

# Magnetic Resonance Imaging Versus Sinogram in Evaluation of Perianal Sinus

Satyabhuwan Singh Netam<sup>1</sup>, Sanjay Kumar<sup>2</sup>, Bhagyashri Bhutada<sup>3</sup>, Vivek Patre<sup>1</sup>, Rajesh Singh<sup>2</sup>, Vishal Jain<sup>4</sup>, Anand Bansal<sup>4</sup>, Swati Gupta<sup>5</sup>

<sup>1</sup>Professor, Radiodiagnosis, Pt JNM Medical College Raipur, Chhattisgarh, India, <sup>2</sup>Associate Professor, Radiodiagnosis, Pt JNM Medical College Raipur, Chhattisgarh, India, <sup>3</sup>PG Student, Radiodiagnosis, Pt JNM Medical College Raipur, Chhattisgarh, India, <sup>4</sup>Assistant Professor, Radiodiagnosis, Pt JNM Medical College Raipur, Chhattisgarh, India, <sup>5</sup>Senior registrar, Radiodiagnosis, Pt JNM Medical College Raipur, Chhattisgarh, India.

## Abstract

**Introduction:** Perianal fistula is a commonly encountered disease, complete evaluation of which is essential to prevent recurrent surgery.

**Aim:** The purpose of this study was to determine the role of magnetic resonance imaging (MRI) and sinogram in evaluation of perianal sinus and comparison between two investigations in pre-operative assessment of perianal fistulas.

**Materials and Methods:** A prospective study was carried on 34 patients studied between the period of May 2015 and August 2016. Patients who had undergone X-ray sinogram followed by MRI non-contrast study were included in the present study. MRI sequences assessed including T2 weighted (T2W) sagittal, axial and coronal, short T1 inversion recovery (STIR) coronal and axial, T1W axial, and coronal sequences.

**Results:** On MRI evaluation, out of 34 patients, 9 patients (26.5%) had only perianal sinus with no communication with the anal canal while 25 patients (73.5%) were diagnosed as perianal fistula. Out of these 34 patients, 5 were female and 29 were male patients. Of the 25 patients with fistula, 24 patients had fistulous communication with anal canal, and 1 patient had extrasphincteric fistula (Type 5 St. James University and Hospital and Type 4 Parks classification) tracking down from a pelvic abscess. Of these 25 fistula cases, 14 (56%) were simple and 11 (44%) cases were associated with branching course. On conventional sinogram out of 34 subjects, 20 cases were diagnosed as sinus and 14 were diagnosed as fistula and out of 20 cases of sinus tracts 11 cases were turned out to be fistula by MRI. Hence, out of 25 fistulas, only 56% (14 patients) of fistulas were picked up correctly. 44% (11 patients) of fistulas were falsely interpreted as sinus tracts.

**Conclusion:** In our study, MRI proved to be a better investigation in the evaluation of perianal fistula in comparison to X-ray sinogram. T2W and STIR sequence have major role in determining detail anatomy of sinus track. Accurate pre-operative assessment of perianal fistula may help in reducing the recurrence and thereby reducing the number of repeated surgery.

**Key words:** Magnetic resonance imaging, Perianal fistula, Sinogram

## INTRODUCTION

Perianal fistula is a commonly encountered disease infamous for its recurrence because of associated concealed infection.<sup>1</sup> The treatment of fistulas requires surgery.

While this is successful in most cases, it is associated with a significant prevalence of recurrence.<sup>2</sup> Successful surgical management of anal fistulas requires accurate pre-operative assessment of the course of the primary fistulous track and the site of any secondary extension or abscesses.<sup>3</sup> A detailed assessment of the anatomic relationship between the fistula and the anal sphincter complex allows surgeons to choose the best surgical treatment, thus significantly reducing recurrence of the disease or possible secondary effects of surgery, such as fecal incontinence.<sup>4,5</sup> Before the era of magnetic resonance imaging (MRI), sinogram was the choice of radiological investigation to evaluate the extension and communication to visceral structures. In

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**Corresponding Author:** Dr. Satyabhuwan Singh Netam, D-20, Avanivihar, Daldalseoni Road, Mova, Raipur, Chhattisgarh, India.  
E-mail: sbsnetam@yahoo.com

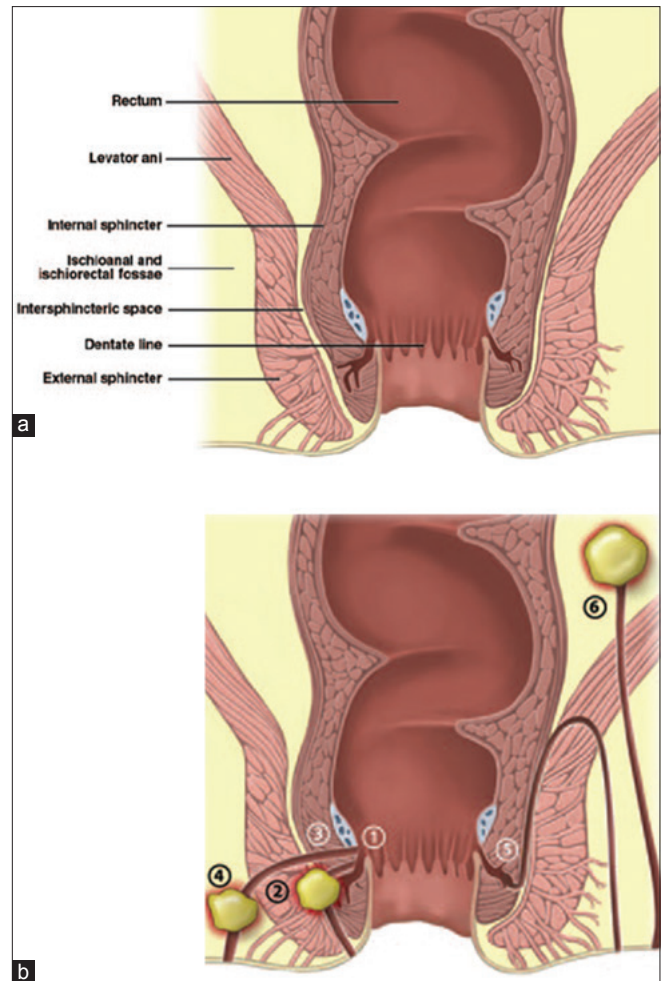
third world, country like India due to unavailability of MRI, surgeon still rely on sinogram. MRI, due to its high soft-tissue contrast resolution and multiplanar imaging helps in accurate assessment of associated abscesses, horseshoe, and secondary tracts<sup>6,7</sup> alerting the surgeon about the complex nature of the disease<sup>1,7,8</sup> and providing an excellent road map before surgery.<sup>9</sup> Depending on the location and course of the primary tract, perianal fistulae have been classified into four types by Parks *et al.*<sup>10</sup> (1) Intersphincteric (incidence 60-70%):<sup>8</sup> The infection starts from an anal gland and develops in the inter-sphincteric plane, lying between the internal and external sphincters, without penetrating the external sphincter. It eventually ruptures onto the skin, thereby creating the fistula. (2) Transsphincteric (incidence 20-30%):<sup>8</sup> This occurs when the intersphincteric infection penetrates the external sphincter to reach the ischioanal fossa and, eventually, the perianal skin. (3) Suprasphincteric (uncommon): These fistulae extend superiorly in the intersphincteric plane to reach above the levator plane and then penetrate inferiorly through the ischioanal fossa. (4) Extrasphincteric (uncommon): These result from extension of primary pelvic disease (e. g., Crohn's disease, diverticulitis, and radiation proctitis) down through the levator plate.

Morris *et al.*<sup>8</sup> using MRI characteristics classified fistula-in-ano into five grades. This classification system is known as St. James University and Hospital (SJUH) classification (Figure 1). Grade 1: A simple linear intersphincteric fistula without involvement of the ischioanal or ischioanal fossa. The tract is confined by the external sphincter and has no extensions. Grade 2: An intersphincteric fistula with an abscess or secondary tract, but bounded by the external sphincter. These secondary tracts may be of the horseshoe variety crossing the midline or may extend up the intersphincteric plane without crossing the midline. Grade 3: A transsphincteric fistula crossing both the internal and external sphincters and the ischioanal fossa before opening onto the skin. Grade 4: A transsphincteric fistula with an associated abscess in the ischioanal or ischioanal fossa. Grade 5: Perianal fistulous disease extending above the levatorani muscle. This includes extrasphincteric fistula and supra-sphincteric fistula, which originates in the inter-sphincteric space before piercing the levator-ani and traveling downward in the ischioanal fossa.

In the present study, our aim is to emphasize the benefits and limitations of sinogram and MRI study by correlating the findings of both studies.

## MATERIALS AND METHODS

The study population comprised 34 patients. These patients were studied prospectively from a period of 16 months (between May 2015 and August 2016). Every patient



**Figure 1: (a) Coronal illustration of relevant anorectal anatomy for magnetic resonance imaging evaluation of perianal fistulas.**

**Anal canal extends from levatorani muscle to anal verge and is surrounded by both internal and external sphincter. Internal and external sphincter are separated by intersphincteric space. Ischioanal space and ischioanal space are superficial to sphincter complex and inferior to puborectalis. (Drawing by Nowak C)<sup>11</sup>, (b) Coronal illustration shows types of perianal fistulas according to St. Jame's classification. Simple intersphincteric, (1) and intersphincteric with abscess, (2) fistulas are both confined by externalanal sphincter, whereas simple transsphincteric, (3) and transsphincteric with abscess, (4) fistulas both involve ischioanal or ischioanal fossae. Extension above levatorani characterizes supralevator fistulas, such as suprasphincteric fistulas, (5) which arise from anal canal before ascending to supralevator space, and extrasphincteric fistulas, (6) which result from pelvic infection extending inferiorly across levatorani and do not involve anal sphincter complex (Drawing by Nowak C)<sup>11</sup>**

who had a complaint of perianal discharging sinus had undergone X-ray sonogram followed by MRI non-contrast study carried out on a 3-T MRI system with body coil was included in the study. Equipment used were Magnetom Skyra, Siemens (3T field strength) MRI machine, and siemens optilix 154/30/5OR-101S X-ray machine. The sequences assessed were: Sagittal T2 TSE (TR/TE 3500/86, FOV 200 × 200, matrix 400 × 400, Nex 2, slice

thickness 3 mm); Axial T2 TSE (TR/TE 4000/86, FOV 200 × 200, matrix 400 × 400, Nex 2, slice thickness 3 mm); Coronal T2 TSE (TR/TE 3500/86, FOV 200 × 200, matrix 400 × 400, Nex 2, slice thickness 3 mm); Coronal short T1 inversion recovery (STIR) TSE (TR/TE 3200/64, FOV 340 × 340, matrix 309 × 309, Nex 2, slice thickness 4 mm); Axial STIR TSE (TR/TE 5150/38, FOV 200 × 200, matrix 333 × 333, Nex 2, slice thickness 3 mm); Axial T1 TSE (TR/TE 550/12, FOV 200 × 200, matrix 333 × 333, Nex 2, slice thickness 3 mm); Coronal T1 TSE (TR/TE 570/12, FOV 200 × 200, matrix 250 × 250, Nex 2, slice thickness 3 mm); The external opening was localized with the primary tract and its course in relation to the anal sphincter. Internal opening in the anal canal if any was noted. The presence of hidden areas of sepsis, any abscess or fluid collection, secondary ramifications, horseshoe branches were noted for every case. The fistulas were classified according to the SJUH and Park's classification.

## RESULTS

In the present study, highest incidence of disease occurred in age group of 41-50 years followed by age group of 31-40 years (Bar Graph 1). Majority diseased patients were male with a male to female ratio of 5.8:1. On conventional sinogram, out of 34 patients, 14 patients had fistulous communication with the hollow viscera, and 20 patients had sinus tracts. Of the 14 fistulas, 3 were branching, and 11 were simple. Out of 20 sinuses, 3 were branching, and 17 were simple sinus tracts. On MRI evaluation, out of 34 patients, 9 patients (26.5%) had only perianal sinus with no communication with the anal canal while 25 patients (73.5%) were diagnosed as fistulas. Of these 25 patients, 24 patients had fistulous communication with anal canal, and 1 patient had extrasphincteric fistula (Type 5 SJUH and Type 4 Parks classification) tracking down from a pelvic abscess. Out of 25 fistulas, 11 (44%) were associated with secondary branches, and 14 (56%) were simple non-branching fistulas. Out of 25 fistulas, 10 (40%) were associated with abscess formation, and 3 (12%) were associated with horseshoe branching. According to SJUH classification we found 25 cases of anorectal fistulas, out of which there were 9 in numbers of type-1, 6 in numbers of type-2, 2 in numbers of type-3, 5 in numbers of type-4 and 3 in numbers of type-5 (Table 1).

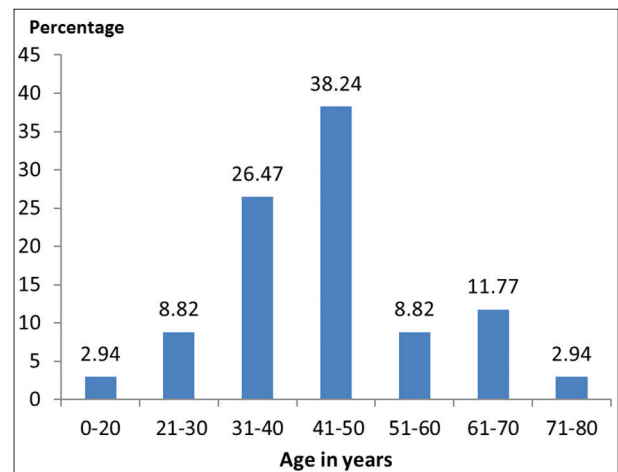
Thus, on conventional sinogram out of 25 fistulas (as diagnosed by MRI) only 56% (14 patients) of fistulas were picked up correctly. 44% (11 patients) of fistulas were falsely interpreted as sinus tracts.

## DISCUSSION

We studied 34 patients with a history of perianal pain and discharging sinus. The patients were investigated

with conventional X-ray sinogram and MRI perineum (non-contrast). Our study was limited to following sequences in MRI-T1 coronal and axial, STIR coronal and axial, T2 coronal, axial, and sagittal. Each sequence has its own importance in contributing to the final description of fistula. In the present study, the highest incidence of disease occurred in the age group of 41-50 years followed by age group of 31-40 years. Majority diseased patients were male with a male to female ratio of 5.8:1. Similar incidences are found by Barker *et al.* in their study.<sup>12</sup>

Similar to Darwish *et al.*,<sup>13</sup> we, in our study, found that the levatorani muscle, ischioanal, and ischiorectal fossae were better appreciated on T1 weighted (T1W) sequences giving a gross anatomical orientation of the perianal infective pathology as depicted in Figure 2. Active disease was picked up on T2W images as the sinus tract and fistulous communication filled with fluid appear hyperintense on this sequence (Figure 3). The distance from anal verge was estimated on T2W sagittal sequence (Figure 4).



Bar Graph 1: Age-wise distribution of disease



Figure 2: The levatorani muscle (white arrow), ischioanal and ischiorectal fossae (red arrow) are better appreciated on coronal T1-weighted sequences as shown in this image

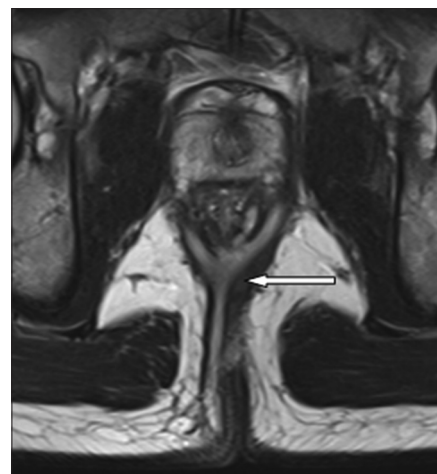


In the present study, we found that STIR sequence by suppressing the background fat signal was most beneficial in easily locating the hidden areas of sepsis and secondary ramification of the primary tract (Figure 5). However, in a prospective study of 42 patients by Halligan and Bartram, STIR imaging failed to demonstrate secondary tracts and did not reveal small residual perianal abscess from perianal inflammation, making it less suitable for demonstration of fluid collections or extensions than are T1W post contrast study.<sup>14</sup> However, we did not use contrast-enhanced sequences in the present study. The combination of T1, T2, and STIR sequences was found sufficient in delineating the perianal disease and classifying the fistulas.

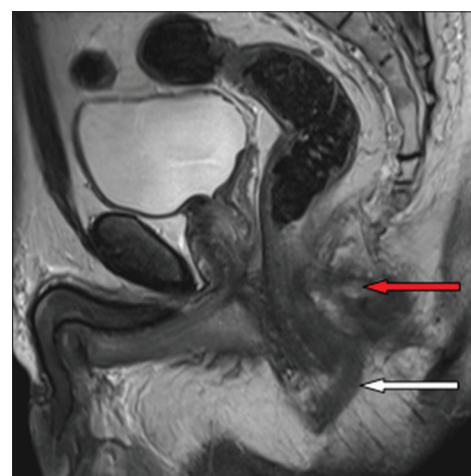
The multiplanar T2 sequence also helps in locating the fistula in relation to the sphincter complex. In the present study, we found that in all the positive cases of perianal fistulas, use of non-contrast MRI, and combination of above sequences with multiplanar imaging produced most of the details necessary for pre-operative evaluation and accurate localization of perianal fistula. The levator plate was best seen on coronal plane while the anal clock and internal opening were best seen on axial images. The disruption of external anal sphincter well distinguished a trans-sphincteric fistula from an inter-sphincteric fistula on T2W sequence. MRI has a major impact in the pre-operative assessment of perianal fistulas.<sup>15-17</sup>

As the sinus tract is directly examined by injecting the radio-opaque contrast in the tract sinogram was considered gold standard. Sinogram is used as initial screening investigation especially in developing countries like India where availability and cost of investigation affect the patient workup. In the present study, only 56% of fistulas were picked up correctly on conventional imaging, 44% of fistulas were falsely interpreted as sinus tracts as depicted in Bar Graph 2. The probable cause for this false interpretation is technical error due to improper seal at the sinus opening while injecting contrast leading to inadequate pressure thus leads to incomplete filling of the sinus tract with contrast leading to failure in delineating the primary tract and secondary branches in its entirety. Conventional imaging also did not help in understanding the relationship of these tracts with the sphincter complex. Thus, the need of MRI before surgery was obvious.

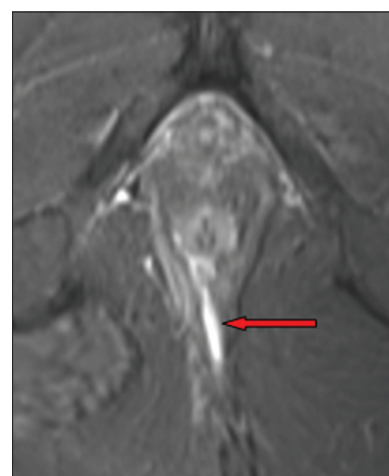
Other investigations that can be used in evaluating perianal fistula are endosonography and contrast-enhanced computed tomography (CT). Endosonography though has good resolution is penalized due to the limited field of view and is an uncomfortable study for the patient whereas contrast-enhanced CT has limited soft-tissue resolution.



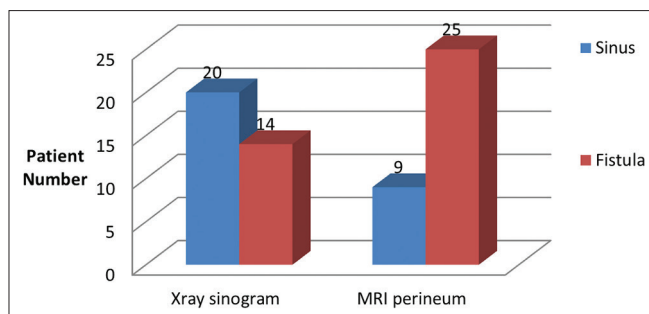
**Figure 3: Active disease were picked up on T2-weighted images as fistulous communication filled with fluid appear hyperintense (white arrow) on this sequence**



**Figure 4: The distance from anal verge (white arrow) of the fistulous communication (red arrow) was estimated on T2-weighted sagittal sequence**



**Figure 5: Short T1 inversion recovery sequence by suppressing the background fat signal, was most beneficial in easily locating the fistulous tract (red arrow)**



**Bar Graph 2: Comparison of conventional X-ray sinogram and magnetic resonance imaging sinogram in detecting perianal fistulas**

However, there is no literature available to compare the result of X-ray sonogram and MRI pelvis in the evaluation of perianal sinuses, we tried to compare the benefits and limitations of both investigations in following parameters:

Conventional X-ray sinogram	MRI perineum
Less efficient in detecting fistulous communication	Detects the fistulous communication, secondary branches, and ramifications
No extra detail about relationship to sphincter so cannot predict post-surgical sphincter incontinence	Detailed anatomical orientation of perianal disease in relation to sphincter can be studied hence can predict chances of post-surgical sphincter incontinence
Suprlevator extension cannot be commented upon accurately	Good in identifying the suprlevator extension
No soft-tissue contrast available	Excellent soft-tissue contrast
Cannot be performed in chronic fibrosed sinuses	Can be performed
Painful and uncomfortable to patient	Use of surface coils makes it a comfortable investigation
Cheaper investigation and easily available	Relatively costly investigation
Initial screening investigation	Investigation of choice

MRI: Magnetic resonance imaging

## CONCLUSION

In our study, MRI proved to be a better investigation in the evaluation of perianal fistula in comparison to X-ray sonogram. T2W and STIR sequence have major role in determining detail anatomy of sinus track. Accurate pre-operative assessment of perianal fistula may help in reducing the recurrence and thereby reducing the number of repeated surgery.

**Table 1: Number of case incidence as per SJUH classification**

SJUH classification	Number of patients (%)
Type 1	9 (36)
Type 2	6 (24)
Type 3	2 (8)
Type 4	5 (20)
Type 5	3 (12)
Total	25 (100)

SJUH: St. Jame's University and Hospital

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