

Efficacy Of Selective Laser Trabeculoplasty In Minimizing Topical Therapy In Primary Open-Angle Glaucoma.

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Abstract

Background: Glaucoma remains one of the leading causes of irreversible blindness worldwide, with intraocular pressure (IOP) being the only modifiable risk factor. While topical medications are the first-line therapy, long-term use is associated with poor compliance, adverse effects, and financial burden. Selective laser trabeculoplasty (SLT) has emerged as a safe alternative.

Objective: To evaluate the effectiveness of selective laser trabeculoplasty as a replacement therapy in patients with medically controlled primary open-angle glaucoma (POAG).

Materials and Methods: A hospital-based longitudinal study was conducted on 30 eyes of 15 patients with medically controlled POAG between June 2024 and October 2025. SLT was performed over 180° of the trabecular meshwork. Patients were followed at 1 hour, 1 day, 1 week, 1 month, 3 months, and 6 months post-procedure. Primary outcome was reduction in the number of antiglaucoma medications while maintaining target IOP.

Results: The mean baseline medicated IOP was 19.67 ± 2.63 mmHg. At 6 months post-SLT, the mean IOP reduced to 18.80 ± 2.38 mmHg without topical medications. Mean IOP reduction from diagnostic baseline was 7.13 ± 1.53 mmHg (27.49%). SLT achieved >20% IOP reduction in 100% of eyes. The average number of medications reduced from 1.6 to 0.17. Complete withdrawal of medications was possible in 87% of eyes.

Conclusion: SLT is an effective replacement therapy in medically controlled POAG, providing sustained IOP control while significantly reducing medication burden.

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I. Introduction

Primary open-angle glaucoma (POAG) is a progressive optic neuropathy characterized by irreversible visual field loss and optic disc damage. Elevated intraocular pressure (IOP) remains the most significant modifiable risk factor in the management of glaucoma. Conventional glaucoma management begins with topical antiglaucoma medications; however, long-term therapy often results in reduced patient compliance, ocular surface toxicity, systemic adverse effects, and increased financial burden.

Selective laser trabeculoplasty (SLT), first introduced in 1995, selectively targets pigmented trabecular meshwork cells using a 532-nm frequency-doubled Nd:YAG laser. By enhancing aqueous outflow facility, SLT offers IOP reduction without causing thermal damage to adjacent tissues. This study was undertaken to evaluate the role of SLT as a replacement therapy in patients with well-controlled POAG.

II. Materials And Methods

Study Design and Ethical Approval

A hospital-based longitudinal study was conducted after obtaining approval from the Institutional Human Ethics Committee.

Study Population

Thirty eyes of 15 patients diagnosed with medically controlled primary open-angle glaucoma attending a tertiary care ophthalmology outpatient department were included.

Inclusion Criteria

- Diagnosed cases of POAG
- Patients on topical antiglaucoma medications

Exclusion Criteria

- Advanced glaucoma
- Angle-closure glaucoma

- Secondary or complicated glaucoma
- One-eyed patients
- Patients on more than three topical medications
- Uncooperative patients

Pre-Procedure Evaluation

All patients underwent complete ophthalmic evaluation including:

- Slit-lamp biomicroscopy
- Goldmann applanation tonometry
- Gonioscopy
- Fundus examination using 78D lens
- Visual field analysis
- Optical coherence tomography (OCT)

SLT Procedure

Patients received 2% pilocarpine 30–60 minutes before the procedure. The eye was anesthetized with 0.5% proparacaine. Using a single-mirror SLT lens, 180° of the inferior trabecular meshwork was treated with mean laser energy of 0.6 mJ (range: 0.4–1.2 mJ), applying an average of 49 non-overlapping spots.

Post-Procedure Follow-Up

IOP was measured at:

- 1 hour
- 1 day
- 1 week
- 1 month
- 3 months
- 6 months

Topical medications were gradually withdrawn based on IOP response.

Statistical Analysis

Data were analyzed using IBM SPSS version 25. Paired t-test was used to compare pre- and post-SLT IOP. A p-value <0.05 was considered statistically significant.

III. Results

A total of 30 eyes (6 males and 9 females) were included with a mean age of 54.73 ± 10.37 years.

- **Mean IOP at diagnosis:** 25.93 ± 3.17 mmHg
- **Mean baseline IOP on medication:** 19.67 ± 2.63 mmHg
- **Mean IOP at 6 months post-SLT:** 18.80 ± 2.38 mmHg

SLT produced a **mean IOP reduction of 7.13 ± 1.53 mmHg (27.49%)** from diagnostic baseline. All eyes (100%) achieved more than 20% IOP reduction at 6 months.

Before SLT:

- 16 eyes were on one medication
- 10 eyes on two medications
- 4 eyes on three medications

After 6 months:

- 26 eyes (87%) required **no medications**
- 4 eyes (13%) required **one medication only**

The mean number of medications decreased from **1.6 to 0.17**.

No significant ocular or systemic complications were noted.

Table 1: Mean IOP at Different Time Intervals

Time Interval	Mean IOP (mmHg)
Baseline	19.67
1 Hour	23.20
1 Day	21.93
1 Week	21.20
1 Month	19.93
3 Months	18.67
6 Months	18.80

Figure 1: Mean IOP Changes After SLT

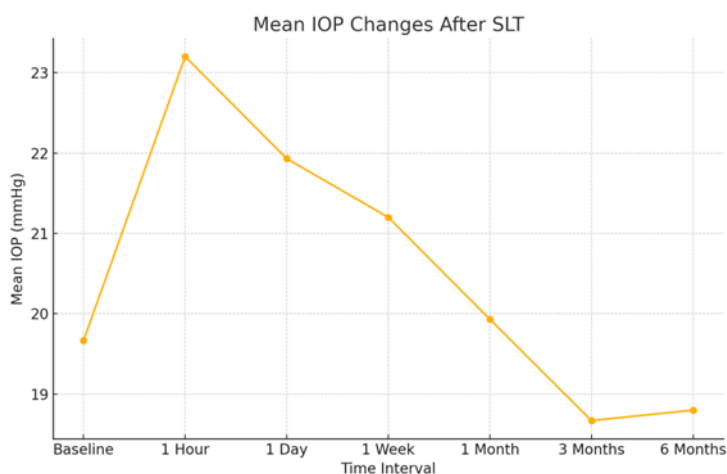


Figure 2: Medication Reduction After SLT

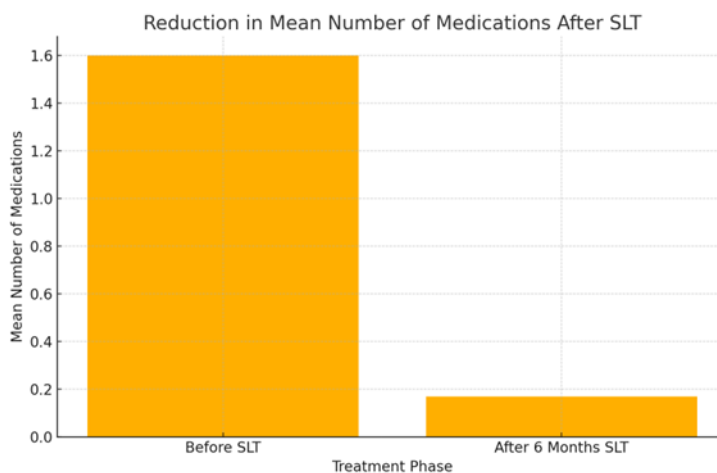


Table 2: Mean Medication Reduction

Treatment Phase	Mean Number of Medications
Before SLT	1.6
After 6 Months SLT	0.17

IV. Discussion

Long-term topical therapy for glaucoma is associated with poor adherence, ocular surface toxicity, systemic adverse effects, and increased healthcare costs. SLT offers an effective, non-invasive alternative that directly improves aqueous humor outflow.

In the present study, SLT achieved more than 20% IOP reduction in all treated eyes, consistent with previously published literature. The medication-free success rate of 87% at 6 months demonstrates the strong potential of SLT as a replacement therapy. The safety profile observed in this study further supports its widespread use.

V. Limitations

- Small sample size
- Short follow-up duration of 6 months Long-term studies with larger populations are required to evaluate sustained efficacy.

VI. Conclusion

Selective laser trabeculoplasty is a highly effective and safe replacement therapy for medically controlled primary open-angle glaucoma. It significantly reduces the dependency on topical medications, improves patient compliance, minimizes adverse effects, and lowers financial burden while maintaining stable IOP control.

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Conflicts of interest There are no conflicts of interest.

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