established their connection to the levator and puborectalis ani muscles with the sensitivity and focus of 88.89% & 95.12%, respectively. Beets-Tan et al.[16] and Mahjoubi et al.[13] showed a sensitivity of 96% and a specificity of 80%, respectively. MRI's sensitivity was 92.86 percent and its specificity was 94.4 percent when it came to accurately detecting secondary ramification, matching the results of a previous study by Mahjoubi et al.[14], who found a sensitivity of 80 percent and a specificity of 100 percent, respectively. Horseshoeing, a form of second tract with expansion across the midline in the horizontal plane, with specificity and sensitivity in our study of (90.91%) & (97.44%), respectively, comparable to Barker et alstudy, 's which indicated sensitivity of 97%.[15]. As MRI cannot differentiate in between internal anal sphincter and the anal canal mucosa, the communication area was selected as the closest place of the tract within the framework that includes gap.[16] With a sensitivity and specificity of 95.45 and 83.33%, respectively, MRI was able to detect the internal opening in about 42 cases, and two patients were recognized prior to surgery. Sensitivity of 96%, specificity of 90%, and positive predictive value (PPV) of 90% were reported in a study by Beets-Tan et al.[17]. In our work, we discovered that T1 weighted (T1W) sequences provided a better understanding of the levatorani muscle, ischioanal, and ischiorectal fossae, providing anatomically, the perianal infectious disease as shown in (Figure-5). T2W pictures revealed active illness as the sinus tract and fistulous communication appeared hyper-intense on this sequence (Figure 6). Examples of fistulas are provided in (figure 7, 8 ,9). On the T2W sagittal and coronal sequence, the separation from the anal verge was estimated. While the majority of high anal fistulas had external openings farther out from the anal margin (> 3 cm), the low anal fistulas' external openings were positioned a short distance from the anal verge (intersphincteric & rare trans-sphincteric) (trans-sphincteric , extra-sphincteric , supra-sphincteric). There were, however, a few rare fistulas, particularly when there were external holes on the posterior midsagittal of the scrotal sac[18]. In the current investigation, we discovered that the STIR sequence, which successfully detects undetected sepsis and collateral ramifications of the primary tract by reducing the background fat signal, was most useful. Using gadolinium-enhanced T1W images, it is possible while telling a fluid-filled tract from an inflamed area. While the core fluid is hypointense, the tract wall intensifies. Post-gadolinium photos can provide excellent representations of abscesses. [18] In order to distinguish the perianal disease and categorise the fistulas, it was determined that the combination of T1, T2, STIR[19], and post contrast T1 sequences was sufficient. Finding the fistula in respect to the sphincter complex is also made easier with the multiplanar T2 sequence.

We found that using contrast enhanced MRI and combining the abovementioned processes with multiplanar imaging provided the majority of the features needed for pre-operative surgical assessment and accurate localization of perianal fistulas in all of the cases where they were present[20]. Axial images were the best for seeing the anal clock and internal aperture, whereas coronal images were the best for seeing the levator plate[21]. Destruction of the external anal sphincter may be diagnostic of a T2W trans-sphincteric fistula as opposed to an inter-sphincteric fistula. MRI has a huge impact on the preoperative assessment of perianal fistulas[22].

CONCLUSION

When mapping a fistula in ano before surgery, MRI is the conventional investigation of choice (main tract and its internal opening, secondary ramification, abscess, and horseshoeing) with great specificity and sensitivity. Pre-operative evaluation of the perianal fistula accurately may help to prevent problems and recurrence, hence minimizing the need for additional surgeries. T2W TSE and post-contrast FS T1W TSE sequences must be used for an accurate evaluation of a fistula-in-ano, and a contrast study must be included to differentiate between an abscess and continuous inflammation.

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