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Original Research Article

Seeing the Unseen Tracts: "The Role of MRI in Recurrent Fistula-in-Ano Surgery"- A Case Control Study

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Abstract

Background: Surgery for recurrent fistula-in-ano is associated with higher rates of recurrence compared to index cases. Accurate delineation of fistula tracts using preoperative magnetic resonance imaging (MRI) fistulogram may improve outcomes.

Aim: To compare recurrence outcomes in patients undergoing surgery for recurrent fistula-in-ano with and without preoperative MRI fistulogram.

Methods: A case–control study was conducted on patients who underwent surgery for fistula-in-ano between May 2024 and December 2025. The cases were patients who underwent surgery with preoperative MRI fistulogram, and controls were those operated without an MRI fistulogram before May 2024. Data for cases were collected prospectively, whereas controls were identified retrospectively and followed prospectively. The primary outcome was recurrence rate. The effect size was based on previous literature suggesting up to a 75% reduction in recurrence with MRI-guided surgery.

Results: Among total cases (n=75), recurrence rates augmented with fistula grade, ranging from 15.7% (Grade 3) to 33.3% (Grade 5), with an overall recurrence of 20% (15/75). In controls (n=75), recurrence rates ranged from 35.7% (Grade 3) to 60% (Grade 5), with an overall recurrence of 45.3% (34/75). The difference was statistically significant ($p < 0.001$).

Conclusion: Preoperative MRI fistulogram significantly reduces recurrence in recurrent fistula-in-ano, particularly in higher-grade fistulas where clinical examination under anesthesia may be inadequate.

Keywords: Recurrent fistula-in-ano, MRI fistulogram, recurrence, case–control study.

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Introduction

Recurrent anal fistula following prior fistula surgery remains one of the most demanding challenges in colorectal practice. These cases often require advanced surgical expertise due to the distorted anatomy, fibrosis, and scarring from previous procedures and chronic inflammation. While the recurrence rate after surgery for primary fistula-in-ano varies from 3–5% [1] in contemporary studies, historical reports cite rates up to 25% [2]. Recurrence is considerably higher in recurrent fistula-in-ano, ranging from 25–57% [3]. Several factors contribute to recurrence, including complex or horseshoe fistulas, comorbidities such as diabetes mellitus or immunosuppression, difficulty in identifying the internal opening (especially when laterally located), history of previous fistula surgeries, suboptimal postoperative hygiene, and inter-surgeon variability [4].In cases of recurrent disease, the presence of scar tissue and peri-anal induration can often hide fistula tracts, rendering intraoperative palpation an unreliable method and heightening the risk of recurrence or persistence. Advances in imaging technologies, particularly preoperative Magnetic Resonance Imaging (MRI), have improved surgical planning by enabling accurate mapping of both primary and secondary tracts, internal openings, and involvement of the sphincter. Among Western groups, preoperative MRI utilization has been linked to a reduction in recurrence rates by up to 75% after surgery for recurrent fistula-in-ano. By offering a comprehensive preoperative guide, MRI may assist surgeons in achieving a vital balance between eliminating infection and maintaining continence. Nonetheless, despite the optimistic findings, the majority of existing data comes from

Western populations. There remains a lack of well-designed studies in the South Asian setting, where patient profiles, healthcare access, and postoperative practices differ significantly. This creates a clear need to evaluate the impact of preoperative MRI fistulography on recurrence outcomes in our population. The Null hypothesis in our study is that introduction of Preoperative MR Fistulogram will not be effective in reducing recurrence rates after surgery for Recurrent Fistula-in-ano. Cases were consecutive patients undergoing Fistula-in-ano surgery between May 2024 and December 2025 for recurrent fistula-in-ano, all evaluated with a preoperative MR Fistulogram. Controls comprised case-matched patients who had surgery for recurrent fistula-in-ano before May 2024, without a preoperative MR Fistulogram. Recurrence was defined as the clinical development of a fistula following complete wound epithelialization within one year of surgery.

A primary fistula-in-ano referred to patients without prior surgery for the condition; a recurrent fistula-in-ano indicated those who had previously undergone surgical intervention. According to clinical and MRI criteria, a simple fistula encompassed intersphincteric and low trans-sphincteric types (St James University Hospital [SJUH] Grades 1, 2, 3a), while complex fistulas included high trans-sphincteric, supra-sphincteric, and extra-sphincteric types (Grades 3b, 4, 5). SJUH Grade 3 was further divided into 3a (low transphincteric) and 3b (high transphincteric) for brevity. The presence of a secondary track or abscess involving ischioanal, ischiorectal, or supralevator spaces, and anterior fistulas in females, was classified as complex. A perianal sinus denoted a blind-ending tract extending from perianal skin into deeper tissues [5]. The current study aimed to compare the recurrence outcomes of surgery in cases of recurrent fistula in ano with and without preoperative MRI Fistulogram.

Material and Methods

The study was conducted at a zonal hospital in Kanpur, Uttar Pradesh, as a case–control study that included both prospective data from May 2024 to December 2025 and retrospective data from January 2023 to May 2024. Sample size was calculated with 80% power and a 5% significance level (95% confidence interval), assuming a 75% reduction in recurrence of fistula-in-ano based on the study by Buchanan et al.; with a margin of error of ±10%, the calculated sample size was 72, rounded up to 75, using the formula Z-) score)^2*P*(1-P)/(margin of error).^{2}

Inclusion Criteria: The study criteria included patients with recurrent fistula-in-ano, aged between 18 and 75 years, of either sex, and with ASA grade I to III.

Exclusion Criteria: Patients with primary or congenital fistula-in-ano, acute perianal abscess; secondary anal fistula caused by Trauma, IBD, STDs, malignancy, or Radiotherapy exposed and follow-up for less than a year. CONSORT statement for the present study is as shown in Table 1 [6]. Reporting participation in case case-control study is as per the EQUATOR network. Table 2 [7].

Preoperative workup: It consisted of an MR fistulogram performed within seven days before surgery at the zonal hospital and reported by a radiologist with over seven years 'MRI experience. The protocol included a sagittal T2-weighted midline scan to define the extent and axis of the anal canal, followed by axial and coronal STIR sequences covering the anal sphincter complex, supralevator, and presacral spaces. All studies were conducted on a 1.5T MR scanner (Achieva, Philips Medical Systems, Netherlands) using a 4-channel phased-array body coil, without intravenous contrast, endorectal/endoanal coil, or anesthesia. Patients were prepared preoperatively with a 100 ml rectal enema on the morning of surgery. Procedures were performed in the lithotomy position under spinal anesthesia by four surgeons, each with more than five years 'experience in fistula-in-ano surgery. Examination under anesthesia involved bi-digital palpation, probing, and methylene blue instillation to delineate tracts and internal openings, with findings recorded. Depending on the anatomy, fistulectomy, fistulotomy, cutting seton, or sinus tract excision was undertaken. Postoperatively, patients were reviewed at one week after discharge and subsequently at 3- to 6-month intervals in the outpatient department. Data for the case cohort were collected prospectively from clinical records and follow-up visits, while control cohort data were obtained retrospectively and supplemented prospectively during follow-up. Matching was done for age, sex, and diagnosis at the last surgery. Fistula grade was assigned according to the St. James's University Hospital (SJUH) classification, and in patients with multiple procedures, only the most recent surgery was analyzed. All data were recorded on a structured proforma and entered into Microsoft Excel (2010).

Results

Table 1 shows the CONSORT flowchart [6] statement for the present study, and Table 2 shows reporting participation in the control group as per the EQUATOR network [7]. Table 3 shows participation in the Case–Control Study (as per EQUATOR Network Guidelines). Table 4 shows a match for age and sex among 75 patients; each was allotted to the case cohort and control cohort. On inferential statistics, a matching analysis was done for the case and control groups. There was no

significant variation in age or gender between the two cohorts. The Pearson chi-square test was used, and the p-value for age and gender cohort matching was 0.67 and 0.68, respectively.

Case Cohort: Operative findings during examination under anesthesia (EUA) were documented using the Parks Classification [8] and categorized into St James's University Hospital (SJUH) grades for comparison with MRI Fistulogram results [9]. Supra-sphincteric fistulas were assigned to Grade 3 or 4 based on extension and abscess aligning with MRI reporting. Simple inter-sphincteric and subcutaneous fistulas were absent; chronic induration cases were marked as 'unclassified'. Correlation between EUA and MRI was observed in 29 cases (38.6%). Reclassification based on combined EUA and MRI findings involved 3 lesions (Grade 2), one sinus, and an unclassified lesion—all re-categorized as Grade 3; one Grade 3 lesion, one sinus, one Grade 5 lesion, and three unclassified lesions were upgraded to Grade 4. Overall, 11 cases (14.6%) required reclassification, resulting in agreement between EUA and MRI in 40 cases (53.3%), while 35 cases (46.6%) revealed additional findings but retained initial grades.

Partial fistulectomy with cutting seton placement was utilized most frequently, reflecting the high prevalence of complex fistulas (70 cases, 93.3%). Total fistulectomy was performed in 4 cases, and complete sinus tract excision in one case. Postoperative recovery was uneventful; median discharge was within one week, with regular three-monthly follow-up and a median duration of 12 months. Grade 2 cases had no recorded recurrences. Recurrence rates increased with higher grades: 15.7% for Grade 3, and 33.3% for Grade 5, totaling 15 recurrences. Of 40 cases with EUA/MRI agreement, recurrences occurred in 5 (12.5%); among the 35 cases with disagreement, 10 cases (28.5%) recurred.

Control Cohort: Retrospective data collection matched age, gender, and disease severity at the time of first redo surgery. Operative findings, recorded using a hospital proforma, were categorized into grades consistent with the case cohort approach. Supra-sphincteric fistulas were classed as Grade 3 or 4 as per the documentation of extension. Clinical course on follow-up was assessed from records and OPD visits.

Partial fistulectomy with cutting seton was the predominant procedure in controls due to complex fistulas (59 cases, 78.6%), including two unclassified cases; total fistulectomy was performed in eight, and sinus tract excision in three cases. Recovery was uneventful, with median hospital stay of one week. Median follow-up was 9 months, with ongoing OPD review possible in 34 controls (45.3%).

Among Grade 2 fistulas, one recurrence was noted at six months. Recurrence rates increased according to grade: 35.7% for Grade 3, and 60% for Grade 5, totaling 34 recurrences.

Comparative Analysis: In the case cohort, 15 recurrences occurred among 75 patients (20%); in controls, 34 recurrences among 75 (45.3%). This difference was statistically significant ($P < 0.001$), with an overall 44.8% reduction in recurrence rates in the case cohort. Subgroup analysis showed the greatest reduction (59.4%) in Grade 5 recurrent fistulas.

This revision enhances coherence, maintains scientific accuracy, and aligns with reporting standards, with technical terminology clarified and rates summarized for direct comparison.

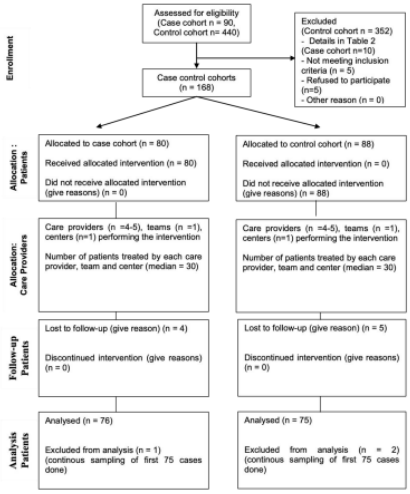

Figure 1: CONSORT Flowchart of Case–Control Cohort

Table 1: Participation in Control study

Method of contacting controls		
	Case records [n=440]	**Follow up OPD Visits [n=88]**
Ineligible sample unit	Primary fistula [n=246] Recurrent fistula but not reoperated [n=24]	n=0
Unable to determine eligibility	EUA finding incomplete [n=38]	n=0
Ineligible respondent	Age <18,>75 [n=18] ASA Grade >3 [n=4] Secondary fistula [n=22] Congenital fistula [n=0]	Lost case records [n=2] Lost to follow up [n=5] Not giving consent [n=4]
Respondent eligible	n=88	n=77

Table 2: Participation in Case–Control Study (as per EQUATOR Network Guidelines)

Parameter	**Cases (n=75)**	**Controls (n=75)**
Eligible subjects approached	80	88
Consented/Included	75 (84.2%)	75 (73.5%)
Median follow-up duration	12 months	9 months
Data collection method	Prospective + OPD follow-up	Retrospective records + OPD follow-up

Table 3: Age and Sex Distribution of Study Groups

Variable	**Cases (n=75)**	**Controls (n=75)**	**p-value**
Mean Age (years) ± SD	42.6 ± 10.3	43.1 ± 11.2	0.67
Male : Female	58 : 17	56 : 19	0.68

The Pearson chi-square test is used for categorical variables.

Table 4: Correlation of EUA and MRI Findings in Case Cohort

Type of Fistula (SJUH)	**EUA (n)**	**MRI (n)**	**Agreement (%)**	**Reclassification (n)**
Grade 2 (IS)	8	5	62.5	3
Grade 3a (low TS)	12	12	100	0
Grade 3b (high TS)	18	20	90	2
Grade 4 (Complex-TS)	21	25	84	4
Grade 5 (supra-S, extra-S)	11	14	78	3
Perianal sinus	5	3	60	2
Unclassified	0	1	–	1
Total	75	75	53.3% agreed	11 reclassified (14.6%)

IS= Intersphincteric; TS = Trans-sphincteric; S = Sphincteric; EUA = Examination under anesthesia.,

Table 5: Recurrence Rates in Cases (MRI) versus Controls (No MRI)

Fistula Grade	**Cases (MRI) Recurrence (%)**	**Controls (No MRI) Recurrence (%)**	**Relative Reduction (%)**
Grade 2	0/5 (0%)	1/6 (16.6%)	100%
Grade 3	5/31 (15.7%)	10/28 (35.7%)	35.2%
Grade 4	6/24 (25%)	11/22 (50%)	54.5%
Grade 5	4/12 (33.3%)	12/20 (60%)	59.4%
Overall	15/75 (20%)	34/75 (45.3%)	44.8% reduction

Statistical significance: $p < 0.001$ (Chi-square).

Discussion

The evaluation of recurrent fistula-in-ano is complicated by anatomical changes resulting from prior surgery, including fibrosis and scarring [10], which can significantly reduce the accuracy of examination under anesthesia (EUA) and increase the probability of misidentifying the primary tract or missing secondary extensions [11]. Jordan et al found complex fistulas have been consistently identified as a principal risk factor for postoperative recurrence. and also found recurrence rates to be particularly high among patients with supra-sphincteric and extra-sphincteric fistulas, noting odds ratios of 10.5 ($P < 0.01$) and 7.8 (95% CI: 1.2–50, $P < 0.02$) for inability to identify the internal opening, respectively.

Published recurrence rates following intervention for recurrent fistula-in-ano can exceed 50%. Imaging modalities, particularly magnetic resonance imaging (MRI), have demonstrated marked improvements in surgical outcomes for these challenging cases.

Buchanan et al. reported that patients who underwent surgery based solely on EUA had a 57% recurrence rate, whereas the introduction of preoperative MRI reduced recurrence rates by up to 75% among those with recurrent disease [4]. Data from the present study reflect similar trends, showing reductions in recurrence of 100% for Grade 2, 35.2% for Grade 3, 54.5% for Grade 4, and 59.4% for Grade 5 fistulas. Furthermore, a majority (93.3%) of the case cohort consisted of complex fistulas. Garg and colleagues illustrated the utility of MRI, noting a significant shift in the classification of fistulas: the proportion identified as complex increased from 67.2% to 78.6% after imaging assessment. There remains a lack of high-quality data addressing recurrence rates in recurrent fistula-in-ano compared to primary cases, often due to substantial patient attrition during follow-up. Enhanced adoption of standardized digital medical records and unique patient identifiers should improve data collection and facilitate more robust, multicenter studies in the future.

Limitations

This case-control study was subject to limitations in matching cohorts on the basis of time, primarily due to limited availability of retrospective data. The case group was followed prospectively for one year, whereas data for the control group were retrieved from records spanning up to two previous years in order to obtain comparability.

Conflict of interest: The Authors declare no conflict of interest. Funding: None.

Availability of data and materials: All data underlying the findings are fully available.

Consent to participate and for publication: Informed consent was obtained from the patients included in this study.

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