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Clinical Outcomes of an Individualized Surgical Approach to Fistula-in-Ano: A Prospective Observational Study

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Abstract

Background: Fistula-in-ano is a common anorectal condition with significant morbidity. Optimal surgical management requires balancing fistula eradication with preservation of continence, particularly in complex cases. This study aims to evaluate outcomes of a tailored surgical approach using different modalities based on fistula complexity and sphincter involvement.

Methods: This prospective comparative study includes 55 patients with fistula-in-ano, treated at a tertiary care center in India between August 2023 and July 2024. We evaluated patients clinically and with imaging (fistulogram/MRI) as needed. We then classified fistulas using Parks' and St. James University Hospital classifications. We selected surgical procedures (fistulotomy, fistulectomy, cutting seton, or fistulectomy with primary sphincter reconstruction) based on intraoperative findings of tract complexity and external anal sphincter involvement. Primary outcomes were healing time, time to return to work, recurrence, and fecal incontinence (assessed by Wexner score). Statistical analysis used Fisher's exact test.

Results: We observed the highest incidence of fistula-in-ano in the 30-45-year age group (19, 34.5%). There were 43 males (78.2%) and 12 females (21.8%). Simple fistula was present in 43 patients (78.2%), while 12 (21.8%) had complex fistula. Multiple external openings were seen in 12 patients (21.8%), most commonly in suprasphincteric fistulas. The external opening was anterior to the transverse anal line in 40 patients (72.7%) and posterior in 15 (27.3%). We then performed MR fistulography in 12 patients (21.8%) with complex fistulas. Intersphincteric fistula was the most common type (41, 74.5%), followed by trans sphincteric (nine,16.4%) and suprasphincteric (five, 9.1%). Fistulectomy was the most common procedure (31, 56.4%), followed by fistulotomy (17, 30.9%), seton (five, 9.1%), and fistulectomy with primary sphincter reconstruction (two, 3.6%). Postoperative flatus incontinence occurred in three patients (5.4%), and we found recurrence in one patient (3.2%). Histopathology shows nonspecific inflammation in 55 patients (100%), with no granulomatous or malignant pathology.

Conclusion: A tailored surgical strategy for fistula-in-ano, guided by precise classification and intraoperative assessment, achieves excellent healing with low recurrence (1.8%) and minimal impact on continence (5.4% minor incontinence). Fistulotomy is ideal for simple fistulas; seton or sphincter-preserving reconstruction for complex/high fistulas optimizes outcomes.

Categories: General Surgery, Medical Simulation, Anatomy
Keywords: anal fistula, fistulectomy, fistulotomy, incontinence, lift, prospective study, recurrence, seton, sphincter preservation

Introduction

Fistula-in-ano is the chronic form of anorectal sepsis and is a chronic abnormal communication between the anorectum and perianal skin, which is lined by granulation tissue [1]. Anal fistula may develop secondary to Crohn's disease, tuberculosis, lymphogranuloma venereum, actinomycosis, rectal duplication, foreign body, and malignancy, and it may follow obstetric injuries [2].

Patients with anorectal fistulas present with perianal discharge, which may be continuous or intermittent, with pain and swelling. Experts have estimated the internal sphincter to contribute 52% to 85% of the resting pressure in the high-pressure zone of the anal canal [3].

Two classification systems are in common use for classifying fistula-in-ano. The standard classification is subcutaneous, low anal, high anal, submucous, and pelvirectal. The classification more commonly used now

is that proposed by Sir Alan Parks, Gordon, and Hardcastle in 1976, which classifies fistulas as intersphincteric (most common: 45%), trans-sphincteric, suprasphincteric, and extra-sphincteric [3].

Researchers use Goodsall's rule to predict the likely position of the internal opening according to the position of the external opening(s) and to predict the course of the fistulous tract. The clinical relevance of Goodsall's rule has diminished after the introduction of new imaging methods [4]. Overall, healing increased to 95.8% after revision surgery [5].

Materials And Methods

This prospective comparative study was conducted in the Department of General Surgery over a period of one year (with effect from August 1, 2023, to July 31, 2024), including all patients with fistula-in-ano after meeting the inclusion and exclusion criteria (Table *1*).

Inclusion criteria	Exclusion criteria
Patients aged >15 years diagnosed with fistula-in-ano	**Patients aged <15 years**
-	Fistula associated with malignancy of the rectum or anal canal
-	Fistula secondary to radiation therapy
-	Patients who did not provide consent for surgery

TABLE 1: Inclusion and exclusion criteria

After detailed clinical examination, including external openings (e.g., number, distance from anal verge, discharge, induration), fistula tract palpation, digital rectal examination, and proctoscopy, the researchers performed all routine baseline investigations, including X-ray fistulogram, and the specific and necessary investigations such as MR fistulogram. They therefore obtained all relevant information in terms of external opening and type of fistula-in-ano (i.e., simple versus complex, as per Park's classification and as per MRI classification in cases wherein researchers performed MR fistulogram). The team carried out routine pre-anesthetic checkups a day prior to surgery. They administered proctoclysis enemas in all patients a night prior to surgery and on the morning of surgery. All patients underwent surgery under regional anesthesia (spinal or epidural) in the lithotomy position. After proctoscopic examination, researchers injected dye through the external opening using a dye injector, followed by probing of the fistula tract in a gentle manner without creating any false internal opening. The team again assessed the type of fistula in terms of external opening, internal opening, length of fistula tract, number of fistula tract/secondary tracts, presence of blind tract, presence or absence of associated abscess collection and, importantly, the extent of the sphincters' involvement, especially the external anal sphincter.

The team selected a specific surgical procedure for each particular patient according to the above-mentioned findings. They removed an anal pack 12 hours following each surgery and began sitz baths. They then discharged the majority of the patients 48 hours following surgery, and they followed up in the outpatient department for wound discharge, fecal soiling, and wound contraction, and enquired about pain, return to routine work, and incontinence of flatus and feces using the Wexner score. They also examined patients for recurrence at further follow-up. Lastly, they checked the desired parameters and obtained results using Fisher's exact test.

Results

Among the patients with fistula-in-ano, the 30-45-year age group had the highest proportion of cases (34.5%). There were 43 males (78.2%) and 12 females (21.8%). Simple fistulas were present in 43 patients (78%), while 12 (21%) had complex fistulas. Multiple external openings were observed in 12 patients (21.8%), most commonly in those with suprasphincteric fistulas. The external opening was anterior to the transverse anal line in 40 patients (72%) and posterior in 15 (27%).

MR fistulography was performed in 12 patients with complex fistulas. According to the St. James's University Hospital classification, 41 patients (74.5%) had intersphincteric fistulas, nine (16.4%) had trans sphincteric fistulas, and five (9.1%) had suprasphincteric fistulas.

Fistulectomy was performed in 31 patients (56%), followed by fistulotomy in 17 (30.9%), seton placement in five (9.1%), and fistulectomy with primary sphincter reconstruction in two (3.6%). Postoperative flatus incontinence occurred in three patients (5.4%). Healing was achieved within 4-6 weeks after fistulectomy, 1-4 weeks after fistulotomy or fistulectomy with primary sphincter reconstruction, and 6-8 weeks after seton

placement.

Return to work occurred within 1-2 weeks after fistulectomy and within one week after fistulotomy, fistulectomy with primary sphincter reconstruction, or seton placement. Recurrence occurred in one patient (3.2%) following fistulectomy. Histopathological examination showed nonspecific inflammation without granulomatous or malignant pathology. Summary of the results is shown in Table *2*. The association between the type of surgery and clinical variables is shown in Table *3*. Fisher's exact test was used

Variable and category	n (%)
Age group: 30-45 years	19 (34.5)
Age group: other age groups	36 (65.5)
Gender: male	43 (78.2)
Gender: female	12 (21.8)
Type of fistula: simple fistula	43 (78.2)
Type of fistula: complex fistula	12 (21.8)
Multiple external openings: present	12 (21.8)
Multiple external openings: absent	43 (78.2)
Location of external opening: anterior to transverse anal line	40 (72.7)
Location of external opening: posterior to transverse anal line	15 (27.3)
Fistula classification (St. James's University Hospital Classification): intersphincteric	41 (74.5)
Fistula classification (St. James's University Hospital Classification): trans-sphincteric	9 (16.4)
Fistula classification (St. James's University Hospital Classification): suprasphincteric	5 (9.1)
Surgical procedure: fistulectomy	31 (56.4)
Surgical procedure: fistulotomy	17 (30.9)
Surgical procedure: seton placement	5 (9.1)
Surgical procedure: fistulectomy with primary sphincter reconstruction	2 (3.6)

TABLE 2: Summary of results

Variable	Statistical test	Test statistic	p-value	Interpretation
Type of fistula	**Fisher's exact test**	**24.758**	**<0.001**	**Statistically significant**
External opening	Fisher's exact test	24.758	<0.001	Statistically significant
Goodsall's rule	Fisher's exact test	17.862	<0.001	Statistically significant
MR fistulogram findings	Fisher's exact test	14.198	0.001	Statistically significant
Intraoperative findings	Fisher's exact test	33.004	<0.001	Statistically significant
Wound healing	Fisher's exact test	60.920	<0.05	Statistically significant
Recurrence	Fisher's exact test	8.629	<0.05	Report exact p-value
Fecal incontinence	Fisher's exact test	2.347	0.699	Not statistically significant

TABLE 3: Association between type of surgery and clinical variables. Fisher's exact test was used

Three external openings were noted adjacent to one another at the one o'clock position (Figure 1). Three closely spaced external openings are interconnected, forming a single trans-sphincteric fistulous tract that opens internally at the level of the dentate line. These findings correlate with the intraoperative findings and are suggestive of a complex trans sphincteric fistula-in-ano (Figure 2). Fistulectomy was followed by primary repair of the sphincter (Figure 3). The excised specimen of fistula-in-ano showed three external openings communicating with a single internal opening (Figure 4). Wound healing was completed by three weeks postoperatively, as depicted in Figure 5.



FIGURE 1: The external openings adjacent to each other a one o'clock position

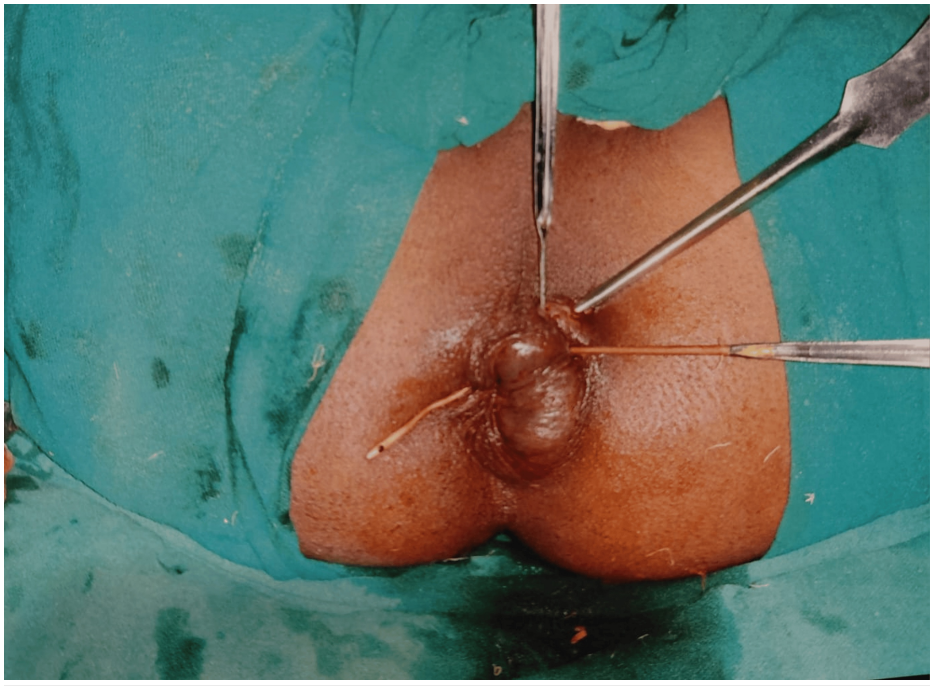


FIGURE 2: All external openings communicating with each other and the resultant trans-sphincteric fistula tract opening at the level of dentate line



FIGURE 3: Fistulectomy with primary sphincter reconstruction done



FIGURE 4: Excised specimen of the fistula having three external openings leading to a common single internal opening



FIGURE 5: Wound completely healed after three weeks

Discussion

This prospective comparative study evaluated the outcome of various surgical modalities for the treatment of fistula-in-ano in terms of healing, time to return to routine work, recurrence, and fecal incontinence. The study consisted of 55 patients with fistula-in-ano of different types. The age of the patients varied from 18 to 76 years. The mean patient age was 38 years. The highest incidence of fistula-in-ano was in the 30-45-year age group (34.5%). Our age incidence corresponds to Marks et al.'s 1977 study, which also revealed that the most affected patients fell into the age group of 20-50 years, showing that fistula-in-ano is rare in extreme age ranges [6].

Out of the 55 patients, 43 were males, and 12 were females, which is comparable to a study conducted by Garcia-Aguilar et al., in which 71% of patients were males and 29% of patients were females [7]. From a total of 55 patients, we found a simple fistula-in-ano in 43 (78%) patients and a complex fistula-in-ano in 12 (21%) patients. Consistent with our results, a study done by Shivakumar et al. demonstrated that simple fistulas (67%) occurred more frequently than complex fistulas (29%) [8]. De Oliveira et al. demonstrated fistulotomy as the most commonly performed surgery (86%) for the treatment of fistula-in-ano [9].

In our study, intersphincteric fistulas were the most common at 41 (74.5%) incidents, followed by trans-sphincteric fistulas at nine (16.4%) incidents. A study conducted by Bakir et al. also illustrated intersphincteric fistula as the most common at 238 (65%) incidents, followed by trans-sphincteric fistulas at 86 (23%) incidents [10].

Fistulectomy was the most commonly performed surgical procedure (56%), followed by fistulotomy (30%). This finding is in contrast to other series in which fistulotomy is the most commonly performed surgical procedure. De Oliveira et al. demonstrated fistulotomy as the most commonly performed surgery (86%) for the treatment of fistula-in-ano [9]. A study conducted by Salem showed that fistulectomy was the predominant surgical approach (146 patients), followed by fistulotomy (126 patients), which is consistent with our findings [11]. In a study by Kronborg et al. [12] on 47 patients, the mean healing time for the fistulotomy group was five weeks, which was shorter than the mean healing time of other surgical modalities for fistula-in-ano. In our study, cutting seton was used in 9.1% of patients. In a study conducted by Bejiga et al. [13], out of 144 patients, researchers applied a seton in 13% of the patients.

Wound healing time was the longest in patients who had undergone seton placement (six-eight weeks), followed by fistulectomy (four-six weeks), as it causes more dissection around the fistula tract and the raw area left after coring. Healing time was the shortest in all patients with fistulotomy and those who had undergone fistulectomy with primary sphincter reconstruction (1-4 weeks).

Our findings suggested that three patients (5.45%) developed incontinence to flatus following fistulectomy, which improved in one week's time. We managed all three patients conservatively with dietary modifications

and Kegel exercises; when we used conventional methods (i.e., fistulotomy or fistulectomy, a large number of patients remained incontinent. In their study, 25% of patients had incontinence to flatus, 17% had incontinence to loose stools, and 31% had complaints of soiling of underclothes [13].

Our study consisted of 43 patients who had a single external opening and 12 patients with multiple external openings. These findings were comparable to a study conducted by Sharmaa et al., which resulted in 40 cases with one external opening and four cases with multiple external openings [14].

Out of 55 patients, the number of patients with an external opening anterior to the transverse anal line passing through the center of the anus was 40 (72%), and those with an external opening posterior to the transverse anal line were 15 (27%). Contrary to our findings, a study conducted by Devi et al. [15] found that the number of cases with opening anterior to the transverse anal line was 66 (31%), and those with opening posterior to the transverse anal line were 122 (64%).

In our study, patients who had undergone fistulotomy, fistulectomy with sphincter reconstruction, and seton placement developed no incontinence to flatus or feces. In a study by Seyfried et al., fistulectomy with primary sphincter reconstruction had a lower incontinence rate than the aforementioned techniques [5].

Our analysis recorded one (3.2%) recurrence in a patient who had undergone fistulectomy during the six months of follow-up. This patient had a complex trans sphincteric fistula with two external openings, and it was grade three, according to the St. James University classification. Seyfried et al. concluded that patients who underwent fistulectomy with primary sphincter reconstruction at the University Medical Centre Mannheim had a low recurrence rate [5]. A comparable study by Farag et al., which consisted of 175 patients who were subjected to fistulectomy with primary sphincter reconstruction, showed a low recurrence and good wound healing, which is akin to our findings [16]. Vyas et al. reported a recurrence of 5.3% with fistulotomy and 18.9% with fistulectomy [17].

The strength of our study is that we maintained data quality, and the study showed comparable results for the assessed procedures despite limited access to investigations. Several limitations should be considered when interpreting these findings. First, the operative procedure was selected according to fistula anatomy, complexity, and sphincter involvement rather than random allocation. This creates confounding by indication: patients undergoing different procedures were not necessarily comparable at baseline, and observed differences in healing, recurrence, or continence may reflect differences in fistula characteristics rather than the procedure itself. Therefore, this study cannot establish the comparative superiority of fistulotomy, fistulectomy, seton placement, or sphincter reconstruction.

Second, the procedural groups were markedly unequal. Thirty-one patients underwent fistulectomy, 17 underwent fistulotomy, five underwent seton placement, and two underwent fistulectomy with primary sphincter reconstruction. Outcomes in the smallest groups are imprecise and should be interpreted descriptively rather than as evidence of comparative effectiveness.

Third, MR fistulography was performed selectively in 12 patients classified as having complex fistulas. This nonuniform imaging strategy may have affected anatomical characterization across the cohort. The terminology used for fistula classification must also correspond to the classification system actually applied.

Fourth, follow-up was relatively short. Six months may identify early recurrence but may not capture later recurrence or long-term continence impairment. Although the Wexner score is mentioned as a continence assessment tool, baseline and postoperative scores are not reported in sufficient detail to quantify changes over time. The reported cases of transient flatus incontinence should therefore be interpreted as a descriptive finding rather than a complete measure of continence outcomes.

Finally, the sample size and single-center setting limit precision and generalizability. These limitations mean that the findings should be interpreted as descriptive and hypothesis-generating rather than as definitive evidence of comparative effectiveness

Conclusions

In this prospective observational cohort, individualized surgical management based on fistula anatomy, complexity, and sphincter involvement was feasible and was associated with the short-term outcomes observed in this series. One recurrence was reported among 55 patients overall (1.8%); if the recurrence occurred in a patient who underwent fistulectomy, this represents 3.2% of the 31 patients in that subgroup. Three patients (5.4%) experienced postoperative flatus incontinence, reported as transient in the study records. Because procedures were selected according to clinical and anatomical characteristics and the treatment groups were small and unequal, these findings do not establish the comparative superiority of any individual procedure. Larger studies with standardized anatomical assessment, clearly defined outcomes, adequate follow-up, and appropriate comparative analyses are needed.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. Institutional Ethics Committee Government Medical College Jammu issued approval ECR/454/Inst/JK/2013/RR-20. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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