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Audit article

An audit of selective laser trabeculoplasty (SLT) performed by two surgeons at a single centre

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Abstract

Newer treatment modalities like selective laser trabeculoplasty (SLT) are gradually taking over conventional topical medications in primary open-angle glaucoma (POAG) management[3]. The mechanism of action in SLT is theorized to be biological as the IOP lowering effect is suggested to be due to the stimulated cellular activity of the trabecular meshwork by laser[10]. This clinical audit demonstrates the changes in intra ocular pressure (IOP) following SLT in a Sri Lankan population. This procedure was performed with SLT Multi-spot Visulas green laser with the use of a Latina gonio lens. 360° of trabecular meshwork (TM) was treated in one session and 10-30 micro joules of energy was used depending on the pigmentation of the TM. IOP was documented preoperatively and in post-operative two weeks and monthly follow-up visits up to 3 months. 26 eyes of 14 patients who underwent SLT by 2 surgeons at one centre were analysed. 100% of eyes showed IOP reduction in two weeks post-operatively with an average IOP reduction of 5.75 mmHg. Post-operative one-month, two-month and three-month average IOP reduction were 5.76mmHg, 6.04mmHg and 6mmHg respectively. IOP reduction following SLT in Sri Lankan POAG patients was comparable to the results of SLT elsewhere[1,2,6]. Continuous clinical audits are needed to evaluate long-term IOP reduction and titrate laser power suitable for the Sri Lankan population.

Key words: POAG, SLT, TM pigmentation

Introduction

Glaucoma, being a cause of irreversible blindness worldwide, accounts for a major public health problem. 80 million people worldwide were estimated to be diagnosed with glaucoma by 2020[11]. Most of them have primary open-angle glaucoma[12]. Despite identifying many risk factors associated with glaucoma lowering IOP is the primary treatment approach in current-day practice[3]. The practice of first-line treatment with IOP-lowering medications in POAG and OHT is now shifting towards SLT[3]. SLT is also recognized as an adjunctive treatment modality[9].

In 2001 US FDA endorsed SLT in the treatment of glaucoma after it was proven to lower IOP in 1998[6,8]. SLT targets pigmented cells in the trabecular meshwork. In SLT a process called selective photo thermolysis targeting the melanin in pigmented cells exerts several biological effects such as the proliferation of trabecular and endothelial cells, release of cytokines, recruitment of macrophages, phagocytosis and TM remodeling leading to increased aqueous outflow. In contrast to Argon Laser Therapy (ALT) structural or coagulative damage to TM was not detected in SLT[10]. Long-term IOP control, repeatability, freedom from drops, reduction of intense medical management, delaying incisional surgical intervention, freedom from side effects associated with topical medication, cost-effectiveness and favorable safety profile are key benefits of SLT[6,7].

Objectives

This clinical audit demonstrates the changes in IOP following SLT in the Sri Lankan population.

Materials and methods

This is a continuous audit by 2 senior consultant ophthalmologists in a single centre. 29 eyes of 16 patients who were diagnosed with POAG underwent SLT from the beginning of the audit (from 2023/03/21 to 2023/08/01). Out of these only 26 eyes of 14 participants were analyzed as the follow-up data of the rest were yet to be retrieved. 5 out of them were males and 8 were females. The age range of the sample was between 20 to 78 years. All were consecutive

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participants who wished to be treated with SLT. During this period of audit, none of the OHT patients were present for SLT. 4 eyes of 2 patients were treatment naïve whereas the rest were on topical monotherapy or combined therapy.

Slit lamp examination, evaluation with gonioscopy, Central Corneal Thickness (CCT), HVF, OCT RNFL, OCT GCA, OCT ONH of all patients were assessed by the same 2 consultants to arrive at a diagnosis of POAG and OHT. Secondary OAG, angle-closure glaucoma and pigment dispersion glaucoma patients were not offered SLT according to recommendations implemented by NICE[9].

POAG patients were categorized as mild, moderate and severe glaucoma according to cup: disc ratio and HVF findings[9]. According to the severity and other patient details personalized target IOP was calculated for individual patients. Multisport SLT laser was delivered by Zeiss Visuals green laser machine using Latina SLT gonio lens.

Coupling gel was applied to the anaesthetized eye and the lens was kept on the eyes to visualize the angle. Then visuals green multisport laser was delivered to 360° of TM. The following table compares conventional SLT with multisport SLT[5].

Table 1. Comparison between Zeiss multisport SLT and conventional SLT

	Zeiss multisport SLT	*Conventional SLT*
Wavelength	532 nm	532 nm
Laser source	Nd:YvO4	Nd:YAG
No of SLT applications	100	100
Pulse duration	200 ns	3 ns
Application diameter	400 micrometers	400 micrometers
Arrangement of SLT application	A pattern of 52 single spots	Single spot
Time for one application	280 ns (max 3 Hz)	3 ns (Max 3Hz)
Titration method	Based on pigmentation	Based on pigmentation and cavitation bubbles
Laser energy	32.7 microjoule	1.31 millijoule

The titration of energy to be delivered was based on the individual's level of pigmentation of TM. Pigmentation is graded according to the Scheie grading system. In this audit between 10 to 30 microjoules of energy was used.

Table 2. Laser energy according to Schie grading

TM pigmentation	*Schie grading*	*Pulse energy*
None to just visible	0	30 - 40 microjoule
Mild to moderate	I + II	20 - 30 microjoule
Moderate to severe	III + IV	10 - 20 microjoule

Pre-SLT and Post SLT IOP values were measured by the same surgeon with the same tonometer within a 2-hour window period. Post-SLT measurements were taken at 2 weeks, one month, two months and three months after the SLT.

All data were recorded in a hospital database accessible only to authorized medical care providers. Microsoft Excel was used for the analysis of data.

Results

Every patient showed a reduction of IOP from their pre-SLT IOP values at each follow-up. Overall IOP reduction ranged from 2 mmHg to 6 mmHg.

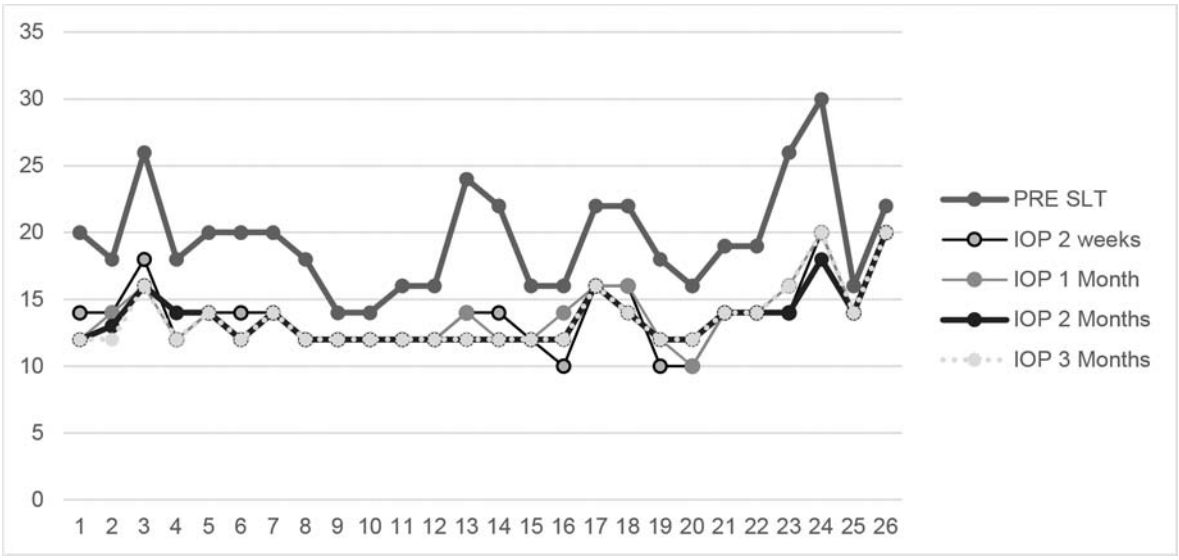

Figure 1. *Pre SLT, post SLT 2 weeks, 1 month, 2 months, 3 months IOP of each eye.*

Respective IOP reduction at two weeks, one month, 2 months and 3 months was by 5.76 mmHg, 5.76 mmHg, 6.04 mmHg and 6 mmHg.

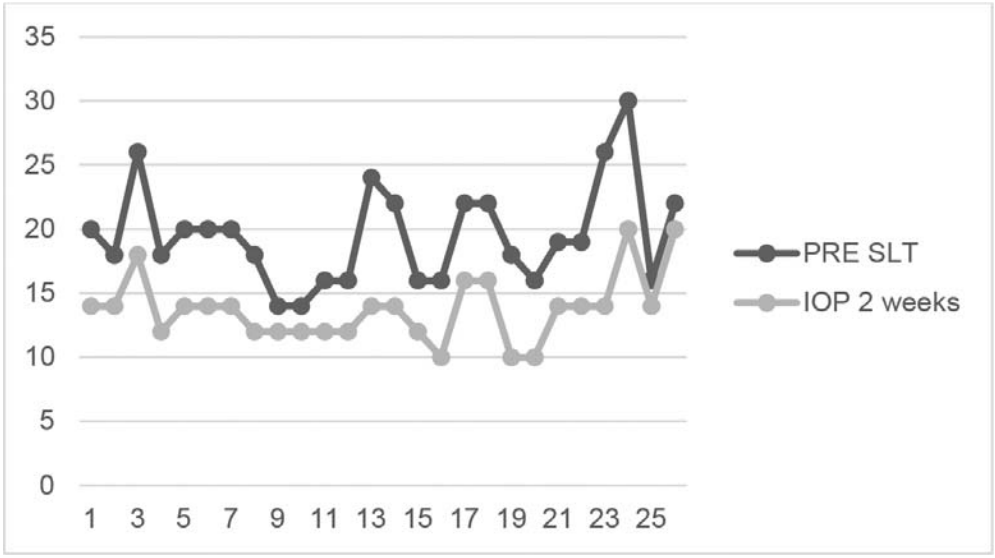

Figure 2. *Comparison between pre-SLT and post-SLT 2 weeks IOP of each eye.*

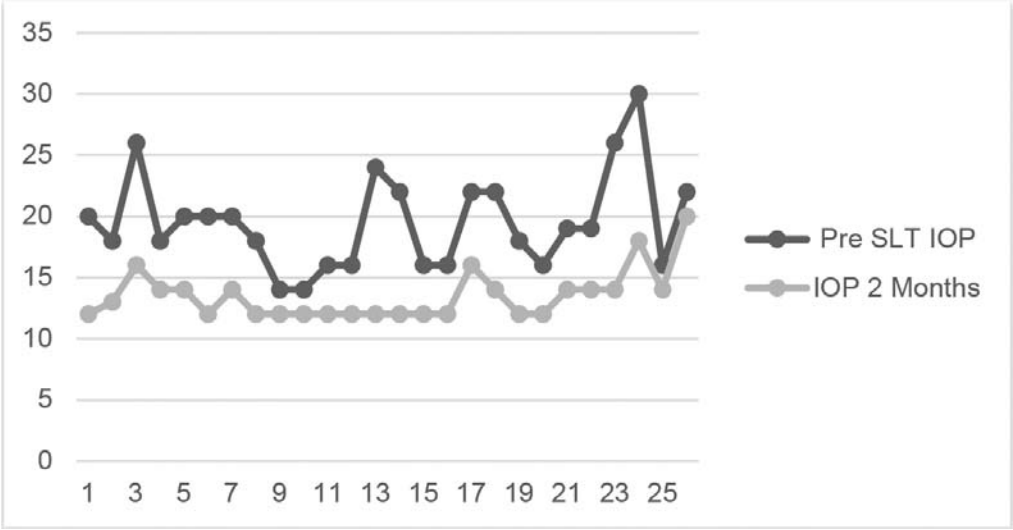

Figure 3. *Comparison between pre-SLT and post-SLT 2 months IOP of each eye.*

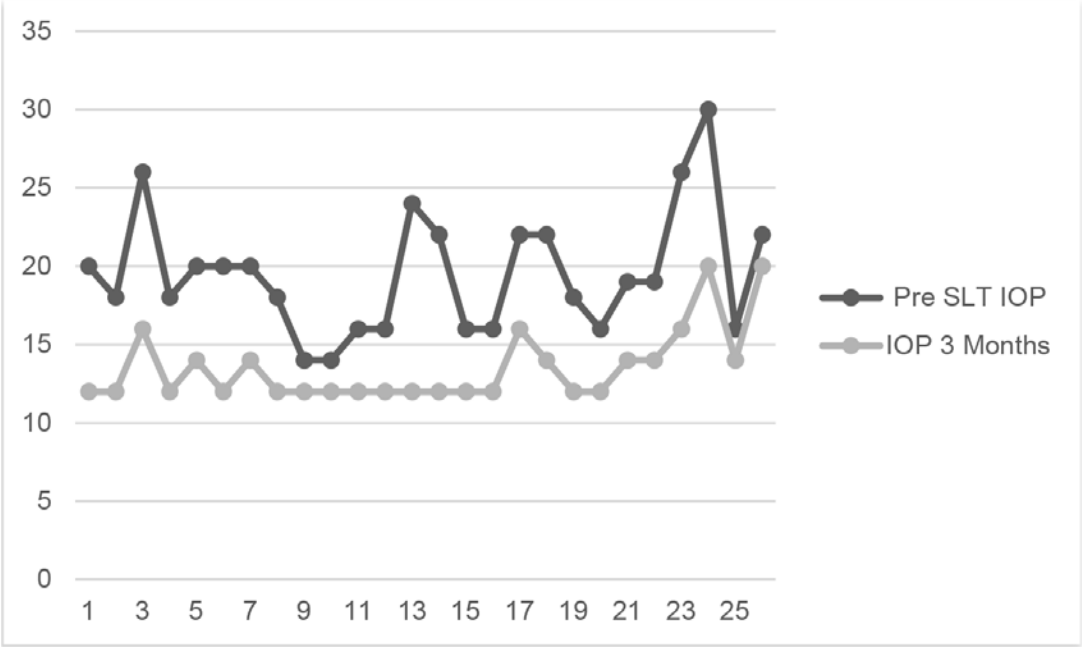

Figure 4. *Comparison between pre-SLT and post-SLT 3 months IOP.*

Three months after the procedure was performed, out of 22 eyes that were on topical medication 20 were free of eye drops. Many patients omitted drugs by themselves, but the IOP-lowering effect continued. Only 2 patients were still on antiglaucoma topical treatment. These 2 who were on combined therapy maintained their targeted IOP with monotherapy. Treatment naïve patients achieved target IOP with SLT alone. In conclusion 24 out of 26 eyes achieved their target IOP with SLT alone at the end of three months. All patients were satisfied with the results at the end of 3 months. 28% of IOP reduction was noted with less than 20 microjoules whereas 35% reduction was observed when more than 20 microjoules were delivered.

Conclusion

IOP reduction following SLT in Sri Lankan POAG patients was comparable to results elsewhere[1,2,6]. More IOP reduction was achieved when higher laser energy was used.

Recommendations

SLT was a new tool for the Sri Lankan population in the management of glaucoma. At this initial stage of the audit, both the medical care providers and patients had minimum experience with SLT. Its efficacy on the Asian population was limited even in the LiGHT trial. So, this audit opens the opportunity to study the effectiveness of this procedure in this population. It will provide a database for more analytical assessment of SLT with enough calculated sample size.

Many patients were not aware of all the available treatment options in POAG. Collaborative decision-making in patient management should be supported with proper patient education on the disease, available treatment options, realistic post-procedure goals and requirement of adherence to medical advice following SLT in this setting.

Participation of treatment naïve patients and patients with OHT was minimal and none respectively. Increasing awareness of SLT will allow us to study IOP changes in detail with an increased number of participants.

As more energy provides more IOP reduction, the grading of TM pigmentation in the Sri Lankan population may need to be re-evaluated.

Availability of SLT is restricted to a few centres at present. Drawing authorities' attention to extending the availability of SLT with solid data will be a key milestone in treating glaucoma patients.

Evaluation of patient satisfaction and health-related quality of life (HRQoL) with a scientifically built questionnaire will bring more validity to the audit.

Areas to improve

Improving the quality of the database, re-evaluation of the pigmentation of TM and creating a questionnaire to scientifically assess patient satisfaction and HRQoL are to be implemented. Audit will be carried out continuously and reaudit will be done as these changes are implemented.

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