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An Investigation Comparing the Efficiency of Timolol 0.5% with Brimonidine 0.2% in Managing the Increase in Intraocular Pressure Subsequent to Nd-Yag Laser Capsulotomy

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ABSTRACT

Objective: Conducting a comparison between the efficacy of Timolol 0.5% eye drops and Brimonidine 0.2% eye drops in managing the elevation of intraocular pressure post Nd-YAG laser capsulotomy.

Study Design: Employed a randomized controlled trial.

Methodology: The research involved 80 patients (one eye per patient) aged between 45 and 70, diagnosed with posterior capsular opacification scheduled for Nd-YAG laser capsulotomy at the Department of Ophthalmology, Mathuradas Mathur Hospital (Dr. S. N. M. C.) in Jodhpur. The patients were divided into two groups, X and Y, each consisting of 40 individuals. Baseline intraocular pressure was measured using an applanation tonometer before administering eye drops. Group X received a single drop of Timolol 0.5%, while group Y received a single drop of Brimonidine 0.2% one hour prior to capsulotomy. Intraocular pressure was recorded at 1 hour and 4 hours post the laser procedure.

Results: Both groups comprised 40 patients each. The baseline IOP was 16±2.16 for group X and 15±2.56 for group Y. There was no statistically significant variance between the two groups in mean IOP changes at 1 hour following Nd-YAG laser capsulotomy. However, after 4 hours, the mean reduction in IOP was -1.54 mmHg for group X and -1.85 mmHg for group Y ($p<0.5$).

Conclusion: Our study indicates that both Timolol 0.5% eye drops and Brimonidine 0.2% eye drops are similarly effective in controlling elevated intraocular pressure after Nd-YAG laser capsulotomy.

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Introduction

Posterior Capsular Opacification (PCO) stands as the most common complication following extracapsular cataract surgery methods such as phacoemulsification and small incision cataract surgery. This condition often leads to reduced vision post-surgery [1]. PCO occurs due to the excessive growth of lens epithelial cells, resulting in fibrotic alterations and wrinkling of the posterior capsule [2-5]. Nd-YAG laser capsulotomy is widely recognized as the standard treatment for PCO and has proven to be an effective approach [6]. However, a common but temporary consequence of Nd-YAG laser capsulotomy is an abrupt increase in intraocular pressure (IOP) [7]. The average IOP tends to reach its peak within three hours post-procedure, showing a mean elevation of 13 mmHg. Although it remains elevated by 5 mmHg at the 24-hour mark, it typically returns to baseline levels within one week.

Materials and Methods

The study was conducted at Mathuradas Mathur Hospital in Jodhpur from December 2022 to February 2023, focusing on Posterior Capsular Opacification (PCO) cases intended for Nd-YAG laser capsulotomy. Patients aged 45 to 70, regardless of gender, with non-glaucomatous eyes, vision below 6/24, and having undergone cataract surgery with PCIOL within 6-12 months were included. Exclusions comprised patients with a history of surgery for traumatic cataract, pseudo-exfoliation, pigmentary glaucoma, open or closed-angle glaucoma, uveitis, or prior long-term corticosteroid use [8-12]. The study documented patient details and conducted ophthalmic evaluations post obtaining written consent explaining the benefits and side effects of both Nd YAG laser capsulotomy and the use of Timolol and Brimonidine. Assessments included BCVA (best corrected visual acuity), slit lamp examination, intraocular pressure measurement, and fundus examination post pupil dilation with 1% tropicamide. The patients

were divided into two groups, X and Y (40 patients each). Baseline intraocular pressure was measured using an applanation tonometer before administering eye drops. Group X received Timolol 0.5%, and group Y received Brimonidine 0.2% one hour before capsulotomy. Nd-YAG laser was preceded by instilling a topical anaesthetic (proparacaine hydrochloride) eye drop. The laser parameters were adjusted based on PCO thickness, and a single ophthalmologist cleared the central 3-4 mm papillary area in the posterior capsule. The energy used in the YAG laser capsulotomy procedure was recorded, and intraocular pressure was measured at 1 and 4 hours post the laser procedure. Intraocular pressure measurements were conducted using the Goldman applanation tonometer based on the Imbert-Fick law. Data analysis was performed using SPSS software, comparing the groups using the Chi-Square test, with a significance level set at $p \leq 0.05$. Certainly, here is the tabular representation of intraocular pressure (IOP) at 1 and 4 hours for Group X and Group Y:

TIME	GROUP X	GROUP Y
Baseline IOP (in mmHg)	16	15
Change at 1 hr (in mmHg)	0.44	0.47
Change at 4 hrs (in mmHg)	-1.56	-1.87

Results

Each group comprised 40 patients, with mean ages of 57.53 in group X and 58.68 in group Y. Baseline IOP: 16±2.18 for group X and 15±2.58 for group Y. No significant difference was observed between the groups in mean IOP changes at 1 hour post Nd-YAG laser capsulotomy. However, after 4 hours, the mean reduction in IOP was -1.56 mmHg for group X and -1.87 mmHg for group Y ($p<0.5$).

Discussion

PCO is a common complication post-cataract surgery, addressed by Nd-YAG laser capsulotomy. While generally safe, this procedure can result in various complications, including transient rise in IOP, IOL damage, uveitis, IOL subluxation, and cystoid macular edema. Elevated IOP post capsulotomy is crucial to monitor due to potential optic nerve damage, especially in compromised cases. Studies indicate a peak in IOP within the first three hours post-laser treatment. Several IOP-lowering agents have been explored to mitigate IOP rise post Nd-YAG laser capsulotomy, with varying degrees of success. The data suggests that Timolol, a non-selective beta blocker, decreases Intraocular Pressure (IOP) by limiting aqueous humor production, with an onset of action within 10-20 minutes post-administration. Its effects last for at least 24 hours, peaking at 2-3 hours. Timolol's side effects are primarily systemic (impacting the heart and lungs) rather than local (like a burning sensation or redness). On the other hand, Brimonidine, a selective alpha 2 adrenergic agonist, reduces IOP by decreasing aqueous humor production and enhancing uveoscleral outflow. It may cause allergic reactions and drowsiness but does not affect cardiac and pulmonary functions. Its peak action occurs around 3-4 hours after administration. In the study, the mean age of patients in the Timolol group was 57.50 years and in the Brimonidine group was 58.66 years. At baseline, the mean IOP in Group A was 16 mmHg and in Group B it was 15 mmHg, with no statistically significant difference between the groups. In the Timolol group, a slight increase in mean IOP was noted after the first hour, but compared to baseline, this difference wasn't statistically significant. However, a significant reduction in IOP was observed after 4 hours compared to baseline. In the Brimonidine group, a slight rise in mean IOP was observed after the first hour, but again, no statistically significant difference was found when compared to baseline. However, a statistically significant reduction in IOP was noted 4 hours after the laser procedure compared to baseline. Comparative analysis between the two groups revealed a 1.54 mmHg reduction in IOP in the Timolol group and a 1.85 mmHg reduction in the Brimonidine group at the end of the 4th hour.

Conclusion

In conclusion, both topical Brimonidine and Timolol proved effective in preventing a rise in IOP after capsulotomy when administered as a single dose an hour before Nd-YAG laser capsulotomy. Considering the safety profiles of both drugs, Brimonidine 0.2% may offer a superior IOP-lowering effect compared to Timolol 0.5% following Nd-YAG laser capsulotomy.

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