



COMPARATIVE STUDY OF MRI FISTULOGRAM AND X-RAY FISTULOGRAPHY WITH OPERATIVE FINDINGS: IN FISTULA IN ANO

Surgery

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ABSTRACT

Background: The current study has attempted to evaluate the effectiveness and diagnostic accuracy of MRI fistulogram over X-ray fistulography by comparing their findings with intraoperative findings.

Methods: A hospital based prospective study was conducted at ESI, PGIMSR, Basaidarapur, New Delhi. with 60 patients to compare the findings of MRI fistulogram and X-ray fistulography with operative finding in fistula in ano. The study was carried out with following two groups of 30 patients each. Group A -30 cases underwent MRI fistulogram. Group B: 30 cases had done X-ray fistulography. Its findings were compared with the final findings of the operation.

Results: On evaluation of the intra-operative findings with MRI fistulogram, we found that inter-sphincteric fistulous tract were noted in 23 patients as compared to 22 patients detected by MRI. In the rest of the findings the sensitivity of MRI with intraoperative findings was nearly 100% with a significant correlation. Sensitivity and specificity of X-ray fistulogram for fistula in ano was very low.

Conclusions: The results have been statistically significant in providing data in favour of MRI fistulogram as diagnostically superior to X-ray fistulography.

KEYWORDS

MRI fistulogram, X-ray fistulography, Fistula

INTRODUCTION

Anal fistula is a common peri-anal surgical problem with which the patient presents to the clinician. Most anal fistulas form a good treatable benign lesion of the rectum and anal canal. 90% or more of these cases are a finale of infections of the cryptoglandular epithelium.¹ As such, the vast majority of these infections are acute and significant majority is due to chronic, low-grade infections.

Most of these anal fistulae are easy to diagnose with a good source of light, a proctoscope and digital rectal examination. Despite this establishing a complete cure of these anal fistulae is very problematic for two reasons.

First being the affection of the disease with respect to the site. Secondly, significant percentage of these diseases persists or resumes when the correct type of surgery is not adopted or when postoperative care is insufficient, or intra-operatively if the extensions are lost or unnoticed.^{2,3}

The state of the spectrum requires the importance of finding the most common cause and therefore a better understanding of the targeted and specialized management of the condition.

In X ray fistulography a water soluble contrast agent is injected gently to define the fistula tract. Fistulography has two major drawbacks. First, extensions from the primary tract may fail to fill with contrast material if they are plugged with debris, are very remote, or there is excessive contrast material reflux from either the internal or external opening. Second, the sphincter muscles themselves are not directly imaged, which means that the relationship between any tract and the sphincter must be guessed. Furthermore, an inability to visualize the levator plate means that it can be difficult to decide whether an extension has a supra or an infralevator location. Similarly, the exact level of the internal opening in the anal canal is often impossible to determine with sufficient accuracy to help the surgeon. The net result is that fistulographic findings are both difficult to interpret and unreliable.

MRI fistulogram features

For a broad anatomic overview, unenhanced T1 weighted images are ideal for anatomically delineating the sphincter complex, levator plate, and ischiorectal fossa. For evaluation of fistulous tracts, T2 weighted images demonstrate hyperintense fluid within the tract as contrasted to the hypointense fibrous wall of the fistula. T2 weighted images help differentiate the boundaries between internal and external sphincters because sphincters and muscles have low signal intensity while active tracts and extensions have high signal intensity. On gadolinium-enhanced fat suppressed T1 weighted images, fistulous tracts and

active granulation tissue demonstrate intense enhancement while any fluid in the track is hypointense.^{4,7}

Chronic fistulous tracts or scars demonstrate low signal intensity on both T1 and T2 weighted images. There is lack of early enhancement of chronic fistulous tracts and scars on gadolinium enhancement images. Abscesses can demonstrate high T2 signal due to the presence of pus in the central cavity. On contrast enhanced fat suppressed T1 weighted images, abscesses demonstrate low signal intensity centrally with ring enhancement. On postoperative MRI, T1 weighted images demonstrate high signal intensity of hemorrhage products and can thereby help differentiate hemorrhage from residual tracks.^{6,7}

The current study has attempted to evaluate the effectiveness and diagnostic accuracy of MRI fistulogram over X-ray fistulography by comparing their findings with intraoperative findings.

MATERIAL AND METHODS

A hospital based prospective observational study was conducted at Department of Surgery, ESI, PGIMSR, Basaidarapur, New Delhi. Out of the patients visiting the Surgery OPD of ESI, PGIMSR, Basaidarapur, New Delhi, 60 patients of fistula in ano admitted at our hospital from August 2014 to March 2015. In all patients, a detailed history was taken and they were subjected to thorough clinical examination. In history, patients name, age, sex, and address was noted.

Patients were divided into two group of 30 patients by random chit system Group A (30), Group B (30). MRI scan was conducted for Group A and X-ray fistulography for Group B. All patients were subjected to operation fistulectomy/fistulotomy and their intraoperative findings were compared with radiological findings of Group A & B. The data was recorded according the proforma to observe the discrepancy and agreement in the tract detection.

The selection of patients for this study was based on inclusion and exclusion criteria.

INCLUSION CRITERIA:

All patients aged 15 to 80 referred with clinically diagnosis of perianal fistula.

EXCLUSION CRITERIA:

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

Under spinal anesthesia, the patient is positioned in lithotomy position. External opening is identified, Methylene blue dye is injected in the external opening to identify the presence and site of internal opening. A grooved probe is passed along the track from external opening to the internal opening, onto which incision is made through anoderm, skin, fat and any sphincter musculature distal to track. The edges are trimmed to marsupialise the track. Fistulous track is layed open and it is allowed to heal. Sutures are not placed.

STATISTICAL ANALYSIS

Data was entered in Microsoft Excel software and analyzed using SPSS Software Version 20. The sensitivity, specificity, Positive predictive value, Negative predictive value, likelihood ratio of the tests was calculated and compared using surgical findings as the reference standard and chi-square test were used. Association among the study groups is assessed with the help of Fisher test, student 't' test and Chi-square test. P value less than 0.05 is taken as significant.

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 patients of group A (MRI fistulogram) was 45.17 ± 11.641 yrs while that of group B (X-ray fistulography) patients was 48.23 ± 12.467 yrs and the difference was not statistically significant. It was seen that there were total 26 male patients in Group A while 27 male patients in Group B.

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: $P=0.067$.

It was seen that the tract detected on MRI was in 28 cases and intraoperatively in 29 cases it was detected, so in Group A in only 1 patient fistulous tract was not detected by any way.

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: $P<0.0001$

Intersphincteric tract on MRI fistulogram was detected in total 19 patients and was conformed in all patients Intra operatively in Group A.

Transphincteric tract on MRI fistulogram was detected in 7 cases and intra-operatively in 8 cases. On MRI it was missed in one patients and was false positive in one patient.

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: $P=0.033$

Horseshoe ramifications on MRI fistulogram was diagnosed in one patient and was also confirmed during operative procedure. Horseshoe ramifications were not detected on X-ray fistulography in group B.

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 fistulogram	13	17	30
Intraoperatively	20	10	30

Fisher exact test: $P=0.001$

On X-ray fistulography tract was detected in 13 cases while intraoperatively it was detected in 20 cases. So in Group B in 10 cases fistulous tract was not detected by any way which is significant.

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: $P=0.009$

Intersphincteric tract on X-ray fistulography was detected in 10 patients, while intraoperatively it was detected in 14 cases, it was missed in 4 patients on X-ray fistulography.

In group B transphincteric tract on X-ray fistulography was detected in 1 case while intraoperatively it was detected in 4 cases, so it was missed on X-ray fistulography in 3 cases.

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 tract was detected on MRI in 19 patients in Group A and on X-ray in 13 patients of Group B. Intra operatively it was detected in 19 patients of Group A and in 14 patients of Group B.

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	

Transphincteric tract was detected on MRI in 7 patients and on X ray in 1 patient. Intra operatively transphincteric tract was detected in 8 patients in Group A and in 5 patients in Group B. The difference observed was not statistically significant.

Horseshoe ramifications were detected in one patient on MRI and in one patient intra operatively in group A.

DISCUSSION

The mean age of patients of Group A (MRI fistulogram) was 45.17 ± 11.64 yrs while that of Group B (X-ray fistulography) patients was 48.23 ± 12.46 yrs and the difference was not statistically significant. In the study by Panda et al mean age 38.96 and SD 13.52.⁹ It was seen that there were total 26 male patients in Group A while 27 male patients in Group B and the difference observed was not statistically significant. Thus male predilection was observed in the present study. Similar findings were also reported by Panda et al. Sofic also observed similar findings in their study. In a study conducted by Sainio, the mean patient age was 38.3 years and the male-to-female ratio was 1.8:1, which was comparable to our study.^{3,11}

Tract detection

It was seen that in 28 cases tract was detected on MRI in Group A and intraoperatively it was detected in 29 cases, so in only 1 case tract was not detected in Group A which is not significant. X-ray fistulography was able to detect tract in 13 cases in Group B while tract was not detected in 17 cases, however intraoperatively tract was detected in 20 cases and in 10 cases tract was not detected which is significant.

In the study by Sofic et al of 24 cases of Perianal Fistula, MRI fistulogram has accurately detected the tract as compared to X-ray fistulography, their study demonstrated the accuracy of X-ray fistulography by 37.5% and that of the MRI by 83.3%. In their study it was concluded that MRI Fistulogram is a better diagnostic tool than X-ray fistulography, which is similar and comparable in our study.¹⁰

Intersphincteric tract

Intersphincteric tract was detected on MRI in 19 (63.3%) cases and intra operatively in 19 cases of group A. On X ray fistulography in Group B it was detected in 10 cases (43.33 %) cases while intra operatively it was detected in 14 (46.66%) cases in Group B.

Intersphincteric tract on MRI fistulogram was detected in total 19 (63.33%) patients and was conformed in all patients intra operatively in Group A. In Group B on X-ray fistulography Intersphincteric tract was detected in 10 (33.33%) patients while intraoperatively it was detected in 14 (46.66%) patients, so X-ray missed intersphincteric tract in 4 (13.33%) patients, the difference observed was statistically significant. Thus as compared to X-ray fistulography, MRI has more accuracy in diagnosing Anal fistula. Similar findings were also reported by Panda et al and Sofic et al in their study of perianal fistula in 24 cases, X-ray was able to diagnose intersphincteric tract in only 4 (16.66%) patients which was significant whereas MRI was diagnostically more accurate.^{9,10}

Transphincteric tract

Transphincteric tract was detected on MRI in 7 (23.33%) cases and intraoperatively in 8 (26.66%) cases in Group A, on X ray it was detected in 1 (3.33%) case while intraoperatively it was detected in 4 (13.33%) cases. The difference observed was not statistically significant.

Transphincteric tract on MRI fistulogram was detected and confirmed intra-operatively in 7 (23.33) patients while it was missed in one patient and was false positive in one patient and the difference observed was statistically significant. In group B transphincteric tract on Intra operative procedure was detected in 4 (13.33%) patients out of them X-ray fistulography was able to detect in only one patient and was missed in 3 (10%) patients.

Thus MRI fistulogram was better in diagnosing the anal fistula as compared to X-ray fistulogram. The findings were consistent with the findings reported by Panda et al and Sofic et al in their study.^{9,10}

Horseshoe ramifications

On MRI fistulogram Horseshoe ramifications was diagnosed in one (3.33%) patient and was also confirmed during operative procedure. Horseshoe ramifications was not detected on X-ray in group B.

The sensitivity of X-ray fistulography ranges from 24-50%. The additional branching tracts are usually filled with granulation tissue and are not filled by the contrast material. In comparison with operative findings, fistulography is unreliable, with only 16% concordance and 12% of false positive findings of high extensions and anal openings.¹²

In another study conducted by Sultan et al of 16 patients with fistula in ano, when MRI imaging findings were compared with clinical examination findings under anaesthesia, the role of MRI as a preoperative assessment tool was demonstrated. It was concluded in the study that MRI is the most accurate method for determination of presence and course of anal fistula.¹³

Lunniss et al reported concordance rate of 86-88% between MRI and surgical findings.¹³ Subsequent studies showed MRI is more sensitive compared to surgical exploration.¹⁴ MRI is very useful in patients with fistulae associated with Crohn's disease and those with recurrent fistulae.¹⁵ Missed tracts are the most common cause of recurrence.¹⁶ Buchanan et al showed that surgery guided by MRI reduced further recurrence by 75% in patients with recurrent anal fistula.¹⁴

CONCLUSION

Thus from the above results and discussion it is concluded that MRI fistulogram is a reliable diagnostic modality as compared to X ray fistulography in the detection of fistulous tract in cases of fistula in ano. MRI Fistulogram provides information about the fistulae with great anatomic detail with respect to multiple tracts and abscesses as well as the surrounding pelvic organs, whereas 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.

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