

Comparative Study of MRI Fistulogram and X-Ray Fistulography with Operative Findings: in Fistula in Ano

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Received: 30-05-2023 / Revised: 22-06-2023 / Accepted: 25-07-2023

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Conflict of interest: Nil

Abstract:

Background: By contrasting their results with intraoperative data, the current study has attempted to assess the efficacy and diagnostic accuracy of MRI fistulogram over X-ray fistulography.

Methods: The Nalanda Medical College and Hospital in Patna, Bihar, undertook a hospital-based prospective study with 60 patients to compare the results of an MRI fistulogram and an X-ray fistulogram with the operative finding of a fistula in ano. The following two groups of 30 patients each were used in the investigation. 30 cases from Group A received an MRI fistulogram. Group B: X-ray fistulography was performed in 30 cases. Its results were compared to the operation's overall conclusions.

Results: When we compared the intra-operative MRI fistulogram findings to the intra-operative findings, we discovered that 23 patients had inter-sphincteric fistulous tracts as opposed to 22 patients. The sensitivity of MRI with intraoperative findings was nearly 100% with a significant association in the remaining findings. The X-ray fistulogram's sensitivity and specificity for a fistula in ano were relatively low.

Conclusions: The findings have been statistically significant in demonstrating that an MRI fistulogram is a better diagnostic tool than an X-ray fistulogram.

Keywords: MRI fistulogram, X-ray fistulography, Fistula.

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Introduction

A typical peri-anal surgical issue that patients present to doctors with is anal fistula. The majority of anal fistulas are benign lesions of the rectum and anal canal that are easily treated. At least 90% of these instances have infections of the cryptoglandular epithelium as their final stage.[1] Since most of these illnesses are chronic, low-grade infections, the vast majority of them are acute.

With the aid of a proctoscope, sufficient lighting, and a digital rectal examination, the majority of these anal fistulae are simple to identify. Despite this, it is quite difficult to completely treat these anal fistulae for two reasons.

The first is the disease's affinity for the location. Second, a sizeable portion of these diseases return or persist when the proper surgical technique is not used, when the postoperative care is inadequate, or during the procedure if the extensions are lost or missed. [2,3] Finding the most prevalent reason is crucial given the status of the spectrum, which leads to a greater comprehension of the condition's targeted and specialised care. A water soluble contrast material is gently administered during X-ray fistulography to characterise the fistula tract.

There are two main downsides of fistulography. First, if extensions from the primary tract are clogged with debris, located far away, or if there is an excessive amount of contrast material reflux from either the internal or exterior orifice, they may fail to fill with contrast material. Second, because the sphincter muscles cannot be seen directly, it is necessary to infer how each tract is related to the sphincter. Furthermore, it can be challenging to determine whether an extension has an in fralevator site or a supralevator location due to the inability to see the levator plate. Similar to the internal hole in the anal canal, it is frequently impossible to pinpoint its precise level with enough accuracy to aid the surgeon. Overall, this leads to fistulographic findings that are unreliable and difficult to interpret.

Unenhanced T1 weighted images are the best for physically defining the levator plate, ischiorectal fossa, and sphincter complex. T2 weighted images for the examination of fistulous tracts show hyperintense fluid within the tract in contrast to the fibrous wall of the fistula, which is hypointense. Sphincters and muscles have low signal intensity,

but active tracks and extensions have high signal intensity, which makes it easier to distinguish the boundaries between internal and exterior sphincters on T2 weighted images. Fistulous tracts and active granulation tissue show strong enhancement on gadolinium-enhanced fat suppressed T1 weighted images, but any fluid in the track is hypointense.[4-7]

On T1 and T2 weighted images, chronic fistulous tracts or scars have low signal intensity. On gadolinium enhancement pictures, chronic fistulous tracts and scars are not early enhanced. Because there is pus in the core cavity, abscesses may show a strong T2 signal. Abscesses show low signal intensity in the centre with ring enhancement on contrast enhanced fat suppressed T1 weighted images. T1 weighted images on postoperative MRI show high signal intensity of haemorrhage products, which can aid distinguish haemorrhage from residual tracks. [6,7] By contrasting their results with intraoperative data, the current study has attempted to assess the efficacy and diagnostic accuracy of MRI fistulogram over X-ray fistulography.

Material and Methods

At the Nalanda Medical College and Hospital in Patna, Bihar, the Department of Surgery undertook a hospital-based prospective observational study. From August 2019 to March 2021, 60 patients with fistula in ano were admitted to our hospital from patients who visited the Surgery OPD at NMCH, Patna. A comprehensive clinical examination and a full history were performed on every patient. Patients' names, ages, sexes, and addresses were recorded in the past. By using a random chit technique, patients were split into two groups of 30 each: Group A (30), and Group B (30). For Group A, an MRI scan was performed, and for Group B, an X-ray fistulography. All patients underwent a fistulectomy or fistulotomy procedure, and the intraoperative results were compared to the radiological results of Groups A and B. To notice the disagreement and agreement in the tract detection, the data were recorded in accordance with the proforma.

The selection of patients for this study was based on inclusion and exclusion criteria. All patients aged 15 to 80 referred with clinically diagnosis of perianal fistula were included in this study and patients with prior history of surgery in the anorectal region are excluded. Fistula in ano with rectal malignancies/ Crohns disease, high fistula/ complex fistula/ tuberculosis/ recurrent fistula in ano, immunocompromised patients.

Operative procedure

Fistulotomy

The patient is placed in the lithotomy position while under spinal anaesthetic. The presence and location of the internal opening are determined by injecting Methylene blue dye into the external opening after identifying the external opening. Anoderm, skin, fat, and any sphincter musculature distal to the track are cut into with a grooved probe that is passed along the track from external entrance to internal opening. In order to marsupialise the track, the edges are trimmed. It is laid open and given time to mend the fistulous track. There are no sutures used.⁸

Statistical analysis

Data was entered into the Microsoft Excel programme, and SPSS Software Version 20 was used for analysis. Using surgical findings as the reference standard, the tests' sensitivity, specificity, positive predictive value, negative predictive value, likelihood ratio, and chi-square test results were calculated and compared. The Fisher test, student 't' test, and Chi-square test are used to determine whether there is any association between the study groups. P value is considered significant if it is less than 0.05.

Pearson's chi-squared test

$$X^2 = \sum_{i=1}^n \frac{(O_i - E_i)^2}{E_i}$$

Where

X^2 = Pearson's cumulative test statistic.

O_i = an observed frequency;

E_i = an expected frequency, asserted by the null hypothesis;

n = the number of cells in the table.

Results were graphically represented where deemed necessary.

Appropriate statistical software, including but not restricted to MS Excel, SPSS ver. 20 will be used for statistical analysis. Graphical representation will be done in MS Excel 2010.

Results

The mean age of the group A patients undergoing an MRI fistulogram was 45.17±11.641 years, whereas the mean age of the group B patients undergoing an X-ray fistulogram was 48.23±12.467 years. However, this difference was not statistically significant. There were 27 male patients in Group B and a total of 26 male patients in Group A.

Table 1: Comparison of tract detected in MRI fistulogram and intraoperatively in No. of cases in Group A

	Tract detected	Tract not detected	Total
MRI fistulogram	28	2	30
Intraoperatively	29	1	30

Fisher exact test: $P=0.067$. In Group A, only 1 patient had a fistulous tract that was never found in any method. It was observed that the tract detected on MRI was in 28 cases and that it was detected intraoperatively in 29 cases.

Table 2: Comparison of intersphincteric tract detected on MRI fistulogram and intraoperatively in Group A

	Present	Absent	Total
MRI fistulogram	19	11	30
Intraoperatively	19	11	30

Fisher exact test: $P<0.0001$. 19 patients had intersphincteric tracts seen on MRI fistulograms, and they were all confirmed internally inside Group A. In 7 cases, a transphincteric tract on an MRI fistulogram was found, and in 8 cases, it was found during surgery. In one patient's MRI, it was missed, and in another, it was a false positive.

Table 3: Comparison of transphincteric tract detected on MRI fistulogram and intraoperatively in Group A

	Present	Absent	Total
MRI fistulogram	7	23	30
Intraoperatively	8	22	30

Fisher exact test: $P<0.0001$

Table 4: Comparison of Horseshoe tract detected on MRI fistulogram and intraoperatively in Group A

	Present	Absent
MRI fistulogram	1	0
Intraoperatively	0	29

Fisher exact test: $P=0.033$. One patient had horseshoe ramifications on their MRI fistulogram, which was later confirmed during surgery. In group B, there were no horseshoe ramifications seen on the X-ray fistulography.

Table 5: Comparison of tract detected in X-ray fistulography and intraoperatively in No. of cases in Group B

	Tract detected	Tract not detected	Total
X-ray fistulography	13	17	30
Intraoperatively	20	10	30

Fisher exact test: $P=0.001$. Thirteen instances had fistulography tracts found on X-rays, whereas twenty cases had them found intraoperatively. As a result, in 10 cases in Group B, there was no method to detect a fistulous tract, which is important.

Table 6: Comparison of intersphincteric tract detected on X-ray fistulography and intraoperatively in Group B

	Present	Absent
X-ray fistulography	10	20
Intraoperatively	14	17

Fisher exact test: $P=0.009$. While the intersphincteric tract was found in 14 cases intraoperatively and in 10 patients on X-ray fistulography, it was overlooked in 4 individuals. In group B, the transphincteric tract was found on X-ray fistulography in just one case while it was found intraoperatively in four cases, leaving three cases where it was missing.

Table 7: Comparison of transphincteric tract detected on X-ray fistulography and intraoperatively in Group B

	Present	Absent
X-ray fistulography	1	29
Intraoperatively	4	26

Fisher exact test: $P=0.17$

Table 8: Comparison of fistulous tract detected in No. of cases in Group A and Group B

	Tract detected	Tract not detected
MRI fistulogram	28(93.33)	2(6.67)
Intraoperatively (Group A)	29(96.67)	1(3.33)
X-ray fistulography	13(43.33)	17(56.67)
Intraoperatively (Group B)	20(66.67)	10(33.33)
	Z value	P value
MRI and X-ray	4.94	<0.0001
Intraoperatively (Group A and B)	3.26	0.001

Intersphincteric tracts were seen in 13 patients in Group B and 19 patients in Group A on X-ray and MRI, respectively. It was found intraoperatively in 14 and 19 patients from Group B and Group A, respectively.

Table 9: Comparison of intersphincteric tract detected in No. of cases on MRI, X-ray fistulography and intraoperatively in Group A and Group B

	Intersphincteric tract		Intraoperatively	
	Group A	Group B	Group A	Group B
Present	19	13	19	14
Absent	11	17	11	16
Total	30	30	30	30
	Chi-square = 2.41, P=0.12		Chi-square = 1.68, P=0.19	

Table 10: Comparison of transphincteric tract detected in No. of cases on MRI, X-ray fistulography and intraoperatively in Group A and Group B

	Transphincteric tract		Intraoperatively	
	Group A	Group B	Group A	Group B
Present	7	1	8	5
Absent	23	29	22	25
Total	30	30	30	30
	Fisher exact test : P=0.052		Fisher exact test : P=0.53	

Table 11: Comparison of Horseshoe ramifications detected in No. of cases on MRI, X-ray fistulography and intraoperatively in Group A and Group B

	Horseshoe Ramifications		Intraoperatively Finding	
	Group A	Group B	Group A	Group B
Present	1	0	1	0
Absent	29	30	29	30
Total	30	30	30	30
	Fisher exact test : P=1		Fisher exact test : P=1	

Seven individuals had transphincteric tracts found on MRI, while one patient had one found on an X-ray. In 8 patients in Group A and 5 patients in Group B, intraoperative transphincteric tracts were found. The observed difference lacked statistical significance. One patient in group A had horseshoe ramifications found on an MRI, and another patient had one during surgery.

Discussion

Patients in Group A (MRI fistulogram) had a mean age of 45.17 ± 11.641 years, while those in Group B (X-ray fistulography) had a mean age of 48.23 ± 12.467 years. However, the difference was not statistically significant. Panda et al study's found a mean age of 38.96 and an SD of 13.52.9.

There were a total of 26 male patients in Group A and 27 male patients in Group B, with the difference between the two groups not being statistically significant. As a result, the present

investigation revealed a preference for men. Panda et al. also reported similar results. In their research, Sofic also found results that were similar. Similar to our findings, a study by Sainio found that the mean patient age was 38.3 years and the male-to-female ratio was 1.8:1. [9-11] In Group A, it was seen that the tract was identified on MRI in 28 cases, and it was identified intraoperatively in 29 cases. This means that the tract was not identified in Group A in just 1 case, which is not significant. However, intraoperatively, tract was discovered in 20 cases and was not detected in 10 cases, which is significant. X-ray fistulography was able to detect the tract in 13 cases in Group B whereas the tract was not detected in 17 cases.

As compared to X-ray fistulography, MRI fistulogram accurately recognised the tract in the study by Sofic et al. of 24 cases with perianal fistula. Their investigation showed that the MRI had an accuracy rate of 83.3% compared to the X-

37.5%. ray's According to their study, MRI fistulograms are a superior diagnostic tool to X-ray fistulograms, which are similar and comparable in our study.[10] Intersphincteric tract was found intraoperatively in 19 cases of group A and 19 cases (63.3%) on MRI. In Group B, it was found on X-ray fistulography in 10 instances (43.33%), and during surgery, it was found in 14 (46.66%) patients.

19 patients (63.33%) had intersphincteric tracts seen on MRI fistulograms, and all of the patients in Group A had they conformed during surgery. Intersphincteric tract was overlooked by the X-ray in 4 (13.33%) patients in Group B on X-ray fistulography, but it was discovered intraoperatively in 14 (46.66%) patients. This difference was statistically significant. Consequently, MRI is more accurate at diagnosing anal fistula than X-ray fistulography. Similar results were also found by Panda et al. and Sofic et al. in their investigation of perianal fistula in 24 instances; X-ray was only able to diagnose intersphincteric tract in 4 (16.66%) patients, which was noteworthy; MRI was more diagnostically accurate. [9,10]

In Group A, the transphincteric tract was identified on MRI in 7 (23.33%) instances and during surgery in 8 (26.66%) cases. It was identified on X-ray in 1 (3.33%) case and during surgery in 4 (13.33%) cases. The observed difference lacked statistical significance. The difference observed was statistically significant. Transphincteric tract on MRI fistulogram was missed in one patient and was false positive in one patient. Transphincteric tract was discovered and verified intraoperatively in 7 (23.33) patients. In patients in group B, the transphincteric tract was found during intraoperative procedures in 4 (13.33%) of them, but X-ray fistulography failed to find the tract in 3 (10%) of the patients.

Therefore, MRI fistulogram was more accurate than X-ray fistulogram in diagnosing the anal fistula. The findings were consistent with the findings reported by Panda et al and Sofic et al in their study.[9,10] A fistulogram on MRI One patient (3.33%) had horseshoe ramifications, which were both detected and verified following surgery. In group B, no horseshoe ramifications were seen on the X-ray.

X-ray fistulography has a sensitivity range of 24-50%. The new branching pathways are not filled with the contrast material; instead, they are often filled with granulation tissue. Fistulography is unreliable in compared to operational findings, showing only 16% concordance and 12% false positive findings of high extensions and anal apertures.[12]

Another study by Sultan et al. on 16 patients with fistula in ano showed the value of MRI as a preoperative screening tool when MRI imaging findings were compared with clinical examination findings while the patients were under anaesthesia. According to the study's findings, MRI is the most reliable approach for determining the existence and progression of an anal fistula.[13]

A concordance rate of 86–88% between MRI and surgical results was reported by Lunniss et al.[13] Later research revealed that MRI is more sensitive than surgical examination.[14] Patients with recurring fistulae and those with fistulae linked with Crohn's disease can benefit greatly from MRI. The most typical reason for recurrence is 15 missed tracts.[16] In patients with recurrent anal fistulas, Buchanan et al. demonstrated that surgery guided by MRI reduced subsequent recurrence by 75%.[14]

Conclusion

Thus, based on the aforementioned findings and analysis, it can be said that MRI fistulograms are a more reliable diagnostic tool than X-ray fistulography for identifying the fistulous tract in cases of fistula in ano. While X-ray fistulography is not as diagnostically accurate as MRI to detect tract and provides very little information about multiple tracts or abscess and has its limitations, MRI fistulography provides information about the fistulae with great anatomic detail with respect to multiple tracks and abscesses as well as the surrounding pelvic organs.

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