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ORIGINAL ARTICLE

Effect of Nd:YAG Laser Posterior Capsulotomy on Intraocular Pressure

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ABSTRACT

Aim: To determine the effect of Nd:YAG laser posterior capsulotomy on Intraocular pressure (IOP).
Study design: Descriptive case series.
Place and duration of study: Department of Ophthalmology Layton Rahmatulla Benevolent Trust Free Eye and Cancer Hospital Lahore Pakistan from 1st July 2018 to 30th June 2019.
Methodology: Three hundred and sixty patients ranged from 40 to 85 years and both males and females were enrolled. The intraocular pressure was measured before the procedure and then at 1 hour and 1 week after the procedure using the Goldmann applanation tonometer by a consultant ophthalmologist.
Results: The mean age of the patients in our study was 62.29±10.90 years that comprised of 206 (57.22%) males and 154 (42.78%) females. The mean IOP before Nd:YAG laser posterior capsulotomy was 15.40±2.71 mmHg whereas the mean IOP after Nd:YAG laser posterior capsulotomy was 19.04±3.50 mmHg. The effect of Nd:YAG laser posterior capsulotomy on IOP was recorded in 88 (24.44%) patients with raised IOP whereas a majority 272 (75.56%) patients had a normal IOP.
Conclusion: The rise in IOP after Nd:YAG laser posterior capsulotomy is statistically significant and each minimum possible laser energy must be used on each patient undergoing Nd:YAG laser capsulotomy.
Key words: Posterior capsular opacification, Nd:YAG laser posterior capsulotomy, Intraocular pressure

INTRODUCTION

Posterior capsular opacification (PCO) is one of the most common post-operative complication of cataract surgery that presents after a long period.[1,2] The incidence of PCO throughout the world in different studies varies from 7-31% by 2 years post-operatively.[3] The equatorial epithelial cells migrate and proliferate along the posterior capsule that results in the formation of PCO.[4] The types of PCO are Elschnig's pearls, capsular fibrosis and wrinkling. PCO reduces contrast sensitivity and visual acquity by obstructing the view, that causes glare as it scatters the light.[5] While undergoing diagnostic and therapeutic procedures the field of view decreases and it can lead to mono-ocular diplopia.[5] The standard treatment of PCO consists of making an opening in the posterior capsule in its central part either via a surgical approach or via laser .[6] Surgical capsulotomy can lead to severe complications such as endopthalmitis and has been replaced with the modern Nd:YAG laser posterior capsulotomy, which is less costly, non-invasive, safe, relatively less costly and highly effective out-patient department procedure.[6]

The complication that is routinely seen with the use of Nd:YAG Laser posterior capsulotomy is a transient rise intraocular pressure.[7] However, the procedure can lead to various other complications also that include cystoid macular edema, IOL pitting, retinal detachment, lowering of corneal endothelial cell count, anterior vitreous destruction and opacification, posterior subluxation of IOL into vitreous cavity and macular haemorrhage.[8-10] It is believed that rise in IOP results from decrease in aqueous outflow, secondary to acoustic shock waves released inflammatory mediators or capsular fragments deposition in the angle of the anterior chamber, pupillary block, swelling of the ciliary body due to inflammation or angle closure related to the iris root and is also related to total amount of laser energy used.[11-13]

Rationale of this study is to determine whether the rise in IOP after Nd:YAG laser posterior capsulotomy is statistically significant or not, since the results of local studies are highly controversial (ranging from 0.80-35.81%) and hence the need to prescribe IOP lowering medications in our population.

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MATERIALS AND METHODS

This study was conducted at Layton Rahmatulla Benevolent Trust Free Eye and Cancer Hospital Lahore Pakistan after permission from IRB, from 1st July 2018 to 30th June 2019 and 360 patients undergoing Nd:YAG laser posterior capsulotomy. The study included patients from both genders (male and female). Patients were given information about the study and patients were asked about their willingness. The study was conducted after taking approved from the Institutional Review Board of the hospital.

Patients having pseudophakes for more than 6 months who have undergone posterior chamber IOL (PC-IOL) and with an impaired vision due to posterior capsular opacification and intraocular pressure within the normal range (10mmHg-20mmHg) were enrolled. Patients having other ocular comorbidities such as diabetic retinopathy, corneal diseases, retinal detachment and inflammatory eye diseases such as endophthalmitis, maculopathy, glaucoma and trabeculectomy as determined by complete ophthalmic examination including fundus examination done by a consultant Ophthalmologist were not included. Patients having a history of ocular surgery, ocular trauma and prolonged glucocorticoid administration were also not included.

To control the bias, all the capsulotomies performed by the same surgeon with same technique. The reading of pre-laser IOP was noted. Pupil dilatation was done with 1% tropicamide (Mydriacyl) eye drops. Topical anesthesia was given by using Proparacaine hydrochloride (Alcaine) eye drops, by administering one drop topically once or twice approximately 2-3 minutes prior to applying contact lens (Abraham Capsulotomy Lens). Nd:YAG Laser (Quantum Switched VISULAS YAG III, Carl Zeiss, Germany) used for capsulotomy. The capsulotomy was done by making an opening of 3.0-4.0mm diameter using minimum possible pulses of Nd:YAG Laser in the posterior capsule with an energy level of 1.0-1.3 mJ/pulse. According to the thickness of capsule, the energy and pulses was gradually increased until an opening was achieved. After the procedure, NSAIDs eye drops advised thrice a day for 1week. The IOP was measured by Goldmann applanation tonometer at 1 week after Nd:YAG laser posterior capsulotomy to determine the change in intraocular pressure. Increase in the IOP of ≥5mmHg from the baseline IOP prior to the procedure compared to the IOP reading after 1 week of the procedure was considered to be significant. Data analysis was done using SPSS-22.

RESULTS

There were 206 (57.22%) males and 154 (42.78%) females. One hundred and sixty seven (46.39%) were of 40-60 years while 193 (53.61%) patients were of 61-85 years with mean age was 62.29±10.90 years (Table 1). The mean IOP before Nd:YAG laser posterior capsulotomy was 15.40±2.71mmHg compared to 19.04±3.50 mmHg after the procedure. (Table 2) Effect of the procedure on the IOP was recorded which shows 88 (24.44%) with raised IOP and 272 (75.56%) had normal IOP (Table 3).

Table 1: Frequency of genders (n=360

Gender	No.	%
Male	206	57.22
Female	154	42.78

Table 2: Effect of Nd:YAG laser on mean IOP

Parameter	Mean±SD
Mean IOP before Nd:YAG laser posterior capsulotomy	15.40±2.71
Mean IOP after Nd:YAG laser posterior capsulotomy	19.0±3.50

Table 3: Effect of Nd:YAG laser posterior capsulotomy on intraocular pressure (n=360)

IOP	No.	%
Raised	88	24.44
Normal	272	75.56

DISCUSSION

Removal of cataract after recognition is recommended and practiced in our population. With the passage of time as cataract surgery has evolved starting from couching, initial techniques of extracapsular extraction of cataract to intracapsular extraction of cataract and high occurrence of the complications associated with intracapsular extraction of cataract that include cystoid macular edema, loss of vitreous and retinal detachment have always provoked the search for excellence in cataract surgery. However, over the past two decades refined techniques related to the extracapsular cataract extraction have evolved that have dramatically decreased the complication rates but if the posterior capsule remains intact it encourages that a posterior chamber intraocular lens should be implanted to attain better vision. Research work has been done in the past to see the effect of this procedure on the intraocular pressure for a prolonged period that reported that the changes in eyes treated with capuslotomy was higher when compared to those in non-capsulotomy eyes with a significant difference.[14,15]

The findings of our study are in agreement with a study done in 2009, which included one forty eight eyes of 148 patients with PCO. Following the laser procedure, raised IOP was noted in 53 (35.81%) patients, while IOP remained normal in 95 (64.19%) patients.[3] Another study conducted in 2007, in which five hundred eyes of 500 patients having PCO showed rise in IOP in 4 (0.80%) patients after Nd:YAG laser posterior capsulotomy, our finidngs are in contrast with the above study.[6]

Khan et al[16] evaluated the complications of this laser procedure and recorded that transient rise of intraocular pressure was seen in 38 eyes (8.69%), which is lower than our study. Channel et al[17] reported that higher IOP was associated with bigger capsulotomies and higher laser energy used during YAG procedures. The mechanisms could not be determined the possible mechanisms may be that during the breakdown of the posterior capsule, the particles that are broken clog the angle of the anterior chamber that eventually leads to a raised IOP. Furthermore, the inflammatory mediators released due to the shock waves alter the aqueous dynamics and trabecular meshwork that leads to a raised IOP.[3]

According to a study conducted in 2014, in which the patient population comprised of two groups on the basis of postoperative capsulotomy size. The study reported that the IOP was significantly raised in both groups one week after the procedure.[18] A study conducted by Parajuli et al[19] in 2019, they also divided the patients in two groups on the basis of the energy used (Group I energy used is less and equal to 50 mJ, Group II energy used is more than 50mJ). In the first group, the IOP was significantly raised at 1 hour after the operation but declined to the preoperative IOP level after 1 month of the procedure. However in the second group the IOP was raised after one hour but didn't return to the baseline IOP before the operation.

Posterior capsular opacification is routinely encountered after undergoing cataract surgery throughout the world but it can be treated effectively by the use of this laser procedure.[20]

CONCLUSION

The rise in IOP after Nd:YAG laser posterior capsulotomy is significant. We also conclude that least possible amount of laser energy is used during this procedure and the patient must be followed.

Conflict of interest: Nil

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