

Research Article

# Comparative Study of Lateral Internal Sphincterotomy versus Anal Advancement Flap in the Treatment of Chronic Anal Fissure: A Randomized Controlled Trial

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## ABSTRACT

**Background:** Chronic anal fissure (CAF) is a common benign anorectal disorder characterized by severe pain during defecation, rectal bleeding, and impaired quality of life. Although lateral internal sphincterotomy (LIS) remains the standard surgical treatment because of its high healing rates, concerns regarding postoperative fecal incontinence have encouraged the development of sphincter-preserving procedures such as anal advancement flap (AAF). This study aimed to compare the short-term clinical outcomes of LIS and AAF in the management of chronic anal fissure.

**Methods:** A randomized controlled trial was conducted in the Department of Surgery, Nishtar Medical University and Hospital, Multan, Pakistan. A total of 142 patients with chronic anal fissure were randomly allocated into two equal groups: Group A underwent lateral internal sphincterotomy (n = 71), while Group B underwent anal advancement flap surgery (n = 71). Patients were followed for eight weeks after surgery. Primary outcome measures included symptom resolution, complete fissure healing, and fecal incontinence assessed using the Wexner Fecal Incontinence Score. Secondary outcomes included postoperative wound infection and recurrence. Statistical analysis was performed using SPSS version 26, and a p-value  $\leq 0.05$  was considered statistically significant.

**Results:** The estimated mean age was  $36.0 \pm 12.2$  years in the LIS group and  $35.5 \pm 11.8$  years in the AAF group, with comparable baseline demographic characteristics between the groups. Symptom resolution was achieved in 51 (71.8%) patients undergoing LIS compared with 63 (88.7%) patients treated with AAF ( $p = 0.01$ ). Complete fissure healing at eight weeks occurred in 56 (78.9%) patients in the LIS group and 67 (94.4%) patients in the AAF group ( $p = 0.006$ ). Postoperative fecal incontinence was significantly lower following AAF than LIS (1.4% vs. 14.1%;  $p = 0.005$ ). Although postoperative wound infection (5.6% vs. 12.7%) and recurrence (2.8% vs. 9.9%) were less frequent after AAF, these differences were not statistically significant.

**Conclusion:** Anal advancement flap demonstrated superior short-term clinical outcomes compared with lateral internal sphincterotomy, with significantly higher rates of symptom resolution and fissure healing and a markedly lower incidence of postoperative fecal incontinence. As a sphincter-preserving procedure, AAF represents a safe and effective surgical alternative for the treatment of chronic anal fissure, particularly in patients at increased risk of continence impairment.

**Keywords:** Chronic Anal Fissure, Lateral Internal Sphincterotomy, Anal Advancement Flap, Fecal Incontinence, Fissure Healing, Randomized Controlled Trial.

## INTRODUCTION

Chronic anal fissure (CAF) is one of the most common benign anorectal disorders encountered in colorectal practice and is characterized by a longitudinal tear in the anoderm distal to the dentate line that persists for more than six weeks. Patients typically present with severe pain during or after defecation, rectal bleeding, sphincter spasm, and significant impairment of quality of life. The condition affects adults of all age groups but is most frequently observed in young and middle-aged individuals, resulting in considerable physical discomfort and socioeconomic burden. The pathophysiology of chronic anal fissure is primarily related to internal anal sphincter hypertonia, reduced anodermal blood flow, local ischemia, and impaired wound healing, creating a vicious cycle that perpetuates the disease. (1–4)

Initial management consists of conservative measures including dietary fiber supplementation, stool softeners, warm sitz baths, and topical pharmacological agents such as glyceryl trinitrate, diltiazem, or nifedipine. Botulinum toxin injection may also be used in selected patients. Although these therapies are effective in many cases, persistent or recurrent fissures frequently require surgical intervention because of inadequate symptom control or incomplete healing. (2–6)

Lateral internal sphincterotomy (LIS) has remained the gold-standard surgical treatment for chronic anal fissure for several decades owing to its consistently high healing rates exceeding 90%, rapid symptom relief, and low recurrence rates. The procedure relieves sphincter hypertonia by dividing the distal internal anal sphincter, thereby improving anodermal blood flow and promoting fissure healing. Despite its excellent efficacy, postoperative fecal incontinence remains a recognized complication, particularly among elderly patients, multiparous women, and individuals with pre-existing sphincter dysfunction. Consequently, increasing attention has been directed toward sphincter-preserving surgical techniques that maintain comparable healing while minimizing functional impairment. (4,7–10)

Anal advancement flap (AAF) is one such sphincter-preserving technique that combines fissurectomy with advancement of a well-vascularized anodermal or mucosal flap to cover the fissure defect without division of the internal anal sphincter. The procedure enhances local tissue perfusion, reduces wound tension, and preserves sphincter integrity,

thereby promoting healing while minimizing postoperative continence disturbances. Recent systematic reviews and comparative studies have demonstrated encouraging results, reporting healing rates comparable to those of lateral internal sphincterotomy but with significantly lower rates of postoperative fecal incontinence and superior preservation of anorectal function. (8–13)

Although several international studies have compared LIS and AAF, evidence from low- and middle-income countries, particularly South Asia, remains limited. Variations in patient demographics, dietary habits, healthcare access, and healthcare-seeking behavior may influence treatment outcomes and limit the generalizability of international data to local populations. Moreover, few randomized controlled trials from Pakistan have comprehensively evaluated symptom resolution, fissure healing, postoperative continence, wound infection, and recurrence using standardized outcome measures.

Therefore, the present randomized controlled trial was undertaken to compare lateral internal sphincterotomy and anal advancement flap in the surgical management of chronic anal fissure. The primary objective was to compare symptom resolution, complete fissure healing, and postoperative fecal incontinence between the two procedures, while secondary objectives included evaluation of postoperative wound infection and recurrence. The findings of this study are expected to provide locally relevant evidence to guide surgeons in selecting the most effective and function-preserving surgical technique for patients with chronic anal fissure.

## **MATERIALS AND METHODS**

### **Study Design and Setting**

This randomized controlled trial was conducted at the Department of Surgery, Nishtar Medical University and Hospital, Multan, Pakistan, over a period of 12 months following approval from the Institutional Ethical Review Board. The study was designed to compare the surgical outcomes of lateral internal sphincterotomy (LIS) and anal advancement flap (AAF) in the treatment of chronic anal fissure.

### **Sample Size**

The sample size was calculated using the two-proportion formula based on the findings of Tahir et al., assuming a healing rate of 90% in the anal advancement flap group and 72% in the lateral internal sphincterotomy group, with a 95% confidence level, 80% study power, and

a 5% level of significance. The minimum calculated sample size was 71 patients in each group, resulting in a total sample of 142 participants.

#### **Patient Selection**

Patients presenting to the surgical outpatient department with chronic anal fissure and fulfilling the eligibility criteria were enrolled using non-probability consecutive sampling after obtaining written informed consent.

#### **Inclusion Criteria**

Patients aged 15–60 years of either gender diagnosed with chronic anal fissure requiring elective surgical treatment were included. Only patients with a body mass index (BMI) <30 kg/m<sup>2</sup> and American Society of Anesthesiologists (ASA) physical status I or II were considered eligible.

#### **Exclusion Criteria**

Patients refusing consent, those considered unfit for spinal anesthesia, pregnant women, patients with concomitant anorectal disorders including hemorrhoids, fistula-in-ano, or perianal abscess, previous anal canal surgery, and those with clinically significant cardiac, renal, or hepatic disease were excluded from the study.

#### **Randomization and Allocation**

After enrollment, patients were randomly allocated in a 1:1 ratio into two equal groups (71 patients each). Randomization was performed using a computer-generated random number sequence. Allocation concealment was maintained using sequentially numbered, opaque, sealed envelopes that were opened immediately before surgery. Owing to the nature of surgical interventions, blinding of the operating surgeon was not feasible; however, postoperative outcome assessment was performed by an investigator who was not involved in the surgical procedures whenever possible.

#### **Preoperative Assessment**

A detailed medical history and physical examination were performed for every participant. Baseline demographic variables including age, gender, body weight, height, body mass index, duration of symptoms, smoking status, diabetes mellitus, hypertension, and ASA physical status were recorded on a predesigned data collection proforma.

Routine pre-anesthetic investigations were carried out according to institutional protocols. All patients were counseled regarding both surgical procedures, expected benefits, possible complications, and postoperative follow-up schedule before obtaining written informed consent.

#### **Surgical Technique**

All operations were performed under spinal anesthesia by consultant surgeons experienced in colorectal surgery. Patients received a single prophylactic intravenous dose of ceftriaxone (1 g) approximately 30 minutes before skin incision.

#### **Group A: Lateral Internal Sphincterotomy**

Patients allocated to Group A underwent conventional open lateral internal sphincterotomy. A small incision was made in the Intersphincteric groove, the distal internal anal sphincter was carefully identified and isolated, and the lower portion of the internal sphincter was divided up to the level of the dentate line. Hemostasis was secured, and the wound was left open according to standard surgical practice.

#### **Group B: Anal Advancement Flap**

Patients allocated to Group B underwent anal advancement flap surgery. Following fissurectomy, a well-vascularized Y-V shaped anodermal flap containing skin and subcutaneous tissue was mobilized sufficiently to allow tension-free advancement into the anal canal. The flap was advanced to cover the fissure defect and secured to the distal anal mucosa using absorbable sutures while preserving an adequate vascular pedicle to ensure flap viability.

#### **Postoperative Care and Follow-up**

All patients received standardized postoperative management including analgesics, stool softeners, dietary advice emphasizing high-fiber intake, adequate oral hydration, and warm sitz baths. Patients were discharged according to institutional discharge criteria and were followed in the outpatient department every two weeks for a total of eight weeks after surgery.

#### **Outcome Measures**

The primary outcome measures included:

- Complete fissure healing at eight weeks, defined as complete epithelialization of the fissure with resolution of symptoms on clinical examination.

- Fecal incontinence assessed at the final follow-up visit using the Wexner Fecal Incontinence Score.  
Secondary outcome measures included: postoperative wound infection, recurrence of symptoms during follow-up, and procedure-related complications.

#### Data Collection

Data were collected prospectively using a structured predesigned proforma. After obtaining written informed consent, baseline demographic and clinical characteristics, including age, gender, body mass index (BMI), duration of symptoms, smoking status, diabetes mellitus, hypertension, and ASA physical status, were recorded. Operative details were documented for each patient according to the allocated surgical procedure. Patients were followed at two-week intervals for eight weeks postoperatively. At each follow-up visit, symptom resolution, fissure healing, and procedure-related complications were assessed and recorded. Complete fissure healing was confirmed by clinical examination, while fecal incontinence was evaluated at the final follow-up using the Wexner Fecal Incontinence Score. Secondary outcomes, including postoperative wound infection and recurrence, were also documented. All data were collected by the principal investigator using standardized assessment criteria to ensure consistency and accuracy.

#### Statistical Analysis

Data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 26. Continuous variables including age, BMI, duration of symptoms, and VAS pain score were expressed as mean  $\pm$

standard deviation, whereas categorical variables including gender, ASA status, smoking, diabetes mellitus, hypertension, fissure healing, fecal incontinence, wound infection, and recurrence were presented as frequencies and percentages.

Baseline characteristics between the two groups were compared using the independent-samples *t*-test for continuous variables and the Chi-square test or Fisher's exact test for categorical variables where appropriate. Stratified analysis was performed for potential effect modifiers including age, gender, and BMI. A two-tailed *p*-value of  $\leq 0.05$  was considered statistically significant.

#### Ethical Considerations

Ethical approval was obtained from the Institutional Ethical Review Board of Nishtar Medical University and Hospital, Multan, before commencement of the study. Written informed consent was obtained from every participant before enrollment. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki (2013). Confidentiality and anonymity of all participants were maintained throughout the study, and patients retained the right to withdraw from the study at any stage without affecting their standard medical care.

#### RESULTS

A total of 142 patients diagnosed with chronic anal fissure were included in this randomized controlled trial. Patients were equally allocated into Group A (Lateral Internal Sphincterotomy; *n*=71) and Group B (Anal Advancement Flap; *n*=71). All patients completed the scheduled follow-up period.

Table 1. Baseline Demographic Characteristics of Study Participants

| Variable           | LS Group (n=71) | AFP Group (n=71) | P-value |
|--------------------|-----------------|------------------|---------|
| <b>Age (Years)</b> |                 |                  |         |
| 15–35              | 35 (49.3%)      | 37 (52.1%)       | 0.93    |
| 36–55              | 30 (42.3%)      | 29 (40.8%)       |         |
| >55                | 6 (8.5%)        | 5 (7.0%)         |         |
| <b>Mean Age</b>    | 36.0 $\pm$ 12.2 | 35.5 $\pm$ 11.8  |         |
| <b>Gender</b>      |                 |                  |         |
| Male               | 40 (56.3%)      | 39 (54.9%)       | 0.86    |
| Female             | 31 (43.7%)      | 32 (45.1%)       |         |

Table 2. Comparison of Primary Outcomes between Study Groups

| Outcome                  | LS Group (n=71) | AFP Group (n=71) | P-value      |
|--------------------------|-----------------|------------------|--------------|
| Symptoms resolution      | 51 (71.8%)      | 63 (88.7%)       | <b>0.01</b>  |
| Complete fissure healing | 56 (78.9%)      | 67 (94.4%)       | <b>0.006</b> |

|                    |            |          |              |
|--------------------|------------|----------|--------------|
| Fecal incontinence | 10 (14.1%) | 1 (1.4%) | <b>0.005</b> |
|--------------------|------------|----------|--------------|

Table 3. Comparison of Secondary Outcomes between Study Groups

| Outcome                       | LS Group (n=71) | AFP Group (n=71) | P-value |
|-------------------------------|-----------------|------------------|---------|
| Postoperative wound infection | 9 (12.7%)       | 4 (5.6%)         | 0.14    |
| Recurrence during follow-up   | 7 (9.9%)        | 2 (2.8%)         | 0.08    |

### Interpretation of Results

A total of 142 patients with chronic anal fissure were enrolled and randomized equally into the lateral internal sphincterotomy (LIS) group (n = 71) and the anal advancement flap (AAF) group (n = 71). The estimated mean age of the study participants was  $36.0 \pm 12.2$  years in the LIS group and  $35.5 \pm 11.8$  years in the AAF group. Patients aged 15–35 years constituted the largest proportion in both groups, accounting for 49.3% of the LIS group and 52.1% of the AAF group. Gender distribution was also comparable, with males representing 56.3% of the LIS group and 54.9% of the AAF group. No statistically significant differences were observed in baseline demographic characteristics between the two treatment groups ( $p > 0.05$ ), indicating successful randomization and ensuring comparability of the study population before intervention.

Evaluation of the primary study outcomes demonstrated a clear clinical advantage of anal advancement flap over lateral internal sphincterotomy. At the end of the eight-week follow-up, symptom resolution was achieved in 63 (88.7%) patients in the AAF group compared with 51 (71.8%) patients in the LIS group, representing a statistically significant improvement ( $p = 0.01$ ). Likewise, complete fissure healing occurred in 67 (94.4%) patients treated with AAF, whereas healing was observed in 56 (78.9%) patients undergoing LIS ( $p = 0.006$ ). Most notably, postoperative fecal incontinence developed in only 1 (1.4%) patient in the AAF group compared with 10 (14.1%) patients in the LIS group, demonstrating a significant reduction in continence-related complications following the sphincter-preserving procedure ( $p = 0.005$ ).

Analysis of the secondary outcomes further favored anal advancement flap. Postoperative wound infection occurred in 4 (5.6%) patients in the AAF group compared with 9 (12.7%) patients in the LIS group, while recurrence during follow-up was documented in 2 (2.8%) and 7 (9.9%) patients, respectively. Although these differences did not achieve statistical significance, both complications occurred less frequently following anal advancement flap surgery. Overall, the findings of the present

study indicate that anal advancement flap provides superior short-term clinical outcomes, characterized by higher rates of symptom resolution and fissure healing, together with a substantially lower incidence of postoperative fecal incontinence and fewer postoperative complications than lateral internal sphincterotomy.

### DISCUSSION

The present randomized controlled trial compared lateral internal sphincterotomy and anal advancement flap for the surgical management of chronic anal fissure. Our findings demonstrated that anal advancement flap achieved significantly higher rates of symptom resolution and complete fissure healing while substantially reducing postoperative fecal incontinence compared with lateral internal sphincterotomy. Although wound infection and recurrence were also less frequent following anal advancement flap, these differences were not statistically significant. These findings support the increasing role of sphincter-preserving surgery in the management of chronic anal fissure and are consistent with contemporary colorectal literature. (6–15)

The baseline demographic characteristics of the study population were comparable between the two treatment groups, confirming adequate randomization and minimizing selection bias. The estimated mean age of the participants was  $36.0 \pm 12.2$  years in the lateral internal sphincterotomy (LIS) group and  $35.5 \pm 11.8$  years in the anal advancement flap (AAF) group, with the majority of patients belonging to the 15–35-year age group. In contrast to several international epidemiological studies, which have reported either a slight female predominance or an almost equal gender distribution among patients with chronic anal fissure, our study demonstrated a modest male predominance (55.6%). This finding is consistent with several studies from Pakistan, where male patients accounted for approximately 61–88% of the study population undergoing treatment for chronic anal fissure. The observed difference may reflect regional variations in healthcare-seeking behavior,

sociocultural factors, occupational exposure, dietary habits, referral patterns, and disparities in access to specialized colorectal surgical services. Furthermore, women in conservative societies may be less likely to seek early surgical consultation because of social and cultural barriers, potentially contributing to the higher proportion of male patients observed in South Asian surgical series. Despite this demographic variation, baseline characteristics remained comparable between the two treatment groups, thereby strengthening the internal validity of the study outcomes and supporting the reliability of comparisons between the two surgical interventions. (6,7,16–19).

The principal finding of the present study was the superior clinical effectiveness of anal advancement flap. Symptom resolution was achieved in 88.7% of patients compared with 71.8% following lateral internal sphincterotomy, while complete fissure healing reached 94.4% in the advancement flap group. These findings are consistent with the randomized trial by Tahir et al., who also reported higher healing and symptom resolution rates following anal advancement flap than lateral sphincterotomy. Patti et al. similarly demonstrated excellent healing rates after advancement flap reconstruction owing to improved local vascularity and preservation of anal sphincter integrity. Recent systematic reviews have further concluded that sphincter-preserving procedures provide healing rates comparable to conventional sphincterotomy while reducing long-term functional complications. (6,8,9,10,12)

Preservation of continence remains one of the most important considerations in surgery for chronic anal fissure. In the present study, postoperative fecal incontinence was significantly lower following anal advancement flap (1.4%) than lateral internal sphincterotomy (14.1%). These findings are clinically important because impairment of continence can substantially reduce postoperative quality of life. Similar observations have been reported by Asefa and Awedew, whose recent meta-analysis demonstrated lower continence disturbances with sphincter-preserving techniques compared with conventional sphincterotomy. Tsunoda and Kusanagi also highlighted the value of advancement flap procedures in maintaining sphincter function while promoting rapid wound healing. Furthermore, the 2023 American Society of Colon and Rectal Surgeons Clinical Practice

Guideline recommends careful patient selection and consideration of sphincter-preserving procedures in patients at increased risk of postoperative incontinence. (8,10,11,15)

Although postoperative wound infection and recurrence occurred less frequently after anal advancement flap, statistical significance was not achieved. Similar findings have been reported in previous randomized trials, where recurrence rates remained low following both procedures but tended to favor advancement flap because of improved tissue perfusion and reduced ischemia. Continued follow-up beyond eight weeks may further clarify long-term recurrence patterns and functional outcomes. Future multicenter randomized trials with larger sample sizes and longer follow-up are warranted to validate these observations and determine the most appropriate surgical approach for different patient populations. (6,9,10,11,16–20)

Overall, the findings of the present study suggest that anal advancement flap is an effective sphincter-preserving alternative to lateral internal sphincterotomy. The procedure provides excellent fissure healing and symptom resolution while minimizing postoperative fecal incontinence, thereby offering a favorable balance between efficacy and preservation of anorectal function. These results contribute additional evidence supporting the growing role of anal advancement flap in the surgical management of chronic anal fissure.

## CONCLUSION

The findings of this randomized controlled trial demonstrate that both lateral internal sphincterotomy (LIS) and anal advancement flap (AAF) are effective surgical procedures for the treatment of chronic anal fissure. However, anal advancement flap was associated with significantly higher rates of symptom resolution and complete fissure healing, together with a markedly lower incidence of postoperative fecal incontinence compared with lateral internal sphincterotomy. Although postoperative wound infection and recurrence were also less frequent following anal advancement flap, these differences were not statistically significant. Overall, the results suggest that anal advancement flap is a safe, effective, and sphincter-preserving surgical technique that offers superior short-term functional and clinical outcomes. It may therefore be considered a preferable surgical option, particularly for patients at increased risk of postoperative continence impairment.

## RECOMMENDATIONS

Based on the findings of the present study, anal advancement flap should be considered a valuable sphincter-preserving alternative to lateral internal sphincterotomy in the surgical management of chronic anal fissure, especially in patients with a high risk of postoperative fecal incontinence. Careful patient selection and individualized surgical decision-making remain essential to optimize clinical outcomes. Further multicenter randomized controlled trials with larger sample sizes and longer follow-up periods are recommended to evaluate long-term fissure healing, recurrence, continence status, patient-reported quality of life, and cost-effectiveness. Future studies should also investigate the role of anal advancement flap in specific high-risk populations, including multiparous women, elderly patients, and individuals with pre-existing sphincter dysfunction, to further define its place in contemporary colorectal surgical practice.

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