

Comparing Outcomes of Lateral Internal Sphincterotomy, Botulinum Toxin Injection and Laser Therapy in the Management of Chronic Anal Fissure

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ABSTRACT

Background: Chronic anal fissure (CAF), which affects both sexes equally, typically develops in early adulthood. For the therapy of CAF, laser sphincterolysis and botulinum toxin (BTX) have been used. **Objective:** The aim of the present study was to evaluate the effectiveness of BTX injection and laser in the treatment of CAF.

Patients and methods: Our clinical trial included 150 patients with CAF and assigned into one of the 3 modalities of treatment: lateral internal sphincterotomy (50 patients, BTX (50 patients) and laser sphincterolysis (50 patients). In BTX group, 20 U was diluted in 1ml isotonic saline and half of this dose was injected on each side of the fissure in all cases. Regarding laser sphincterolysis, all procedures were carried out using the Lasotronix Smart M 1470 nm diode laser (Poland); for Anal fissure 70-100 W energy given. Patients were followed up after 1 week then every 2 weeks for 8 weeks after intervention.

Results: All cases in all groups stayed for one day at hospital. Healing period was significantly shorter among Botox group then laser group and significantly longer among open group. In BTX group, 7.5% of the patients were reinjected with the same dose of botulinum toxin and had healed fissure 2 months after reinjection. Incontinence was significantly associated with open group and was lower in laser and Botox groups with no significant difference between them.

Conclusion: BTX injection is more suitable first-line treatment of choice for chronic idiopathic anal fissure, which is not associated with other anal conditions. It is a simple procedure, easy to learn and can be done in outpatient clinic without need for sedation or local anesthesia. Regarding laser, it has less operation time, discharge may be given within a few hours, within a day patients can go back to normal routine work, with greater surgical precision and fastest recovery, fewer blood loss during surgery and no or minimal post-operative pain.

Keywords: Anal Fissure, Sphincterotomy, Botulinum Toxin Injection, Laser Therapy.

INTRODUCTION

A longitudinal ulcer that extends from below the dentate line to above the anocutaneous line is called a chronic anal fissure (CAF); 90% of the time, it is the posterior. The anterior commissure is the second place. In women, 80% of birth defects occur anteriorly and 20% are posterior ⁽¹⁾. In contrast to botulinum toxin (BTX) injection, which has a 70% healing rate with a 20% incidence of recurrence, surgery lateral internal sphincterotomy (LIS) has a 90% healing rate after 2 months and no recurrence rate has been seen ⁽²⁾.

When medical therapy for a persistent fissure is ineffective, surgical procedures are advised. The preferred course of therapy in these circumstances is LIS. By severing a piece of the muscle, this treatment reduces internal sphincter spasm. With either open or closed techniques, around 30% of the internal sphincter fibers are severed laterally ⁽³⁾.

Because it is rapid, simple, and has few risks, LIS is an effective therapy for CAF. Rarely do recurrences occur. There is no chance of anesthesia or surgical complications with BTX, which is safe and simple and provides quick pain relief. Although it is far less intrusive than surgery and has fewer side effects, its recurrence rate is greater. Therefore, BTX injection is preferable in middle-aged and older patients, risk factors for anal incontinence, or those who have recently complained of anal fissure. The risk of anal incontinence is higher in the surgical group, especially in senior patients, than BTX injection ⁽⁴⁾.

The autonomic nervous system is a mediator of BTX activity. The internal sphincter spasm is intended to be stopped by BTX therapy. It is true that sphincter manometry following BTX injection has shown a reduction in resting internal pressure ⁽⁵⁾. BTX causes transient muscular paralysis by preventing the release of acetylcholine from presynaptic nerve terminals. It has also been proposed that BTX injections can cure persistent fissures instead of surgery ⁽⁶⁾.

Since the skin of the perianal region is delicate and thin, laser therapy is a cutting-edge method of treating these lesions. Laser therapy for perianal lesions is a non-contact procedure that often causes the patient to have reduced bleeding, pain, and discomfort. Therefore, it is regarded as a good alternative for the treatment of perianal and rectal tumors, anal fistula, hemorrhoids, and anal fissure ⁽⁷⁾. Numerous researches on the use of laser therapy for the treatment of tumors, anal fistulas, and hemorrhoids have been conducted in the last ten years. However, there are few researches on the use of laser therapy for acute anal fissures ⁽⁸⁾.

It was discovered that treating an anal fissure with this novel surgical technique was effective, simple, and rapid. Additionally, the procedure improved blood flow and lessened discomfort. Reduced recovery time, efficient eradication of all clinical problems, and a minimum of dangers and side effects are all advantages of laser treatment ⁽⁹⁾.

Although the method is painless and patients are more likely to accept and be happy with therapy, it has certain drawbacks. Surgeons should be taught surgical

approaches, bio stimulation effects, and how to use the hand parts. When using the laser, safety is also crucial⁽¹⁰⁾. However, no clear research compared these techniques' effects on incontinence and quality of life. Therefore, the aim of the present study was to evaluate the effectiveness of BTX injection and laser in the treatment of CAF, recurrence, incontinence (wexener score of incontinence) and to patient's quality of life.

PATIENTS AND METHODS

A clinical trial was conducted during the period from January 2022 to September 2022 in outpatient clinic of General Surgery Department of Zagazig University. A total of 150 patients with CAF were recruited and assigned into one of the 3 modalities of treatment: lateral internal sphincterotomy (50 patients), BTX (50 patients) and laser sphincterolysis (50 patients).

Inclusion criteria: CAF patients diagnosed based on evidence of posterior circumscribed ulcer with a sentinel tag of skin, induration at the edges and exposure of the horizontal fibers of internal anal sphincter. Symptoms (post defecatory or nocturnal pain, bleeding or both) lasting for more than 2 months. Patients of both sex (male and females). Age from 18 to 60 years old.

Exclusion criteria: Patient refusal to share or follow up. Allergy against BTX injection material. Patients with acute anal fissure. Patients with complicated bleeding anal fissure. Patients with age >60 or <18 years old. Recurrent surgically treated patients. Associated complicated piles. Atypical anal fissure. Specific pathology: i. abnormal anal function and previous anal surgery or rectal surgery.

All patients were subjected to:

- Complete history taking focusing on pain, bleeding, constipation, pruritus, and discharge.
- Full general and local examination.
- Routine lab investigations including CBC, bleeding and clotting times, INR, serum creatinine, LFT, and FBS.
- Manometric study for all cases.

Pre-operatively, all patients received: 1) Metronidazole 500mg three times per day 5days before operation. 2) Low residual diet one day before operation. 3) Manometry to assess the anal sphincter. 4) Enema 6 hours before surgery.

Operative Assessment:

(a) Lateral internal sphincterotomy (LIS) group: The patients of this group were subjected to surgical treatment of CAF in the form of open LIS; in the open approach, a small incision is made in the left or right side of the anal skin to expose the internal sphincter muscle fibers. The surgeon lifts up the internal anal sphincter muscle and divides it using a knife or thermal cautery. Cutting the muscle relaxes the pressure in the anus and allows the fissure to heal. The operation was

done under general anesthesia without muscle relaxant or with spinal anesthesia. The patient started liquid diet four hours after the operation and anal dressing was removed eight hours after the operation with application of local anesthetic cream before defecation. In this group, the patients were discharged on the next postoperative day with instructions concerning high residue diet, analgesics, and warm sitz baths.

(b) BTX group: BTX was injected in the internal anal sphincter. The toxin was diluted in saline to 20 u/ml. Up to 20 units of BTX were administered, and then internal anal sphincter was palpated between index finger and thumb of the left hand while patient in the left side position. An equal volume (10 U) of BTX was injected on each side of anterior midline. Local anesthesia was used during the procedure.

(c) Laser therapy group: This group comprised patients who did not want to undergo surgery despite having indications for surgical treatment. Laser therapy was carried out using a Diode laser. Treatment in this group consisted of 1-2 sessions of laser therapy depending on disease severity and response to treatment. Each treatment session lasted 5-10 minutes. During laser treatment sessions, the patients did not receive any other medical treatment. Patients in both groups were re-examined 6 months after the end of the treatment and followed up and recorded in a specific checklist.

Ethical Consideration:

This study was ethically approved by the Institutional Review Board of the Faculty of Medicine, Zagazig University. Written informed consent was obtained from all participants. This study was executed according to the code of ethics of the World Medical Association (Declaration of Helsinki) for studies on humans.

Statistical Analysis

The collected data were introduced and statistically analyzed by utilizing the Statistical Package for Social Sciences (SPSS) version 20 for windows. Qualitative data were defined as numbers and percentages. Chi-Square test and Fisher's exact test were used for comparison between categorical variables as appropriate. Quantitative data were tested for normality by Kolmogorov-Smirnov test. Normal distribution of variables was described as mean and standard deviation (SD), and independent sample t-test, Paired t-test and ANOVA test were used for comparison between groups. P value ≤ 0.05 was considered to be statistically significant.

RESULTS

Table 1 summarizes and compares the demographic data of the studied groups. There were no significant differences regarding age and sex distribution.

Table (1): Age and sex distribution among the studied groups.

Variable			Open LIS Group	Botox Group	Laser Group	F / X ²	P-value
Age			34.3 ± 11.35	38.76 ± 10.86	38.14 ± 12.91	2.02	0.139
Gender	Female	N	28	29	27	0.37	0.82
		%	56%	58%	54%		
	Male	N	22	21	23		
		%	44%	42%	46%		
Total		N	50	50	50		
		%	100%	100%	100%		

Pain was fixed among all groups pre-Op then at day 1 and day 7 it was associated significantly with open group then laser group and BTX group was significantly lower then at 2 week it was associated only with open group with no significant difference between other 2 groups and at 30 day no significant difference was founded among groups, and all groups significantly improved regard pain (Table 2).

Table (2): Pain distribution among the studied groups at different times.

Variable			Group			X ² Fisher	P-value
			Open LIS Group	Botox Group	Laser Group		
Pre-op pain	Negative	N	0	0	0	0.0	1.0
		%	0.0%	0.0%	0.0%		
	Positive	N	50	50	50		
		%	100%	100%	100%		
Day one pain	Negative	N	4	43	26	61.21	0.000**
		%	8%	86%	52%		
	Positive	N	46*	7 #	24		
		%	92%	14%	48%		
Day 7 pain	Negative	N	34	47	43	12.37	0.002*
		%	68%	94%	86%		
	Positive	N	16*	3 #	7		
		%	32%	6%	14%		
Two weeks pain	Negative	N	44	50	48	5.79	0.025*
		%	88%	100%	96%		
	Positive	N	6*	0	2		
		%	12%	0.0%	4%		
Day 30 pain	Negative	N	47	50	50	2.81	0.247
		%	94%	100%	100%		
	Positive	N	3	0	0		
		%	6%	0.0%	0.0%		
Total		N	50	50	50	---	
		%	100%	100%	100.0%		

* Group significantly higher # Group significantly lower.

Incontinence was significantly associated with open group and was lower in laser and BTX groups, with no significant difference between them (Table 3).

Table (3): Wexener Score regard incontinence among the studied groups.

Variable			Group			X ² Fisher	P- value	
			Open LIS Group	Botox Group	Laser Group			
Wexener Score	Continent	N	35	49	46	20.08	0.01*	
		%	70%	98%	92%			
	Gas	N	9*	1	3			
		%	18%	2%	6%			
	Liquid	N	3*	0	1			
		%	6%	0.0%	2%			
	Solid	N	2*	0	0			
		%	4%	0.0%	0.0%			
	Wears pad	N	1	0	0			
		%	2%	0.0%	0.0%			
	Total		N	50	50			50
			%	100%	100%			100%

All cases in all groups stayed for one day at hospital. Healing period was significantly shorter among Botox group then laser group and significantly longer among open group (Table 4).

Table (4): Healing period distribution among the studied groups.

Variable			Group			X ² Fisher	P- value
			Open LIS Group	BOTOX Group	Laser Group		
Healing period	1-2 days	N	0	48	0	153.9	0.00**
		%	0.0%	96.0%	0.0%		
	3-7 days	N	37	2	50		
		%	74.0%	4.0%	100.0%		
	> Week	N	13	0	0		
		%	26.0%	0.0%	0.0%		
Total		N	50	50	50		
		%	100.0%	100.0%	100.0%		

BTX group was significantly associated with recurrence (Table 5). Open group was significantly lower regard quality of life index with no significant difference between laser and BTX groups at one month but at 3 months there was no significant difference among groups (Table 6).

Table (5): Recurrence distribution among studied groups.

Variable			Group			X ²	P-value
			Open LIS Group	Botox Group	Laser Group		
Recurrence	-Ve	N	48	29	44	25.73	0.00**
		%	96%	58%	88%		
	+Ve	N	2	21*	6		
		%	4%	42%	12%		
Total		N	50	50	50		
		%	100.0%	100.0%	100.0%		

Table (6): Quality of life distribution among studied groups.

Variable	Open LIS Group	Botox Group	Laser Group	F	P-value
Quality of life index Month	19.68 ± 2.69*	28.80 ± 1.01	25.14 ± 1.51	298.35	0.00**
Quality of life index 3 months	29.56 ± 2.94	29.82 ± 1.87	29.75 ± 1.68	2.82	0.095

DISCUSSION

Acute anal fissures are conservatively treated with a fibre supplement, stool softeners, plenty of water intake, sitz baths, and topical anesthetic ointment, all of which typically result in full recovery. However, persistent anal fissure typically does not respond to conventional therapy ⁽¹¹⁾.

The surgical method of choice for treating CAF is LIS. It functions by lowering the internal anal sphincter muscle's spasm, which lowers the mean resting anal pressure and gives the anal fissure a chance to heal. However, due to muscle injury, LIS may result in either transient or chronic fecal incontinence ⁽¹²⁾.

By blocking neurotransmission without disrupting the internal anal sphincter muscle (chemical sphincterotomy), BTX injection into the internal anal sphincter muscle relieves internal anal sphincter spasm ⁽⁶⁾. Following research examined BTX's safety and effectiveness in treating anal fissures in more detail. The internal sphincter has a significant role in determining the resting pressure in the anal canal. The sphincter's ongoing partial contraction is caused by an innate myogenic tone and pathways mediated by the alpha-adrenergic nerve ⁽¹³⁾.

Due to the hypertonicity of the internal sphincter, patients with chronic anal fissure typically have elevated resting anal pressure. The blood vessels feeding the distal anal canal that cross the internal sphincter on their way to the anal mucosa, may be squeezed by the hypertonic muscle, resulting in CAF, which limits the anal mucosa's ability to receive oxygen-rich blood. This is why ischemic ulcer has been used to define CAF ⁽¹⁴⁾.

In 90-95% of instances, LIS improves the circulation of the distal anal mucosa and heals CAF by lowering sphincter hypertonia. Internal anal sphincterotomy has disadvantages despite the high healing rate, including incontinence, wound-related problems, the requirement for hospitalization, and the anesthetic risk ⁽¹⁵⁾.

Incontinence due to flatus can occur in up to 35% of individuals who have had lateral sphincterotomies, according to a major study of these patients. Patients who had lateral sphincterotomies had severe sphincter deficiencies, according to endoanal ultrasonography ⁽¹⁶⁾.

Muscle damage is permanent even if the patient recovers from sphincterotomy without losing consciousness. Patients would be susceptible to developing incontinence as they age because resting pressure lowers ⁽¹⁷⁾.

Chemical sphincterotomy caused by BTX's blocking of sympathetic nerve function and myogenic tone of the internal anal sphincter results in an increase in local tissue perfusion and the repair of CAF. Muscle paralysis happens within hours and has 3-4 months duration. The fissure can mend thanks to this sustained impact ⁽¹⁸⁾. Because new nerve endings are formed and

axonal regeneration occurs afterward, there is no chance of the sphincter becoming permanently damaged ⁽¹⁹⁾.

Some of the recognized effects of laser therapy include better microcirculation, rapid wound healing in cases of sports injuries and accidents, and increased ATP generation, which serves as the catalyst for the bio-stimulating effect. Additionally, it has the potential to expand the collagen fibril sizes in a rat model ⁽²⁰⁾.

Analysis of 150 such patients treated at Zagazig University Hospital since 2022 has shown very satisfactory results. Eighty-one percent have been cured. Two percent of patients have presented with recurrence in LIS group, within a six-month period. These patients were treated with a second surgical procedure, relieving them of their recurrent symptoms. Four percent have been lost to follow up and it is very difficult to comment. Two percent of cases have not responded, but have not expressed dissatisfaction, and have not become worse with the treatment.

In our investigation, we discovered that 8 of the patients recovered after receiving BTX injections for 8 weeks. **Steele and Glazier** ⁽²¹⁾ reported that BTX was successful in 96% of the patients, **Brisinda et al.** ⁽²²⁾ recorded that BTX was effective in 92%, and **Alghaity et al.** ⁽²³⁾ showed that BTX was effective in 86% of the patients, which is in contrast to our findings.

But according to **Asim et al.** ⁽²⁴⁾ and **Berkel et al.** ⁽²⁵⁾, BTX was successful in 57% and 67% of cases, respectively. These low percentages might be explained by varying individual responses and be consistent with our findings.

Maria et al. ⁽²⁶⁾ reported 53.3% (8 of 15) healing in the BTX patients at 2 months in a double-blind, placebo-controlled study of BTX injection (20 U) for the treatment of CAF, which is similar to our findings. A second injection of BTX (25 U) was given to the four patients in the BTX group who still had a persistent fissure at two months. All four patients recovered by two months following the re-injection and there were no relapses during an average follow-up of 16 months.

Our present study has shown that BTX injection for treatment of CAF is a safe and less effective than other methods. The indication of BTX injection (chemical sphincterotomy) is similar to surgical LIS that is chronic idiopathic anal fissure with comparable success rate in both procedures.

A chronic idiopathic anal fissure with elevated anal sphincter tone that is not linked with or aggravated by other anal disorders that need surgical treatment, such as a fistula in ano or hemorrhoids, can be treated with a BTX injection. Without the use of sedation or local anesthetic, BTX injection is a straightforward operation that may be performed in an outpatient clinic ⁽¹¹⁾.

A laser sphincterotomy and fissurectomy have proven to be highly successful therapeutic options since the development of the CO2 laser. The procedure can be done as an outpatient "walk in," "walk out" procedure.

In 98% of cases, the procedure can be done while you're under local anesthetic. In rare circumstances where exposure is challenging or pain tolerance is poor, spinal anesthesia and general anesthesia may be necessary. The procedure may be performed for a fraction of the cost of hospital surgical care, and patient acceptability is exceptional ⁽²⁷⁾.

CONCLUSION

BTX injection is more suitable first-line treatment of choice for CAF, which is not associated with other anal conditions. It is a simple procedure, easy to learn and can be done in outpatient clinic without need for sedation or local anesthesia.

Thus, BTX injection decreases the use of hospital resources and so, it is of less cost. Regarding laser, it has less operation time, discharge may be given within a few hours, within a day patients can go back to normal routine work, with greater surgical precision and fastest recovery, fewer blood loss during surgery and no or minimal post-operative pain.

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