Original Article

Intraocular Pressure Changes after Neodymium Doped: Yttrium-Aluminum-Garnet (Nd: Yag) Laser Capsulotomy

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ABSTRACT

Purpose: To assess the difference in intraocular pressure before and after Nd-YAG laser posterior capsulotomy.

Study Design: Quasi-experimental study.

Place and Duration of Study: Layton Rahmatulla Benevolent Trust Eye Hospital, Karachi, from July 2021 to October 2021.

Methods: Patients of both gender with posterior capsular opacification (PCO) after cataract surgery, were included. Age ranged between 40 and 60 years. Patients with less than 6 months of surgery were excluded. Patients with posterior segment pathology like glaucoma, uveitis, high myopia, diabetic retinopathy, macular pathology, and hereditary fundus dystrophies were excluded from the study. After detailed history, complete ocular examination was performed. After pupil dilatation, YAG laser capsulotomy was done.IOP was measured with Goldmann Applanation Tonometer after instilling a topical anesthetic agent. Post-YAG, IOP was again measured at 1 hour and on day 1. Data was analyzed using SPSS version 25. Paired T-tests were used to assess the significance of any change in IOP.

Results: Ninety eyes of 90 patients were inducted into the study in which 51 (57%) were male and 39 (43%) were female. The age varied from 40 to 60 years (mean 52.3 ± 10.25 years). There was no statistically significant difference between pre-YAG and post-YAG IOP. Similarly, no difference in IOP was found depending upon the age of the patients. No significant change was observed after 1 hour and 1 day in both groups with P > 0.05.

Conclusion: This showed no significant change in intraocular pressure at one hour and one day, after Nd-YAG laser posterior capsulotomy.

Key Words: Capsulotomy, Intraocular pressure, Nd-YAG laser, Cataract.

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INTRODUCTION

The commonest late post-operative complication of cataract surgery with intraocular lens implantation is Posterior Capsular Opacification (PCO). There are multiple factors responsible for PCO but remaining lens matter, certain type of lens and uveitis are considered to be contributing factors.[1] It is usually detected on routine follow-up examinations but may be delayed for many years. PCO accounts for as much as 65% to 70% of all complications after surgery and 75% to 80% of this occurs within 10 years post-operatively.[2] It may occur even 20 years after initially successful surgery.[3] Different types of lenses after phacoemulsification have different rates of PCO formation.[4]

PCO is treated with Neodymium doped: Yttrium-Aluminum-Garnet (Nd: Yag) laser capsulotomy,

which is a non-surgical and effective treatment. It provides excellent results in terms of visual improvement and most of the patients have a rise of < 5 mm Hg which is transient in nature. Some surgeons have suggested use of anti-glaucoma medications in patients prone to develop high IOP.[5] Complications related with YAG include; IOP spikes, cystoid macular oedema, corneal burns, intraocular lens (IOL) pits and retinal detachment.[6-9] Although a transient rise of IOP is the commonest complication but few cases of intractable rise of IOP is also reported.[10] Thus use of IOP lowering agents must be judicious and balanced.

In this study, we assessed the preoperative and postoperative intraocular pressure without giving anti-glaucoma medication to avoid unnecessary use of anti-glaucoma medication in pseudophakic patients after Nd-Yag capsulotomy. These findings will ease patients' pockets and decrease the burden of medicines in underdeveloped countries like Pakistan.

METHODS

In this Quasi-experimental study, patients of both genders with posterior capsular opacification (PCO) after cataract surgery, who presented to LRBT Tertiary Teaching Eye Hospital Karachi, were included. Duration of study was from July 2021 to October 2021. The institutional ethical review committee approved the study. Age ranged between 40 and 60 years. Patients with less than 6 months of surgery were excluded. A single surgeon performed the procedure.

With 10% margin of error and 95% confidence interval and considering 1000 patient a month the calculated sample size was 88 (www.raosoft.com). The patients signed informed consent forms, and the pupils of all patients were pharmacologically dilated with Tropicamide 1% eye drops before performing the YAG laser capsulotomy. All procedures were done as an outpatient procedure. Patients with posterior segment pathology like glaucoma, uveitis, high myopia, diabetic retinopathy, macular pathology, and hereditary fundus dystrophies were excluded from the study. After detailed history, complete ocular examination was performed; including best-corrected visual acuity, slit lamp examination and Fundoscopy with 90 diopters (90D) lens. IOP was measured with Goldmann Applanation Tonometer (Haag-Streit AT 900) after instilling a topical anesthetic agent (Proparacaine hydrochloride 0.5%). After YAG, IOP was again measured at 1 hour and on day 1. Data was analyzed using SPSS version 25. Paired T-tests were used to assess the significance of any change in IOP.

RESULTS

Ninety eyes of 90 patients were inducted into the study in which 51 (57%) were male, and 39 (43%) were female. The age varies from 40 to 60 years (mean age 52.3 ± 10.25 years). Paired T-tests were applied to IOP measurements, and the results were statistically insignificant **(Table 1).**

Table 1: *Paired T test for IOP measurements.*

		Mean	Std. Deviation	p value
Pair 1	Pre-YAG IOP	13.88	1.715	0.401
	IOP 1 hour Post-YAG	13.66	1.684	
Pair 2	Pre-YAG IOP	13.88	1.715	0.214
	IOP 1 day Post-YAG	13.57	1.696	
Pair 3	IOP 1 hour Post-YAG	13.66	1.684	0.725
	IOP 1 day Post-YAG	13.57	1.696	

In age group 40 to 50 years the mean Pre-operative IOP was 13.86 and in 51 to 60 years old patient it was 13.89mm Hg. No significant change was observed after 1 hour and 1 day in both groups with P>0.05 **(Table 2).**

Table 2: *Paired T test for IOP measurements in different age groups.*

		Mean IOP (40 – 50 Years Old)	Mean IOP (51 to 60 Years Old)	P-value
Pair 1	Pre-YAG IOP	13.86	13.89	0.87
	IOP 1 hour Post-YAG	13.65	13.67	
Pair 2	Pre-YAG IOP	13.86	13.89	0.35
	IOP 1 day Post-YAG	13.55	13.58	
Pair 3	IOP 1 hour Post-YAG	13.65	13.67	0.45
	IOP 1 day Post-YAG	13.55	13.57	

DISCUSSION

It has been reported that rise in IOP after YAG occurs due to reduced outflow facility secondary to blockage of trabecular meshwork by the capsular debris and vitreous particles floating in the anterior chamber.[11] Some studies have shown that higher elevation of IOP

was noticed in larger capsulotomies. It showed that size of the Nd: YAG capsulotomy was an important factor in IOP spikes.[12]

The maximum increase in intraocular pressure is seen 1 – 2 hours after the procedure and many ophthalmologists recommend anti-glaucoma treatment for seven days after the procedure. The medications preferred are α_2 adrenergic receptor agonists such as apraclonidine 0.5% as ocular hypotensives.[13] In this particular study there was insignificant rise of IOP which did not require any post-laser medication.

Thus all pseudophakic patients do not require anti-glaucoma medication pre, or post Nd YAG laser capsulotomy. Another researcher found that only patients who required more than 40 shots for capsulotomy needed a close observation.[13]

Our results are in agreement with the findings of a study conducted in India to evaluate the IOP and macular thickness after ND-YAG laser capsulotomy.[14]

In yet another research on visual acuity and IOP changes after ND: YAG capsulotomy, it was concluded that post-operatively, there was a rise in IOP in most of the patients, but they achieved their baseline IOP within 1 day and none of the patients had increase IOP after 1 week without anti-glaucoma medications. The rise in IOP was transient in nature and became normal within 1 week.[15]

Another prospective study which was conducted to determine the influence of Nd: YAG laser capsulotomy on various factors like intraocular pressure (IOP), best-corrected visual acuity (BCVA), anterior chamber depth (ACD), pupil depth (PD), central corneal thickness (CCT) and axial length (AL), revealed that there were no significant changes found during the after YAG.[16] In yet another research determining the pre and postoperative IOP after YAG, no substantial difference was seen.[17]

It was also shown that pretreatment with dorzolamide 2% or brimonidine 0.2% reduce the intraocular pressure rise after Nd: YAG laser capsulotomy in pseudophakic patients with glaucoma.[18]

Effect of energy on IOP was also evaluated in a study. It showed that IOP increased more in patients with high energy group than the low energy. However, the increased IOP was transient and became normal after postoperative 1 week with an insignificant pvalue.[19]

In contrast to that Kapoor et al determined the pattern of IOP rise after YAG, immediately after YAG, at 1 week, at 2 weeks and at 1 month. The results of the study showed rise in IOP immediately after the procedure. However, it declined and became normal without any anti-glaucoma medicine over 1 month follow-up.[20]

CONCLUSION

There is no change in intraocular pressure after photo disruption of the posterior capsule with Nd-Yag laser photo disruption in patients with 6/12 – 6/24 visual acuity; however, anti-glaucoma medication should be prescribed in patients with thick post capsular opacification and were a more significant number of shots are required.

Conflict of Interest

Authors declared no conflict of interest.

Ethical Approval

The study was approved by the Institutional review board/Ethical review board **(LRBT/TTEH/ERC/3539/01).**

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Authors' Designation and Contribution

Syed Muhammad Saad; Consultant Ophthalmologist: *Concepts, Design, Literature search, Manuscript preparation, Manuscript review.*

Sabeen Abbasi; Consultant Ophthalmologist: *Literature search, Manuscript review.*

Mariam Shamim; Consultant Ophthalmologist: *Design, Literature search.*

Mahtab Mengal; *Senior Registrar: Data acquisition, Manuscript editing, Manuscript review.*

Asfa Munir; RMO: *Data analysis, Statistical analysis.*