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Research Article

Topical 0.3% Nifedipine–Lidocaine Versus Lateral Internal Anal Sphincterotomy in the Management of Anal Fissure: A Non-Randomized Controlled Trial

Divin George Jose[1]; Jacob Jayakar[2]

[1]Resident, Department of General Surgery, Pondicherry Institute of Medical Sciences (PIMS), Puducherry, India
[2]Professor & Head, Department of General Surgery, Pondicherry Institute of Medical Sciences (PIMS), Puducherry, India

*Corresponding Author
Dr. Divin George Jose, Department of General Surgery, PIMS, Puducherry – 605014, India

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Abstract: ***Introduction:*** Anal fissure is a painful anorectal disorder managed by chemical or surgical sphincterotomy. Lateral internal anal sphincterotomy (LIS) is the established standard, but carries a risk of fecal incontinence. Topical 0.3% nifedipine with 1.5% lidocaine offers a non-invasive alternative; however, comparative evidence in South Asian outpatient settings remains limited.**Objective:** To compare pain relief (Visual Analogue Scale [VAS]) and fissure healing at 12 weeks between topical 0.3% nifedipine–lidocaine and LIS in adult patients with anal fissure.**Methods:** A hospital-based, prospective, non-randomized controlled trial was conducted at the Department of General Surgery, PIMS, Puducherry (March 2024 – February 2026). One hundred and fifty adults with acute, chronic, or recurrent anal fissure were allocated to Group A (topical nifedipine–lidocaine; n=75) or Group B (LIS; n=75) based on clinical indication and informed patient preference. Standardized supportive care was provided to both arms. Primary outcome was VAS pain score at 12 weeks; secondary outcomes included fissure healing rate, time-to-healing, adverse events (particularly minor incontinence), and composite treatment success (healing plus VAS ≤2).**Results:** Baseline characteristics were comparable except for a higher proportion of acute fissures in Group A (64.0% vs. 38.7%; p=0.008). At 12 weeks, Group A achieved significantly lower mean VAS pain scores than Group B (1.9±1.2 vs. 2.8±1.5; difference −0.9, 95%CI −1.4 to −0.4; p<0.001). Clinically meaningful pain relief (VAS reduction >50%) was achieved by 96.0% vs. 85.3% (p=0.02). Healing at 12 weeks was 94.7% vs. 77.3% (risk difference 17.3%, 95%CI 7.1–27.6; p<0.001). Median time-to-healing was shorter with nifedipine (6.0 vs. 8.0 weeks). Minor incontinence was markedly higher after LIS (20.0% vs. 2.7%; p<0.001). Incontinence-free healing was 92.0% (Group A) vs. 57.3% (Group B).**Conclusion:** Topical 0.3% nifedipine–lidocaine achieved superior pain relief, comparable or superior healing, and a markedly safer functional profile relative to LIS at 12 weeks. These findings support a step-up strategy in which topical nifedipine is offered as first-line therapy, reserving LIS for refractory, recurrent, or preference-driven surgical candidates.

Keywords: Anal fissure; nifedipine; lateral internal sphincterotomy; chemical sphincterotomy; VAS; pain relief; fissure healing; incontinence

INTRODUCTION

Anal fissure is a common, highly painful anorectal condition defined as a linear tear or ulcer of the anoderm distal to the dentate line, typically located in the posterior midline.1 An acute fissure, following defecatory trauma, may heal spontaneously with conservative measures. When symptoms persist beyond six weeks, the lesion is considered chronic, sustained by a self-perpetuating pain–spasm–ischemia cycle involving internal anal sphincter (IAS) hypertonia, raised resting anal pressure, and impaired anodermal perfusion.1–4 Clinical consequences include severe defecation-associated pain, bleeding per rectum, fear of defecation, constipation, and measurable impairment of quality of life.

Lateral internal sphincterotomy (LIS) is the established definitive surgical treatment for chronic anal fissure, achieving healing rates exceeding 90% in multiple series.5,6 By partially dividing the IAS, LIS reliably reduces resting anal pressure and restores anodermal perfusion. However, the procedure carries a clinically meaningful risk of transient or permanent fecal incontinence, a trade-off that limits its universal first-line use—particularly in younger patients, women, and those with baseline sphincter vulnerability.7–10

Pharmacological "chemical sphincterotomy" with topical calcium channel blockers (CCBs) offers a non-invasive, continence-sparing alternative. Topical nifedipine (commonly 0.3%) combined with lidocaine has accumulated supportive evidence, with reported healing rates of 73–94% over 6–12 weeks and generally mild, self-limiting adverse effects.7,11–14 In a pivotal randomized double-blind trial, Perrotti et al. demonstrated that 0.3% topical nifedipine with lidocaine achieved high healing rates and favorable tolerability, supporting its use as a first-line medical option.7 However, concerns persist regarding adherence-dependent outcomes, slower initial response, and higher long-term recurrence compared with LIS.11–14

Despite substantial global evidence, regionally applicable head-to-head data comparing topical 0.3% nifedipine (a concentration commonly used in Indian practice) with LIS using standardized VAS-based pain quantification, serial follow-up, and detailed adverse-event profiling in South Asian outpatient settings remain limited.10,11 In resource-constrained healthcare environments, an effective outpatient medical regimen may reduce surgical burden, hospitalization costs, and service load while improving access to care. The present non-randomized controlled trial was therefore designed to generate locally applicable comparative effectiveness data to inform patient-centered decision-making in routine general surgery practice.

AIM AND OBJECTIVES

Aim: To compare the effectiveness of topical 0.3% nifedipine plus 1.5% lidocaine ointment with lateral internal anal sphincterotomy in terms of pain relief and fissure healing in adult patients with anal fissure over a 12-week follow-up period.

Primary Objective: To compare pain relief measured by the Visual Analogue Scale (VAS) at 12 weeks between the two treatment groups.

Secondary Objectives: (1) To compare fissure healing rates at 2, 6, and 12 weeks; (2) to determine median time-to-healing; (3) to assess composite treatment success (healing plus VAS ≤2 at 12 weeks); (4) to compare adverse events, particularly minor fecal incontinence; and (5) to evaluate incontinence-free healing as a patient-centered functional outcome.

MATERIALS AND METHODS

Study Design and Setting

This was a hospital-based, prospective, non-randomized controlled trial conducted in the Department of General Surgery, Pondicherry Institute of Medical Sciences (PIMS), a tertiary-care teaching hospital in Puducherry, India. The study period was March 2024 to February 2026. The non-randomized parallel-arm design was adopted for ethical and pragmatic reasons, as uniform random allocation to surgery or topical therapy is constrained in real-world outpatient practice by patient preference, clinical indication, and fitness for anesthesia. The study was registered with the Clinical Trials Registry–India and approved by the Institutional Ethics Committee, PIMS.

Study Population

Eligible participants were adults (age >18 years, either sex) presenting to the General Surgery OPD with clinically diagnosed acute, chronic, or recurrent anal fissure. Inclusion criteria: acute fissure (symptoms <6 weeks); chronic fissure (>6 weeks, with features such as indurated edges, ulcer base, sentinel pile, or hypertrophied anal papilla); recurrent fissure; and written informed consent with commitment to follow-up. Exclusion criteria: fissure associated with significant coexisting anorectal disease (haemorrhoids, high fistula, abscess); suspected anorectal malignancy; prior fissure surgery; known allergy or contraindication to nifedipine or lidocaine; pregnancy or lactation; severe uncontrolled comorbidities; and inability or refusal to attend follow-up.

Sample Size

Sample size was calculated based on anticipated pain-relief proportions at 12 weeks derived from comparative data by Katsinelos et al.[9] Assuming 80% pain relief with nifedipine and 96% with LIS, at two-sided α=0.05 with 80% power, a minimum of 68 participants per arm was required. Adding 10% for anticipated attrition yielded a final target of 75 per group (total N=150).

Allocation and Interventions

Following consent and baseline assessment, participants were allocated by clinical indication and informed patient preference to:

Group A (Nifedipine arm; n=75): Topical 0.3% nifedipine with 1.5% lidocaine ointment (Fidonal®) applied twice daily (~2 cm, inserted ≥1.5 cm into the anal canal) for 12 weeks. All patients received standardized supportive care: high-fibre diet, adequate oral hydration, stool softeners, and warm sitz baths three times daily. Patients were educated on VAS scoring and ointment adherence.

Group B (Surgical LIS arm; n=75): Lateral internal sphincterotomy performed under regional or general anesthesia using a standardized open or closed technique by a qualified surgeon. Post-operative management included analgesics, stool softeners, dietary counselling, and wound care. Equivalent VAS education was provided.

Follow-up and Outcome Assessment

All patients were followed at 2, 6, and 12 weeks. At each visit, the following were systematically assessed: (1) pain intensity on a 0–10 VAS (0="no pain"; 10="worst imaginable pain"); (2) fissure healing status on clinical inspection and digital rectal examination (healing defined as complete re-epithelialization with absence of pain and bleeding on defecation at two successive visits); (3) adverse events (headache, flushing, anal itching, minor incontinence); and (4) medication adherence. Recurrence among healed patients was documented at 12 weeks.

Statistical Analysis

Continuous variables were summarized as mean ± standard deviation (SD) or median with interquartile range (IQR), as appropriate. Categorical variables were reported as frequency and percentage. Between-group comparisons for continuous variables used the independent-samples t-test or Mann–Whitney U test (non-normal distribution); categorical variables were compared with the Chi-square test or Fisher's exact test. Paired t-tests were used for within-group VAS changes

from baseline. Multivariable binary logistic regression was performed to estimate adjusted odds ratios (aOR) for healing, controlling for age, fissure duration, comorbidities, and baseline VAS. Relative risk (RR) was calculated for incontinence. Statistical significance was set at two-sided $p<0.05$. Analyses were performed using SPSS v26 (IBM, USA). Intention-to-treat analysis was the primary approach.

were strictly maintained throughout the study.

RESULTS

A total of 150 adult patients with anal fissure were enrolled and allocated: Group A (n=75, topical nifedipine–lidocaine) and Group B (n=75, surgical LIS). Both groups completed the 12-week follow-up with full intention-to-treat analysis.

Baseline Demographic and Anthropometric Characteristics

Baseline demographic and anthropometric characteristics were comparable between groups (Table 1). Mean age was 46.76±10.72 years in Group A and 44.57±14.79 years in Group B (p=0.376). Sex distribution (males: 60.0% vs. 57.3%) and BMI classification were similar (p=0.740 and p=0.940, respectively), confirming demographic equivalence at baseline.

Characteristic	Group A (n=75)	Group B (n=75)	Statistical Test	p-value
Age (years), mean±SD	46.76±10.72	44.57±14.79	Mann-Whitney U=3048	0.376
Height (cm), mean±SD	155.39±5.69	155.95±7.07	Mann-Whitney U=2752	0.820
Weight (kg), mean±SD	73.65±6.33	73.07±5.69	Mann-Whitney U=2975	0.541
Sex: Male, n (%)	45 (60.0%)	43 (57.3%)	χ^2=0.11, df=1	0.740
Sex: Female, n (%)	30 (40.0%)	32 (42.7%)	—	—
BMI Normal, n (%)	30 (40.0%)	32 (42.7%)	χ^2=0.12, df=2	0.940
BMI Overweight, n (%)	35 (46.7%)	33 (44.0%)	—	—
BMI Obese Class I, n (%)	10 (13.3%)	10 (13.3%)	—	—

SD=standard deviation; BMI=body mass index. p-values: Mann-Whitney U for continuous variables; Chi-square for categorical variables.

Table 1. Baseline demographic and anthropometric characteristics of study participants.

Baseline Symptoms, Fissure Classification, and Comorbidities

Presenting symptoms were comparable between groups at baseline (Table 2). Pain during defecation was present in 60.0% vs. 57.3% (p=0.728); bleeding in 46.7% vs. 58.7% (p=0.229); constipation in 29.3% vs. 32.0% (p=0.742); and hard stools in 49.3% in both groups (p=1.000). Comorbidity profiles were balanced: diabetes mellitus (20.0% vs. 21.3%), hypertension (28.0% vs. 28.0%), dyslipidaemia (21.3% vs. 22.7%), and bronchial asthma (5.3% vs. 5.3%) were similar in both arms. However, the distribution of final fissure diagnosis differed significantly (p=0.008): acute fissures predominated in Group A (64.0%), while chronic fissures were more frequent in Group B (46.7%), reflecting the allocation pattern of this non-randomized design.

Variable	Group A n (%)	Group B n (%)	Statistical Test	p-value
Pain during defecation	45 (60.0%)	43 (57.3%)	χ^2=0.12, df=1	0.728

Bleeding during defecation	35 (46.7%)	44 (58.7%)	χ^2=1.45, df=1	0.229
Constipation	22 (29.3%)	24 (32.0%)	χ^2=0.11, df=1	0.742
Hard stools	37 (49.3%)	37 (49.3%)	χ^2=0.00, df=1	1.000
Acute fissure	48 (64.0%)	29 (38.7%)	χ^2=9.66, df=2	**0.008***
Chronic fissure	21 (28.0%)	35 (46.7%)	—	—
Recurrent fissure	6 (8.0%)	11 (14.7%)	—	—
Diabetes mellitus	15 (20.0%)	16 (21.3%)	χ^2=0.03, df=1	0.868
Hypertension	21 (28.0%)	21 (28.0%)	χ^2=0.00, df=1	1.000
Dyslipidaemia	16 (21.3%)	17 (22.7%)	χ^2=0.04, df=1	0.841

**Statistically significant ($p<0.05$). χ^2=Chi-square statistic; df=degrees of freedom.*

Table 2. Baseline presenting symptoms, fissure classification, and comorbidities.

Primary Outcome: VAS Pain Scores at 12 Weeks

The primary outcome demonstrated statistically significant superiority of topical nifedipine over LIS for pain relief at 12 weeks (Table 3). Group A recorded a mean VAS of 1.9±1.2 compared to 2.8±1.5 in Group B, yielding a between-group difference of −0.9 VAS units (95%CI: −1.4 to −0.4; p<0.001). Within-group analysis confirmed large improvements from baseline in both arms (Group A: −7.1 points, 95%CI −7.4 to −6.8; Group B: −6.2 points, 95%CI −6.6 to −5.8; both p<0.001), but the magnitude was greater with nifedipine. Clinically meaningful pain relief (VAS reduction >50%) was achieved by 96.0% vs. 85.3% of patients, respectively (p=0.02).

Time Point	**Group A Mean (SD)**	**Group B Mean (SD)**	**Between-group Difference (95%CI)**	**p-value**
Baseline	9.0 (0.2)	9.0 (0.2)	0.0 (—)	0.98
2 Weeks	7.1 (1.1)	6.8 (1.2)	+0.3 (−0.1 to 0.7)	0.12
6 Weeks	4.2 (1.0)	4.8 (1.3)	−0.6 (−0.9 to −0.2)	**0.008***
12 Weeks (Primary)	1.9 (1.2)	2.8 (1.5)	−0.9 (−1.4 to −0.4)	**<0.001***
Within-group change (baseline→12 wk)	−7.1 (−7.4 to −6.8)	−6.2 (−6.6 to −5.8)	—	**<0.001***

*Values in "Within-group change" row denote 95%CI. SD=standard deviation; CI=confidence interval. *Statistically significant.*

Table 3. VAS pain scores over time (longitudinal trajectory).

Secondary Outcome: Fissure Healing Rates

Healing rates increased over time in both groups but followed distinct temporal trajectories (Table 4). Early healing at 2 weeks was superior in Group B (32/75, 42.7% vs. 18/75, 24.0%; p=0.019), consistent with the immediate

mechanical effect of sphincterotomy. By 6 weeks, Group A had overtaken Group B (52/75, 69.3% vs. 35/75, 46.7%; p=0.005). At 12 weeks, complete healing was achieved in 71/75 (94.7%) in Group A vs. 58/75 (77.3%) in Group B (risk difference 17.3%, 95%CI 7.1–27.6; p<0.001). Median time-to-healing was shorter with nifedipine (6.0 weeks, IQR 4.0–8.0) than with LIS (8.0 weeks, IQR 6.0–10.0). Time-to-healing distribution significantly favoured nifedipine (χ^2=10.23, df=2, p=0.006).

Time Point	Group A n/N (%)	Group B n/N (%)	Risk Difference (95%CI)	p-value
2 Weeks	18/75 (24.0%)	32/75 (42.7%)	−18.7% (−32.5 to −4.9)	**0.019***
6 Weeks	52/75 (69.3%)	35/75 (46.7%)	+22.6% (8.6 to 36.6)	**0.005***
12 Weeks	71/75 (94.7%)	58/75 (77.3%)	+17.3% (7.1 to 27.6)	**<0.001***
Median time-to-healing (IQR)	6.0 wk (4.0–8.0)	8.0 wk (6.0–10.0)	Δ=2 weeks	—

*IQR=interquartile range; CI=confidence interval. *Statistically significant.*

Table 4. Fissure healing rates at each follow-up timepoint and median time-to-healing.

Adverse Events and Safety Profile

Treatment-specific adverse events are presented in Table 5. Headache was significantly more frequent with nifedipine (15/75, 20.0% vs. 5/75, 6.7%; p=0.019), reflecting the vasodilatory mechanism of topical CCBs. Minor fecal incontinence was markedly more frequent after LIS (15/75, 20.0% vs. 2/75, 2.7%; p<0.001), yielding a relative risk (RR) of 0.13 (95%CI: 0.03–0.60) for nifedipine—representing >7-fold lower incontinence risk compared with surgical sphincterotomy. Flushing (4.0% vs. 0.0%; p=0.250) and anal itching (6.7% vs. 9.3%; p=0.550) were not statistically different.

Adverse Event	Group A n (%)	Group B n (%)	RR / Test Statistic	p-value
Headache	15 (20.0%)	5 (6.7%)	χ^2=5.47	**0.019***
Minor Incontinence	2 (2.7%)	15 (20.0%)	RR=0.13 (0.03–0.60)	**<0.001***
Flushing	3 (4.0%)	0 (0.0%)	Fisher's exact	0.250
Anal itching	5 (6.7%)	7 (9.3%)	χ^2=0.36	0.550

**Statistically significant.*

Table 5. Adverse events by treatment group. RR=relative risk with 95%CI shown for incontinence.

Composite and Patient-Centered Outcomes

Table 6 summarises composite and patient-centered efficacy endpoints. Composite treatment success (healing plus VAS ≤2 at 12 weeks) was achieved in 56/75 (74.7%) in Group A vs. 45/75 (60.0%) in Group B (risk difference 14.7%, 95%CI −0.2 to 29.5; p=0.082), showing a clinically relevant but non-significant trend favouring nifedipine. Among healed patients, early recurrence by 12 weeks was numerically higher with nifedipine (8/71, 11.3% vs. 2/58, 3.5%; Fisher exact p=0.058), suggesting superior durability with LIS. Incontinence-free healing—the most clinically meaningful patient-centered composite—was achieved by 92.0% of Group A vs. 57.3% of Group B, a 34.7 percentage-point superiority favouring topical therapy.

Outcome Metric	Group A	Group B	Effect Measure (95%CI)	p-value

Composite success (healing + VAS≤2), n/N (%)	56/75 (74.7%)	45/75 (60.0%)	RD +14.7% (−0.2 to 29.5)	0.082
VAS reduction >50% at 12 wk, %	96.0%	85.3%	RD +10.7%	**0.02***
Recurrence (among healed), n/N (%)	8/71 (11.3%)	2/58 (3.5%)	RR=3.3	0.058
Incontinence-free healing, %	92.0%	57.3%	Δ +34.7%	**<0.001***

**Statistically significant (p<0.05).*

Table 6. Composite efficacy and patient-centered outcomes at 12 weeks. RD=risk difference; RR=relative risk.

Multivariable Adjusted Analysis and Subgroup Outcomes

Multivariable logistic regression confirmed independent superiority of nifedipine for healing after adjusting for age, fissure duration, comorbidities, and baseline VAS (aOR 4.8, 95%CI 1.9–12.1; p<0.001) (Table 7). Subgroup analysis by sex revealed consistent healing superiority with nifedipine regardless of sex (males: 94.4% vs. 76.3%; females: 95.0% vs. 78.3%; treatment-sex interaction p=0.12). Healing by fissure duration was broadly comparable: acute fissures healed in 85.0% (nifedipine) vs. 82.0% (LIS; p=0.650); chronic fissures in 75.0% vs. 85.0% (p=0.210).

Analysis / Predictor	**Group A (Nifedipine)**	**Group B (LIS)**	**p-value**
aOR for healing – nifedipine vs. LIS (adjusted)	4.8 (95%CI: 1.9–12.1)	Reference	**<0.001***
Healing – Males, %	94.4%	76.3%	Interaction p=0.12
Healing – Females, %	95.0%	78.3%	—
Healing – Acute fissure (<6 wk), %	85.0%	82.0%	0.650
Healing – Chronic fissure (≥6 wk), %	75.0%	85.0%	0.210
Healing in patients with comorbidities, %	93.3%	73.3%	**<0.05***

*Statistically significant.

Table 7. Multivariable adjusted odds ratio (aOR) for healing and subgroup analyses. aOR adjusted for age, fissure duration, comorbidities, and baseline VAS.

Figures

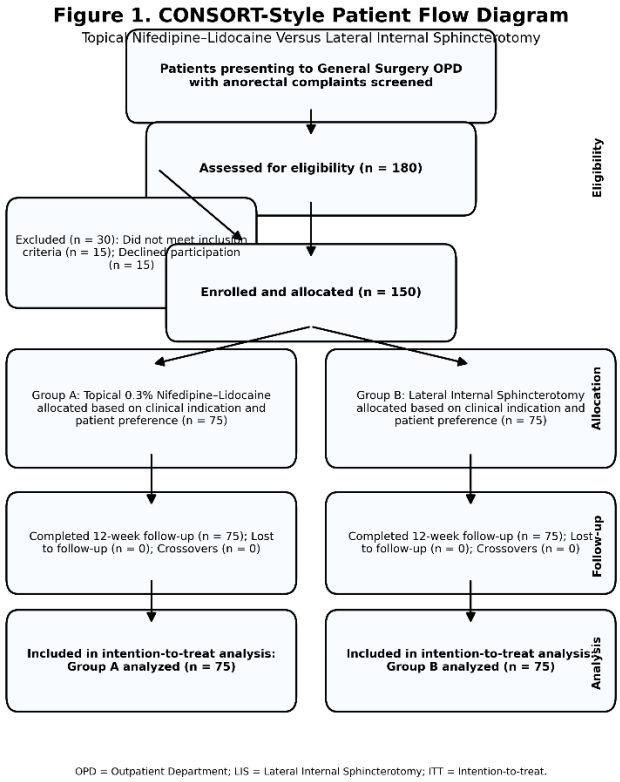

Figure 1. CONSORT-Style Patient Flow Diagram

All patients presenting to the General Surgery OPD with anorectal complaints were screened. Of 180 assessed for eligibility, 30 were excluded (15 did not meet inclusion criteria; 15 declined participation). A total of 150 were enrolled and allocated to Group A (Topical Nifedipine–Lidocaine; n=75) or Group B (Lateral Internal Sphincterotomy; n=75) based on clinical indication and patient preference. All 150 completed 12-week follow-up and were included in the intention-to-treat analysis. Group A: 75 analyzed; Group B: 75 analyzed. No crossovers occurred.

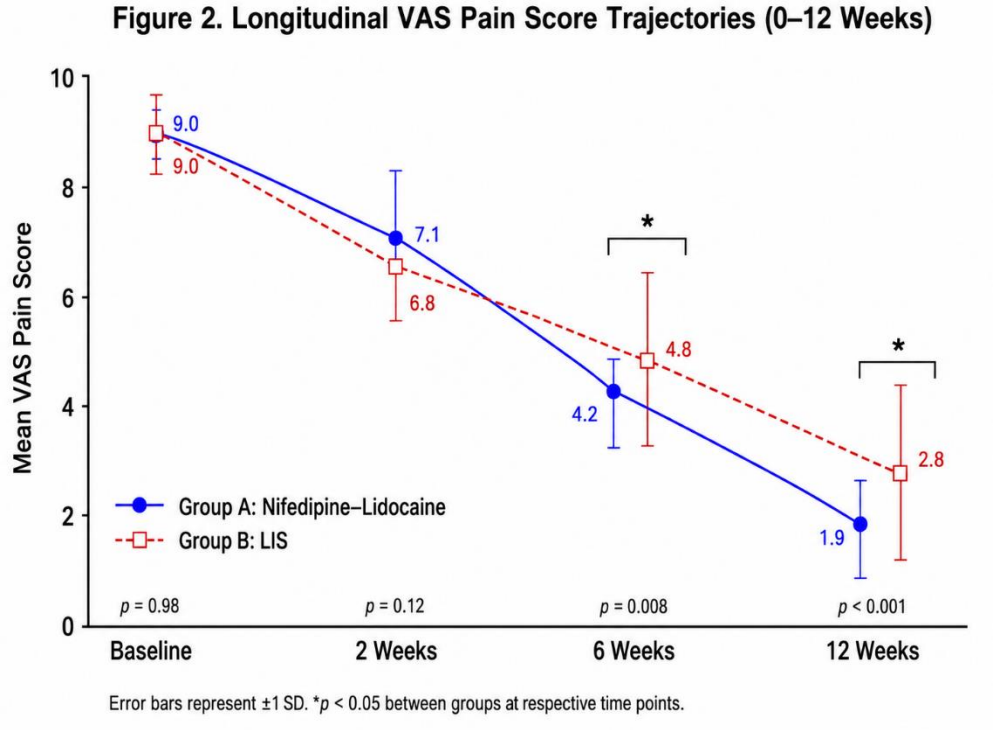

Figure 2. Longitudinal VAS Pain Score Trajectories (0–12 Weeks)

Line graph showing mean VAS pain scores (±SD) at baseline, 2, 6, and 12 weeks for Group A (Nifedipine–Lidocaine; filled circles, blue) and Group B (LIS; open squares, red). Both groups commenced at equivalent high pain levels (mean VAS 9.0±0.2). Group B showed a marginally faster early decline at 2 weeks (6.8±1.2 vs. 7.1±1.1; p=0.12). From 6 weeks onward, Group A demonstrated significantly lower VAS scores (4.2±1.0 vs. 4.8±1.3 at week 6, p=0.008; 1.9±1.2 vs. 2.8±1.5 at week 12, p<0.001). Error bars represent ±1 SD. *p<0.05 between groups at respective time points.

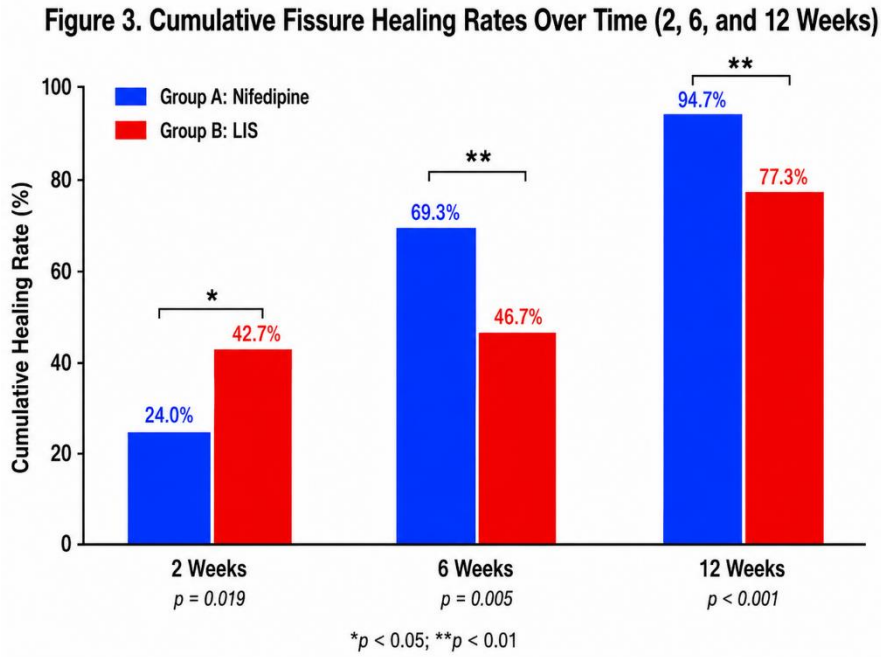

Figure 3. Cumulative Fissure Healing Rates Over Time (2, 6, and 12 Weeks)

Grouped bar chart depicting cumulative fissure healing rates (%) at 2, 6, and 12 weeks for Group A (nifedipine; blue bars) and Group B (LIS; red bars). At 2 weeks, Group B showed superior healing (42.7% vs. 24.0%; p=0.019). At 6 weeks, Group A overtook Group B (69.3% vs. 46.7%; p=0.005). By 12 weeks, both groups achieved high and comparable rates (94.7% vs. 77.3%; p<0.001). Significance markers (*p<0.05; **p<0.01) shown at the top of respective bar pairs.

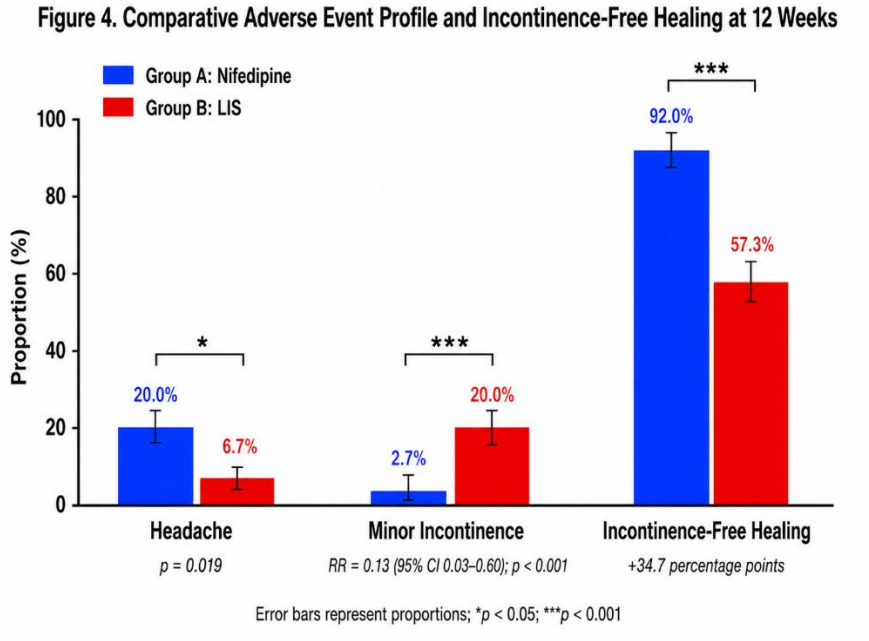

Figure 4. Comparative Adverse Event Profile and Incontinence-Free Healing at 12 Weeks

Grouped bar chart comparing key adverse events and the patient-centered outcome of incontinence-free healing between Group A (nifedipine; blue) and Group B (LIS; red). Headache was significantly higher with nifedipine (20.0% vs. 6.7%; p=0.019); minor incontinence was markedly higher after LIS (20.0% vs. 2.7%; RR=0.13, 95%CI 0.03–0.60; p<0.001). Incontinence-free healing, shown on the right panel, was 92.0% in Group A vs. 57.3% in Group B—a 34.7

percentage-point superiority favouring topical nifedipine. Error bars represent proportions; significance levels (*p<0.05; ***p<0.001) indicated.

DISCUSSION

This non-randomized controlled trial compared topical 0.3% nifedipine with 1.5% lidocaine against lateral internal anal sphincterotomy in 150 adults with anal fissure managed in a South Indian tertiary-care outpatient setting. The two cohorts were broadly comparable in baseline demographics, symptom burden, and comorbidity profiles, with the clinically anticipated exception that acute fissures were more prevalent in the medical arm and chronic fissures in the surgical arm—a distribution consistent with real-world allocation patterns reported in comparable Indian and international observational comparisons.[11]

Pain Outcomes (Primary Endpoint)

Pain reduction was substantial in both groups from the baseline equivalent of VAS 9.0. Topical nifedipine demonstrated significantly superior pain control at 12 weeks (mean VAS 1.9 vs. 2.8; p<0.001) and a greater proportion of clinically meaningful pain responders (VAS reduction >50%: 96.0% vs. 85.3%; p=0.02). These findings are consistent with the physiological basis of chemical sphincterotomy: nifedipine reduces IAS tone, improves anodermal perfusion, and disrupts the pain–spasm–ischemia cycle that sustains fissures.[1–4] In the pivotal randomized trial by Perrotti et al.,[7] topical nifedipine–lidocaine produced meaningful pain reduction and favorable tolerability over 6–8 weeks. The present data extend these findings to 12 weeks under pragmatic outpatient conditions, showing that a structured adherent regimen can yield analgesic outcomes at least as favorable as and in this dataset, superior to definitive sphincterotomy.[15-19]

Healing Trajectory and Time-to-Event

Complete fissure healing at 12 weeks was significantly higher in Group A (94.7% vs. 77.3%; p<0.001). The healing trajectories were temporally distinct: LIS showed superior early healing at 2 weeks (42.7% vs. 24.0%; p=0.019), consonant with the immediate mechanical effect of sphincterotomy; nifedipine overtook at 6 weeks (69.3% vs. 46.7%; p=0.005) and remained ahead at 12 weeks. This "catch-up" pattern is biologically plausible: chemical sphincterotomy progressively reduces sphincter tone, improves perfusion, and facilitates re-epithelialization over 6–12 weeks, especially when bowel regulation and adherence are optimized.[7–12] Median time-to-healing was shorter with nifedipine (6.0 vs. 8.0 weeks), partly attributable to the higher proportion of acute, less-established fissures in Group A and the protocol-mandated intensive adjunctive measures.[20-26] Subgroup analyses showed no significant difference in healing by sex or fissure duration, suggesting therapeutic equivalence in acute fissures and an acceptable, if numerically inferior, response with nifedipine for chronic disease.[9–11,27]

Safety and Functional Outcomes

The safety profile strongly favored nifedipine. Minor incontinence—the most clinically critical trade-off of LIS—occurred in 20.0% of surgical patients vs. 2.7% with nifedipine (RR=0.13; p<0.001), consistent with published LIS series and systematic review estimates.[6,17,28-31] This risk is clinically significant even when mild, as even transient incontinence impairs quality of life and influences future treatment decisions. The composite outcome of incontinence-free healing (92.0% vs. 57.3%) represents the most patient-centered summary of effectiveness and safety, and strongly favors the topical approach. Headache, the dominant adverse effect of nifedipine, was mild and self-limiting in the majority and is consistent with its vasodilatory mechanism.[7,20]

Recurrence and Durability

Recurrence at 12 weeks among healed patients trended higher with nifedipine (11.3% vs. 3.5%; Fisher exact p=0.058). Although not reaching conventional significance, this direction aligns with the established literature: chemical sphincterotomy is reversible, and resumption of sphincter tone upon treatment cessation can reinitiate the ischemic cycle in a subset of patients, particularly those with persistent constipation.[12,31] These findings support structured follow-up, continued bowel-habit counselling after completion of medical therapy, and timely escalation to LIS in non-responders or those who relapse—consistent with contemporary step-up algorithms.[31–34]

Comparison with Existing Literature

The present findings are broadly consistent with comparative studies from South Asian and international settings. Shahi et al.10 and Chauhan et al.[11] reported meaningful pain reduction and satisfactory healing with topical nifedipine versus LIS in pragmatic outpatient contexts, while affirming LIS as more definitive for refractory disease. Katsinelos et al.[9] demonstrated that nifedipine achieves substantial early pain relief and healing but showed higher long-term recurrence compared with LIS. Libertiny et al.[8] reported comparable short-term outcomes for topical diltiazem versus LIS, reinforcing the class-level efficacy of topical CCBs. Systematic reviews by Nelson et al.[31] and evidence syntheses consistently conclude that LIS offers the highest healing durability and lowest recurrence, while topical therapies are clinically important for continence preservation and outpatient feasibility—conclusions congruent with the present trial.

Clinical Implications

These results support a step-up, patient-centered treatment strategy in which topical 0.3% nifedipine–lidocaine is offered as first-line outpatient therapy—particularly for patients who are concerned about

incontinence, prefer to avoid hospitalization, or have acute fissures. LIS should be reserved for refractory disease, recurrence after adequate medical therapy, or patients who prefer definitive surgical cure with full counselling regarding continence risk. In resource-constrained South Indian outpatient settings, optimized medical therapy may reduce surgical workload and inpatient utilization without compromising short-term patient outcomes, aligning with guideline recommendations from the American Society of Colon and Rectal Surgeons33 and the American College of Gastroenterology.[34]

Limitations

Several limitations must be acknowledged. First, the non-randomized allocation, with a higher proportion of acute fissures in the medical arm and chronic fissures in the surgical arm, introduces confounding by indication and may influence healing and time-to-event comparisons. Multivariable adjustment was performed, but unmeasured confounders cannot be excluded. Second, the 12-week follow-up, while clinically meaningful, is insufficient to characterize long-term recurrence and durability; longer follow-up (12–24 months) is required to determine whether the superior pain outcomes and incontinence-adjusted success with nifedipine persist. Third, the single-centre design and patient-preference–driven allocation limit generalisability. Fourth, discrepancies in some healing estimates across analytical datasets in the original thesis underline the importance of pre-specified primary analyses in future trials. Fifth, anorectal manometry was not employed to objectively quantify sphincter pressure changes, which limits mechanistic interpretation.

CONCLUSION

In this prospective non-randomized controlled trial from a South Indian tertiary-care outpatient setting, topical 0.3% nifedipine with 1.5% lidocaine demonstrated statistically significant superiority over lateral internal anal sphincterotomy for pain relief at 12 weeks, with higher complete healing rates, shorter median time-to-healing, and a markedly safer functional profile including a >7-fold lower risk of minor fecal incontinence. Composite treatment success and incontinence-free healing strongly favored the topical approach. Although early healing at 2 weeks was superior with LIS and a numerically higher recurrence rate was observed with nifedipine at 12 weeks, these findings collectively support topical 0.3% nifedipine–lidocaine as an effective, safe, and continence-preserving first-line outpatient therapy for adult anal fissure. Lateral internal anal sphincterotomy retains its role as a definitive treatment for refractory, recurrent, or preference-driven surgical cases. Future long-term randomized controlled trials with manometric endpoints are warranted to confirm the durability of these findings.

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