ORIGINAL RESEARCH ARTICLE

Botulinum toxin injections vs lateral internal sphincterotomy in chronic anal fissure management

DOI: 10.29063/ajrh2025/v29i12.13

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Abstract

Among the various treatment modalities for chronic anal fissures, lateral internal sphincterotomy, acknowledged as the gold standard, is associated with superior healing rates but entails a higher risk of complications due to its invasive nature. Conversely, botulinum toxin injection, a minimally invasive alternative, remains a viable therapeutic option for select patient populations despite its relatively higher recurrence rate, owing to its favorable safety profile. The objective of this study was to compare the botulinum toxin and sphincterotomy efficacy in the management of chronic anal fissure. Two groups were compared in treatment outcomes after botulinum toxin injection and lateral internal sphincterotomy. The study cohort comprised women diagnosed with chronic anal fissure and treated between 2017 and 2022. Patients underwent botulinum toxin injections and partial sphincterotomy. Clinical outcomes and examination findings were assessed to determine the therapeutic efficacy of botulinum toxin infiltration in comparison to surgical intervention. An increased recurrence rate was noted in patients with a prolonged disease course and posteriorly located fissures. Botulinum toxin may serve as a first-line therapeutic strategy in individuals with a low predisposition to recurrence, offering an effective and safer alternative in appropriately selected cases. *(Afr J Reprod Health 2025; 29 [12]: 131-138).*

Keywords: Chronic anal fissure, lateral internal sphincterotomy, botulinum toxin

Résumé

Parmi les différentes modalités de traitement des fissures anales chroniques, la sphinctérotomie latérale interne, reconnue comme le « gold standard », présente des taux de guérison supérieurs mais comporte un risque accru de complications en raison de son caractère invasif. À l'inverse, l'injection de toxine botulique, alternative minimalement invasive, demeure une option thérapeutique valable pour certaines populations de patients, malgré un taux de récidive relativement plus élevé, en raison de son profil de sécurité favorable. L'objectif de cette étude était de comparer l'efficacité de la toxine botulique et de la sphinctérotomie dans la prise en charge de la fissure anale chronique. Deux groupes ont été comparés selon les résultats du traitement après injection de toxine botulique et après sphinctérotomie latérale interne. La cohorte étudiée comprenait des femmes diagnostiquées avec une fissure anale chronique et traitées entre 2017 et 2022. Les patientes ont bénéficié d'injections de toxine botulique et de sphinctérotomie partielle. Les résultats cliniques et les constatations à l'examen ont été évalués afin de déterminer l'efficacité thérapeutique de l'infiltration de toxine botulique en comparaison à l'intervention chirurgicale. Un taux de récidive accru a été observé chez les patientes présentant une évolution prolongée de la maladie et des fissures situées en position postérieure. La toxine botulique peut constituer une stratégie thérapeutique de première intention chez les individus présentant une faible prédisposition à la récidive, offrant ainsi une alternative efficace et plus sûre dans les cas judicieusement sélectionnés. *(Afr J Reprod Health 2025; 29 [12]: 131-138).*

Mots-clés: Fissure anale chronique, sphinctérotomie latérale interne, toxine botulique

Introduction

Anal fissure is a significant pathological condition that profoundly impacts patients' quality of life. It is characterized by a longitudinal tear in the anal mucosa, extending from the anal margin to the dentate line. The predominant clinical manifestations include pain and rectal bleeding, typically occurring during and after defecation.

The underlying pathophysiology primarily involves internal anal sphincter hypertonicity, leading to persistent sphincter spasm and mucosal ischemia, which exacerbate the mucosal defect.[1,2] Observational data indicate that approximately 85%

of anal fissures are usually localized along the posterior midline. Fissures in atypical locations should prompt consideration of alternative etiologies, including inflammatory bowel diseases, tuberculosis, trauma, or malignancy.[3]

Lateral internal sphincterotomy (LIS) remains the gold standard for the management of chronic anal fissure, demonstrating a healing rate of 88% to 100%. However during surgery, unforeseen circumstances arise,[4] and this surgical intervention may be associated with complications such as anal incontinence, with transient rates reaching up to 45% and persistent cases occurring in up to 10% of patients.[5,6] Additional adverse effects include postoperative pain and bleeding.[7,8] The risk of sphincter-related morbidity has driven the exploration of alternative therapeutic strategies, including botulinum toxin (BT) injection.[9] BT functions by inhibiting acetylcholine release at the neuromuscular junction, thereby inducing temporary chemical sphincterotomy and promoting fissure healing.[10,11] This study aims to compare the efficacy and safety of botulinum toxin injection (BTI) vs lateral internal sphincterotomy in the treatment of chronic anal fissure.

Methods

Study design

The study was conducted at the III Department of Surgical Diseases at Azerbaijan Medical University and compared the clinical outcomes of 48 female patients with chronic anal fissure underwent outpatient treatment via Botox injection and lateral internal sphincterotomy.

Settings

Study cohort was examined between 2017 and 2022.

Participants

Patients ranged from 19 to 45 years old, with a mean age of 37.1 ± 1.04 years. Initially, 74 female patients with chronic anal fissure were screened between 2017 and 2022. After applying inclusion and exclusion criteria and accounting for withdrawals, 48 eligible participants were randomly assigned into two equal groups: the study group received BTI, and the control group underwent LIS. This random allocation ensured comparable baseline characteristics between the groups. Main group (n = 24) received botulinum toxin (Allergan) injections of 20–30 U into the internal anal sphincter. If healing was incomplete, a repeat injection was administered after two months. Control group (n = 24) underwent LIS.

The inclusion criteria included patients with chronic anal fissure. The exclusion criteria encompassed acute anal fissures, previous anal surgeries, immunodeficiency, inflammatory bowel disease, tuberculosis, leukemia, pregnancy, colorectal malignancies, anal fistulas or abscesses, and hypersensitivity to botulinum toxin.

As part of the treatment procedures for the control group, BTI was performed under general anesthesia in the lithotomy position. For this, botulinum toxin (Botox, Allergan) diluted with saline to a concentration of 100 U/mL was injected in doses of 25 U at four sites (12, 3, 6, and 9 o'clock positions) within the internal sphincter, not exceeding the middle of the anal canal (the injection depth was approximately at the level of the dentate line). For the procedure, a 26G insulin syringe with a short thin needle was used, inserted to a depth of about the dentate line. LIS was performed under general anesthesia with the patient in the lithotomy position. A 10 mm incision was made at the left intersphincteric groove at the 3 o'clock position, and the lower portion of the internal anal sphincter was carefully divided using electrocautery up to the proximal end of the fissure. Hemostasis was ensured, and the wound was left open for secondary healing without suturing to minimize postoperative complications.

The LIS procedure in the treatment group was performed under general anesthesia. The lower internal sphincter was removed using electrocautery through a skin incision at the left intersphincteric groove. Under excision, the incision did not extend beyond the proximal end of the fissure (10 mm incision at the level of the dentate line anal canal 3 o'clock position).

The study identified several qualitative variables - pain, hemorrhage (bleeding), constipation, itching, fissure healing, and fecal incontinence - as key outcome measures for

evaluating treatment efficacy and safety between the BTI and LIS groups. Subjective symptoms such as pain, bleeding, constipation, and itching were recorded through structured patient interviews and self-reports during follow-up visits at 2, 6, and 12 months after treatment. Objective variables, namely fissure healing and anal incontinence, were determined through direct visual inspection and digital rectal examination performed by the attending surgeon. Fissure healing was defined as the complete epithelialization of the mucosal defect, while incontinence was noted based on the presence or absence of uncontrolled gas or stool leakage. To complement these qualitative assessments, anorectal manometry was conducted to provide a quantitative physiological correlate of sphincter function. Manometric evaluation was performed using the balloonographic method with an MMS Anorectal Manometer (Netherlands, Figure 1).

This device measured intraluminal anal canal pressure both at rest and during voluntary and reflex contractions, enabling the researchers to assess changes in internal sphincter tone before and after treatment. The combination of qualitative symptom reports, clinical findings, and manometric measurements allowed for a comprehensive comparison between the two groups. The qualitative variables were analyzed using Fisher's exact test to determine statistically significant differences in healing, incontinence, and symptom resolution between BT and LIS groups, while manometric data provided objective confirmation of functional improvement following each therapeutic approach. This integrated assessment ensured that both subjective patient outcomes and objective physiological changes were considered in evaluating treatment efficacy and safety.

Follow-up care

To determine the effectiveness and safety of treatment of chronic anal fissure in terms of healing rate, relapse rate, and fecal incontinence as a disabling complication, postoperative care was performed. Patients of both groups underwent a comprehensive obstetric history, clinical examination, and digital rectal examination. Post-treatment management included a 10-day antibiotic course, stool softeners, and sitz baths for three weeks to prevent constipation, infection, pain, and bleeding.

Bias

Any reluctance of the patient to participate in the further experiment was respectfully satisfied and negative comment on well-being was recorded. If a patient was unwilling to continue participation, his decision was accepted without any pressure to remain in the study. Any comments or concerns expressed by the patient regarding discomfort, side effects, or general well-being were documented. This approach helped ensure voluntary participation and reduced bias related to participant dissatisfaction or withdrawal.

Figure 1: Manometer

Statistical methods

Quantitative data were obtained from clinical and patient-reported outcome measures assessing pain, bleeding, constipation, itching, healing of fissures, and presence of incontinence at 2, 6, and 12 months after treatment. These constituted the main outcome variables used to evaluate therapeutic efficacy and safety. Pain, bleeding, constipation, and itching were elicited through patient self-reports during follow-up visits, while fissure healing and incontinence were determined by clinical examination and digital rectal assessment performed by the attending surgeon.All data were entered into Microsoft Excel spreadsheets for preliminary organization and subsequently analyzed using MedCalc version 20.011. Descriptive statistics were used to summarize variables: quantitative data were expressed as arithmetic mean (M) and standard error (SE), and categorical variables as frequencies and percentages. Group comparisons were performed using nonparametric tests: the Mann–Whitney U test for independent continuous variables and Fisher's exact test for categorical data in contingency table analyses. A *p*-value of less than 0.05 was considered statistically significant.

Ethical consideration

This study was conducted in full accordance with the ethical principles outlined in the Declaration of Helsinki and international standards for biomedical research involving human subjects. Ethical approval was obtained prior to the commencement of data collection from the Azerbaijan Medical University Ethics Committee (Protocol No. 2), on June 25, 2017. The approval covered all aspects of study design, participant recruitment, data collection, and analysis. All participants were adequately informed about the objectives, procedures, potential risks, and anticipated benefits of the research. Participation was entirely voluntary, and each participant provided written informed consent before inclusion in the study.To ensure data privacy and participant protection, all personal identifiers were removed before analysis, and data were stored in password-protected files accessible only to the research team. The confidentiality and anonymity of participants were strictly maintained throughout the study and during the publication process.

Results

Chronic anal fissure complications

Participants

Initially, 74 patients expressing willingness to receive qualified medical care were selected for the study. However, 19 were subsequently excluded: 10 due to voluntary withdrawal and 9 due to non-compliance with the eligibility criteria. Among the 55 patients underwent randomization, 29 were allocated to the Botox intervention group. However, 4 declined treatment due to concerns regarding the novel methodology, resulting in 25 patients receiving Botox injections. Additionally, 1 patient relocated abroad, precluding long-term follow-up, while 3 patients discontinued treatment after the first injection, citing skepticism regarding novel method efficacy. In the surgical intervention group, 26 patients were initially allocated, of whom 24 underwent the assigned procedure, while 2 declined surgery for unspecified reason. Ultimately, the final analysis was conducted on 24 patients in each treatment group. Patients admitted to the clinic presented symptoms such as pain, bleeding, constipation and itching. Posterior fissures were more prevalent (n = 35), while anterior fissures were observed in 13 cases (Table 1). Eleven out of 48 patients had a history of spontaneous vaginal delivery.

Post-treatment outcomes

In the BT group, complete healing occurred in 18 out of 24 patients (75%). Among the six (25%) unsuccessful cases, three patients declined further treatment, while three underwent a second injection, increasing the healing rate to 87.5% (21 out of 24) within six months. In the sphincterotomy group, the initial healing rate was 95.8% (23 out of 24), while one patient experienced recurrence (4.1%).

At 12 months, healing rates remained higher in the sphincterotomy group with 23 patients (95.83%) compared to the BTgroup with 18 patients (75%), though this difference was not

Table 1: Baseline clinical characteristics and aggravating conditions among patients with chronic anal fissure before treatment

Aggravating Condition	Botulinum Toxin (n = 24)	Lateral Internal Sphincterotomy (n = 24)	p-value
Physiologic birth	6 (25.0%)	5 (20.8%)	0.7468
Pain	24 (100%)	24 (100%)	–
Hemorrhage	13 (54.2%)	14 (58.3%)	1.0000
Constipation	19 (79.2%)	18 (75.0%)	1.0000
Itching	8 (33.3%)	7 (29.2%)	1.0000
Posterior fissure	17 (70.8%)	18 (75.0%)	1.0000
Anterior fissure	7 (29.2%)	6 (25.0%)	1.0000

Note: For all parameters, the differences between the groups were not statistically significant ($p > 0.05$; Fisher's exact test).

Table 2: Treatment outcomes: healing rate and anal incontinence after BT and LIS

Follow-up Period	Healed fissures		p-value	Incontinence – BT (n = 24)	Incontinence – LIS (n = 24)	p-value
	BT (n = 24)	LIS (n = 24)				
2 months	18 (75.0%)	23 (95.8%)	0.0532	3 (12.5%)	11 (45.8%)	0.0243
6 months	21 (87.5%)	22 (91.7%)	1.0000	0 (0%)	5 (20.8%)	0.0496
12 months	18 (75.0%)	23 (95.8%)	0.0532	0 (0%)	2 (8.3%)	0.2447

Note: BT – Botulinum toxin therapy; LIS – Lateral internal sphincterotomy. *p*-values represent results of Fisher's exact test comparing BT and LIS groups.

statistically significant (p = 0.0532, Fisher's exact test). Healing outcomes exhibited considerable variability across studies, with sphincterotomy associated with superior healing rates, whereas Botox injections necessitated repeated administrations due to delayed or unsuccessful healing. Furthermore, it was observed that patients with an extended disease history experienced a higher incidence of delayed or failed healing outcomes. Incontinence was reported in three BT patients (12.5%) during two months but resolved completely at six and twelve months of follow-up (Table 2).

Sphincterotomy was associated with a higher complication rate, with two patients developing persistent incontinence (8%). Recurrence was higher in the BTgroup (in 3 out of 21 patients, 14.28%) compared to the sphincterotomy group (4.1%), likely due to the temporary nature of BT effects.

Post-treatment complications

One month post-treatment, bleeding was observed in 3 (12.5%) LIS patients, but completely absent in the BT group. Pain was reported in 2 (8.3%) LIS patients and 1 (4.16%) BT patient (p > 0.05). Three months after treatment, 1 (4.16%) patient in the sphincterotomy group experienced bleeding, whereas no patients in the botulinum toxin group had this complication. The BT group demonstrated a faster full return to daily activities soon after the procedure, whereas in the control, sphincterotomy group, patients remained hospitalized for approximately five days.

Discussion

This study compared the efficacy and safety of BT and LIS in the management of chronic anal fissure. The findings confirm that both treatments are effective in promoting fissure healing and symptom relief; however, their risk-benefit profiles differ substantially. Initially, LIS achieved a higher healing rate and a lower recurrence rate than BT, consistent with previous literature identifying it as the gold standard for chronic anal fissure management. Nevertheless, these benefits were offset by a greater risk of postoperative complications, particularly persistent fecal incontinence. In contrast, BT therapy offered comparable healing outcomes for most patients, with a markedly lower incidence of complications and faster postoperative recovery.

BTI results in quick recovery, with minimal downtime and return to normal activities within 1–3 days, whereas LIS requires longer recovery (2–4 weeks) with post-op pain and wound healing considerations. Nevertheless, BT causes temporary chemical denervation of the internal anal sphincter by inhibiting acetylcholine release at the neuromuscular junction, leading to reversible sphincter relaxation,[12,13] while LIS involves surgical division of a portion of the internal anal sphincter, leading to permanent sphincter relaxation and reduced resting pressure. Healing rates after BT range between 75 – 87.5% depending on dose and injection technique. LIS healing rates exceed 90%, making it the gold standard treatment.

BT therapy exhibited higher recurrence rates (14.28%) due to the temporary nature of muscle relaxation, whereas LIS showed lower recurrence rate (4.1%) due to permanent structural changes. BT treatment exhibited mild and self-limiting adverse effects, including temporary fecal incontinence during the first two months (12.5%), which fully resolved by the 6th and 12th months. Additionally, at BT minor hematomas and transient discomfort were observed. LIS resulted in persistent fecal incontinence beyond 12 months post-surgery (8%), with a higher prevalence among older patients and women with a history of obstetric injury. This phenomenon is most likely attributed to alterations in resting anal pressure following the therapeutic intervention. So, it is known that BT inhibits myogenic tone and sympathetic nerve function reducing anal resting pressure by 20–40%,[14,15] allowing fissure healing while preserving sphincter function, whereas LIS reduces resting pressure by 30–60%, providing more consistent relief but at the cost of a higher risk of sphincter dysfunction.[16,17] The temporary nature of BT-induced sphincter relaxation explains the higher recurrence rate observed, yet its favorable safety profile and minimally invasive approach make it a viable alternative, especially for patients at increased risk of incontinence. Therefore, finally BT is preferred for patients with high risk of incontinence (e.g., elderly, multiparous women, prior anorectal surgery), whereas LIS is more suitable for young, healthy males with high sphincter tone and no predisposing factors for incontinence.

BT gives moderate satisfaction due to the need for repeat treatments. Some patients require dose escalation or combination therapies, whereas LIS leads to high long-term satisfaction due to definitive cure. Some researchers suggest that BT can be combined with topical nitroglycerin, diltiazem, or fiber therapy to enhance efficacy.[18,19,20] But LIS is not usually combined with other treatments, though post-op wound care is crucial for success.[21] BT is more expensive per treatment, requiring repeat injections in some cases. However, it is an outpatient, non-invasive procedure with minimal recovery time. Taking into account that LIS is one-time surgical intervention, we conclude that it is more cost-effective in the long run, but requires a surgical facility. From a clinical standpoint, these results suggest that treatment selection should be individualized . BT injection is best suited for patients such as multiparous women, elderly individuals, or those with prior anorectal surgery, where sphincter integrity preservation is critical. Conversely, LIS remains appropriate for younger, healthy patients with elevated sphincter tone and no risk factors for incontinence. The findings have significant implications for clinical practice and health policy. Incorporating BT therapy as a first-line or alternative option in national treatment guidelines could improve patient outcomes, especially in resource-limited settings where access to surgical facilities may be constrained. Its outpatient feasibility, minimal invasiveness, and low complication rate make it an attractive option for broader implementation. However, clear treatment protocols, appropriate patient selection, and training for clinicians are essential to ensure its effective and safe use.

Study strengths and limitations

This study provides valuable comparative evidence on the efficacy and safety of BTI versus LIS in the management of chronic anal fissure among women. One of its major strengths lies in the prospective design and the randomized allocation of participants, which helped minimize selection bias and ensured comparability between treatment groups. The study also benefits from clearly defined inclusion and exclusion criteria, standardized treatment protocols, and systematic follow-up

assessments at multiple time points (2, 6, and 12 months), allowing for reliable evaluation of both short- and long-term outcomes. Moreover, by focusing on a female patient cohort, the research contributes specific insights into a population that may present distinct anatomical and functional considerations relevant to continence outcomes.

However, several limitations should be acknowledged. The relatively small sample size (n = 48) limits the generalizability of the findings to broader populations and may reduce the statistical power to detect subtle differences between treatment modalities. Additionally, the study was conducted in a single-center setting, which may introduce institutional or procedural bias. The reliance on self-reported symptoms such as pain, constipation, and itching could be subject to reporting bias, despite efforts to corroborate findings through clinical examination. Furthermore, long-term follow-up beyond one year was not performed, limiting conclusions regarding sustained treatment efficacy and late complications.

Despite these limitations, the findings have important implications for clinical practice and health policy. The results suggest that BTI can serve as an effective and safer first-line therapy for selected patients, particularly those at higher risk of postoperative incontinence or those preferring minimally invasive treatment. Conversely, LIS remains the most effective definitive treatment for younger, otherwise healthy individuals without risk factors for sphincter dysfunction. Policymakers and clinicians should therefore consider integrating BT therapy into national treatment guidelines as a cost-effective, outpatient-based alternative, especially in resource-limited settings where surgical interventions may be less accessible.

Future studies with larger, multicenter samples and extended follow-up are recommended to validate these findings further and inform evidence-based practice and policy development in colorectal surgery and women's health.

Conclusion

The study indicates that lateral internal sphincterotomy (LIS) achieves superior *initial* healing rates and a *lower recurrence* risk; however, it is more invasive, associated with *extended recovery duration* and carries a higher complication rate, such as increased incidence of *persistent incontinence*. Conversely, botulinum toxin (BT) injection, despite exhibiting a comparatively *higher recurrence rate*, presents a more favorable *safety* profile, *minimal procedural invasiveness*, and *accelerated postoperative recovery*. We find BT effective and *simpler* option than surgical intervention that can be considered an alternative treatment for *select patients* due to its lower complication rate. Future investigations should prioritize the optimization of BT dosing regimens and injection techniques to enhance its long-term therapeutic efficacy.

Findings

LIS is superior in efficacy and long-term cure rates but carries a risk of permanent incontinence BTI is a safer, non-invasive alternative with fewer complications but higher recurrence. BTI is preferred for high-risk patients, while LIS remains the first-line definitive treatment for young, healthy individuals.

Conflict of interest

The authors declare they have no conflicts of interest to disclose.

Contribution of authors

Abdiyeva G.Kh. - conceived and designed the study, collected and analysed the data, prepared of draft

Amirova M.F. - preparation of draft, editing and language correction.

All authors mentioned in the article approved the manuscript.

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