



Original Research Article

Evaluation of the effectiveness of selective laser trabeculoplasty (SLT) in patients with open angle glaucoma

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ABSTRACT

Context: Glaucoma is second leading cause of blindness in world. Various treatment modalities are available for glaucoma management. Thus, the question arises whether SLT can be interchangeably used in place of medical drugs or not.

Aims: To examine the effect of selective laser trabeculoplasty (SLT) as a replacement therapy for medically controlled primary open-angle glaucoma (POAG) patients.

Design: A longitudinal study

Subjects and Methods: SLT was performed in 30 eyes of 15 patients with medically controlled primary open-angle glaucoma (POAG) cases from June 2018 to October 2019 and with no previous history of glaucoma surgery. Data were recorded 1 hr, 1day, 1 week, 1, 3 and 6 months after SLT. The primary outcome was number of medications at 6 months while maintaining a predetermined target intraocular pressure (IOP).

Results: Selective laser trabeculoplasty (SLT) reduced number of medications from a mean of 1.6 at baseline to 0.17 after 6 months. Meanwhile, SLT achieved more than 20% IOP lowering in 100% of eyes after 6 months. Eighty seven percent of our eyes no longer needed any medication after SLT at 6 months.

Conclusions: Selective laser trabeculoplasty was able to completely replace medical therapy in 87% of eyes after 6 months. Medically managed POAG patients who underwent SLT, maintained good IOP control with less medications, better compliance, reduced side effects and financial burden.

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1. Introduction

Glaucoma is a progressive optic neuropathy which results with vision loss if left untreated.¹ Raised intra-ocular pressure is the only factor that can be controlled to prevent progressive glaucomatous optic neuropathy. This can be achieved via medication, surgery and laser.

A medicine-only approach is generally considered as the first option. However, decades of taking topical medications have a serious influence on quality of life.²⁻⁴ Laser surgery is next option for treatment.

Selective laser trabeculoplasty is a laser treatment option that was introduced by Dr. Latina and colleagues

in 1995. SLT uses a 532 nm Q-switched, frequency-doubled neodymium-yttrium-aluminum-garnet (Nd: YAG) laser that delivers a short pulse duration (3 ns)⁵ to reduce IOP by increasing aqueous outflow through the trabecular meshwork (TM).⁶ SLT has the potential advantage of avoid issues associated with topical IOP-lowering medications, such as local and systemic side effects and variable patient adherence.

The purpose of this study will evaluate selective laser trabeculoplasty as replacement therapy in medically controlled open-angle glaucoma patients while maintaining target intraocular pressure.

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2. Subjects and Methods

Ethical permission was taken from Human Research and Ethics Committee. This study is a hospital based longitudinal study of patients with primary open angle glaucoma attending the outdoor patient in ophthalmology department in a tertiary care hospital. All the patients enrolled in the study were evaluated during a period from June 2018- October 2019. These patients were examined and investigated thoroughly as per the protocol. 30 eyes of 15 Patients who presented to tertiary care during the study period with glaucoma were included.

2.1. Inclusion criteria

All diagnosed patients of open angle glaucoma visiting outdoor patient department who were on topical medication.

2.2. Exclusion criteria

Advanced open angle glaucoma, Angle closure glaucoma, Uncooperative patient, Complicated glaucoma, One Eyed glaucoma patient, Patient on more than topical 3 drugs for open angle glaucoma

2.3. Methodology

With standard protocol, we diagnosed open angle glaucoma by using Slit lamp bio-microscope (Appasamy AIA-11 5S slit lamp), Goldman's Applanation tonometer, gonioscope, 78 D lens (volk), perimeter [Carl Zeiss Humphrey Field Analyzer (Carl Zeiss Meditec, Inc., Germany)], OCT (topcon 3D OCT- 1 maestro machine).

Pre-operatively patient maintained their usual medication regimen. Used pilocarpine (2%) 30 minutes to 1 hour prior to the SLT procedure. The eye was pre-treated with a drop of alpha agonists, if not contraindicated, just before or immediately after the procedure. One drop of topical anesthetic drug (proparacaine 0.5%) instilled. The patient made to seat at the laser -slit lamp system (SOLO ELLEX). Volk-single mirror SLT lens was attached to the eye with coupling agent like methylcellulose (1%). All anterior chamber angle were inspected. The laser beam focused onto the pigmented trabecular meshwork. Approximately 180 degrees of the inferior trabecular meshwork was treated with a mean power of 0.6 m J (0.4-1.2 m J), spots of 49 (38 to 61). The power can be titrated till it causes champagne bubbles to form. Adjacent but Non over lapping spots are applied in one session. IOP was measured for 2 hours for post procedure IOP spike and then on 1 day, 1 week, 1 month, 3 months and 6 months after the procedure. Post SLT one medication discontinued on the same day of treatment, further topical medications discontinued on successive follow up.

Data was entered in Microsoft excel and analysed using IBM SPSS software version 25. Frequency was

obtained for age and sex distribution for participant. Mean IOP and impact of treatment on IOP at different stages postoperatively was compared using paired T test.

3. Results

Selective laser trabeculoplasty was done in 30 eyes (15 patients: 6 males & 9 females). The mean age of the patients was 54.73 ± 10.37 years. Mean baseline IOP with topical medications for 30 eyes was 19.67 ± 2.63 mmHg. Post SLT mean IOP at 1 hour, 1 day, 1 week, 1 month, 3 months and 6 months was 23.20 ± 3.09 mmHg, 21.93 ± 2.43 mmHg, 21.20 ± 2.55 mmHg, 19.93 ± 2.54 mmHg, 18.67 ± 2.43 mmHg, 18.80 ± 2.38 mmHg respectively. Figure :1 shows that the mean IOP at 6 months post SLT was below mean baseline IOP with topical medications which was significant ($p < 0.005$). This mean IOP was maintained even after topical medications were discontinued post SLT.

In our study the mean IOP at diagnosis was 25.93 ± 3.17 mmHg. After 6 months post mean IOP was 18.80 ± 2.38 mmHg. Post SLT mean IOP reduction from mean IOP at diagnosis was 7.13 ± 1.53 mmHg (27.49 %). SLT achieved more than 20% IOP lowering in 100% of eyes after 6 months.

Total 30 eyes were studied in which 16 eyes were on one medication, 10 eyes on two medications and 4 eyes on three medications. After selective laser trabeculoplasty, one topical medication was discontinued from all 30 eyes. After 1 month further reduction of topical medications were done in 14 eyes. At end of 6 months only 4 (13%) eyes were on single topical medication who were on three medications and in remaining 26 (87%) eyes topical medications were discontinued. Thus selective laser trabeculoplasty (SLT) reduced number of medications from a mean of 1.6 at baseline to 0.17 after 6 months.

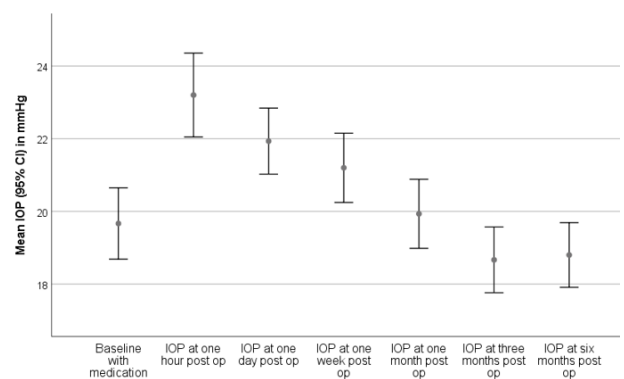


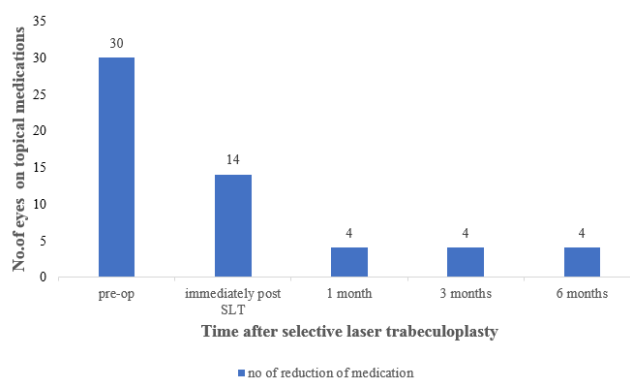
Fig. 1: Mean IOP change from baseline after Selective laser trabeculoplasty

Table 1: Evaluation of mean IOP

Time	Mean IOP in mmHg After SLT	Post SLT mean IOP difference from baseline IOP (mmHg)	P Value
1 hour	23.20 ± 3.09	3.53 ± 1.63	0.0001
1 day	21.93 ± 2.43	2.26 ± 1.55	0.0001
1 week	21.20 ± 2.55	1.53 ± 1.63	0.0001
1 month	19.93 ± 2.54	0.26 ± 1.94	0.459
3 months	18.67 ± 2.43	1.00 ± 1.72	0.003
6 months	18.80 ± 2.38	0.87 ± 1.55	0.005

Table 2: Comparison of mean IOP at diagnosis to mean IOP at 6 months post SLT

	Mean IOP
Mean IOP at diagnosis	25.93±3.17 mmHg
Mean baseline IOP with topical medication	19.67±2.63mmHg
Mean IOP at 6 months post SLT without topical medication	18.80±2.38 mmHg
Post SLT mean IOP reduction from mean IOP at diagnosis (mmHg)	7.13±1.53 mmHg
Post SLT mean IOP reduction(in percentage)from mean IOP at diagnosis	27.49%
No. of eyes achieved >20% IOP reduction from IOP at diagnosis	30 eyes (100%)

**Fig. 2:** Stepwise post SLT reduction of topical medications

4. Discussion

The medical treatment of glaucoma has associated local⁷ and systemic side-effects⁸, is expensive,⁹ non-compliant and often inconvenient. It is therefore not surprising that glaucoma can have a large impact on a patients' quality of life.³ The burden of this treatment can lead to poor or non-compliance, followed by progression of disease.¹⁰ Application of SLT can bypass these problems.¹¹ Selective laser trabeculoplasty is short and out-patient based non-invasive procedure having good safety profile.¹² This study demonstrates that SLT can be used in patients that are well-controlled with their topical medications. After SLT, topical medications can be gradually diminished.

While maintaining good control, SLT substantially reduces the number of antiglaucoma medications needed. In our study, SLT produced a mean reduction in medications of 1.43 after 6 months. Francis et al.¹³ in their study found that a mean reduction of 1.5 medications after 12 months. Myrjam De Keyser, et al.¹⁴ reported a mean reduction

of 1.15 medications 12 months after SLT.

The success of Selective laser trabeculoplasty is defined as IOP decrease of >3 mmHg or IOP decrease of >20%. In our study the mean IOP at diagnosis was 25.93 ± 3.17 mmHg. After 6 months post mean IOP was 18.80 ± 2.38 mmHg. SLT achieved more than 20% IOP lowering in 30 (100%) eyes after 6 months. Myrjam De Keyser, et al.¹⁴ in their study found that SLT achieved more than 20% IOP lowering in 95% of eyes after 18 months. Ian McIlraith, et al.¹⁵ in their study, SLT achieved more than 20% IOP lowering in 83% of eyes after 12 months. The result of our study was not comparable to previous mention study due to short duration of follow up of our study.

In our study 30 eyes were on topical medications before SLT. After SLT at end of 6 months, 4 (13%) eyes remained on single topical medications who were on three medications and in remaining 26 (87%) eyes topical medications were discontinued. Brian A. Francis, et al.¹³ in their study found that 68% of previously medically treated patients no longer needed any topical medications 12 months after SLT. Myrjam De Keyser, et al.¹⁴ in their study found 77% of the previously medically treated patients no longer needed any topical medications 12 months after SLT.

No serious adverse reaction related to selective laser trabeculoplasty were noted in our study as well as visual acuity, gonioscopic finding, visual field remained unchanged during the follow up period. The results of our study indicate that SLT allows discontinuation of medications in a majority of patients with medically controlled POAG.

Due to selective laser trabeculoplasty, number of medications lowers and patient's compliance improve and reduce financial burden, selective laser trabeculoplasty (SLT) can be used as replacement therapy in well-controlled patients. Selective laser trabeculoplasty (SLT) lowers the

IOP enough in a vast majority of patients.

Limitation of our study: Longer follow up needed to study the long term effect of SLT.

5. Conclusions

Our study attempted to evaluate Selective Laser Trabeculoplasty as a replacement therapy in medically controlled open angle glaucoma. We found that SLT replaced medical therapy in 87% of eyes after 6 months. We conclude that medically managed POAG patients who underwent SLT, maintained good IOP control, static disc and field changes with less medications, better compliance, reduced side effects and financial burden.

6. Source of Funding

None.

7. Conflict of Interest

None.

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