

SURGEON'S CORNER

Intraocular Pressure Response to Selective Laser Trabeculoplasty in the First Treated Eye vs the Fellow Eye

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Objective: To determine if the intraocular pressure (IOP) response to selective laser trabeculoplasty (SLT) in one eye predicts long-term response to SLT in the fellow eye.

Methods: A retrospective medical record review was performed of patients who underwent SLT as primary treatment in both eyes and who completed at least 30 months of follow-up visits. Pearson product moment correlation analysis was performed to determine correlations between the 3-month percentage of IOP reduction in the first treated eye and long-term percentages of IOP reduction in the fellow eye.

Results: Medical records of 80 eyes in 40 patients were reviewed. In patients with ocular hypertension, the 3-month percentage of IOP reduction in the first treated

eye correlated strongly with long-term percentages of IOP reduction in the fellow eye ($r > 0.652$). In patients with primary open-angle glaucoma, the 3-month percentage of IOP reduction in the first treated eye correlated moderately with percentages of IOP reduction in the fellow eye up to 9 months ($r > 0.367$).

Conclusions: In patients with ocular hypertension, the 3-month percentage of IOP reduction in the first treated eye in response to SLT was predictive of response in the fellow eye up to 30 months. In patients with primary open-angle glaucoma, the 3-month percentage of IOP reduction in the first treated eye in response to SLT was predictive of response in the fellow eye up to 9 months.

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OCULAR HYPERTENSION (OHT) and primary open-angle glaucoma (POAG) are predominantly bilateral diseases, with some degree of asymmetry. Medical treatment, laser trabeculoplasty, and surgery can be used to control the intraocular pressure (IOP). Selective laser trabeculoplasty (SLT) was first reported by Latina et al¹⁻³ to be clinically effective in lowering IOP among patients with open-angle glaucoma. The procedure is often used to treat both eyes, with variable intervals between treatments depending on the IOP, symmetry of glaucoma, and rate of glaucomatous visual field progression. No published studies to date correlate the IOP-lowering effect of SLT in the first treated eye with that in the fellow eye of patients who received SLT as primary treatment for OHT or POAG. This information may be helpful to better predict the fellow eye response to SLT based on response of the first treated eye. The

objectives of this study were to investigate the predictive value of response to SLT in the first treated eye and to develop realistic expectations of response in the fellow eye IOP among patients with OHT and with POAG.

METHODS

This retrospective medical record review included all patients who underwent SLT in both eyes between February 1, 2002, and December 1, 2005, by one of us (M.A.L.). Data were reviewed from postoperative visits at 2 weeks and at 3, 6, 9, 12, 18, and 30 months. Inclusion criteria were performance of SLT in both eyes, diagnosis of OHT or POAG in both eyes, and recording of data at all time points. Patients included in the study were diagnosed as having high-risk OHT or mild to moderate POAG. Patients were excluded if they used an ocular hypotensive medication or had an intraocular surgical procedure performed during the 30 months following SLT. Patients with a history of SLT or argon laser trabeculoplasty were also excluded.

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Table 1. Baseline Characteristics of the Sample (80 Eyes in 40 Patients)

Characteristic	Value
Age, mean (SD), y	67.85 (10.36)
Female sex, %	62.5
Baseline intraocular pressure, mean (SD), mm Hg	23.63 (3.21)
Procedure variables, mean (SD)	
Energy per shot, W	0.99 (0.17)
No. of shots	86.82 (34.20)
Total energy, W	88.19 (41.44)
Diagnosis, No. of eyes (No. of patients)	
POAG	52 (26)
OHT	28 (14)

Abbreviations: OHT, ocular hypertension; POAG, primary open-angle glaucoma.

Table 2. Successful Selective Laser Trabeculoplasty (SLT) in the Fellow Eye of Patients With OHT vs POAG

Successful SLT in the Fellow Eye at	SLT in the First Treated Eye			
	OHT Cohort, %		POAG Cohort, %	
	Successful (n = 12)	Failed (n = 3)	Successful (n = 16)	Failed (n = 9)
2 wk	100	67	88	33
3 mo	100	67	100	33
6 mo	92	67	88	44
9 mo	92	67	88	67
12 mo	83	67	81	67
18 mo	83	33	81	33
30 mo	83	33	75	33

Abbreviations: OHT, ocular hypertension; POAG, primary open-angle glaucoma.

The SLT procedure was performed in a standard fashion among all patients. An initial power setting between 0.6 and 0.9 mJ was selected. The procedure was then completed for 180°. The end point was to visualize fine bubbles at the laser-treated area, and the intended number of spots was between 55 and 70. Patients received topical apraclonidine hydrochloride, 0.5%, 15 minutes before the procedure. Following the procedure, patients used ketorolac tromethamine, 0.4%, twice daily for 2 days.

Statistical analysis was performed using commercially available software (SPSS, version 9.0; SPSS, Inc, Chicago, Illinois).

The percentages of successful and unsuccessful SLT in the fellow eye were calculated among patients who had successful and unsuccessful SLT in the first treated eye, respectively. Successful SLT was defined as IOP reduction following the procedure by 20% or more from the untreated baseline IOP.

Two-tailed Pearson product moment correlation was used to determine the direction and degree of linear relationship of the percentage of IOP reduction after surgery at 2 weeks and at 3, 6, 9, 12, 18, and 30 months in both eyes. In this way, we determined the prognostic value of the percentage of IOP reduction in response to SLT in the first treated eye as a predictor of long-term percentages of IOP reduction in the fellow eye following SLT.

Pearson product moment correlation (*r* value) ranges from 1 to -1. A correlation of 1 means that there is a perfect positive linear relationship between variables. An *r* of 0.7 to less than 1

is considered strong, 0.4 to less than 0.7 is moderate, and less than 0.1 to less than 0.4 is weak. Zero is a negligible correlation.

Bonferroni correction was used for multiple comparison adjustment to avoid spurious positive correlations.⁴ The *P* value for the entire set of comparisons was calculated by dividing the *P* value for each comparison (*P* < .05) by the number of comparisons (*n* = 7), so correlations were considered significant at *P* < .007.

Institutional review board approval for the study was not required. We retrospectively studied existing data recorded by us in such a manner that subjects cannot be identified directly or through identifiers linked to the subjects.

RESULTS

The age and sex of the 40 patients were consistent with a population having glaucoma (**Table 1**). The indication for SLT was POAG in 26 patients (65%), while the indication for SLT was OHT in 14 patients (35%).

The mean (SD) baseline IOP in the first treated eyes was 23.53 (3.34) mm Hg, while it was 23.66 (3.08) mm Hg in the fellow eyes. The mean (SD) decrease in IOP from baseline to 2 weeks in the first treated eyes was 6.46 (3.46) mm Hg (mean [SD] decrease from baseline, 26.41% [11.77%]), while in the fellow eyes it was 5.72 (3.88) mm Hg (mean [SD] decrease from baseline, 23.11% [14.73%]).

The interval between SLT in the first treated eye and in the fellow eye among the OHT cohort ranged from 2 weeks to 28 months (mean [SD], 154.9 [274.0] days). Among the POAG cohort, it ranged from 2 days to 26 months (mean [SD], 150.7 [244.1] days).

OHT COHORT

As summarized in **Table 2**, the success rates in the fellow eye of patients with OHT who had successful SLT in the first treated eye were 100% at 2 weeks after SLT, 92% at 6 months, and 83% at 12 to 30 months. In contrast, patients with OHT who had failed SLT in the first treated eye had lower success rates in the fellow eye of 67% at 2 weeks to 12 months and 33% at 18 to 30 months.

POAG COHORT

As summarized in Table 2, the success rates in the fellow eye of patients with POAG who had successful SLT in the first treated eye were 88% to 100% at 2 weeks to 9 months after SLT and 75% to 81% at 12 to 30 months. Patients with POAG who had failed SLT in the first treated eye had lower success rates in the fellow eye.

We performed Pearson product moment correlation analysis between the percentage of IOP reduction in the first treated eye and the percentage of IOP reduction in the fellow eye. Comparison of the percentage IOP reductions in the first treated eye at 2 weeks vs at 3 months showed that the 3-month percentage of IOP reduction in the first treated eye correlated better with the percentage of IOP reduction in the fellow eye in response to SLT. The explanation for this finding may be that the maximum IOP-lowering effect of SLT takes 2 to 8 weeks.

Among the OHT cohort, the Pearson product moment correlation between the percentage of IOP reduction in the first treated eye at 3 months and that in the fellow eye at 2 weeks was strong and statistically significant ($r=0.865$, $P<.001$) and was maintained up to 30 months ($r=0.804$, $P=.001$). These results are summarized in **Table 3**. Among the POAG cohort, the Pearson product moment correlation between the percentage of IOP reduction in the first treated eye at 3 months and that in the fellow eye at 3 months was significant ($r=0.652$, $P=.001$) and was maintained up to 9 months ($r=0.367$, $P=.10$). After 9 months, no significant correlation was noted between the percentage of IOP reduction in the first treated eye and that in the fellow eye ($P>.007$).

COMMENT

A review of the literature indicated that SLT is a viable option as primary or adjuvant treatment for patients with OHT, POAG, or pseudoexfoliation glaucoma.⁵⁻⁸ Selective laser trabeculoplasty is not only as effective as medical therapy but also a more economical treatment option.⁹ Johnson et al¹⁰ observed that the 2-week follow-up visit results after SLT predicted findings at the 4-week and 3-month visits in the same eye if the 2-week visit had recorded a decrease in IOP. Studies¹⁰⁻¹² have shown that the baseline IOP is predictive of successful SLT. Selective laser trabeculoplasty lowers IOP not only in the treated eye but also in the untreated eye.¹³

Our study shows that among patients with OHT, the 3-month percentage of IOP reduction in the first treated eye in response to SLT was predictive of response in the fellow eye up to the 30-month visit. This is reflected by correlations of the IOP in the first SLT-treated eye at the 3-month visit with IOPs in the fellow eye at 3 months after SLT ($r=0.886$) and at 30 months after SLT ($r=0.804$).

Similarly, among patients with POAG, the 3-month percentage of IOP reduction in the first treated eye in response to SLT was predictive of response in the fellow eye up to the 9-month visit. This is reflected by correlations of the IOP in the first SLT-treated eye at the 3-month visit with IOPs in the fellow eye 3 months ($r=0.652$) and 9 months ($r=0.367$) after SLT.

An IOP-lowering effect of SLT in the contralateral eye is well known and is a confounder that cannot be completely eliminated in a study that compares the outcome of SLT in both eyes. However, we believe that such confounding in our study is minimal based on 2 published studies on the crossover IOP effect of SLT. Kirzhner et al¹⁴ noted that 31% of untreated eyes demonstrated greater than 20% reduction in IOP following SLT treatment of the other eye. This effect was transient, with only 18% of eyes maintaining greater than 20% reduction in IOP at the 1-year follow-up visit. Rhodes et al¹³ observed that the mean IOP reduction in the fellow untreated eyes of 43 patients was 11.2% over 6 months of follow-up after SLT. In our study, we reviewed SLT outcomes over 30 months and found that SLT success in the first treated eye of patients

Table 3. Pearson Product Moment Correlation Between the Percentage of Intraocular Pressure Reduction in the First Treated Eye at 3 Months and That in the Fellow Eye

Correlation at	OHT Cohort		POAG Cohort	
	r Value	P Value	r Value	P Value
2 wk	0.865 ^a	<.001	0.511 ^a	.02
3 mo	0.886 ^a	<.001	0.652 ^a	.001
6 mo	0.830 ^a	<.001	0.582 ^a	.005
9 mo	0.705 ^a	.007	0.367	.10
12 mo	0.750 ^a	.003	0.400	.07
18 mo	0.758 ^a	.003	0.309	.16
30 mo	0.804 ^a	.001	0.336	.13

Abbreviations: OHT, ocular hypertension; POAG, primary open-angle glaucoma.

^aStatistically significant at adjusted $P < .007$.

with OHT was highly predictive of SLT success in the fellow eye up to 30 months. Based on the aforementioned studies, the crossover IOP effect of SLT is minimal beyond 12 months, which weakens the role of this factor as a confounder. In addition, the mean intervals herein between SLT of the first treated and fellow eyes were 154.9 and 150.7 days in the OHT and POAG cohorts, respectively. This allows time to attenuate the contralateral effect of SLT.

It is possible that our results are subject to selection bias if patients who had successful SLT in the first treated eye are more likely to undergo SLT in the fellow eye. However, the practice has been to perform SLT in both eyes regardless of the SLT response in the first treated eye. In addition, the success rate of SLT in the first treated eye among this sample was 70% (56 of 80 eyes), which is equivalent to or slightly lower than the success rates of SLT reported in prior publications.⁵⁻⁸ If patient selection bias was significant, the success rate in the first treated eye would be expected to be higher than the published rates.

In conclusion, among patients with OHT, the 3-month IOP response to SLT in the first treated eye was predictive of response in the fellow eye up to 30 months, while among patients with POAG, it was predictive of response in the fellow eye only up to 9 months. These findings suggest that the magnitude of IOP response at 3 months following SLT (ie, the percentage of IOP reduction from baseline) in the first treated eye of patients with OHT can predict long-term response to SLT in the fellow eye. However, in patients with POAG, the percentage of IOP reduction at 3 months following SLT in the first treated eye cannot predict response to SLT in the fellow eye beyond 9 months.

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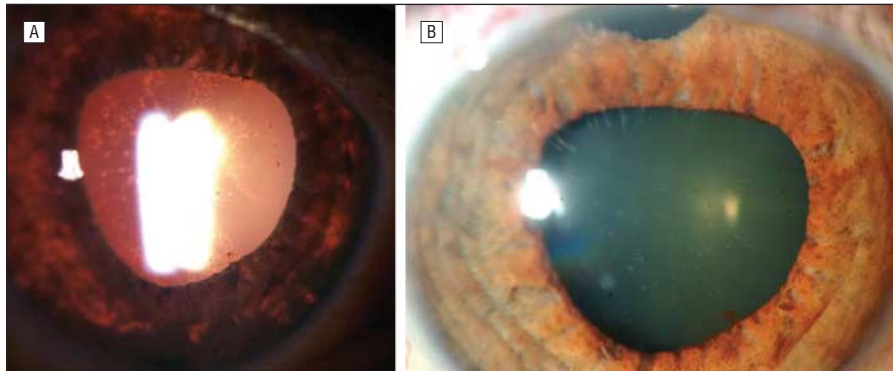
Financial Disclosure: Dr Latina has financial interest in SLT technology and receives patent royalties related to it.

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Archives Web Quiz Winner

Congratulations to the winner of our January quiz, Arun Lakshmanan, MS, DNB, FRCS, MRCOphth, Department of Ophthalmology, Queens Medical Centre, Nottingham, England. The correct answer to our January challenge was herpes simplex virus-associated iritis. For a complete discussion of this case, see the Research Letters section in the February *Archives* (Dastrup BT, Cantor L, Moorthy RS, Vasconcelos-Santos D, Rao N. An unusual manifestation of herpes simplex virus-associated acute iris depigmentation and pigmentary glaucoma. *Arch Ophthalmol*. 2011;129[2]:253-254).



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