

PROPHYLACTIC ROLE OF TIMOLOL TO PREVENT RISE OF INTRAOCULAR PRESSURE AFTER ND-YAG LASER POSTERIOR CAPSULOTOMY

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ABSTRACT

This study was conducted to know the effectiveness of topical 0.5% timolol maleate for the intraocular pressure rise after Nd-YAG laser posterior capsulotomy. Ninety-six eyes of 92 patients undergoing Nd-YAG laser posterior capsulotomy were randomly selected for pretreatment with topical 0.5% timolol maleate, 48 patients (Group A) or control 48 patients (Group B). The mean IOP of the group A was 14.8 ± 3.0 mmHg before capsulotomy and 15.7 ± 3.4 mmHg after capsulotomy ($P > 0.05$), whereas 15.1 ± 3.3 mmHg and 17.2 ± 4.3 mmHg ($P < 0.05$) of the group B. There was no statistically significant difference between the two groups with regard to mean IOP before capsulotomy ($P > 0.05$), but statistically significant difference between two groups after capsulotomy ($P < 0.05$). Pretreatment with topical 0.5% timolol maleate is effective in preventing IOP elevation after Nd-YAG laser posterior capsulotomy.

KEYWORDS

Nd:YAG laser, intraocular pressure, timolol maleate

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INTRODUCTION

Cataract surgery is currently the most common ophthalmic surgical procedure in the world. This procedure involves the extracapsular extraction of the opaque lens fibers and implantation of an intraocular lens (IOL) which restores good vision.¹ However, posterior capsular opacification (PCO), which is also termed as secondary cataract, formation of PCO may start in few weeks or even take years to develop is a common long-term complication of modern cataract surgery.²

The PCO may lead to either partial or complete obstruction of the visual axis thus causing the problems of decreased vision, increased glare and interference in the day to day activities of the patient. Therefore, PCO removal is important to restore vision in such patients.

Of the various interventions available for treatment of PCO, Nd: YAG laser capsulotomy is an established and safe procedure³ for which photo disruption property of Nd: YAG laser is utilized. Nd: YAG laser clears the visual axis by creating a central opening in the opacified posterior capsule, but this procedure is not devoid of complications. Transient rise of intraocular pressure (IOP) is the most common complication following laser capsulotomy, which peaks in the first 3 hrs. of laser application.⁴ The increase in IOP as reported by literature is 5-10 mmHg which may lead to serious eye damage, especially in patients with advanced glaucoma who have higher frequency of this complication.⁵

Various oral or topical hypotensive agents have been used prophylactically in an attempt to prevent the post laser IOP rise. Pretreatment with oral acetazolamide,⁷ dorzolamide,⁸ topical 1% apraclonidine^{8,9} or 0.5% levobunolol¹⁰ proved very effective, while topical 0.5% timolol maleate or 4% pilocarpine¹¹ provided only partial protection.

There are varied opinions about the use of Timolol maleate eye drops, which is a non-selective beta₁ and beta₂ adrenergic receptor antagonists and has an IOP lowering action by reducing aqueous humor production.⁶

There is lack of common consensus about the efficacy and need of pre-capsulotomy use of Timolol maleate in controlling raised IOP hence this study was undertaken with the aim to evaluate the role and efficacy of prophylactic use of Timolol maleate (0.5%) eye drop in preventing rise of IOP post Nd: YAG capsulotomy.

MATERIALS AND METHODS

It was a prospective study which included patients who underwent phacoemulsification cataract surgery with foldable intraocular lens implantation. The study was conducted in Nepal Eye Hospital, Kathmandu from January 2021 to June 2022.

Ninety-six eyes of 92 patients (46 were males, 50 females) from fifty to eighty-five years old undergoing Nd-YAG laser posterior capsulotomy after phacoemulsification with implantation of posterior chamber intraocular lens were included in this study. All the used lenses were posterior chamber foldable IOLs. In every case, the posterior capsule was opacified to cause an objective decrease in best-corrected visual acuity. None of the patients had a history of glaucoma or IOP higher than 21 mmHg before treatment. Informed consent was obtained from all the patients.

Before capsulotomy, all patients underwent slit-lamp bio microscopy and IOP was measured with goldmann applanation tonometer. Either topically one drop of 0.5% timolol maleate (48 eyes of 46 patients, group A) or nothing (48 eyes of 46 patients, control group B) in a randomized, double-masked fashion.

All posterior capsulotomies were performed by one surgeon, after topical anesthesia with one drop of 1% propacaine. A Nd-YAG laser contact lens was used in each case. We used Nd-YAG laser with the laser beam focused on the posterior capsule and used a single pulse with the energy level ranging from 1.0 to 2.5 mj based on the thickness of the opacified capsule. A 2 to 3 mm diameter opening in the center of the opacified capsule with the lowest laser energy and the least laser spots for each patient. IOP was measured after one hour after capsulotomy. All eyes received one drop of a combination of Chloramphenicol 1% and Dexamethasone 0.1% in both groups 4 times a day for 1 week.

Numerical data were recorded as mean (SD). Statistical significance for data comparison between patient groups was analyzed using t test analysis. P values of less than 0.05 were considered significant

RESULTS

The mean IOP of the therapy group was 14.8±3.0 mmHg before capsulotomy and 15.7±3.4 mmHg after capsulotomy (P>0.05), whereas 15.1±3.3 mmHg and 17.2±4.3 mmHg (P<0.05) of the control group. There was no statistically

Table 1: Comparison of IOP changes before and after capsulotomy.

Group	Before Capsulotomy	After capsulotomy	mean
A	14.8 mmhg	15.7 mmhg	p > 0.05
B	15.1 mmhg	17.2 mmhg	P < 0.05

significant difference between the two groups with regard to mean IOP before capsulotomy ($P > 0.05$), but statistically significant difference between two groups after capsulotomy ($P < 0.05$).

DISCUSSION

PCO is one of the major complications of phacoemulsification and extracapsular cataract extraction, and is also the most important reason of decreased vision after cataract surgery. At present, Nd: YAG laser posterior capsulotomy is the method of choice to treat this complication. The criteria of success for this procedure is that the incision on capsule must be in center and at least 2mm in size and patients have better vision.

There are some complications following Nd: YAG laser posterior capsulotomy, such as the IOP elevation, IOL injuries, iritis, anterior chamber bleeding, retinal detachment.¹²

IOP elevation is the major complication of Nd: YAG laser posterior capsulotomy. According to the statistics, more than half patients have the post laser IOP elevation which generally less than 30.0 mmHg, but there is also someone getting more than 50.0 mmHg. The post laser IOP rise mainly due to the block of chamber angle caused by the remained lens cortex, pieces of posterior capsule, inflammatory cells and exudative protein after laser treatment while someone considered that the IOP elevation was related to the release of prostaglandin. The IOP rise is mainly momentary and generally reaches its peak during the first 2 to 4 hours after laser treatment, and mostly resumes to normal in the following 4 to 8 days. However, we must pay more attention to patients with pre-existing glaucoma or who have got a precapsulotomy IOP greater than 25 mmHg, prophylactic treatment and postcapsulotomy treatment in time is necessary.

Study proved that pretreatment with a low dose of acetazolamide was highly effective in preventing the post laser IOP elevation.⁷

A study by Jiping Cai *et al*¹³ reported that with temporary administration of 0.5% timolol maleate after laser treatment, only 1.7% patients had an IOP greater than 20.0 mmHg

the next day following Nd:YAG laser posterior capsulotomy and all IOPs resumed to normal in the following week. Because the IOP elevation generally reaches its peak during the first 2 to 4 hours after laser treatment, we tried to evaluate whether topical administration of 0.5% timolol maleate one hour before laser treatment was effective to prevent the post laser IOP elevation. And we found that there was no statistically significant difference between precapsulotomy and postcapsulotomy IOP in therapy group ($P > 0.05$), statistically significant difference between precapsulotomy and postcapsulotomy IOP in the control group ($P < 0.05$), no statistically significant difference between the two groups with regard to mean IOP before laser treatment ($P > 0.05$) and statistically significant difference between two groups with regard to mean IOP after laser treatment ($P < 0.05$). The results of this study showed that the prophylactic administration of topical 0.5% timolol maleate momentarily was effective for the prevention of IOP elevation following routine Nd:YAG laser posterior capsulotomy.

Several studies⁷⁻¹¹ have shown that the prophylactic use of other antiglaucoma medication such as acetazolamide, dorzolamide, apraclonidine, levobunolol, timolol maleate, and pilocarpine is also effective in preventing or reducing the IOP rise after Nd-YAG laser posterior capsulotomy. As some of this medication is not readily available worldwide, we believe that a widely available and cheap drug (such as 0.5% timolol maleate) is an important alternative therapy in the prevention of vision-threatening IOP elevation in patients undergoing Nd-YAG laser posterior capsulotomy.

Nd: YAG laser posterior capsulotomy is the treatment of choice for the PCO. This procedure has gained popularity as it is non-invasive, relatively safer, less time consuming and free from infections as compared to needle capsulotomy but has been associated with complications like corneal burns, intra ocular lens pitting and raised IOP varying from 1.6%¹⁴ to 42.85%.¹⁵ In this study, the focus was kept on IOP changes following Nd: YAG laser capsulotomy with and without precapsulotomy use of Timolol maleate 0.5% eye drops. It has been shown in literatures that Timolol maleate 0.5% is a useful intervention

to inhibit IOP rise following Nd: YAG laser posterior capsulotomy.^{14,16,17}

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