



Case report

Selective laser trabeculoplasty in patients with angle recession glaucoma: A small case series

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ABSTRACT

Purpose: To describe the results of selective laser trabeculoplasty (SLT) in eyes with angle recession glaucoma (ARG). To our knowledge, this is the first report of SLT being used as treatment modality for angle recession glaucoma. Argon laser trabeculoplasty (ALT) was used for ARG but showed a little therapeutic effect.

Observations: Retrospective case series of 4 eyes of 4 patients with history of non-penetrating injury to the eye resulted in angle recession glaucoma. All eyes underwent SLT. Post-treatment, the best-corrected visual acuity (BCVA), intraocular pressure (IOP), number of glaucoma medications, additional need for intervention, and complications were recorded. Success of treatment was defined as an IOP reduction of 20% or reduction in medications and maintaining target IOP without further intervention during follow up period of more than 3 months.

Mean patient age was 44 years (SD = 9) and 2 out of 4 were females. SLT treatment resulted in decreased IOP from 21 to 12 mmHg in one patient and from 26 to 20 mmHg with reduced medication burden in another patient and reduced medication burden in the third patient who stopped glaucoma medication with no significant change in IOP (from 10 to 14 mmHg) at last follow up visit at 45 months. Two SLT sessions failed in one patient who underwent tube surgery.

In the 3 patients with successful treatment, IOP remained controlled for the duration of follow up ranging from 4 to 45 months.

Conclusions and Importance: Predicting IOP outcomes after SLT is difficult in patients with ARG. Success was noted early in the post-treatment period and was maintained for years. Repeating SLT in a case of early failure didn't change the result and is not recommended. A larger study is required to confirm the safety and effectiveness of SLT for ARG.

1. Introduction

Angle recession glaucoma (ARG) is open-angle glaucoma secondary to ocular trauma. Angle recession is characterized by marked widening of the ciliary band on gonioscopic examination, due to tears between the longitudinal and circular muscles of the ciliary body. Damage to angle and trabecular meshwork (TM) structures by direct injury or subsequent scarring can lead to chronic IOP elevation, with subsequent optic nerve damage. This rise in pressure may occur many months, years, or even decades after the ocular injury.¹ Management of ARG can be challenging. Initial management is medical therapy eventually followed by surgery. Although trabeculectomy is the first surgical choice, poor outcomes have been reported in cases of ARG.² Minimal therapeutic effect has been reported with argon laser trabeculoplasty (ALT) in cases of

ARG.³

2. Methods

This retrospective review evaluated a case series of patients presenting with ARG treated with SLT. In these patients, SLT was performed for uncontrolled IOP with maximum tolerable medications, or when noncompliance to medication was suspected and prior to planned surgical intervention. The study was conducted at the King Khaled Eye Specialist Hospital (KKESH), Riyadh, Saudi Arabia. The Institutional Research and Ethics board at KKESH approved this study. Medical records of all patients were reviewed and the data were collected and analyzed on: demographic information, type of glaucoma, number of glaucoma medications, concurrent ocular surgeries, follow-up period

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after Laser, laser setting used for the treatment, best corrected visual acuity (BCVA), and intraocular pressure (IOP).

SLT treatment was considered successful if: i) IOP decreased by at least 20% compared with the baseline IOP, following the laser treatment, or; ii) a reduction in glaucoma medications by one or more medications, maintaining the target IOP without further intervention.

3. SLT procedure

SLT was performed by 1 ophthalmologist (LA). After informed consent from the patient, the eyes were pretreated with apraclonidine 0.5% (Alcon Laboratories Inc. Fort Worth, TX, USA) 30 minutes before the procedure. SLT was performed under topical anesthesia using Latina lens, with the Ellex Tango laser (Ellex Medical Laser Pty. Adelaide, SA, Australia) in the SLT mode (Q-switched, frequency doubled Nd:YAG 532 nm, 3-ns pulse, spot size 400 μm). Laser applications were applied to every quadrant of the visible TM avoiding areas of recession, peripheral anterior synechiae and areas with limited visibility of the TM. The laser energy settings ranged between 0.4 and 0.7 mJ based on the degree of TM pigmentation, the energy level was increased or decreased in 0.1 mJ steps until mini-bubble formation was observed and this energy setting was used to complete the treatment. Postoperative treatment included a single application of topical apraclonidine ophthalmic solution 0.5% and prednisolone acetate ophthalmic suspension 1% (Allergan Inc. Irvine, CA). IOP was measured 1 hour after the procedure, and the number of glaucoma medications prescribed in the postoperative period was decided according to IOP level and the target IOP, no topical steroid or NSAIDs were used during the post laser period (according to our hospital post SLT management protocol). Follow-up visits were performed at 1, 3, and 6 months post-SLT, and then every 3–6 months. Glaucoma medications were titrated based on the target IOP during the postoperative visits. The laser powers were used in each patient shown in Table 2.

4. Findings

Four patients were included in the study. Demographic characteristics and clinical characteristics at baseline are presented in Table 1 and laser parameters are presented in Table 2.

5. Case I

A 33-year-old woman presented to the emergency department. Her

Table 1

Demographics of patients who underwent selective laser trabeculoplasty for angle recession glaucoma.

	Case 1	Case II	Case III	Case IV
Sex	Female	Female	Male	Male
Eye	Right Eye	Left Eye	Left Eye	Left Eye
Age (years)	33	55	36	51
BCVA	20/25	20/40	2/200	20/30
Period between trauma+/- glaucoma diagnosis and SLT (years)	>7 years	>15 years	>10 years	>20 years
Degree of angle recession (clock hour)	3	6	6	6
Baseline IOP (mmHg)	10	24 mmHg	21 mmHg	26 mmHg
Baseline number of glaucoma medications	1	4	4	4
Lens Status	Phakic	Pseudophakic	Phakic	Phakic
Cup: disc ratio	0.3	0.6	1.0	0.5
Ocular surgeries	None	ECCE + PC IOL	None	None
Glaucoma Surgeries	None	Trabeculectomy	None	None

ECCE + PC IOL = extracapsular cataract extraction with posterior chamber intraocular lens.

Table 2

Selective laser trabeculoplasty setting for angle recession glaucoma and early post-laser complications.

	Case I	Case II	Case III	Case IV
Power per shot (mJ/shot)	0.7	0.7	0.7	0.7
Spot count	71	97	101	96
Total energy (mJ)	26	71	86	58
Post SLT IOP spike	No	No	No	No
Post SLT prolonged uveitis	0	0	0	0

SLT = selective laser trabeculoplasty; IOP = intraocular pressure. IOP spike: is an IOP increase by 30% or 10 mmHg 1 h after SLT.¹⁹

medical history was positive for trauma by firecrackers and there was no history of surgery. On examination, a 4 mm hyphema was present in the anterior segment with a corneal epithelial defect. Fundus examination indicated commotio retina and retinal hemorrhage and IOP was 5 mmHg. During the subsequent follow-up visits hyphema cleared and her IOP increased to 31 mmHg with gonioscopic examination showing angle recession in one quadrant. The patient was started on antiglaucoma medications and her IOP was well controlled during follow up. At the last visit prior to SLT, 3 years following the initial injury, the patient was on one antiglaucoma medication (Betaxolol) and requested to stop using it due to difficulty with compliance (Table 1).

SLT was performed and post-treatment visits indicated controlled IOP (12–14 mmHg) with no medication. At last follow-up (45 months following SLT) the IOP was 14 mmHg without antiglaucoma medications and she had stable disc cupping. SLT succeeded in controlling her glaucoma without medication (Table 3).

6. Case II

A 55-year-old female was referred to our clinic for management of ARG. Her medical history revealed trauma to the left eye, 13 years prior to presentation. Her BCVA was 20/200 and 20/30 with pinhole, IOP was 35 mmHg and the patient was on 4 antiglaucoma medications (Latanoprost 0.005, Pilocarpine 1% and Brinzolamide 1%/Timolol 0.5%). Gonioscopy indicated 2 quadrants of angle recession and posterior subcapsular cataract. Fundus examination indicated a flat retina with a cup:disc(C:D) of 0.6.

During follow-up, IOP was not controlled with medication and the

Table 3

Baseline and follow up ocular characteristics of patients who underwent selective laser trabeculoplasty for angle recession glaucoma.

	Case I	Case II	Case III	Case IV
A. Vision				
Baseline	20/25	20/40	2/200	20/30
Last visit	20/30	20/40	1/200	20/25
B. IOP (mmHg)				
Baseline	10	24	21	26
3 months following SLT	12	25	16	20
Last visit	14	33	12	20
IOP change following SLT	+4	+9	-9	-6
Percentage of IOP reduction following SLT	NA	NA	42%	23%
C. Number of glaucoma medications				
Baseline	1	4	4	4
Last visit	0	4	4	3
glaucoma medications changes following SLT	1	0	0	1
D. Success	yes	no	yes	yes
E. further intervention	0	Glaucoma tube surgery	0	0

SLT = selective laser trabeculoplasty.

cataract progressed. The patient underwent combined extracapsular cataract extraction and posterior chamber intraocular lens and trabeculectomy. For years postoperatively, the IOP remained on target and glaucoma was well controlled (Figure.1). After 10 years the trabeculectomy failed and the IOP started to increase, antiglaucoma medication therapy was unsuccessful at controlling the IOP.

SLT was performed. At the first post-laser follow-up visit, IOP was 20 mmHg (on 4 medications) and 25 mmHg at the 2nd visit. The SLT procedure was repeated. At the first follow-up visit after repeat SLT treatment, IOP was 33 mmHg; patient was booked for tube surgery, as her laser treatment had failed (Table 3).

7. Case III

A 36-year-old male presented to the emergency department with significant optic disc cupping and high IOP due to ARG in the left eye. Past medical history revealed trauma 10 years prior to presentation. On examination, IOP was 40 mmHg with total optic disc cupping. Medical treatment was started and his IOP and glaucoma was controlled for a period of more than 10 years and then the IOP started to increase to 21 mmHg with progression of a visual field defect (Table 2).

SLT was performed. During follow-up, the IOP was controlled with the same medications as prior to SLT. For 2 years the IOP was controlled, with a maximum reading of 16 mmHg. At last visit, the IOP was 12 mmHg and his visual field defect stabilized and SLT was successful at reducing IOP by more than 20% (Table 3).

8. Case IV

A 51-year-old male presented to the clinic with ARG of 8 years duration. On examination, BCVA was 20/30, IOP was 32 mmHg, angle recession was present in 2 quadrants (180°), and C:D was 0.5. The rest of examination was within normal limits. Thirty-six months later the IOP increased to 26 mmHg on 4 antiglaucoma medications and the C:D increased to 0.7.

SLT was performed. At 4 months post-laser the IOP was 20 mmHg on 3 antiglaucoma medications. SLT lowered the IOP by more than 20% with reduction in the glaucoma medications (Table 3).

9. Discussion

Selective laser trabeculoplasty (SLT) is a non-invasive procedure used to lower intraocular pressure (IOP). The effects of laser trabeculoplasty on aqueous drainage may be explained by several mechanisms, including mechanical pulling that opens uveoscleral trabecular meshwork and Schlemm canal,^{4,5} cellular mechanisms that stimulate cell division,⁶ and biochemical mechanisms that alter cytokines and stimulate macrophage-like capacity of trabecular-lining cells.⁷ The use of SLT in glaucoma treatment is well established.⁸

This study found overall success in 3 out of 4 patients after SLT for ARG. In all three cases, the patients had not undergone previous ocular surgery. SLT reduced IOP by 20% or reduced the burden of medications. In case I the IOP was controlled without medication. In Case III IOP was successfully controlled the IOP over a period of 2 years (at last visit). Case IV had reduction in IOP. However, the follow up was short.

Several retrospective studies have demonstrated the efficacy and safety of SLT in treating various types of secondary glaucoma.⁹⁻¹¹ To our knowledge this is the first report of SLT for the treatment of ARG. A previously series reported that ALT for ARG was unsuccessful in cases where maximum tolerable medications failed to control IOP.³ However, we achieved good outcomes in 3 out of 4 cases, likely because SLT preserves TM tissue whereas ALT causes more damage to an already damaged TM.

SLT in Case II was unsuccessful and the patient had a history of trabeculectomy surgery and cataract extraction. However, good outcomes have been reported after SLT following failed trabeculectomy.¹¹

Studies have reported that repeating SLT is beneficial in POAG,¹² but in our failed case repeating the procedure was unsuccessful.

A 10 year prospective study of 31 eyes by Kaufman and Tolpin reported that only 6% of patients with angle recession will go on to develop ARG,¹³ Tesluk and Spaeth reported that the risk to have open angle glaucoma in the other eye is 50%.¹⁴ This has led to the hypothesis that eyes with ARG having predispose factors for open-angle glaucoma and the damage to part of the angle may have accelerated the progression rate to glaucoma and this also could explain why some patients with ARG benefit from the SLT treatment.

Known complications of SLT are IOP spikes and uveitis post-operatively.¹⁵ However, none of our cases developed these complications after SLT. The number of cases presenting in this series is low. However, ARG is a rare disease with a US study reporting only 3.39% of patients with angle recession develop glaucoma.¹⁶ Additionally, tissue damage and the extent of damage varies from case to case,^{17,18} making it difficult to conduct a controlled clinical trial on the efficacy and safety of SLT for ARG.

10. Conclusion

SLT is a safe procedure that could be a reasonable alternative management in ARG when patients are unwilling to try medical or surgical intervention.

Further investigations are warranted to determine the role of SLT for ARG.

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We confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that we have followed the regulations of our institutions concerning intellectual property.

Research ethics

We further confirm that any aspect of the work covered in this manuscript that has involved human patients has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript.

IRB approval was obtained (required for studies and series of 3 or more cases).

Written consent to publish potentially identifying information, such as details or the case and photographs, was obtained from the patient(s) or their legal guardian(s).

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Declaration of competing interest

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