



## MAGNETIC RESONANCE IMAGING; THE BEST IMAGING TECHNIQUE IN DETECTION OF PERIANAL FISTULAS WITH DIAGNOSTIC ACCURACY

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**ABSTRACT:** Perianal fistula is defined as an abnormal communication channel between anal canal and perianal skin. Among all the imaging tools Magnetic resonance imaging (MRI) is of choice in the diagnosis and management of perianal fistulas. **Objectives:** "To determine the diagnostic accuracy of MR imaging in detection of perianal fistulas and comparing it with per operative findings". Peroperative findings are taken as gold standard. **Place and Duration of Study:** This study was carried out in Diagnostic Radiology, Pakistan Institute of Medical Sciences (P.I.M.S) Islamabad, over a period of nine months from 01-02-2012 to 31-10-2012. For this collaboration was made with the Department of General Surgery P.I.M.S and Department of gynecology (MCH center) PIMS and gastroenterology Department. **Patients and Methods:** A total of 95 patients were included in study having perianal fistulas on clinical examination. MRI was performed in the patients and T1-weighted fast spin echo (T1W FSE) images were taken before and after gadolinium injection. Fat suppressed T2-weighted fast spin echo (T2W FSE) images were obtained in all three planes including transverse, sagittal and coronal. All the scans were viewed by a single consultant radiologist to avoid observer bias. **Results:** Out of 95, 81 patients (85.3%) were male and 14 (14.7%) were female. Sensitivity, specificity and accuracy of magnetic resonance imaging (MRI) was 96.2%, 75.0% and 92.6%, respectively. Positive predictive value was 95.0% and negative predictive value was 80.0%. **Conclusion:** our study proves that among imaging modalities MRI is of choice for preoperative assessment of perianal fistulas. It provides highly accurate, noninvasive and relatively very less time consuming means of performing pre-operative evaluation, specially the complex, branching fistulas. This diagnostic accuracy not only helps in surgical cure but avoids recurrence and post-operative complications like fecal incontinence

**Key words:** Perianal fistulas, MRI, Diagnostic accuracy.

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### INTRODUCTION

Perianal fistula is defined as an abnormal communication channel between anal canal and perianal skin. It is frequently occurring disease and is often compromising for patient.<sup>1</sup> Major causes include of perianal fistulas are Crohn's disease, tuberculosis, and steroid therapy, previous radiation therapy for prostate or rectal cancer, HIV infection and diverticulitis.<sup>2</sup> Its prevalence is 8.6 cases per 100,000 population. In men its prevalence is 12.3 cases per 100,000 population and in women 5.6 cases per 100,000 population. The male to female ratio is 1.8:1 and the mean age of the patients is 38 years.<sup>3</sup>

Failure to diagnose fistulas in time may converted

them into complex fistulas and complex can result in recurrent sepsis and increase burden of disease.<sup>4</sup> It is therefore important to identify perianal fistulas, their accurate anatomical mapping, extensions and relationship to the pelvic floor, sphincters and surrounding perirectal structures, complicated with infection or not. This is important for prompt treatment and surgical cure.

Now a days by the use of endo-anal ultrasounds, MRI and computed tomography (CT), it is quite possible to identify these tracts, including highly complicated fistulas. MRI is considered as the investigation of choice among all the imaging studies in detection and anatomical assessment

of fistula in ano because of its three dimensional imaging capability and higher soft tissue resolution. It has advantage of non-invasive nature and easy to perform on outpatient without use of anesthesia. One of the recent studies states that MRI is more sensitive 0.97(CI 0.92-1.01) to distinguish simple from complex disease as compare to clinical examination 0.75(0.65-0.86).<sup>5</sup> A concordance rate of MRI fistulography is 86-88% between MRI and surgical findings.<sup>6</sup>

MRI has sensitivity of 100% and specificity of 86 % in detection of perianal fistulas.<sup>7</sup> Endoanal ultrasound demonstrate comparable sensitivities but the specificity for MRI is higher<sup>8,9</sup> while the combined sensitivity and specificity of MRI in detection of perianal fistulas is 87% (95% CI: 0.63-0.96) and 69% (95% CI: 0.52-0.82).

In our local settings the role of MRI in detection of peri-anal fistulas has not been established much, therefore sufficient statistical data is not available in our population. This study is therefore designed as a milestone in devising a protocol in the diagnosis and management of perianal fistulas. It will surely help in early diagnosis, recognition of complications, prompt treatment, reducing the time of surgery and better cure thus provide ease and relief to patients.

### Study Design

Study design is validation, Cross-sectional

### Settings

This study is conducted at Diagnostic Radiology, Department of P.I.M.S. Islamabad. Collaboration was established with other departments like General Surgery P.I.M.S, Department of gynecology P.I.M.S, and Gastroenterology Department of PIMS to receive patients having clinical suspicion for Ano rectal Fistula.

### Duration of Study

This Study was carried out over a period of nine months from 01-02-2012 to 31-10-2012.

### Sample Size

Total 95 Patients with clinical suspicion of perianal fistula were considered for MRI of perianal region

### Sample Technique

Non-probability, purposive.

### Inclusion Criteria

As collaboration were established with other departments of PIMS where patients of peri-anal fistula visited (both indoor and outdoor) to receive medical care. These departments then refer such patients having strong clinical suspicion of perianal fistula for MRI, to department of diagnostic radiology. Patients selected were between the ages 18 and 60 and had subsequently undergone further examination with MRI. An informed consent was taken. During this study we ensured strict adherence to standards of diagnostic Accuracy (STARD) criteria.<sup>9</sup> Also single consultant were chosen for reporting MRI to avoid observer bias.

### Exclusion Criteria

1. All the Patients who had previous surgery for perianal fistulas were excluded from the study.
2. Claustrophobic patients were also excluded.

### Data Collection Procedure

Patients who presented with clinical features of perianal fistulas and meet the inclusion/ exclusion criteria were identified and were booked for Magnetic Resonance Imaging of pelvis after obtaining written and informed consent. All patients had thorough clinical examination from experienced surgeon prior to the MRI. Clinical examination focused on external and internal opening, perianal abscesses and discharge from the opening was performed.

MRI Procedure and protocol of the examination were clearly explained to each patient including all the relevant instructions required for the preparation. Ethical code of conduct was maintained and at the time of examination a female chaperone presented for each female patient. MRI examinations were performed in the department of radiology, PIMS, Islamabad by a chief MRI technician. The MRI scanner used was 1.5 tesla units (Philips Medical Systems). T1 and T2 weighted images in coronal, axial and sagittal planes were obtained along with PD coronal, STIR coronal and PD- SPAIR sagittal sequences. Slice thickness ranged from 3 to 5 mm. The films were

interpreted by single consultant radiologist. Any abnormalities were described on a standard form/performa. MRI diagnoses and clinical findings were then correlated. Later on all these patients were followed throughout course of management till the time he/she was operated upon by one consultant surgeon. Thus both the report of the MRI of perianal fistulas and per operative findings were recorded in the proforma.

**Data Analysis Procedure**

The data obtained from study was analyzed in SPSS version 17. A 2 x 2 table was used to determine sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy. Mean ± standard deviation for numerical data like age and frequency percentages for categorical data like gender was calculated.

**RESULTS**

A total of 95 patients having perianal fistulas on clinical examination were included in this study.

Regarding the age distribution, most common age group was 31-40 years and minimum number of patients were between 51-59 years old. Mean

age of the patients was 36.95±8.0 years.

Out of 95 patients, 81 patients (85.3%) were male while remaining 14 patients (14.7%) were female.

Comparison of magnetic resonance imaging vs Per operative findings of perianal fistula shows 80 positive cases on MRI and 79 positive cases on per operative findings (Table-I).

MRI	Per operative findings (Gold Standard)		Total
	Fistula Present	Fistula Absent	
Fistula Present	76 (TP)	4 (FP)	80
Fistula Absent	3 (FN)	12 (TN)	15
<b>Total</b>	<b>79</b>	<b>16</b>	<b>95</b>

**Table-I. Comparison of magnetic resonance imaging vs Per-operative findings of perianal fistula**  
Key:

TP = True positive                      FP = False positive  
FN = False negative                    TN = True negative

Sensitivity, specificity and accuracy of magnetic resonance imaging (MRI) was 96.2%, 75.0% and 92.6%, respectively (Table-II). Positive predictive value was 95.0% and negative predictive value was 80.0% (Table-III).

$$\text{Sensitivity rate} = \frac{\text{True Positive}}{\text{True Positive} + \text{False Negative}} \times 100 = \frac{76}{76 + 3} \times 100 = 96.2\%$$

$$\text{Specificity rate} = \frac{\text{True Negative}}{\text{True Negative} + \text{False Positive}} \times 100 = \frac{12}{12 + 4} \times 100 = 75.0\%$$

$$\text{Diagnostic Accuracy} = \frac{\text{True Positive} + \text{True Negative}}{\text{True Positive} + \text{True Negative} + \text{False Positive} + \text{False Negative}} \times 100 = \frac{76+12}{12 + 4} \times 100 = 92.6\%$$

**Table-II. Sensitivity, Specificity and Accuracy of MRI**

$$\text{Predictive value of Positive test} = \frac{\text{True Positive}}{\text{True Positive} + \text{False Negative}} \times 100 = \frac{76}{76 + 4} \times 100 = 95.0\%$$

$$\text{Predictive value of Negative test} = \frac{\text{True Negative}}{\text{True Negative} + \text{False Positive}} \times 100 = \frac{12}{12 + 3} \times 100 = 80.0\%$$

**Table-III. Positive Predictive Value and Negative Predictive of MRI**

## DISCUSSION

Anal fistulas is relatively common disease which affects young including both male and female. Common causes are inflammatory bowel disease (chrons), tuberculosis, diverticulitis, post radiation and malignancies. It not only causes a constant distress for patients but affects quality of life as well. Patients often face social disability and dependency due to this disease. Failure to diagnose these fistulas tracts and/ or missed branches lead to either delay in surgery, or failure of completely repaired tracts that lead to recurrence, it is therefore utmost important to pick these tracts earlier and completely repair them. All the clinically suspected cases need to be evaluated via most accurate, highly sensitive and specific imaging studies. The age prevalence of perianal fistulas in literature is commonly in middle-aged men.<sup>10</sup> They are a consequence of anal glandular obstruction, with ramifications, secondary branches, and adjacent abscess formation and sinus tracts of the abscess.<sup>10</sup> They have traditionally been imaged by conventional fistulograms under fluoroscopic guidance; This method has two main disadvantages: First, the primary tract and its extensions do not fill with contrast if they are plugged with pus or debris and, second, the sphincter muscle anatomy is not imaged and hence the relation between the tract, the internal/ external sphincter, and the levator ani muscle is not visualized.<sup>11</sup>

Other diagnostic modality is Trans-anal sonogram depicts fistulae and their relation to the anal sphincter muscles in a better way. It is noninvasive and radiation free. Disadvantages include the absence of a coronal plane of imaging, operator dependence and limited field of view.<sup>11</sup>

CT fistulography is another diagnostic tool but it has its limitations. Like attenuation values of fistula tracts, fibrotic areas and the areas of sphincter muscles all are similar to each other. MDCT fistulography is rather expected to improve the results from this modality.

The role of MR fistulography in preoperative evaluation of perianal fistulae is now well

established. Not only this but it picks up fistulous communications even in the presence of infection, abscess. It also provides anatomical details with respect to surrounding structures<sup>12</sup>.

An optimal examination utilizes endo-luminal as well as external phased-array surface coils.<sup>11</sup> However, imaging with an external coil alone also provides good results.<sup>13</sup> The external anal sphincter is adequately and accurately visualized on MRI. It is hypo intense on T1WI, hyper intense on T2WI, and is not suppressed on fat-suppressed T2W images. Recent advances also suggest to detect these fistulas on Gadolinium enhanced T1WI with additional fat suppression techniques.

In one of the early studies on MRI fistulography, Lunniss et al. reported a concordance rate of 86-88% between MRI and surgical findings.<sup>14</sup> Our study has provided almost similar results by showing high sensitivity, specificity, positive and negative predictive values. This is also supported by concordance with per-operative findings. Some studies have suggested that MRI is even more sensitive than surgical exploration of the tracts.<sup>15</sup> Detection of branching fistulas is a diagnostic challenge because missed extension is the commonest cause of recurrence. MRI is especially helpful in such cases<sup>11</sup> and thus very helpful in guiding surgeons towards complete surgical cure, like in cases of chron's disease.<sup>16</sup>

## CONCLUSION

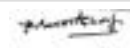
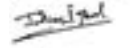
MRI is best imaging technique and investigation of choice for preoperative assessment of perianal fistulas. It provides highly accurate, noninvasive and relatively less time consuming means of performing pre-operative evaluation. It provides accurate anatomical mapping of fistulas and picks up potential perirectal suppuration, secondary extensions/ branches and relationship to the pelvic floor, sphincters and adjacent perirectal structures. It is very helpful in guiding surgeons for treatment decisions and planning for surgery. This diagnostic accuracy not only helps in surgical cure but avoids recurrence and post-operative complications like fecal incontinence.

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## AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Dr. Yasma Ashraf	Intellectual concept, Data collection	
2	Dr. Irum Iqbal	Study design, data collection	
3	Dr. Shafaat Khatoon	Data interpretation, Discussion, Recommendations	