ORIGINAL ARTICLE

Brimonidine 0.2% for Prevention of Intraocular Pressure Elevations after YAG Posterior Capsulotomy

Muhammad Khizar Niazi[1], Ali Rauf[2], Yasser Nadeem[3]
[1-3]*Combined Military Hospital (CMH) and Medical College, Lahore*

ABSTRACT

Purpose: To see the efficacy of Brimonidine 0.2% in controlling intraocular pressure (IOP) elevations after YAG-posterior capsulotomy.

Study Design: Quasi Experimental study.

Place and Duration of Study: Combined Military Hospital, Lahore from February to December 2019.

Material and Methods: Eighty-four pseudophakic eyes with Posterior capsular opacities were included in the study. Exclusion criteria were; patients with diagnosis of glaucoma, complications during surgery or in postoperative period. Cases with any other ocular disease or history of ophthalmic surgeries prior to Nd: YAG laser posterior capsulotomy were also excluded from the study. Before the laser treatment, Intraocular Pressure was measured in all patients. After YAG capsulotomy patients were either administered Brimonidine 0.2% or were not given any IOP lowering drug after noting a rise in Intra-ocular pressure. Eyes received either one drop of Brimonidine 0.2% per day starting one hour after the laser procedure or no treatment after laser therapy. Intraocular pressure was measured one hour and three days after laser therapy in both the groups.

Result: Mean IOP of 84 eyes was 14.43 mm of Hg before the procedure.. One hour after the procedure, 52 patients had a rise in IOP. Mean IOP-hike was 8.76 mm of Hg. 26 patients were administered Brimonidine drops immediately while rest were left untreated and observed. On the third day after laser therapy, only one patient had an increased IOP in the treated group while 18 patients in the un-treated group had higher than normal IOP. After 3rd day, all patients were treated for the raised IOP.

Conclusion: Once daily dose of Brimonidine 0.2% is effective in maintaining a lower IOP after YAG capsulotomy.

Key Words: Brimonidine, Intraocular pressure, Nd YAG capsulotomy.

How to Cite this Article: Niazi MK, Rauf A, Nadeem Y. Brimonidine 0.2% for Prevention of Intraocular Pressure Elevations after YAG Posterior Capsulotomy. Pak J Ophthalmol. 2020, **36 (2):** 147-150.

Doi: 10.36351/pjo.v36i2.1006

INTRODUCTION

Cataract surgery is continuously being improved upon and associated complications declining day by day. Posterior capsular opacification (PCO) is the commonest post-operative complication of the modern surgery[1]. Reduced visual acuity that is induced by PCO is reported in 20% to 40% of patients, 2 to 5 years after cataract surgery[2]. At present, the only definite solution of PCO is Nd: YAG laser capsulotomy. It involves clearing the visual axis by making a central clear area within the opaque posterior capsule. Although this procedure is facile and time-saving, there are recognised complications, including

Correspondence to: Muhammad Khizar Niazi
CMH Lahore and Medical College, Lahore
E-mail: Khizaraleem@hotmail.com

retinal detachment, damage to the IOL, cystoid macular oedema, an increase in intraocular pressure, iris haemorrhage, corneal oedema, IOL subluxation, and exacerbation of localized endophthalmitis[3].

There are several reports that have mentioned displacement of IOLs after laser treatment. By employing dual-beam partial coherence interferometry the procedure has been shown to produce a negligible but measurable backward displacement of the IOL. It is quoted that the larger capsulotomy size induces greater backward movement, and it is recommended that small openings should be carved to avoid this complication[4]. It is also recommended in case of large capsulotomies to prescribe new spectacles at least 1 to 4 weeks after Nd: YAG laser capsulotomy[5]. The commonest complication of posterior capsulotomy is raised IOP. Various explanations which have been given for the pressure rise following Nd: YAG laser treatment include the collection of debris in the trabecular meshwork, pupillary block, and inflammatory oedema of the ciliary body or iris root co-existent with angle closure. Despite the prophylactic treatment, increased IOP was reported in 15% to 30% of patients in many studies[6]. Other mechanism includes trabeculitis as a result of radiating "shock waves"[7].

The aetiology of CME following Nd: YAG laser capsulotomy most likely encompasses movement of the vitreous cavity and vitreous damage, which results in the release of inflammatory mediators. Vitreoretinal traction as a result of the procedure may also play a part. Previous studies have gone into details to probe variations of macular thickness after Nd: YAG laser capsulotomy. Although a few studies did report cystoid macular oedema, majority of them found no significant changes in macular thickness following Nd: YAG laser capsulotomy[7].

Brimonidine exerts its effects in the eye due to its significant a2- adrenoceptor affinity, due to which it is considered a standard reference compound. In radio ligand binding assays using human colonic cell lines (a2-adrenoceptors) and human cerebral cortex neurons (a1-adrenoceptors), the ratio of a2:a1-adrenoceptor selectivity was 974 for brimonidine, 151 for clonidine and 30 for apraclonidine, thus, indicating that brimonidine was 6 – 32 times more selective for a2-adrenoceptors than clonidine and apraclonidine, respectively[8]. Brimonidine lowers IOP by both decreasing aqueous humor production and enhancing aqueous outflow via the uveoscleral pathway. Both of these mechanisms are mediated by stimulation of ocular a2-adrenoceptors. Brimonidine may also have a neuroprotective effect in addition to its ability to lower IOP. The mechanisms underlying this are not completely comprehended but may include an up regulation of basic fibroblast growth factor, causing a cell hyperpolarization and a reduction in the release of glutamate from neurons, or an up regulation of antiapoptotic genes[9]. An early study concluded that brimonidine in concentrations of 0.08, 0.2 and 0.5% with double daily dosing lowered IOP by 20 – 30% in glaucoma and ocular hypertension patients[10].

MATERIAL AND METHODS

This study was performed at Eye department, CMH Lahore from February 2019 to December 2019. Written informed consent was obtained from the patients before intervention. Ethical committee board of Combined Military Hospital, Lahore approved the study. A total of 84 pseudophakic eyes with posterior capsular opacity and BCVA of ≤ 6/9 (Log MAR 0.176) were included in the study. Only those cases that had undergone uncomplicated phacoemulsification with posterior chamber intraocular lens (PCIOL) in the bag implantation at CMH, Lahore were included in the study. Multiple surgeons did the surgeries. Exclusion criteria were; complications during cataract surgery or during the postoperative period. Diagnosed cases of glaucoma, patients with corneal opacities, retinal diseases, uveitis, optic neuropathy, and those who had undergone any other ophthalmic surgeries prior to Nd: YAG laser posterior capsulotomy treatments were also excluded from the study.

All the patients who underwent Nd: YAG laser were examined preoperatively, at 1hr. postoperatively, and at 3rd day after Nd: YAG laser capsulotomy. Patients were divided into two groups according to the treatment. Group 1 received Brimonidine while Group 2 was observed without treatment from time of laser till 3rd day. There were 42 patients in each group. Multiple surgeons performed the capsulotomy, though each capsulotomy was performed by a single surgeon in a single session with an Nd: YAG laser. All patients underwent a complete ocular examination on all visits, including BCVA, refraction (auto refraction followed by subjective refraction); slit lamp biomicroscopy, IOP measurement. BCVA was measured in a darkened room using projection-type Snellen chart. Tropicamide 0.1% was administered for pupillary dilatation prior to

the procedure. All pretreatment data and data at 3rd day follow-up were collected from non-dilated eyes. However, data at 1 hr. after treatment were taken from dilated eyes. After capsulotomy, a combination of antibiotic and steroid (Tobradex, Alcon laboratories) was prescribed four times daily for 7 days. SPSS 17 Statistics was used for statistical analysis. The independent *t*-test was used for the comparisons between the groups. A *P*-value of < 0.05 was considered statistically significant.

RESULTS

Sixty-two males and 22 female patients were enrolled in this study. 81 patients received treatment in unilateral eyes and 3 patients in both eyes. There were 42 eyes in each group. Mean age of the patients was 65.30 ± 10.10 years (range: 42 – 82) in Group I and 64.64 ± 12.70 years (range: 42 – 85) in Group II. Mean age was not significantly different between the two groups (*P* = 0.334, 0.348 respectively). IOP rose in 52 patients (mean 24 mmnHg) remained normal in 32 patients (mean 15.02 mm Hg). Table 1 compares the Mean IOP 01 hour post-procedure and 3 days post-procedure in the two groups.

Table 1: *Comparison of IOP in Two Groups.*

IOP	Group I (Treated)	Group II (Untreated group)
Before laser	14.43 mm of Hg	14.43 mm of Hg
1 hour post-procedure	24.47 mm of Hg	24.10 mm of Hg
3 days post-procedure	13.87 mm of Hg	23.02 mm of Hg

DISCUSSION

PCO is the commonest cause of diminished visual acuity post extra-capsular cataract surgery[10]. Nd: YAG laser capsulotomy is the most authentic and confirmed treatment of PCO[11]. Some studies reported an immediate improvement in visual acuity in majority of cases treated by capsulotomy. In a review by Weiblinger et al, gross visual acuity improved in 83–94% and decreased in 3.5 – 6% of the cases[12]. But the procedure has its associated complications. Commonest among them are an intra-ocular pressure hike and macular edema. Intraocular pressure rise after Nd: YAG laser capsulotomy is a complication reported at different studies[13]. Studies in literature exhibit the performance of various anti-glaucomatous agents in the control of IOP. It was reported in a study that IOP control was effectively achieved with 1 week of brimonidine use after prophylactic apraclonidine[14]. In a recent study, it was shown that IOP rose after YAG capsulotomy but it did not require use of any anti-glaucoma therapy[15]. Holweger and Marefat reported no significant rise in IOP at 1–3 hrs and 1 day after capsulotomy[16]. Some researchers showed no significant change in IOP after Nd: YAG capsulotomy.

There are also some studies which indicate that rise in IOP was associated with the level of energy used[17-19]. Other researchers have denied such relationship[20,21].

The limitation of our study was that the number of shots applied during laser procedure, total power used, and the level of post-procedure inflammation suppressed with an agent can be significant agents affecting IOP variations after YAG laser. Additional studies are required to evaluate the effects of these factors on IOP modulations after YAG laser posterior capsulotomy. Another limitation of this study was short follow-up.

CONCLUSION

We observed a significant IOP increase in the group where prophylactic brimonidine was not given; efficient IOP control was seen in the group where brimonidine was used.

Ethical Approval

The study was approved by the Institutional review board/Ethical review board.

Conflict of Interest

Authors declared no conflict of interest

Author Designation and Contribution

Muhammad Khizar Niazi; Professor: *Study design, Data collection, analysis, final review.*

Ali Rauf: *Study design, Data collection, analysis, final review.*

Yasser Nadeem: *Study design, Data collection, analysis, final review.*

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