Selective laser trabeculoplasty for primary open-angle glaucoma patients younger than 40 years

Viney Gupta, M.D.,* Sarbani Ghosh, M.D.,* M. Sujeeth, M.B.B.S,* Sunil Chaudhary, M.D.,* Shikha Gupta, M.D.,* Abadh Kishore Chaurasia, M.Sc,* Ramanjit Sihota, F.R.C.S.,* Amisha Gupta, M.Sc,* Kulwant Singh Kapoor, M.Sc†

ABSTRACT •

Objective: To evaluate the efficacy of selective laser trabeculoplasty (SLT) among patients with juvenile-onset primary open-angle glaucoma (JOAG).

Methods: Patients diagnosed with JOAG who were not controlled on medical therapy were offered a trial of SLT. The patients were followed up prospectively for 1, 3, 6, and 12 months postlaser to evaluate the efficacy of SLT as second-line therapy. Success was defined as an intraocular pressure (IOP) reduction of ≥20% at 12 months without the need for further medication, laser, or surgery. Factors associated with success/failure, prelaser IOP, age, and angle dysgenesis on gonioscopy were analysed.

Results: The average prelaser IOP in these JOAG eyes (n = 30) was 25.3 ± 6.5 mm Hg, which reduced to 17.3 ± 5.8 mm Hg at 12 months ($p = 0.01$). All patients were of Indian ethnicity. Out of 30 eyes, at 12 months post-SLT, 13 (43%) eyes had at least a 20% reduction in IOP. In the eyes that achieved success, the average reduction of IOP was 37.6%. There was no difference in the prelaser IOP between those with success (25.5 ± 5.6 mm Hg) and those that failed (25.1 ± 8 mm Hg; $p = 0.8$), nor was there a difference in the mean age between successful cases (34.4 ± 9.4 years) and failures (31.6 ± 8.9 years; $p = 0.4$). However, those without angle dysgenesis were 4 times (CI 1.1–15.2) more likely to succeed with SLT than those with angle dysgenesis ($p = 0.03$).

Conclusions: A significant proportion of patients with JOAG can benefit from an IOP reduction after SLT. Those with gonioscopically normal-appearing angles are more likely to respond to SLT.

Selective laser trabeculoplasty (SLT) is being increasingly demonstrated as safe, well tolerated, and effective for intraocular pressure (IOP) reduction in several forms of glaucoma.[1–5] It has proven to be equally efficacious as a primary and adjunct therapy in relation to medication and other laser treatments and delivers greater cost-effectiveness and compliance over topical glaucoma medications.[6–8] There are very few studies on the efficacy of SLT among young patients.[9,10] In their study Liu and Birt noted a complete success of 40% and qualified success of 75% over 2 years among relatively younger patients.[9] However, in this study, only 6 patients were less than 40 years of age. Song et al.[10] reported good response in 2 pediatric glaucoma patients who underwent SLT, one of whom possibly had juvenile-onset primary open-angle glaucoma (JOAG). This patient had a 39% drop in IOP after 4 weeks of follow-up.

JOAG is considered a primary glaucoma that lies between a spectrum ranging from primary congenital glaucoma to adult onset open angle glaucoma. The onset of JOAG occurs before 40 years of age and is associated with high IOP; deep, steep optic nerve head cupping; and diffuse visual field loss.[11] Most of these patients, being young, report loss of quality of life if they have to use medication for the rest of their lives.[12] Compliance with medical therapy is also difficult in this age group.[13] However, if properly treated, long-term blindness can be prevented in these eyes.[14]

There is no literature to support or refute the efficacy of SLT in eyes diagnosed with high-pressure JOAG. This study aimed to prospectively evaluate the outcomes of SLT in patients with JOAG and to assess factors associated with treatment success or failure.

Methods

This study included consecutive patients with JOAG attending our glaucoma clinic who were on medications for glaucoma. The study was conducted after receiving the approval of the Ethics Committee of the institute and was carried out as per the tenets of the Declaration of Helsinki. Written and informed consent was obtained from all patients/parents before inclusion in the study. SLT was offered to patients on maximally tolerable medical therapy to reduce IOP that was above the target.

Diagnostic criteria for JOAG were as follows: (*i*) primary open-angle glaucoma (POAG) with an age of onset between 10 and 40 years; (*ii*) baseline IOP >22 mm Hg in at least 1 eye on more than 2 occasions; (*iii*) glaucomatous optic neuropathy in at least 1 eye with or without visual field loss consistent with optic nerve damage; and (*iv*) wide-open angles on gonioscopy in both eyes.

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Table 1—Demographic and clinical characteristics of patients

Age at the time of laser (years), mean ± SD (range)	34.3 ± 9 (19–50)
Sex (M:F)	26:4
Ethnicity	Indian
Untreated IOP (mm Hg), mean ± SD (range)	36.1 ± 10.3 (23–56)
Prelaser IOP (mm Hg), mean ± SD (range)	25.3 ± 6.5 (18–44)
Mean vertical cup–disc ratio, mean ± SD	0.75 ± 0.14
Average mean deviation (dB), mean ± SD	−14.7 ± 10.8
Prelaser medications, mean ± SD (range)	2.8 ± 1 (2–5)
Duration of therapy (months), mean ± SD (range)	30 ± 21 (4–110)

IOP, intraocular pressure.

Exclusion criteria were history or signs of trauma, steroid intake, presence of enlarged corneal diameters, any other ocular pathology, previous laser/incisional surgery, and being unable to complete the 12-month follow-up.

All patients underwent a thorough examination to rule out secondary causes of glaucoma. Goniophotography, optic disc photography, visual fields, and scanning laser ophthalmoscopy were done for each patient for future documentation.

One eye of each patient was included. If both eyes of the patient were eligible, the eye with higher prelaser IOP was selected for the study.

Success was defined as a reduction of IOP by 20% or more from the prelaser value at 12-month follow-up without any further IOP-lowering medication, laser, or surgery.

Factors such as age at the time of laser treatment, prelaser IOP, and the gonioscopic features (presence of dysgenesis) were assessed to determine their association with treatment outcome.

Procedure

A Latina SLT lens (Ocular Instruments, Bellevue, Wash.) was used to visualize the angle. All lasers were performed by the same ophthalmologist using the SLT machine (Lightmed; Optimed Group, San Clemente, Calif.). The entire 360 degrees of angle was treated using 0.8–1 mJ and applying 90–110 spots. The IOP in all patients was subsequently measured after 1 hour. If any patient had a rise of IOP >5 mm Hg, acetazolamide tablet was prescribed and the IOP was checked again the next day.

Postlaser, patients were continued on their previous antiglaucoma medication. Medication was altered depending on the response seen at 1 month. Patients were followed up at day 1 and 1, 3, 6, and 12 months. For consistency, the IOP at 12 months was taken as an average of 2 visits conducted 3 days apart.

If the desired IOP reduction was not achieved by 3 months, medications were added or the patient was given a choice of repeat laser (using the same procedure)/incisional surgery. These were considered as failures of SLT.

Statistical Analysis

Average IOP reduction from prelaser values was compared using the paired t test. Factors associated with success or failure were analyzed using the χ^2 test for categorical variables and the independent t test for continuous variables. A p-value <0.05 was considered significant. A logistic regression analysis was carried out to assess the predictors associated with success of SLT. The variables found to significantly affect success (dependent variable) were entered in a binary logistic regression model. Kaplan-Meier analysis was carried out with the success criterion being an IOP reduction ≥20% from prelaser. The SPSS software (version 11.5; Chicago, Ill.) was used for statistical analysis.

Results

Thirty eyes of 30 patients diagnosed with POAG before the age of 40 years underwent SLT and were prospectively followed up for 12 months. Although some patients had a follow-up greater than 12 months, only the 12-month IOP was taken for analyses. Table 1 shows the clinical and demographic characteristics of the patients. There was a preponderance of males. Mean age of the patients at the time of laser was 34.3 ± 9 years. Patients were divided into those aged ≤25 years (n = 10) at the time of SLT and those aged >25 years (n = 20). There was no significant difference in terms of success in either age group ($p = 0.08$).

All eyes had a prelaser IOP ≥18 mm Hg. Overall, there was a reduction of IOP from prelaser 25.3 ± 6.5 to 17.3 ± 5.8 mm Hg ($p = 0.01$) at 12 months (Fig. 1). At 12 months, 13 (43%) eyes achieved an IOP reduction ≥20% from prelaser values. In the eyes that achieved success, the percentage reduction of IOP was 37.6% on an average. Seven eyes (23%) had >40% reduction in IOP (Fig. 2). There was no difference in the prelaser IOP between those with success (25.5 ± 5.6 mm Hg) and those who failed

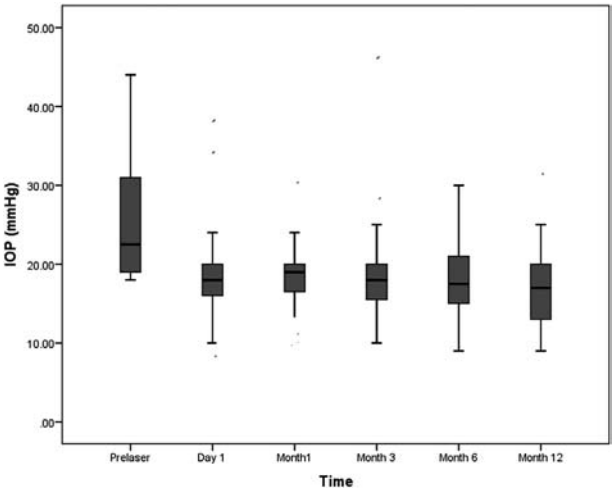

Fig. 1—A boxplot showing change in intraocular pressure (IOP) over time after selective laser trabeculoplasty.

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