



Results of Selective Laser Trabeculoplasty (SLT) in lowering intraocular pressures (IOP) at 6 weeks

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Background: Various treatments modalities have been advocated to treat patients with glaucoma or OHT. Selective Laser Trabeculoplasty (SLT) has been highlighted recently for treatment of glaucoma patients.

Objectives: To analyse the reduction of IOP with SLT treatment.

Design: A retrospective study on 24 eyes treated with SLT treatment.

Settings: Pennine Acute Health Trust.

Participants: POAG or OHT patients in one or both eyes who were aged ≥ 18 years, able to provide informed consent, visual acuity of at least 6/36 in the study eye with suboptimal IOP control despite on antiglaucoma medications. Patients were excluded if they had congenital, early childhood or secondary

glaucoma or ocular comorbidities, if they had any previous ocular surgery except phacoemulsification. The patients should not have previous SLT treatment before.

Interventions: SLT performed with 100 shots for 360 degrees to lower IOP.

Main outcome measures: Effectiveness of IOP lowering at 6 weeks after treatment.

Results

SLT were performed on 24 eyes of 15 patients, 8 were female and 13 procedures on the left eye. There were 11 patients with POAG and 4 patients with OHT. Average visual acuity before the laser was 6/9. The average IOP pre op was 19.7 +/- 1.01 mm Hg with average post treatment IOP of 16.2 +/- 0.61 mm Hg. All patients after the SLT were told to continue with their medications.



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Limitation: Retrospective study on a small group of glaucoma patients with follow up of 6 weeks.

Conclusions

SLT is a proven, effective and safe procedure and should be considered in patients with raised IOPs.

Glaucoma is a one of the commonest cause of blindness worldwide. Prevalence of glaucoma is estimated to be 2.1% in adults over the age of 40 [1]. The different treatment modalities to lower intraocular pressure (IOP) include medications, laser, stents or surgery. Selective Laser Trabeculoplasty (SLT) can be performed at the outpatient laser clinics. It results in selective absorption of thermal energy by trabecular pigmented cells, sparing adjacent cells and tissues. SLT has overtaken Argon Laser Trabeculoplasty (ALT) recently in the treatment of open-angle forms of glaucoma due to the lack of collateral thermal damage and trabecular meshwork scarring with SLT as compared to ALT [2]. It does not have the issues of causing local or systemic side effects of topical antiglaucoma medications and not dependent on patients' compliance.

It was first introduced in 1995 and for the past few years has been advocated to be offered as first line of treatment [3]. Success rate of SLT to lower IOP has been reported from 6.9-35.9% [4,5]. We analysed the reduction of IOP when SLT were carried out in glaucoma patients and looked at the results at 6 weeks.

Methods

Study design and participants

This is a retrospective study on a group of glaucoma patients who underwent SLT in our department. The group consisted of 24 eyes were recruited between 1st January 2019 to 16th May 2021. Inclusion criteria were open-angle glaucoma patients (primary open-angle, pseudoexfoliation or pigmentary glaucoma, OHT), ≥ 18 years of age, who were uncontrolled on maximum tolerable medical therapy. Exclusion criteria included previous SLT or ALT treatment or previous trabeculectomy surgery. Pre and post procedural Intraocular pressure, visual acuity and medication regimes were recorded pre-procedure and post-procedure at 6 weeks post SLT. Data was analysed using R statistical software 5 using paired T tests to assess significance. The study was conducted in accordance with good clinical practice guidelines and adhered to the tenets of the Declaration of Helsinki. The study was registered with the trust audit and research committees. Ethics approval was not needed as this is a retrospective study.

Technique

SLT

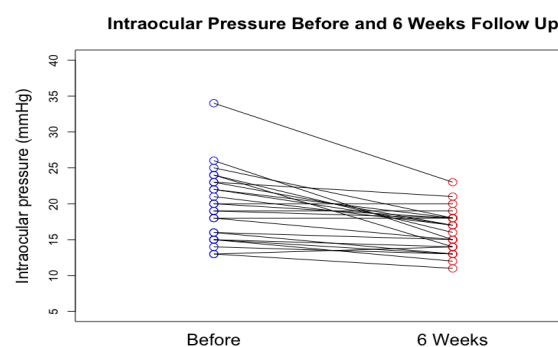
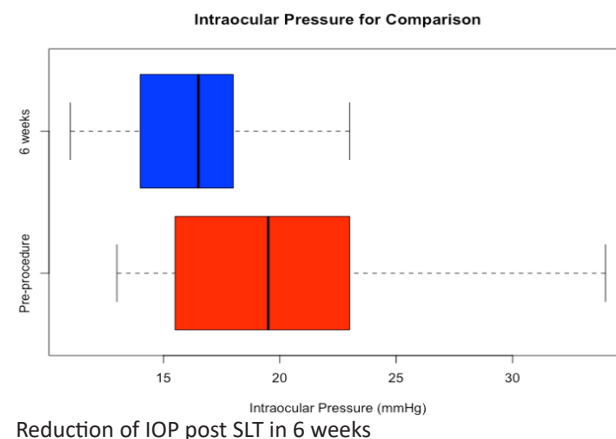
The SLT platform used was a Selecta Duet Laser with 532 nm Q-switched frequency doubled Nd: YAG laser source. The laser platform uses a standardized spot size of 400 microns and pulse width of 3 ns. The patients' eyes were prepared with topical pilocarpine 2% for visualization of angle structures and apraclonidine 1.0% eye drops instilled 20 minutes prior to laser treatment to prevent IOP spikes. Laser was delivered immediately after instillation of topical anesthetic oxybuprocaine 0.4% and application of Latina SLT Gonio Laser Lens with a coupling methylcellulose agent on the lens surface. Our standard treatment consisted of treating 360 degrees of the trabecular meshwork (TM) with total laser applications of 100 continuous non-overlapping laser spots (25 per quadrant) delivered during one

session. The energy level per shot used in our study eyes ranged from 0.3 to 1.4 mJ which was adjusted at 0.1 mJ increments while titrating to individual target end responses. The end response was gauged by tiny bubbles in at least 50 % shots next to the TM but not to have high power. Topical Apraclonidine 1.0% was instilled immediately after the procedure to prevent any IOP spikes post laser. No topical corticosteroids or NSAIDs were prescribed before or after the SLT treatment.

Results

SLT were performed on 24 eyes of 15 patients, 8 were female and 13 procedures on the left eye. There were 11 patients with POAG and 4 patients with OHT. 66 % of the patients were on 1-2 antiglaucoma medications and 29% of the patients were on 3-4 antiglaucoma medications. Average visual acuity before the laser was 6/9. The average IOP pre op was 19.7+/- 1.01 mm Hg with average post treatment IOP of 16.2 +/- 0.61 mm Hg. These were found to be statistically significant. All patients after the SLT were told to continue with their medications. No differences in visual acuity were detected at 6 weeks follow up. The mean initial IOP lowering at 6 weeks was 5 mmHg in OHT eyes and 3 mmHg in OAG eyes. Mean percentage IOP reduction was 22.9% in OHT eyes and 18.5% in OAG eyes. We looked at the short term follow up of this group of patients and will be reporting our data at 6 months and 1 year.

The t-test is a powerful method for pairwise comparison in small samples, having a sample bigger than 10 in KDB alone would have increased the magnitude of the effect and hence the external validity of the results. There was a limitation of follow-up for these patients as during the pandemic period quite a number of patients were loss to follow up. This is a retrospective study on a small group of patients. Though our results are only at 6 weeks, our study will remain to be monitored for the assessment of decreased in IOP and complications from the treatment and we hope to collect data at longer interval.



Plot Data demonstrating IOP reduction at 6 weeks follow-up compared to before procedure, * $p < 0.05$.

Conclusion

SLT is effective and safe to reduce IOP and the number of medications in patients with severe glaucoma. The profile of the procedure safety is outstanding and comparable with other glaucoma procedures. This procedure can be done in the outpatients and is a cost effective way of reducing the intraocular pressures in glaucoma patients.

SLT was compared with topical anti-glaucoma eye drops as first line therapy to treat ocular hypertension and glaucoma in the LIGHT study and it was found that the SLT treated patients have IOPs within target at more follow up visits (93% vs 91.3%), needing no glaucoma surgery vs 11 in the eye drops group and found to be more cost effective. It was found from the light study that there was a 97% probability of Laser-1st being more cost-effective than Medicine-1st for the NHS- a willingness to pay for a quality-adjusted life-year of £20,000, with a reduction in ophthalmology costs of £458 per patient [3].

Our data on IOP reduction post SLT at 6 weeks are comparable to other studies post SLT with IOP reduction of 20-22% from baseline [6,7]. In our study mean initial IOP lowering at 6 weeks was 5 mmHg in OHT eyes and 3 mmHg in OAG eyes. While the mean percentage IOP reduction was 22.9% in OHT eyes and 18.5% in OAG eyes. Compared to data from the laser in glaucoma and OHT trial, their mean initial IOP lowering at 2 months was 8 mmHg in OHT eyes and 6.5 mmHg in OAG eyes. Mean percentage IOP reduction was 29.7% in OHT eyes and 26.1% in OAG eyes respectively. They have similar number of OHT (30%) in their study glaucoma patients. They found a trend toward increasing absolute IOP reduction with higher baseline IOP in both OHT and OAG eyes. They found that higher baseline IOP was a predictor of early absolute IOP lowering at 2 months in a mixed-effects linear regression model. They also found that successful eyes achieving drop-free disease-control after initial single SLT at 36 months had a lower IOP at 2 months compared with non-successful eyes (adjusted mean difference $\frac{1}{4}$ \pm 1.9 mmHg; 95% CI, \pm 1.4 to \pm 2.3 mmHg), there may not be enough specificity in this observation (because of the SD of IOP measurements [8]). The difference in the IOP reduction between the two groups could be the fact that our results were at 6 weeks while theirs at 8 weeks and the different characteristics of glaucoma in the two populations with their group having higher pre-treatment IOPs. It has been reported that a single SLT treatment offers reduction of IOP of more than 20% from baseline in 54% of patients and 15% from baseline in 65% of patients [9].

It is difficult to establish definite predictors of SLT success, and multiple studies have had various results. The most consistently reported patient factor predictive of success is elevated baseline IOP; other patient factors, such as sex, race, age, glaucoma type, trabecular meshwork pigmentation, lens status, and central corneal thickness, have not been found to be predictive of success [10,11].

SLT is a cost effective and outpatient based procedure to lower intraocular pressures in glaucoma patients. The complication rates of SLT are low and most of them were reversible in a few days. SLT is an established method for Lowering Intraocular Pressure (IOP) in Open-Angle Glaucoma (OAG) and Ocular Hypertension (OHT) and it can be repeated at a later stage if the IOP control is inadequate. Clinicians should not hesitate to choose SLT especially for patients with glaucoma and suboptimal IOP control despite using multiple topical antiglaucoma treatment.

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