

# Argon Laser Trabeculoplasty as Primary Therapy in Open Angle Glaucoma

P.S. Mahar and K.K. Jamali

## ABSTRACT

**Objective:** To determine the effect of Argon Laser Trabeculoplasty (ALT) as a primary mode of therapy in reducing the intraocular Pressure (IOP) of patients diagnosed with Primary Open Angle Glaucoma (POAG).

**Study Design:** Quasi experimental study.

**Place and Duration of Study:** The study was carried out at Isra Postgraduate Institute of Ophthalmology, Karachi, from July 2003 to July 2004.

**Patients and Methods:** A total of 35 eyes of 35 patients with the gender distribution of 27 men and 8 women who were newly diagnosed with POAG, were included in this study. Mean age of the patients was 55.2 years with the range of 32 to 76 years. All of them were treated with argon laser trabeculoplasty as a primary mode of therapy. Intra ocular pressure was measured objectively using Goldman applanation tonometer, pre-and-post laser therapy.

**Results:** The pre-laser mean IOP was 27.63 mmHg (range 21–40 mmHg). The post-laser mean IOP measured at 6 months follow up was 15.5 mmHg (range 11 – 33 mmHg) with mean decrease of 12.1 mmHg. The decrease in IOP was seen in 32 eyes (95%) with no change observed in 3 (5%) eyes.

**Conclusion:** The result shows a marked decline in IOP in patients with POAG who underwent ALT as a primary mode of treatment. Further studies with large sample size and longer follow-up will help in making future recommendations.

**Key words:** Argon laser trabeculoplasty. Primary open angle glaucoma. Intraocular pressure.

## INTRODUCTION

Glaucoma is one of the leading causes of severe visual impairment and blindness worldwide.<sup>1</sup> It is characterized by optic neuropathy with cupping resulting in corresponding visual field defect. Patients usually present with reduced vision in one or both of their eyes. Major risk factors among most of these cases is elevated intraocular pressure (IOP). Lowering of eye pressure can halt the optic nerve damage.<sup>2</sup>

It is the third cause of registerable blindness in Pakistan in people over 40 years of age.<sup>3</sup> Primary Open Angle Glaucoma (POAG) is one of common types of glaucoma in which raised intraocular pressure (IOP) occurs due to impaired drainage through the trabecular meshwork. Traditionally, all patients with POAG are initially treated with medical therapy and once medical therapy fails, patients are offered surgical intervention. In 1979, Wise and Witter<sup>4</sup> used Argon laser applied to trabecular meshwork to reduce IOP as an option for the treatment of the POAG. Multiple studies followed showing the effectiveness of Argon Laser Trabeculoplasty (ALT) lowering the IOP through enhancement of aqueous outflow.<sup>5-8</sup> There are two hypothesis for the mechanism

of increased aqueous outflow after ALT. The first is a mechanical tightening of the trabecular meshwork lamellae with opening of inter-trabecular spaces.<sup>9-11</sup> The second hypothesis is a cellular activation of the trabecular meshwork with increased rate of trabecular cell replication, increasing the number of cells involved in maintaining the trabecular meshwork outflow<sup>12,13</sup>. In USA, ALT has now been established as a primary mode of therapy in patients diagnosed with POAG,<sup>14</sup> However, there are only few reports of the effectiveness of this procedure in patients with dark pigmented iris. The aim of the present study was to evaluate ALT, as a primary therapy to reduce IOP, in patients with POAG in the local population.

## PATIENTS AND METHODS

This study was carried out at Isra Postgraduate Institute of Ophthalmology, Karachi, from July 2003 to July 2004. Patients with diagnosis of POAG made with gonioscopic examination were enrolled from the glaucoma clinic. The study was approved by the hospital administration.

The inclusion criteria are newly diagnosed cases of POAG not using any anti-glaucoma medication and having IOP between 22 mmHg to 40 mmHg. Patients with narrow angle congenital, developmental and secondary type of glaucoma were excluded. Patients having IOP of more than 40 mmHg or having only one eye were also excluded.

All the patients had detailed ocular examination before laser procedure. That included, recording of their best

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corrected visual acuity, adnexa and external ocular examination including pupillary reflex and slit lamp examination of the anterior segments. IOP was measured with Goldman applanation tonometer with gonioscopy carried out using Goldman two mirror lens. All patients had their fundus examination carried out using +90D lens to assess the optic discs. The patients visual field status was evaluated with 30-2 programme using Humphrey automated perimeter.

All data regarding treatment and follow-up was entered in a proforma.

Data analysis was performed through SPSS version-10.0. Frequencies and percentages were computed for presentation of all categorical variables including gender and post-laser complications. Continuous variants including age, pre-and post-laser intraocular pressures were presented by mean  $\pm$  standard deviation (SD). The repeated measures analysis of variance (ANOVA) was performed to compare pre-and postoperative IOP; Post-Hoc (least significance difference test) was applied for pair-wise comparison of pre-and post-laser IOP. The statistical significance was considered if  $p < 0.05$ .

Before the laser procedure, a drop of Timolol maleate 0.5% was instilled in the eye. ALT was performed under topical anesthesia with Proparacaine using Ritch trabeculoplasty lens (Figure 1) coated with Hydroxy Propyl Methyl Cellulose (HPMC). The laser setting used were, power set at 1000 mw, duration of 0.1 second and the spot size of 50 microns. The inferior 180° anterior segment angle was treated with 25 burns in each quadrant. Laser was applied at the junction of pigmented and non-pigmented trabecular meshwork with blanching of the meshwork or bubble formation taken as the end point (Figure 2). At the end of the procedure, a drop of diclofenic sodium 0.1% was instilled in the eye. IOP's were checked after one hour to record any unwanted spike and patients were then sent home to continue diclofenic sodium 0.1% four times a day for five days.

All patients were followed-up at one week, one month, 3 months and 6 months after the laser treatment.

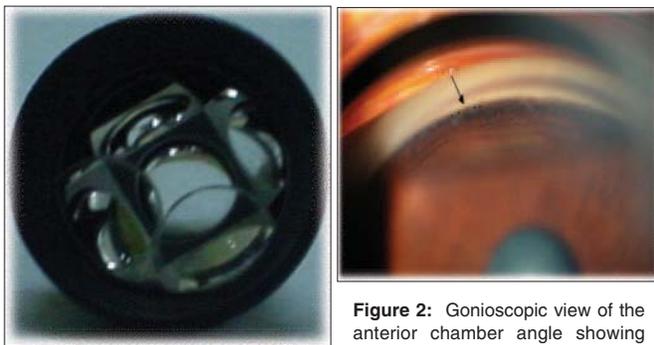


Figure 1: Ritch trabeculoplasty lens.

Figure 2: Gonioscopic view of the anterior chamber angle showing laser marks applied at the junction of non-pigmented and pigmented

## RESULTS

A total of 35 eyes of 35 patients were evaluated for ALT. Of these patients 27 were male and 8 female. The age ranged from 32 to 72 years with mean age of 55.2 years. The right eye was treated in 21 patients (61%) and left eye in 14 patients (39%). The mean pre-laser IOP in our patients was recorded at 27.63 ( $\pm$  4.57) mmHg (ranging from 21 mmHg – 40 mmHg). The mean IOP at one month visit after laser treatment was found at 20.89 ( $\pm$  5.85) mmHg (range 11 mmHg - 33 mmHg). At 6 months follow-up, the mean IOP was found at 15.54 ( $\pm$  3.62) mmHg (range 11 mmHg - 33 mmHg). There was an overall mean decrease of 12.1 mmHg in IOP from the base line (Table I). The decrease in IOP was seen in 32 eyes (95%) with no change observed in 3 (5%) eyes.

Table I: Outcome of laser trabeculoplasty (n = 35).

Factors	Intraocular pressure	Mean $\pm$ S.D	Comparisons	p-value
I	Pre-laser	27.63 $\pm$ 4.57	F = 88.16 <sup>^</sup>	<0.001
II	Post-laser 1 month	16.34 $\pm$ 4.58	I vs. II	0.001*
III	Post-laser 6 months	15.54 $\pm$ 3.62	I vs. III	0.001*

<sup>^</sup> Significant by using ANOVA (repeated measures).

\* Shows statistically significant low average IOP than pre-laser IOP (by post-hoc comparison, LSD test; paired t-statistic).

Iritis was the common complication seen in 15 (42%) eyes during the 1st week of ALT, which settled with the non-steroidal anti-inflammatory drops. Transient rise in IOP was seen in 13 (37%) eyes. It was not found severe enough to require any anti-glaucoma medication. One (2.85%) of the patients developed Peripheral Anterior Synechiae (PAS) one week after the laser treatment, which was broken with Argon laser gonioscopy applying less power, high duration burns in peripheral iris adjacent to the area of synechiae formation.

## DISCUSSION

ALT has been established as an effective procedure in lowering IOP in patients with POAG. Glaucoma Laser Trial (GLT),<sup>15</sup> a multicentre randomized clinical trial carried out in USA assessed the efficacy and safety of ALT as an alternative mode of therapy to the topical medication for controlling IOP in patients with newly diagnosed POAG. Throughout the two-year follow-up, all laser treated eyes had lower mean IOP than patients treated with topical anti-glaucoma medication. There was mean reduction of IOP of 9 mmHg in laser group compared to 7 mmHg mean drop in IOP in patients treated with topical medication.

Schwartz and co-workers<sup>16</sup> reported a drop in IOP of 9.7 mmHg at 2 months, 7.3 mmHg at 2 years and 4.9 mmHg at 5 years in the group of 82 eyes treated with ALT. Spaeth<sup>17</sup> concluded that ALT can defer the need for filtration surgery in around one-third of patients with POAG.

Majority of the work related to the usefulness of ALT has been reported in the literature in white Caucasian eyes. There are few reports of ALT, causing a successful drop in IOP in the dark pigmented eyes, like those seen in this country.

Agarwal *et al.*<sup>18</sup> from India performed ALT as a primary procedure in 40 eyes of 21 patients. The mean pre-laser IOP was 25.8 mmHg in his group of eyes reducing to 17.4 mmHg at 3 months, 17.8 mmHg at 6 months, 18.2 mmHg at 9 months and 18.1 mmHg at 12 months suggesting a decrease of about 8 mmHg. The complications reported in his series were transient post-ALT IOP spike in 18 eyes (45%), with iritis and hyphema occurring in one eye (2.5%).

Sharma and Gupta<sup>19</sup> reported success rate of ALT as a primary treatment of POAG in Indian eyes to be 76% at one year and 59% at 2 years. The IOP decreased from the base line value of 25.48 (4.13) mmHg to 18.24 mmHg at 2 years showing a mean fall in IOP of 5.85 ( $\pm 3.46$ ) mmHg.

In this series of 35 eyes of 35 patients, the mean drop in IOP was recorded at 12.1 mmHg at 6 months follow-up. All these patients were diagnosed with POAG and had ALT as a primary mode of therapy.

Although the sample size of series is small and follow-up of 6 months is short, but for a life-long disease, the success and significant effect of ALT was demonstrated as primary treatment in patients with POAG in reducing IOP.

The other modes of treating patients with POAG are medical therapy and drainage surgery. The usefulness of these treatment modalities is very well established. The problem with medical therapy is life-long commitment on patient's part to use the drops, multiple dosages of multiple drugs effecting quality of life and the overall cost of the medicines. The drainage procedure, trabeculectomy is a choice of surgical procedure in the country. Although its very effective in controlling IOP, two major disadvantages with it are danger of endophthalmitis and induction and progression of cataract.

It, therefore, makes sense if alternative therapy, such as ALT, are explored as a primary mode of therapy in patients with POAG.

## CONCLUSION

Argon Laser Trabeculoplasty (ALT) is a simple and safe procedure with fewer complications. This study demonstrates the effectiveness of ALT in reducing the IOP of patients with the diagnosis of POAG. Although the role of medical therapy and surgery is very well established, ALT should be considered as an alternative

mode of therapy in controlling the IOP of patients with the diagnosis of POAG.

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