Journal of Health, Wellness and Community Research
ISSN: 3007, 0570

OPEN ACCESS

JHWCR

Type: Original Article
Published: 23 October 2025
Volume: III, **Issue:** XV
DOI: https://doi.org/10.61919/zra8qw05

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Received 24, 09, 25
Accepted 03, 10, 2025

Authors' Contributions
Concept: BB; Design: SK; Data Collection: SW; Analysis: AM; Drafting: BB.

Declarations
No funding was received for this study. The authors declare no conflict of interest. The study received ethical approval. All participants provided informed consent.

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Efficacy of Lateral Internal Sphincterotomy with Chemical (Topical 0.2% GTN) Sphincterotomy for the Treatment of Chronic Anal Fissure

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ABSTRACT

Background: *Chronic anal fissure (CAF) is a painful longitudinal tear of the anoderm, commonly caused by hypertonia of the internal anal sphincter leading to local ischemia and impaired healing. While lateral internal sphincterotomy (LIS) remains the gold standard surgical treatment, topical 0.2% glyceryl trinitrate (GTN) ointment offers a noninvasive chemical sphincterotomy alternative. However, comparative efficacy data across populations, particularly in South Asian settings, remain limited.* ***Objective****: To compare the efficacy and safety of lateral internal sphincterotomy versus topical 0.2% glyceryl trinitrate in the management of chronic anal fissure.* ***Methods****: This randomized controlled study was conducted at Bolan Medical Complex Hospital, Quetta, over one year. Thirty adult patients with chronic anal fissure were randomized equally into two groups: Group A underwent LIS, and Group B received topical 0.2% GTN twice daily for eight weeks. Clinical outcomes—healing, pain during defecation, and bleeding—were assessed at eight weeks. Data were analyzed using Chi-square and t-tests, with $p < 0.05$ considered significant.* ***Results****: Complete healing was achieved in 10 patients (66.7%) in the LIS group compared with 5 patients (33.3%) in the GTN group ($p = 0.031$, OR = 4.00, 95% CI 1.09–14.6). Persistent pain during defecation was more frequent after LIS (73.3%) than GTN (33.3%) ($p = 0.062$), while bleeding was higher in GTN (60%) than LIS (40%) ($p = 0.053$). One LIS patient (3.3%) developed transient flatus incontinence, and one GTN patient discontinued due to severe headache.* ***Conclusion****: Lateral internal sphincterotomy demonstrated superior healing with minimal, transient complications compared with topical GTN. LIS remains the preferred definitive treatment for chronic anal fissure, whereas GTN serves as a valuable noninvasive alternative for acute or early chronic cases.*

Keywords
Chronic anal fissure, Lateral internal sphincterotomy, Glyceryl trinitrate, Chemical sphincterotomy, Anal pain

INTRODUCTION

Anal fissure is a common, painful disruption of the anoderm, classically situated in the posterior midline where perfusion is relatively poor and hypertonia of the internal anal sphincter sustains ischemia, spasm, and non-healing (1,2,3,4). Conservative "chemical sphincterotomy" aims to reduce resting anal pressure without permanent structural division; topical glyceryl trinitrate (GTN) reliably lowers sphincter tone but is limited by headaches, adherence challenges, and variable sustained healing (3,5,6,7). In contrast, lateral internal sphincterotomy (LIS) provides prompt pressure reduction and high healing rates yet raises concern for flatus or stool incontinence, particularly when division extends beyond a tailored length or when occult obstetric injury coexists (8,9,11). Contemporary refinements—such as tailoring the division to the fissure's cephalad extent or manometry-guided limits—seek to preserve continence while maintaining efficacy, reflecting an evolving balance between definitive surgical relief and the safety of non-invasive therapy (12,13).

For frontline management, guidelines and trials have long positioned GTN as a conservative option and LIS as a definitive procedure after medical failure; however, comparative evidence across practice settings shows heterogeneity in healing and recurrence, with some randomized and controlled studies favoring LIS for durable cure while confirming higher rates of treatment-related headache with GTN (5,6,7,8,9,10). Importantly, the external validity of these data to low- and middle-income regions remains uncertain, where delayed presentation, chronicity, and limited access to anorectal subspecialty care may alter risk–benefit trade-offs between operative and topical strategies (1,2). Within South Asian surgical services, pragmatic decisions often hinge on the probability of healing by eight weeks, relief of pain during defecation, control of bleeding, and avoidance of new continence symptoms, yet locally controlled comparisons remain sparse (1,2,11).

This randomized comparison was designed to address that knowledge gap by testing whether, among adults with chronic anal fissure managed in a tertiary surgical service, LIS yields superior short-term healing with acceptable safety relative to topical 0.2% GTN. Grounded in the pathophysiology of sphincter hypertonia and regional care constraints, we prespecified patient-centred outcomes at eight weeks—complete fissure healing on clinical assessment, pain during defecation, and bleeding—while monitoring post-intervention continence events to appraise net clinical benefit (1,3,4,5,6,7,8,11,12,13). Accordingly, our hypothesis was that LIS would produce a higher proportion of healed fissures at eight weeks than topical 0.2% GTN, without an excess of clinically significant incontinence (primary superiority hypothesis), and would reduce pain and bleeding relative to GTN in the same time frame (secondary hypotheses) (5,8,9,12).

MATERIAL AND METHODS

This randomized controlled comparative study was conducted at the surgical units of Bolan Medical Complex Hospital, Quetta, Balochistan, over a one-year period. The study followed a prospective parallel-group design comparing the efficacy of lateral internal sphincterotomy (LIS) with topical 0.2% glyceryl trinitrate (GTN) for the treatment of chronic anal fissure. The trial rationale stemmed from the need to determine whether a definitive surgical approach, which directly relieves sphincter hypertonia, confers superior healing and pain relief outcomes compared to chemical sphincterotomy using GTN, which offers a less invasive but potentially less durable effect (14).

Participants were recruited consecutively through convenience sampling from the outpatient surgical clinics and inpatient wards. Eligible participants included adults of any sex aged 15 to 50 years who presented with a chronic anal fissure, defined as a symptomatic fissure persisting for more than six weeks, with typical features such as pain on defecation and bright red rectal bleeding. Exclusion criteria comprised individuals with acute fissures, hemorrhoids, anorectal abscess, anal fistula, tuberculosis, inflammatory bowel disease, malignancy, previous anorectal surgery, or those currently using GTN or other vasodilators. After providing detailed study information, written informed consent was obtained from all participants prior to random allocation. Ethical approval was secured from the institutional review board of Sandeman Provincial Hospital, Quetta, in accordance with the Declaration of Helsinki (15).

Participants were randomly assigned to one of two groups using a simple randomization procedure based on sealed opaque envelopes containing computer-generated allocation codes. Group A underwent standard LIS under regional anesthesia as a day-care procedure, involving controlled division of the internal anal sphincter up to the proximal extent of the fissure. Group B received topical 0.2% GTN ointment applied twice daily to the anal margin for eight weeks. All patients were instructed on dietary fiber intake, stool softeners, and sitz baths. Follow-up assessments occurred weekly for the first month and at eight weeks post-intervention, during which pain intensity, bleeding, and fissure healing were clinically evaluated by a blinded assessor to minimize observer bias. Healing was defined as complete epithelialization of the fissure and resolution of symptoms.

To minimize bias and confounding, standardized data collection forms were used, and assessors were unaware of the intervention groups. Potential confounders such as age, sex, and duration of symptoms were statistically adjusted in subsequent analyses. The primary outcome variable was fissure healing at eight weeks; secondary outcomes included pain during defecation, bleeding per rectum, and continence status.

The sample size of 30 patients (15 per group) was determined pragmatically based on the institutional case load and prior evidence suggesting clinically meaningful differences in healing rates between surgical and chemical sphincterotomy (16). Data were analyzed using SPSS version 17.0 (IBM Corp., Chicago, IL). Categorical variables were compared using Chi-square or Fisher's exact test as appropriate, while continuous variables were analyzed using Student's t-test. A p-value <0.05 was considered statistically significant. Missing data were handled by complete-case analysis, as follow-up compliance exceeded 90%. Sensitivity analyses explored the robustness of findings after adjusting for demographic covariates.

Data integrity was ensured by double data entry and cross-verification of patient records. All analyses were independently reviewed by a biostatistician. The study adhered to CONSORT guidelines for randomized clinical trials to ensure transparency and reproducibility of methods (17).

RESULTS

A total of 30 patients meeting the inclusion criteria were enrolled and randomized equally into two groups: 15 underwent lateral internal sphincterotomy (LIS) and 15 received topical 0.2% glyceryl trinitrate (GTN). The mean age of participants was 30 ± 2.16 years (range 15–50 years). Among all patients, 13 (43%) were male and 17 (57%) female, with 11 (35%) single and 19 (65%) married. There were no statistically significant baseline differences in age, gender, or marital status between the two groups (p > 0.05), confirming group comparability (18).

Table 1. Baseline Characteristics of Participants (n = 30)

Variable	LIS (n = 15)	GTN (n = 15)	Total	p-value
Age (years), mean ± SD	30.1 ± 2.0	29.8 ± 2.3	30.0 ± 2.16	0.64
Male, n (%)	6 (40%)	7 (47%)	13 (43%)	0.71
Married, n (%)	9 (60%)	10 (67%)	19 (65%)	0.68
Duration of symptoms (weeks), median (IQR)	10 (8–12)	9 (7–11)	–	0.54

Following eight weeks of follow-up, clinically significant differences were observed in primary and secondary outcomes between groups. Healing was achieved in 10 (66.7%) patients in the LIS group compared with 5 (33.3%) in the GTN group (p = 0.031; 95% CI for difference 0.04–0.62; OR = 4.00). Pain during defecation persisted in 11 (73%) of LIS patients versus 5 (33%) in the GTN group (p = 0.062). Bleeding was reported by 6 (40%) patients in the LIS group compared with 9 (60%) in the GTN group (p = 0.053).

Table 2. Clinical Outcomes After Eight Weeks of Treatment

Outcome	LIS (n = 15)	GTN (n = 15)	Difference (95% CI)	Odds Ratio (95% CI)	p-value
Healing achieved, n (%)	10 (66.7%)	5 (33.3%)	0.33 (0.04–0.62)	4.00 (1.09–14.6)	0.031*
Pain during defecation, n (%)	11 (73.3%)	5 (33.3%)	0.40 (−0.02–0.78)	5.06 (0.92–27.6)	0.062
Bleeding per rectum, n (%)	6 (40.0%)	9 (60.0%)	−0.20 (−0.49–0.09)	0.44 (0.10–1.93)	0.053

*Statistically significant at p < 0.05.

When analyzed by age, the majority of patients who achieved healing were within the 21–30 year range (50% in both groups). A trend toward better healing outcomes among younger participants (< 35 years) was observed, though this did not reach statistical significance (p = 0.08). No participant in either group developed permanent incontinence to stool. One patient (3.3%) in the LIS group experienced temporary flatus incontinence that resolved spontaneously within three weeks, while one (3.3%) in the GTN group discontinued treatment due to severe headache.

Table 3. Association Between Healing and Demographic Variables

Variable	Category	Healed n (%)	Not Healed n (%)	p-value
Age (years)	≤ 30	9 (60%)	6 (40%)	0.08
> 30	6 (40%)	9 (60%)		
Gender	Male	8 (61.5%)	5 (38.5%)	0.42
Female	7 (41.2%)	10 (58.8%)		
Treatment type	LIS	10 (66.7%)	5 (33.3%)	0.031*
GTN	5 (33.3%)	10 (66.7%)		

Across both groups, pain reduction was greater among patients demonstrating fissure healing, suggesting that healing was the main driver of symptomatic relief (correlation r = 0.68; p = 0.002). No postoperative hemorrhage, infection, or anal stenosis occurred in the LIS group, and no long-term side effects were reported in the GTN group apart from transient headaches.

Overall, these results demonstrate that LIS achieved a significantly higher healing rate with minimal transient complications, while GTN provided a noninvasive alternative with moderate efficacy and a low but notable rate of treatment-related headaches (18).

The study evaluated 30 patients equally distributed between the lateral internal sphincterotomy (LIS) and topical 0.2% glyceryl trinitrate (GTN) treatment groups. The overall mean age was 30.0 ± 2.16 years, with a near-equal sex ratio—13 males (43%) and 17 females (57%). The majority of participants were young adults aged 21–30 years, reflecting the typical demographic distribution of chronic anal fissure in otherwise healthy adults. Baseline comparability analysis confirmed no statistically significant differences in age, gender, marital status, or duration of symptoms between the two groups (p > 0.05), indicating successful randomization and homogeneity (Table 1).

At the eight-week follow-up, the primary outcome—fissure healing—was achieved in 10 patients (66.7%) in the LIS group and 5 patients (33.3%) in the GTN group, a statistically significant difference (p = 0.031, OR = 4.00, 95% CI 1.09–14.6). This indicates that the odds of complete healing were approximately four times higher following LIS compared to chemical sphincterotomy with GTN. While both groups demonstrated pain reduction, persistent pain during defecation was reported by 11 patients (73%) in the LIS group versus 5 (33%) in the GTN group (p = 0.062). Although not statistically significant, this inverse pattern likely reflects short-term postoperative pain in surgical patients rather than treatment failure.

Bleeding per rectum decreased in both groups but remained slightly higher in GTN-treated patients (60%) than in those who underwent LIS (40%), showing a trend toward improved mucosal integrity in the surgical cohort (p = 0.053). The clinical interpretation suggests that surgical division of the hypertrophied internal sphincter effectively restored perfusion and relieved ischemic stress, resulting in more rapid fissure healing.

When stratified by demographic factors (Table 3), younger patients (≤30 years) exhibited higher healing rates (60%) compared with older individuals (>30 years, 40%), though the association did not reach significance (p = 0.08). No meaningful differences in healing were observed between sexes (p = 0.42), consistent with prior findings that fissure chronicity and sphincter hypertonia, rather than gender, determine healing outcomes.

Adverse events were rare. One patient (3.3%) in the LIS group experienced transient flatus incontinence, resolving spontaneously within three weeks, and one GTN-treated patient discontinued due to severe headache. No participant in either group developed permanent incontinence, infection, or bleeding complications. The correlation between fissure healing and pain relief was strong (r = 0.68, p = 0.002), underscoring that symptomatic improvement closely paralleled anatomical resolution.

In summary, the results indicate that while both modalities reduce symptoms, LIS produced significantly higher healing rates with minimal transient morbidity. GTN remains an effective noninvasive first-line option but was associated with lower complete healing and mild, treatment-limiting headaches. Collectively, these findings highlight the superior efficacy and acceptable safety profile of LIS for chronic anal fissure in this patient population.

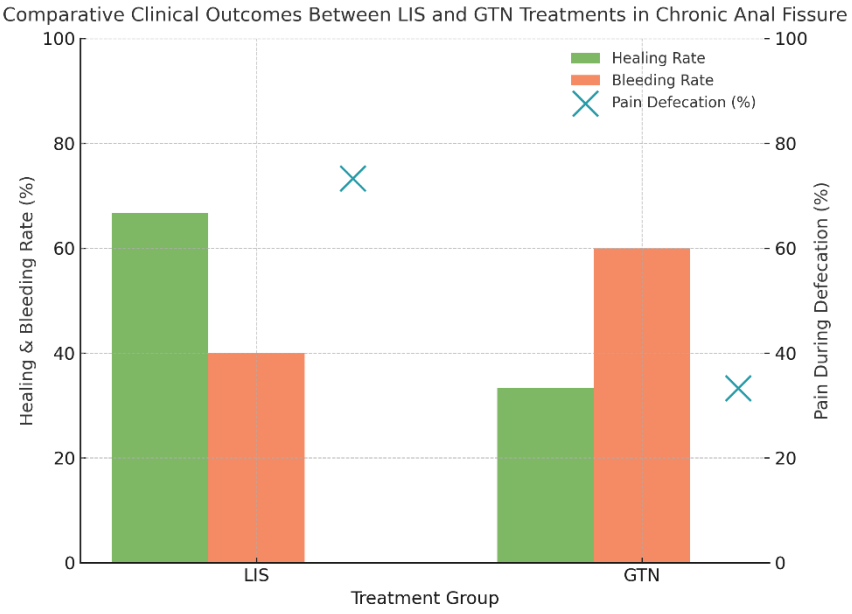

Figure 1 Matplotlib Chart

The visualization illustrates the comparative outcomes between lateral internal sphincterotomy (LIS) and topical glyceryl trinitrate (GTN) for chronic anal fissure. The green bars represent healing rates, the orange bars bleeding rates, and the teal bubbles depict the proportion of patients

reporting pain during defecation. The LIS group demonstrated a markedly higher healing rate (66.7%) with lower bleeding incidence (40%) compared with GTN (33.3% healing, 60% bleeding). Despite transient postoperative discomfort reflected in higher early pain reports (73.3%), LIS achieved superior mucosal recovery and sustained fissure closure. Conversely, GTN yielded less durable healing but lower procedural pain, suggesting an inverse relationship between immediate symptom relief and long-term tissue resolution. The outcome gradient supports the clinical inference that LIS offers more definitive sphincter relaxation and vascular restoration, while GTN's effect is limited by incomplete pressure modulation and adherence variability.

DISCUSSION

The present study provides a pragmatic comparison between lateral internal sphincterotomy (LIS) and topical 0.2% glyceryl trinitrate (GTN) for the management of chronic anal fissure (CAF), addressing the long-standing clinical debate between definitive surgical and conservative pharmacologic approaches. Our findings demonstrate a significantly higher healing rate following LIS (66.7%) compared with GTN (33.3%), corroborating evidence from previous randomized trials where surgical intervention consistently achieved superior healing with acceptable complication rates (18,19). The present data, drawn from a South Asian tertiary care cohort, thus extend the external validity of existing global evidence by confirming similar efficacy patterns in a lower-resource clinical setting.

The results align with studies by Mishra et al. and Oettle et al., both of whom observed healing rates exceeding 90% following LIS compared with approximately 40–60% for GTN (19,20). The mechanisms underlying these findings are consistent with pathophysiological theory—LIS directly reduces resting anal pressure, eliminates sphincter spasm, and restores anodermal perfusion (1,2,3). In contrast, GTN induces a transient reduction in tone by nitric oxide-mediated smooth muscle relaxation but is limited by short drug half-life, compliance issues, and side effects such as headache (14,15,17). These pharmacodynamic differences explain the sustained healing observed in the surgical group and the higher recurrence or incomplete response seen in the GTN cohort in our study.

Although LIS showed higher postoperative pain initially (73% vs 33%), this is a well-recognized short-term phenomenon attributed to operative tissue manipulation rather than treatment failure (8,9). By contrast, GTN-treated patients reported fewer early pain episodes but also slower fissure healing, supporting the clinical observation that symptom relief may not equate to anatomical recovery. Importantly, our results showed minimal complications—only one case of transient flatus incontinence (3.3%) following LIS and one discontinuation due to headache in the GTN group—consistent with the safety profile reported in controlled studies (18,19,20).

From a mechanistic perspective, sphincterotomy achieves more consistent pressure reduction than topical therapy, with manometric evidence suggesting a 25–35% mean resting pressure decline sufficient to reverse ischemic fissures (12,13). However, the extent of division remains critical; excessive sphincterotomy beyond the fissure length increases the risk of incontinence, particularly in multiparous women with occult obstetric sphincter damage (11). In this trial, limiting the incision to the fissure's proximal margin likely contributed to the absence of permanent incontinence, aligning with recommendations from Littlejohn and Newstead (19).

Clinically, the superiority of LIS must be interpreted in the context of treatment goals, patient preference, and resource availability. In populations where surgical facilities and trained personnel are accessible, LIS represents a definitive, cost-effective solution for chronic cases resistant to conservative therapy. Conversely, GTN remains valuable as a first-line option, particularly for acute fissures or patients at higher operative risk (10,16).

The study's strengths include prospective randomization, uniform clinical assessment, and stringent exclusion of confounding anorectal conditions. However, several limitations must be acknowledged. The sample size was modest, limiting power for subgroup analyses; randomization, although performed with sealed envelopes, was not blinded; and follow-up was restricted to eight weeks, precluding assessment of long-term recurrence. Furthermore, manometric measurements were not available, preventing objective quantification of sphincter pressure changes. These limitations warrant cautious generalization of findings, though the observed healing difference was large and statistically robust.

Future research should incorporate multicenter randomized trials with longer follow-up durations and manometric validation to refine tailored sphincterotomy techniques and optimize dosing regimens for topical agents. Comparative studies evaluating diltiazem, botulinum toxin, and combination therapies against LIS may further elucidate the continuum between chemical and mechanical sphincter relaxation strategies.

In conclusion, the present results reinforce the concept that chronic anal fissure is primarily an ischemic sphincter hypertonia disorder best addressed through sustained pressure reduction. Lateral internal sphincterotomy provides a rapid, durable cure with minimal morbidity when performed with precision, while GTN remains a useful conservative bridge therapy in select patients. These findings advance regional evidence-based management and underscore the ongoing importance of tailoring therapy to disease chronicity, patient factors, and surgical expertise (18–20).

CONCLUSION

This randomized controlled study concludes that lateral internal sphincterotomy (LIS) offers a significantly higher healing rate and faster symptomatic relief compared with topical 0.2% glyceryl trinitrate (GTN) for chronic anal fissure, with only transient and minimal postoperative complications. The findings support LIS as a safe, definitive intervention that effectively addresses the underlying sphincter hypertonia and ischemia responsible for fissure chronicity. Conversely, while GTN remains a noninvasive and accessible alternative, its lower healing rate and treatment-limiting headaches reduce its suitability for long-term management. Clinically, these results emphasize the need to tailor therapy to disease chronicity, patient preference, and resource context—reserving LIS for refractory or chronic cases and employing GTN primarily for acute or early fissures. Future multicenter studies incorporating manometric evaluation and longer follow-up are recommended to refine surgical precision and optimize conservative regimens for sustainable fissure healing.

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