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Safety and efficacy of selective laser trabeculoplasty among Ethiopian open-angle glaucoma and ocular hypertension patients

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ABSTRACT

BACKGROUND: The objective was to assess efficacy of selective laser trabeculoplasty (SLT) in terms of mean baseline intraocular pressure (IOP) reduction and safety of SLT among Ethiopian patients.

MATERIAL AND METHODS: A prospective cohort hospital-based study conducted at Saint Paul Hospital Millennium Medical College (SPHMMC) in Addis Ababa, Ethiopia. The study included consecutive patients aged 40 years or older diagnosed with primary open-angle glaucoma (POAG), pseudoexfoliative glaucoma (PXG), or ocular hypertension (OHT) and had an IOP ranging from 21 to 33 mm Hg. Each patient had a six-month follow-up after laser procedure. Successful SLT define as ≥ 20% reduction in IOP or a decrease in the number of glaucoma medication ≥ 1 and IOP spike define as ≥ 6 mm Hg increase from baseline at first hour of post-SLT.

RESULTS: Study included 95 eyes of 95 patients with 92 completed 6-month follow-up. POAG account for 45, OHT for 26, and PXG for 21 cases. Baseline mean IOP was 25.06 ± 2.62 mm Hg, and the mean number of medications was 1.109 ± 0.94. After 6 months, the mean IOP was reduced by 7.96 ± 3.0 mm Hg (31.63%), and the mean number of medications by 0.14 ± 0.5. In 81 patients (88.04%) the treatment was successful. Patients reported transient ocular pain, brow ache, photophobia, and/or blurring of vision after undergoing the laser procedure. AC reactions of grade 0.5 or above were observed in 73 (80.6%) patients and 17 eyes (18.5%) experienced an IOP spike, but none required medical intervention.

CONCLUSION: SLT effectively reduced mean baseline IOP and mean antiglaucoma medication among Ethiopian patient with minimal and transient complication.

KEY WORDS: selective laser trabeculoplasty; open-angle glaucoma; ocular hypertension; Ethiopia

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INTRODUCTION

Glaucoma is a collection of diseases marked by a gradual loss of retinal ganglion cells, leading to alterations in the optic nerve head and visual field defects [1]. The loss of these ganglion cells is primarily associated with intraocular pressure (IOP), although other factors may also contribute. IOP is the only modifiable risk factor identified, and lowering the IOP is associated with lesser progression of the disease. There are multiple ways to reduce IOP, which include medical, surgical, and laser therapies. Laser trabeculoplasty (LT) is a specific technique

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involving laser energy on the trabecular meshwork (TM), targeting particular areas. Typically, the treatment covers the entire 360-degree circumference to improve the flow of fluid out of the eye, consequently reducing IOP.

LT is an option for open-angle glaucoma (OAG) and pseudoexfoliative glaucoma (PXG) that can reduce IOP without causing systemic side effects. Instead of relying on medication, LT uses various laser wavelengths and delivery systems such as argon, diode, and Q-switched Nd: YAG laser. The specific energy of the frequency-doubled Q-switched Nd: YAG laser used in SLT can effectively target and treat the TM, offering an alternative primary therapy for patients who cannot tolerate or comply with initial medical treatments. Latina and Park introduced selective laser trabeculoplasty in 1995 as an alternative to argon laser trabeculoplasty (ALT). Selective laser trabeculoplasty (SLT) utilizes a very short pulse duration (3 ns), which is shorter than the thermal relaxation time of melanin. This allows for selective photo thermolysis, explicitly targeting the pigmented TM. SLT delivers significantly lower energy levels than ALT, specifically less than 1% of ALT. SLT provides a range of 0.6 to 1.2 MJ per pulse.

In comparison, ALT delivers a higher range of 40 to 70 MJ per pulse, making SLT a safer laser treatment with minimal Histological scarring or coagulative damage to the TM or conjunctiva. This minimizes collateral damage to surrounding tissues. SLT is considered a potentially repeatable procedure, suitable for patients who have previously undergone unsuccessful SLT or ALT. Additionally, SLT does not interfere with future micro-invasive angle or external filtration surgeries.

MATERIAL AND METHODS

This study was a prospective cohort hospital-based study conducted at the Glaucoma Clinic of Saint Paul Hospital Millennium Medical College (SPHMMC), Department of Ophthalmology, located in Addis Ababa, Ethiopia. The college is a medical institution affiliated with a tertiary hospital serving a population of over 5 million people. All patients who fulfilled the inclusion criteria and underwent SLT as a procedure for IOP control at SPHMMC during the study period and who could attain a scheduled follow-up period were included in the study.

Eligibility criteria

The inclusion criteria were as follows:

- individuals aged 40 years or older, diagnosed with early to moderate POAG or early to moderate PXG;
- patients with ocular hypertension (OHT);
- patients who, upon gonioscopy examination, exhibit an open angle with visible angle structure in all four quadrants, extending up to the posterior level of the TM.
- patients with IOP ranging from 21 to 33 mm Hg, which has been measured on at least two occasions prior to SLT, either with or without prior medical therapy.

The exclusion criteria were as follows:

- individuals with congenital, juvenile, inflammatory, pigment dispersion, traumatic, neovascular glaucoma, or iridocorneal endothelial (ICE) syndrome.
- patients with corneal edema or corneal pathology that prevents accurate measurement of IOP and visualization of the anterior chamber angle structure;
- patients with advanced glaucoma with vertical cup-to-disc (VCD) greater than 0.85 and visual field defects involving the central 10 degrees of vision;
- individuals with media opacity that prevents examination of the posterior segment, cataracts requiring surgery, vitreous opacity, or vitreous hemorrhage;
- individuals with evidence of mental impairment that hinders their understanding of the study protocol or their ability to provide informed consent;
- patients who are unable to attend scheduled follow-up visits.
- individuals who have undergone any form of surgical glaucoma treatment in the past, including laser treatment;
- individuals who are pseudophakic or aphakic.

All patients who met the inclusion criteria were selected for enrollment. The purpose of the study was explained to them in their native language, with the help of an efficient translator, and they provided informed consent by signing a written document. In cases where both eyes of a patient were eligible, one eye was chosen for participation based on the patient's preference. Information regarding the patients' socio-demographic and clinical background, such as age, sex, medical history, and details about the type and duration of

antiglaucoma eye drops used, was collected from patient records for all participants. The phone numbers of the patients and close family members were gathered for follow-up tracking. The Snell Visual Acuity test was used to initially measure the baseline visual acuity (VA). The Goldmann Applanation Tonometry was used to measure the IOP, and the recording time was clearly noted as a reference for future measurements. Before deciding on SLT during follow-up visits within two weeks, two measurements of IOP were taken and averaged. This average was considered as the baseline for further assessment.

A gonioscopy examination was carried out using a Sussman Four-Mirror Gonio Lens to assess the status of the anterior chamber angle. The degree of pigmentation in the angle was assessed using the Spaeth grading system. Furthermore, after dilating the pupil with tropicamide 1%, a fundus examination was conducted with a 90D lens under a slit-lamp microscope to assess the retina and optic nerve head. Once written consent was obtained, the procedure was performed by a skilled glaucoma specialist at the Glaucoma Clinic. The principal investigator administered the initial and post-SLT questionnaires. To minimize the risk of post-procedural IOP spike, a single drop of brimonidine 0.2% was applied one hour before and immediately after SLT. Topical anesthesia (tetracaine 0.5%) was applied shortly before the procedure. The SLT laser, specifically the Ultra Q Reflex laser system emitting at 532 nm with a pulse duration of 3 nanoseconds and a spot size of 400 μm, along with a Latina SLT Gonio Lens by Ocular Instruments, was used for the procedure. The energy level of the laser was adjusted until fine campaign bubbles were observed, and this energy level was utilized for subsequent spots. The treatment involved delivering single non-overlapping pulses, placing 100 continuous spots along the TM (360°).

Any complications that occurred after undergoing the laser procedure, such as brow ache, ocular pain, headache, or blurred vision, were documented. One hour following the procedure, the patient's IOP was measured, and a slit-lamp examination was performed to check for signs of conjunctival injection, corneal edema, anterior chamber reaction, or hyphema. These evaluations were conducted by the principal investigator. Following the laser treatment, patients were instructed to use topical nonsteroidal anti-inflammatory drugs (NSAIDs), 0.03% flurbiprofen sodium, four times a day for one week. If the patients were already using glaucoma medication, they were instructed to continue their usual glaucoma drops. The principal investigator arranged the patients' follow-up appointments through telephone calls. These appointments were scheduled at the 1st week, 2nd month, and 6-month intervals following the procedure. During these visits, the patient's vision was assessed using best-corrected visual acuity, and their IOP was measured within a 2-hour window from the baseline measurement time. The patient also underwent a slit-lamp examination to check for potential long-term complications such as corneal decomposition, persistent anterior chamber reaction, hyphema, and posterior synechiae.

Additionally, changes in the optic nerve head were monitored through a dilated fundus examination. Any patient who did not achieve the desired level of intraocular pressure during their second visit, which took place two months after undergoing SLT, had an additional two weeks of consecutive follow-up to monitor their IOP and were provided with supplementary methods. These methods included the use of antiglaucoma medication or a repeat SLT procedure in order to effectively manage their IOP. These patients were automatically categorized as having failed SLT. Furthermore, patients who experienced a persistent spike in IOP for more than a week were monitored for two consecutive weeks to track their IOP level and anterior chamber reaction. Patients who underwent cataract extraction surgery after the SLT procedure or those who were lost to follow-up were not included in the study group.

Data analysis

The data analysis involved computing different statistics such like range, mean with standard deviation, frequencies (count of cases), relative frequencies (percentages), and inter-eye correlation. When appropriate, Huber regression was utilized to calculate the inter-eye correlation. A probability value (p-value) below 0.05 was considered statistically significant.

All statistical computations were performed using Statistical Package for the Social Sciences (SPSS) version 26, developed by SPSS Inc.

Operational definition

OHT is diagnosed when the IOP level is higher than 21 mm Hg, but there are no signs of optic nerve damage or visual field loss.

Early glaucoma is characterized by early signs of glaucomatous damage to the optic disc (such as a vertical cup-to-disc ratio of less than 0.65) and/or mild visual field defects outside the central 10 degrees of fixation.

Moderate glaucoma is defined by moderate signs of glaucomatous damage to the optic disc (such as vertical cup-to-disc ratio between 0.7–0.85) and/or moderate visual field defects outside the central 10 degrees of fixation.

POAG is diagnosed when the anterior chamber angle appears normal on gonioscopy; there are elevated IOP levels and evidence of glaucomatous damage to the optic disc without any other identifiable underlying cause.

PXG is diagnosed when white powdery deposits (pseudoexfoliation material) are observed on the lens capsule or at the pupillary margin during slit-lamp examination, along with elevated IOP levels and glaucomatous disc damage.

A successful SLT treatment is defined as achieving a minimum 20% reduction in IOP levels from the initial measurement after six months of undergoing SLT. Additionally, it may also involve ≥ 1 medication reduction while maintaining a targeted IOP level.

The failure of SLT treatment is deemed to be a decrease in IOP levels below 20% from the initial measurement or the requirement of further medications or surgical intervention to manage IOP levels subsequent to SLT.

Post-SLT IOP spike refers to an increase in IOP levels of at least 6 mm Hg from baseline within the first hour after undergoing SLT.

RESULTS

In the study, a total of 95 eyes from 95 patients were included. Out of these, 92 patients completed a six-month follow-up period. The average age of the participants was 54.4 ± 10.3 years, ranging from 40 to 80 years. Among the 92 patients, 85 (92.4%) were under the age of 70. Regarding sex, there were 47 (51.01%) females and 45 (48.9%) males. The most commonly diagnosed conditions were POAG, OHT, and PXG, accounting for 45 cases (48.9%), 26 cases (28.26%), and 21 cases (22.83%), respectively. This information is illustrated in Table 1. Some of the individuals involved in the study had additional health conditions. Out of all the participants, 5 individuals (5.43%) were identified as having diabetes, and an equal number (5.43%) were diagnosed with systemic hypertension. Additionally, 2 individuals (2.1%) were found to have retroviral infection (RVI). Both diabetes and hypertension coexisted in 8 participants (8.69%).

Table 1. Demographic and clinical characteristics of patients who underwent selective laser trabeculoplasty (SLT) at the Glaucoma Clinic of Saint Paul Hospital Millennium Medical College (SPHMMC) between January 2022 and June 2022

Characteristic	Value
Age	
Mean (SD)	54.4 ± 10.3 years
Sex	**No (%)**
Male	45 (48.9)
Female	47 (51.09)
Diagnosis	**No (%)**
POAG	45 (48.9)
OHT	26 (28.2)
PXG	21 (22.8)

SD — standard deviation; POAG — primary open-angle glaucoma; OHT — ocular hypertension; PXG — pseudoexfoliative glaucoma

Regarding treatment, 62 (67.4%) participants were already using a topical antiglaucoma medication, but for 30 (32.6%) patients, SLT was performed as the primary therapy. Among patients who are already receiving topical glaucoma medication, 28 patients are on a single medication regimen, an equal number are on dual therapy, and 6 patients are receiving triple therapy.

Our study provides a comprehensive baseline data set, including a mean IOP of 25.06 ± 2.62 mm Hg (range between 21 and 32 mm Hg), a mean baseline antiglaucoma of 1.108 ± 0.942, with a range from zero to three, and a mean VCD ratio of 0.59 ± 0.115. The procedure, on average, consumed a total energy of 81.91 ± 9.1 mJ, ranging from 40 to 100 mJ, as shown in Table 2.

Mean post-SLT IOP measurements were 24.6 ± 7.6 mm Hg, 20.0 ± 4.6 mm Hg, 17.25 ± 3.18 mm Hg, and 17.1 ± 3.01 mm Hg at 1st hour, 1st week, 2nd month, and 6th month respectively (Tab. 3). The mean decreases in IOP and the corresponding percentages during each follow-up were 5.01 mm Hg (19.67%) after one week, 7.8 mm Hg (31%) after 2 months, and 7.9 mm Hg (31.6%) after 6 months. After 6 months, the average VCD was 0.592 ± 0.115. The mean change in VCD was 0.0054 ± 0.021, which was not considered statistically significant (p-value = 0.155). Out of 92 patients, 86 (93.5%) did not exhibit any changes in their VCD when observed at the end of the six months.

Table 2. The average baseline value of patients who underwent selective laser trabeculoplasty (SLT) therapy at Saint Paul Hospital Millennium Medical College (SPHMMC) from January 2022 to June 2023

Clinical feature			
Mean baseline IOP No (SD)	Mean baseline medication No (SD)	Mean baseline VCD No (SD)	Mean energy used No (SD)
25.06 ± 2.62	1.108 ± 0.942	0.59 ± 0.115	81.9 ± 9.1

IOP — intraocular pressure; SD — standard deviation; VCD — vertical cup-to-disc ratio

Table 3. Mean baseline and after selective laser trabeculoplasty (post-SLT) intraocular pressure (IOP) level at subsequent visits

Clinical feature				
Mean average baseline IOP (SD): 25.059 ± 2.62 mm Hg				
	After 1st hour	**After 1st week**	**After 2nd month**	**After 6 months**
Mean IOP after SLT	24.6 ± 7.6	20.0 ± 4.6	17.25 ± 3.18	17.1 ± 3
Mean IOP change, No (%)		5.09 (19.6%)	7.8 (31%)	7.9 (31.6%)

SD — standard deviation

Table 4. Mean number of antiglaucoma medications during both at baseline and at subsequent visits after selective laser trabeculoplasty (SLT)

Clinical feature		
Mean number of baseline anti-glaucoma medication (SD): 1.108 ± 0.94		
	By 2nd month	**By 6th month**
Mean number of anti-glaucoma medication after SLT No (SD):	1.04 ± 0.93	0.96 ± 0.895
Mean Medication change No (SD)	0.06 ± 0.44	0.14 ± 0.5

SD — standard deviation

From a total of 92 eyes that completed a six-month follow-up period, 80 eyes (41 males and 39 females) successfully achieved a reduction in their IOP by at least 20%. One patient experienced a reduction of IOP by 16.67% in their IOP levels and was able to decrease their reliance on glaucoma medication. This resulted in a success rate of 88.04% (81 eyes). Among these successful cases, 66.66% (54 eyes) were initially treated with medication, while 33.33% (27 eyes) received primary laser therapy. Overall, after SLT, 69 patients (75%) were able to achieve a reduction of 25% or more in their average baseline IOP by the end of the six-month period. Mean pre-SLT IOP in men was 25.2 ± 2.74 mm Hg and had a mean reduction of 7.82 ± 2.62 mm Hg (31.2%) by the end of the 6th month with a success rate of 93.3%. In women, baseline IOP was 24.94 ± 2.53 mm Hg and had an average reduction of 8.09 ± 3.3 mm Hg (32%) from the baseline with a success rate of 82.97%. Notably, the mean decrease in IOP did not show any statistically significant difference between men and women, with a p-value of 0.711.

The mean use of antiglaucoma medications was significantly reduced over the course of the study. At two months, the mean use was 1.041 ± 0.93, and it further decreased to 0.96 ± 0.895 after six months (Tab. 4). This reduction, by 0.06 ± 0.44, and 0.14 ± 0.546 by second and six months respectively period, is a significant benefit of the SLT treatment, as indicated by a p-value of 0.001.

Before the study, 30 patients (32.6%) were not using any glaucoma medication. In the second month, this number increased to 33 patients, which included 4 new patients and 29 individuals who had initially undergone primary SLT, making up 35.86% of the total. By the sixth month, this number further rose to 36 patients, with 7 new patients and the remaining 29 still undergoing primary SLT, accounting for 39.1% of the total. A notable correlation was observed between the number of anti-glaucoma medications initially used and the change in medication use at the six-month mark, with

a p-value of 0.001. After six months, 29 out of 30 patients who had laser therapy as their first treatment for glaucoma remained medication-free.

Primary laser treatment was given to 30 (33.4%) participants and had a mean pre-SLT IOP of 24.16 ± 2.1 mm Hg; by the end of six months, the mean IOP reduced by 8.2 ± 2.9 mm Hg (33.4%), with a success rate of 90%. On the other hand, among the 62 patients receiving adjuvant laser therapy, the mean baseline IOP was 25.27 ± 2.8 mm Hg with a mean IOP reduction of 7.8 ± 3 mm Hg (30.78%) with a success rate of 87%. The statistical analysis revealed no significant difference in the mean change in IOP between the two groups (p-value of 0.5).

The mean pre-SLT IOP measurements for individuals with OHT, POAG, and PXG were 25.7 ± 2.86 mm Hg, 24.59 ± 2.3 mm Hg, and 25.23 ± 2.8 mm Hg, respectively. Over a six-month period, the mean reduction in IOP was 7.95 ± 3.3 mm Hg (30.65%) for OHT, 7.74 ± 2.86 mm Hg (31.4%) for POAG, and 8.43 ± 2.97 mm Hg (33.38%) for PXG. Furthermore, although the PXG group exhibited the most significant reduction in IOP, this difference did not reach statistical significance with a p-value of 0.69.

In the group, 5 eyes (patients) had diabetes and their pre-SLT mean IOP was 25.2 ± 2.28 mm Hg. After 6 months, IOP reduced by 7.38 ± 2.54 mm Hg (28.9%). Similarly, 5 eyes had HTN and had a mean baseline IOP of 26.1 ± 2 mm Hg, and IOP decreased by 6 ± 2.5 mm Hg (23.3%). 8 patients had both diabetes mellitus and hypertension with a mean baseline IOP of 25.87 ± 2.4 mm Hg and an IOP decrease of 6.95 ± 3.24 mm Hg (26.2%). In addition, 72 patients without any known systemic illness had a mean pre-SLT IOP of 24.9 ± 2.73 mm Hg and had a mean IOP reduction of 8.194 ± 3 mm Hg (32.78 ± 11.21%) by the end of six months. There was no significant difference in the mean IOP change between the groups, evidenced by a p-value of 0.42.

In the study, 28 patients had a baseline IOP higher than 26 mm Hg, ranging from 26.5 to 32 mm Hg, with a mean baseline IOP of 28.28 ± 1.68 mm Hg. By the end of the six months, their mean IOP had decreased by 9.3 ± 3.09 mm Hg (32.75% reduction). On the other hand, 64 patients had an average baseline IOP lower than 26 mm Hg, ranging from 21 to 26 mm Hg. These patients had a mean baseline IOP of 23.65 ± 1.44 mm Hg. By the end of the six months, their mean IOP had decreased by 7.37 ± 2.79 (a 31.15% reduction) (Fig. 1). Notably, the statistical analysis yielded significant results, demonstrated by a p-value of 0.004.

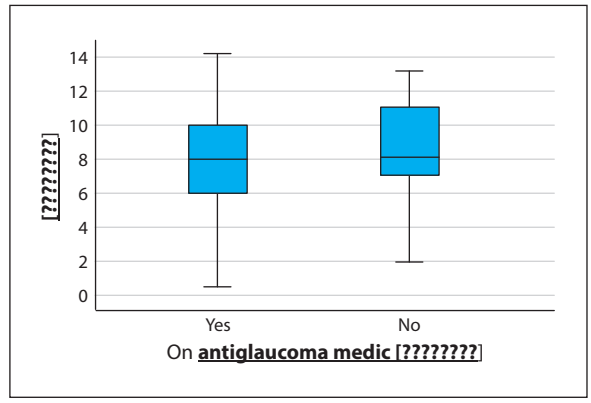

FIGURE 1. Box and Whisker of the comparison between primary and adjuvant laser therapy in terms of the mean reduction in intraocular pressure (IOP) after six months. Yes — adjuvant selective laser trabeculoplasty (SLT); No — primary SLT)

The mean energy per spot, along with its standard deviation, was 0.819 ± 0.09 mJ (ranging from 0.4 to 1 mJ), and the total energy used was 81.9 ± 9.18 mJ (ranging from 40 to 100 mJ). However, no statistically significant correlation was observed with the six-month mean decrease in IOP, as indicated by a p-value of 0.67. This study also examined the average IOP and mean change in IOP by the end of 6 months in different age groups. The average IOP level for patients aged 40–50 was 24.62 ± 2.47 mm Hg, while it was 25.20 ± 3.33 mm Hg for patients aged 50–60, 25.11 ± 3.07 mm Hg for patients aged 60–70, and 26.07 ± 2.62 mm Hg for patients aged 70–80. The average change in IOP by the end of the study was 8.29 ± 2.56 mm Hg (33.58%), 7.36 ± 3.33 mm Hg (29.14%), 8.18 ± 2.82 mm Hg (32.38%), and 8.10 ± 4.19 mm Hg (31.06%) respectively. The success rates were 93.1% for the age group of 40–50, 79.3% for 50–60, 92.5% for 60–70, and 85.7% for 70–80. However, despite the higher mean change in IOP and success rates in the relatively younger age group, no statistically significant correlation was seen between the age range and mean change in IOP, with a p-value of 0.950.

Immediately after undergoing SLT, individuals reported a range of symptoms, including eye pain, discomfort in the eyebrows, light sensitivity, and/or blurred vision. However, none of these symptoms were reported during the follow-up period. A follow-up examination using a slit-lamp one hour after

Table 5. The incidence and percentage of complications observed in patients after undergoing selective laser trabeculoplasty (SLT) procedures

Post-SLT complication	Value
Post-SLT AC reaction	No (%)
Grade 1	55 (59.1)
Grade 2	2 (13)
Grade 3	7 (7.6)
Grade 0	18 (19.4)
Post-SLT corneal edema	1 (1.08)
1st hour post-SLT IOP spike	17 (18.5)
Post-SLT IOP spike for more than a week	2 (2.1)

AC — anterior chamber; IOP — intraocular pressure

the SLT procedure revealed that out of the total patients, 55 (59.1%) had a grade 1 reaction in the anterior chamber (AC), 12 patients (13%) had a grade 2 AC reaction, 7 patients (7.6%) had a grade 3 AC reaction, and 18 individuals (19.4%) did not display any AC reaction. No signs of AC reaction were also seen after the first-week post-SLT period (Tab. 5). One individual developed cornea edema within the initial hour after SLT treatment and a post-SLT IOP of 50 mm Hg, but it resolved within one week without treatment. One hour after SLT, 17 eyes (18.5%) showed an increased IOP of 6 mm Hg or more. Two patients (2.17%) had consistently high IOP spikes that lasted over a week but spontaneously resolved in the second week. However, no cases of hyphema or posterior synechiae occurred during the six-month follow-up visit. No significant correlation was observed between the mean six-month change in IOP and the first-hour post-SLT IOP, as indicated by a p-value of 0.05. However, a strong correlation was observed between the grade of post-SLT AC reaction and the change in IOP within the first hour. This correlation is supported by a p-value of 0.001.

DISCUSSION

In our research, we examined how effective and safe selective laser trabeculoplasty is for treating patients with OHT and different forms of open-angle glaucoma. Our patients received laser treatment as either their primary or adjuvant therapy. After six months of treatment, we observed a significant reduction in IOP by 7.9 mm Hg (31.64%) and an overall success rate of 88.04%.

The findings of this study suggest that the decrease in IOP observed is more favorable compared to a previous study conducted by Gemida et al. in Ethiopia. Their study only reported a success rate of 60% at the end of their research. The differences in the definition of successful SLT therapy, the timing of reported successful results after undergoing SLT treatment, and the inclusion of pseudophakic or aphakic patients could provide clarification for the variation observed. However, our study's findings align with a previous research conducted by Mahdy et al. in Cairo, Egypt. Their study demonstrated a comparable average reduction of 7.44 mm Hg in mean IOP. In their study, a significant 77.1% of patients achieved a mean IOP reduction of more than 25% from the baseline at the conclusion of the research. Our study's results are also comparable to a study conducted by Melamed et al. in Tel Hashomer Israel, which demonstrated a mean IOP reduction of 7.7 mm Hg along with a success rate of 89% at the end of their study.

This study also reports a comparable success rate to the study conducted in South Africa by Goosen et al., which demonstrated a 90% success rate among the black South African population at the 6th month and after the 12-month study [23].

Another similar study was conducted by Realini et al. in St. Lucia, focusing on patients of African descent, which reported comparable findings to ours, with a 93% success rate in maintaining success after 12 months. The mean change in IOP ranged from 7.3 to 8.3 mm Hg (34.1–38.8%) in right eyes and from 7.6 to 8.2 mm Hg (36.0–38.9%) in left eyes throughout the 12 months [22].

Also, our study yielded varying success rates and mean IOP reduction compared to a study conducted by Damji at the University of Iowa in Canada. The study found that the mean IOP reduction after SLT treatment was 4.8 mm Hg by the end of six months. However, this discrepancy could be attributed to several factors, including their small sample size of only 18 participants, a lower baseline IOP level of 22.8 mm Hg, and the inclusion of patients who had previously undergone ALT treatment [16].

Over a period of six months, individuals with PXG showed slightly better response with an average reduction in IOP of 8.43 ± 2.97 (33.38%) and a success rate of 90.4%. These results align with a previous study conducted in Ethiopia [10], providing a strong foundation for our findings.

Furthermore, a study conducted in Iran by Miraftabi et al. investigated the effectiveness of selective laser trabeculoplasty in patients with PXG

compared to those with primary open-angle glaucoma. They observed a mean change in IOP over a six-month period, which was higher in PXG compared to primary open-angle glaucoma (7.8 *vs.* 4.5) by the end of the six-month time frame. Additionally, the success rate for PXG was 94%, whereas it was 75% for primary open-angle glaucoma [24].

This study also examined the reduction of IOP in patients with diabetes, hypertension, or a combination of both. Patients without any underlying systemic illnesses demonstrated a higher decrease in IOP of (8.13 ± 3 mm Hg) over a six-month period. However, no statistically significant association was found regarding this reduction. These findings align with a previous study in Ethiopia [10]. During the latest examination, it was observed that patients with higher initial IOP experienced a more significant reduction in mean IOP. 9.3 ± 3 mm Hg, corresponding to a 32.74% decrease. Importantly, this reduction in the latter group is statistically significant, with a p-value of 0.04. These findings support previous multicenter pilot study conducted by Latina et al. [11], Gemeda et al. in Ethiopia [10] and a study conducted in Colombia by Hirabayashi et al. [25].

This study also examined the average levels of IOP and the average change in IOP after SLT over a six-month period in various age groups. However, while higher mean IOP changes and success rates were observed in the younger age group, there was no statistically significant correlation between age range and mean IOP change. The obtained p-value was 0.950, which differs from the findings of a previous study conducted in Ethiopia [10]. In their research, a significant correlation was found between the age of patients and a 20% reduction in IOP at the 12-month follow-up. This disparity in findings may be attributed to the fact that our study had relatively lower mean baseline IOP levels in the younger age group compared to other age ranges and a different follow-up period after SLT. We also found a consistent decrease in the average usage of antiglaucoma medications over time. Initially, the average was 1.108 ± 0.94, but after six months, it decreased to 0.96 ± 0.91, a statistically significant reduction with a p-value of 0.001. Similar findings were also observed in the studies conducted in Egypt [21] and in Ethiopia [10].

During our analysis, it was observed that a majority of patients (80.6%) experienced varying levels of anterior chamber reaction after undergoing selective laser trabeculoplasty. This finding aligns with a previous multi-center study conducted by Latina et al. [11] and a review of SLT complications done by Julia Song et al. [26], In which they reported that 89% and 83% of patients respectively exhibited some degree of anterior chamber reaction. However, a significantly higher number of patients developed anterior chamber reactions compared to a study conducted in Ethiopia [10], which reported a rate of 38.6%. This variance could be attributed to differences in the energy range utilized or variances in patient angle pigmentation. Different rates of ocular discomfort were reported in previous studies conducted by Latina et al. [11] and a study performed in England by Nagar et al. [27], 15% and 39%, respectively. In contrast, all our patients experienced some form of ocular discomfort, such as photophobia, ocular pain, headache, and/or blurred vision. The disparities in these findings can be attributed to the fact that the aforementioned studies utilized questionnaires administered one hour after the SLT procedure. In contrast, our study examined the immediate post-SLT period. We observed that 17 eyes (18.5%) in our study exhibited spikes in IOP of ≥ 6 mm Hg one hour after SLT. This finding is comparable with the results obtained by Latina et al. [11]. Although it is slightly higher than the results conducted in Ethiopia [10], possibly due to their consistent use of Pilocarpine 2% eye drops before the laser procedure besides 0.2% brimonidine.

RECOMMENDATION

Given the uncertainty surrounding the availability and affordability of eye drops in this region, SLT still presents itself as a viable treatment option for 10/10/2024 Ethiopian OHT and mild to moderate open-angle glaucoma patients above the age of 40.

Data availability

Data used to support the findings of the study are available from the corresponding author via matiyas89@gmail.com.

Conflicts of interest

The authors declare that there are no conflicts of interest.

Authors' contributions

Dr. Matiyas was involved in selecting the research article, preparing the proposal, selecting patients for enrollment, and post-procedural follow-up and

data entry, and also interpreted the data, drafted and wrote the article.

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