



ORIGINAL ARTICLE

Diagnostic accuracy of magnetic resonance imaging in diagnosing and classifying fistula in Ano taking surgical findings as gold standard.

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ABSTRACT... Objective: The gold standard for assessing the diagnostic precision of magnetic resonance imaging in identifying an ano fistula is surgical findings. **Study Design:** Comparative Cross-sectional study. **Setting:** Department of Radiology, Aziz Fatima Medical and Dental College, Affiliated Hospital, and Allied Hospital Faisalabad. **Period:** November 2024 to March 2025. **Methods:** Eighty patients, of either gender, aged 25–70 years, with suspected fistul symptoms lasting more than four weeks, were included. The following patients were not included: those with a history of perianal fistula surgery and those who were contraindicated for MR imaging due to cardiac. They were evaluated with pelvic magnetic resonance imaging (1.5T) utilizing a phase array coil without intestinal preparation. Patients were placed in a supine position for the purpose of acquiring images. To ascertain the presence and grade of the fistula, the consultant radiologist assessed the MRI findings. The MRI results and the surgical results were compared after surgery was performed in the relevant ward. **Results:** Overall MRI sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy are used to determine the ano fistula using surgical findings as the gold standard were 90.80%, 90.0%, 91.62%, 89.06%, and 90.44%, respectively. **Conclusion:** According to the study's findings, magnetic resonance imaging has a fairly high diagnostic accuracy when used to evaluate perianal fistulas prior to surgery.

Key words: Magnetic Resonance Imaging Sensitivity, Perianal Fistula.

INTRODUCTION

A perianal fistula is defined as an irregular contact between the perianal or perineal skin and the anal canal. It is a prevalent lesion that has a high rate of morbidity. The most frequent causes include cryptoglandular tissue infection, Crohn's disease, hematological cancer that result in neutropenia, previous surgical procedure for hemorrhoids or anal fissures or trauma during childbirth.¹ Park et al.'s approach, which divided perianal fistulas into five degrees based on perioperative physical examination, is the most often used method for classifying these conditions.² It is essential to evaluate theses correctly. fistula-in-ano since surgical treatment needs to focus on maintaining continence, which is dependent on maintaining the anal-sphincter complex, in addition to eliminating the fistulous tract and, consequently, the source of infection.³ Nonetheless, the MRI

technique is essential, particularly when it comes to choosing the sequences for diagnosis and abnormality characterisation. The fundamental anatomical sequences (T1 or T2), screening for aberrant diffusion, screening for edema or screening for short inversion recovery (STIR) are the main alternatives.⁴ Grade 1 (Simple linear intersphincteric fistula) was the most common type of ano-rectal fistula in a study, occurring in 37.5% of cases. In this type of fistula, the ischio-rectal and ischio-anal fossae are transparent, and the fistulous track extends from the natal cleft or perineum's skin to the anal canal.⁵ Three components provide voluntary control of the striated external sphincter muscle: deep, superficial, and submucosal muscle. Its deep portion creates the anorectal ring, which is felt during digital examination, and is continuous with the puborectalis.

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An extension of the rectum's circular muscle, the internal sphincter muscle is a smooth muscle that is controlled by the autonomic nervous system. In straightforward situations, the Goodsall rule can be used to predict the structure of a fistula-in-ano. According to this rule, fistulas with an external entrance in front of a plane that passes through the anus's center transversely will travel directly to the dentate line. Fistulas that have their apertures behind this line will curve toward the back midline. This restriction does not apply to external apertures that are more than 3 cm away from the anal margin. As is typical of a prior horseshoe abscess, these nearly always begin as a primary or secondary tract from the posterior midline.⁶

An anorectal abscess is the primary cause of fistula-in-ano in the great majority of cases. At the level of the dentate line, eight to ten anal crypt glands are often found circumferentially in the anal canal. The intersphincteric plane is where these glands terminate after penetrating the internal sphincter. They give pathogenic germs a way to enter the intramuscular spaces. An anorectal abscess is caused by an infection that starts in the anal canal glands and spreads to the anal sphincters' muscular wall, according to the cryptoglandular hypothesis.⁷ The role of imaging techniques in evaluation of perianal fistulas has been addressed by many authors. In particular, MR imaging has emerged as the technique of choice for preoperative evaluation of perianal fistulas to improve patient outcome. Before the introduction of MR imaging for these purposes, several other imaging techniques were used, with disappointing results. In a retrospective review of fistulography images from 25 patients to ascertain the utility of contrast material-enhanced fistulography, correct diagnoses were achieved in only 16% of the patients, demonstrating that this approach was inaccurate and unreliable.⁸

Computed tomography (CT) with rectal and intravenous contrast material can be used to analyze anal fistulas, particularly those in the rectal area. While useful for evaluation of perirectal inflammatory disease and suspected perirectal abscesses, CT usually fails to define

subtle fistulas and abscesses owing to poor resolution of soft tissue.⁹ A detailed description of the anatomy of the anal canal and anal sphincters was initially provided by anal endosonography.¹⁰

This method offers superior imaging of the anal sphincter and rectal wall, as well as of intersphincteric fistulas and how they relate to the anal sphincters.¹¹ As a result, the importance of MR imaging in the preoperative assessment of perianal fistula and patient outcome is becoming more widely acknowledged. When MR imaging results were contrasted with the results of inspection under anesthesia, the full potential of MR imaging in evaluating anal fistulas became clear in a study of 16 patients with cryptoglandular fistulas.¹² More recently, 56 individuals with anal fistulas who had high-spatial-resolution MR imaging showed that MR imaging offers valuable extra information about recurring fistulas and secondary expansions, especially in patients with Crohn's disease. The preoperative work-up should include MR imaging, according to the authors.¹³

Lastly, the best strategy for categorizing perianal fistulas was identified by comparing the outcomes of MR imaging, anal endosonography, and clinical examination using evidence-based medicine techniques. It was determined that MR imaging is the best method for differentiating between complex and simple perianal fistulas; however, anal endosonography is better than clinical evaluation and can be utilized if MR imaging is not readily available.¹⁴ A high degree of soft-tissue distinction and multiplanar imaging are two benefits of MR imaging that display the fistulous track in respect to the underlying anatomy in a projection pertinent to surgical exploration.¹⁵ No specific patient preparation is necessary for MR imaging exams using body or phased-array coils, which are also well tolerated and offer superior anatomic detail of the pelvic anatomic borders and the anal sphincters. It was first suggested that endoanal coils be used to enhance the MR imaging assessment of perianal fistulas; however, these coils are not well tolerated by individuals who are exhibiting symptoms. Endoanal coils offer the sphincter's fistulous illness better

anatomic resolution.¹⁶

STIR imaging was less appropriate for demonstrating fluid collections or extensions than T1-weighted sequences with intravenous contrast material in a prospective study of 42 patients because it was unable to show secondary tracks and small residual perianal abscesses from perianal inflammation.¹⁷ In patients recovering after surgery, choosing the right MR imaging strategy is crucial. A foreign body's local modification of the magnetic field may result in susceptibility artifacts. A substance's capacity to alter the static magnetic field is referred to as its susceptibility. When substances with different magnetic susceptibilities come into contact, an artifact is created. In the postoperative patient, suture artifacts, such as a seton, inserted via the fistula track, may cause MR imaging artifacts. Compared to all other types of sutures, the susceptibility artifact caused by silk is the most noticeable and is one of the most widely used sutures.¹⁸

Only the extrasphincteric fistula (which accounted for 5% of the study's patients) has an origin that the cryptoglandular hypothesis cannot account for. The track of extrasphincteric fistulas travels from the perineal skin to the rectum via the levator muscles and ischiorectal fossa. Therefore, this fistula is entirely beyond the external sphincter complex at this point. Both the anal canal and the intersphincteric area are free of infection. When diagnosing this kind of fistula, it's critical to rule out primary pelvic or rectal conditions such as diverticular disease, Crohn's disease, or cancer.¹⁹ Incision or excision of the fistulous track is frequently required to split the external sphincter in order to eradicate sepsis. The only steps involved in treating perianal abscesses caused by Crohn's disease or cryptoglandular illness are incision and drainage. Fecal deviation colostomy is only allowed for individuals with significant clinical symptoms and uncontrollably widespread perianal fistulous illness, which is typically linked to Crohn's disease-related proctitis.²⁰ Several therapeutic alternatives, especially for first-time treatment attempts, do not need separation of the anal sphincter complex in an effort to

maintain continence. To enable drainage, a seton is a thread that is inserted through the fistulous track rather than cutting the fistula. In order to lessen the severity of the fistula, setons may be positioned to provide continuous drainage. They may be employed as a temporary therapy or as a primary treatment. More recent methods of therapy include the use of glue and fibrin plugs to close the track.²¹

MR imaging has shown itself to be an effective method for assessing perianal fistulas treated with infliximab in patients with Crohn's disease during the first year of follow-up. Just 50% of patients show improvements at MR imaging that correspond with the clinical and endoscopic response to infliximab throughout long-term follow-up.²² MR imaging shows that infliximab-treated individuals with fistulous illness may not benefit from skin healing as a predictor of success. After infliximab therapy, draining exterior orifices close, but fistula tracks remain with variable levels of residual inflammation. This can lead to pelvic abscesses and recurrent fistulas.²³

METHODS

Aziz Fatima Medical and Dental College, together with its connected hospital and allied hospital in Faisalabad, served as the site of this comparative cross-sectional study. Following institutional ethical review committee permission (CPSP/REU/RAD-2021-035-3577), 80 patients who met the inclusion criteria and were seen in the radiology department of Aziz Fatima Medical and Dental College, affiliated hospital, and allied hospital Faisalabad were chosen. We obtained each patient's informed permission. They were evaluated utilizing a phase array coil and pelvic magnetic resonance imaging (1.5T) without intestinal preparation. Patients were placed in the supine posture for the duration of the picture acquisition procedure. In order to incorporate the distal rectum and subcutaneous tissue, the imaging volume was expanded to cover the anal canal, sphincter muscles, ischio-rectal fossa, levator muscle, and supralelevator space. The first images taken in three planes were obtained. Following the acquisition of axial and coronal images, recurrent patients received

an intravenous dosage of 0.1 to 0.2 mmol/kg of contrast material (gadolinium-DTPA) (Magnevist, Bayer, Leverkusen, Germany) to obtain more detailed images. To ascertain the presence and grade of a fistula, MRI scans were examined by a consultant radiologist with a minimum of three years of post-fellowship experience. The MRI and surgical results were compared following surgery in the appropriate ward. The entire set of data was recorded using a specially designed proforma (Annexure-I). The two participating centers received ethical approval from their Institutional Review Boards. An 80-patient sample size was calculated using the Raosoft Software tool.

The inclusion criteria includes;

- All patients with suspected fistula in ano (as per-operational definition) of symptoms duration >4 weeks.
- Age 25-70 years of either gender.

The following criteria led to exclusion from the study:

- Patients with h/o previous surgery for perianal fistula.
- Individuals with conditions that preclude MR imaging, such as metallic implants that are incompatible with MR imaging, aneurysmal clips, or cardiac pacemakers.

Software called SPSS 25.0 was used to evaluate the data that was gathered. The data's normality was examined using the Shapiro-Wilk test. For age and symptom duration, the mean, SD, or median (IQR) were computed. Gender, fistula grade, and whether or not there was a fistula in ano on MRI and surgery were all represented by frequency and percentage. Effect factors like age, gender, fistula grade, and duration of symptoms were controlled for by stratification. The post-stratification diagnostic accuracy, sensitivity, specificity, and positive and negative predictive values of magnetic resonance imaging were calculated.

RESULTS

The mean age in this study was 41.21 ± 8.60 years, with a range of 25 to 70 years. Table-II shows that the sickness lasted an average of 9.38 ± 2.88

weeks the distribution of patients by fistula grade is displayed in Table-III. Every patient underwent magnetic resonance imaging. There were 35 false positives and 45 real positives among the MRI-positive individuals. Table-IV shows that out of the 80 MRI-negative individuals, 35 were false negatives and 45 were actual negatives.

Age (years)	No. of Patients	%age
25-45	50	62.5
46-70	30	37.5
Total	80	100.0

Table-I. Distribution of patient according to age

Duration (Weeks)	No. of Patients	%age
≤12	50	62.5
>12	30	37.5
Total	80	100.0

Table-II. Distribution of patient according to duration

	Positive Result on Surgery	Negative Result on Surgery	P-Value
Positive result on MRI	45 (TP)*	35 (FP)***	0.0001
Negative result on MRI	35 (FN)**	45 (TN)****	

Table-III. Magnetic resonance imaging's diagnostic precision in identifying an ano fistula, using surgical findings as the gold standard

	Positive Result on Surgery	Negative Result on Surgery	P-Value
Positive result on MRI	15 (TP)	02 (FP)	0.001
Negative result on MRI	3 (FN)	10 (TN)	

Table-IV. Stratification of diagnostic precision in relation to age 46-70 years (n=30)

DISCUSSION

A frequent ailment that is typically easy to treat surgically is fistula in ano. However, a sizable fraction of patients are challenging to treat, either because it is unclear how the fistula and anal sphincter are related, or because they have recurrence as a result of fistulas and any additional

tracks (also known as “extensions”) that are not identified and hence not addressed during surgery.²⁴ In this work, I used surgical findings as the gold standard to assess the diagnostic accuracy of magnetic resonance imaging in identifying an ano fistula. Positive and negative predictive values, sensitivity, specificity, and overall diagnostic accuracy of MRI in detecting an ano.²⁵

CONCLUSION

According to the study’s findings, magnetic resonance imaging has a fairly high diagnostic accuracy when used to evaluate perianal fistulas prior to surgery. It has also significantly enhanced our capacity to identify perianal fistula tracts and enhanced patient care by enabling prompt and appropriate surgical intervention, which in turn lowers complications. Therefore, we advise that MRIs be performed on all patients who exhibit clinical signs of perianal fistulas in order to detect them early and accurately. This will assist surgeons in properly planning preoperative procedures for these patients and lower their morbidity.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

1	Shamoona Rashid: Principal Investigator.
2	Sadia Zafar: Discussion writing.
3	Sayyada Mehwish Zahra: Data collection.
4	Saddam Rasheed: Review of manuscript.