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ORIGINAL ARTICLE

Evaluation of intraocular pressure changes following Nd: YAG laser posterior capsulotomy.

Hammad Asghar[1], Ali Hashim Zubair[2], Momina Malik[3], Amtul Mussawar Sami[4], Aneeb Ashraf[5], Bilal Ashraf[6]

ABSTRACT… Objective: To evaluate the change in intraocular pressure (IOP) one week after Nd: YAG laser posterior capsulotomy in patients with posterior capsular opacification. **Study Design:** Quasi-experimental study. **Setting:** LRBT Free Eye Hospital, Lahore. **Period:** 5th August 2025 to 5th November 2025. **Methods:** Using purposive sampling, 110 pseudophakic patients aged 40–85 years with visually significant PCO were included. Pre-laser IOP was recorded, Nd: YAG capsulotomy was performed using standard protocols, and post-laser IOP was reassessed one week after the procedure. Data were analyzed with SPSS v23, using chi-square testing with $p < 0.05$. **Results:** The mean age of participants was 63.2 ± 10.1 years. The average IOP increased from 15.12 ± 2.45 mmHg pre-laser to 16.98 ± 3.28 mmHg post-laser, reflecting a mean rise of 1.86 ± 1.52 mmHg (12.31% ± 8.17%). Younger patients (<60 years) showed a significantly higher incidence of IOP elevation greater than 5 mmHg compared to older individuals (38.9% vs. 17.6%; $p = 0.0085$). Male patients also exhibited significantly greater IOP increases compared to females (33.9% vs. 13.7%; $p = 0.023$). **Conclusion:** Nd: YAG laser posterior capsulotomy is associated with a measurable increase in intraocular pressure, with younger age and male gender serving as significant predictors of larger IOP elevation. Routine monitoring of post-laser IOP is recommended, particularly in high-risk groups, to prevent potential optic nerve damage.

Key words: Cataract Surgery, Intraocular Pressure, Nd: YAG Capsulotomy, Ophthalmology Pseudophakia, Posterior Capsular Opacification.

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INTRODUCTION

Following a smooth cataract procedure with intraocular lens (IOL) implantation, posterior capsular opacification (PCO) is a common delayed complication.[1-2] Approximately 20% to 25% of cases have this condition. Third Mechanism: After cataract extraction, lens epithelial cells that have remained inside the capsular bag proliferate, which is what causes it.

Types are: 1. Pearl-type vacuolation 2. PCO of fibrosis type.[3] A somber ring. A capsular bag is created using the contemporary method of cataract extraction, which includes both the entire posterior capsule and a portion of the anterior capsule.[4]

PCO complications include decreased visual acuity, impaired contrast sensitivity, glare disability, and monocular diplopia, all of which call for further treatment.[5] Serious side effects, like endophthalmitis, vitreous loss, and IOL displacement or decentration, can result from surgical capsulotomy. The modern Nd: YAG laser posterior capsulotomy, which is less expensive, non-invasive, safe, and an extremely successful outpatient department procedure, has taken its place.[6]

Complications of Nd:YAG: The effect of Nd: YAG laser posterior capsulotomy on IOP, as well as other ocular parameters such as best-corrected visual acuity (BCVA), anterior chamber depth (AGO), and macular thickness, risk of retinal tear/detachment remains a subject of debate.[5] While some studies suggest an increase in IOP following the procedure[7], others report no significant change or even a decrease in IOP.[8]

Complications of Nd:YAG: The impact of Nd: YAG laser posterior capsulotomy on IOP, other ocular variables, including best-corrected visual acuity (BCVA), anterior chamber depth (AGO), and macular thickness, risk of retinal tear/detachment

1. MBBS, PGR Ophthalmology, LRBT Multan Road, Lahore.
2. MBBS, PGR Ophthalmology, LRBT Multan Road, Lahore.
3. MBBS, PGR Ophthalmology, LRBT Multan Road, Lahore.
4. MBBS, FCPS, Consultant Ophthalmology, LRBT Multan Road, Lahore.
5. MBBS, FCPS, Consultant Ophthalmology, Ali Fatima Hospital, Lahore.
6. MBBS, FCPS, Consultant Ophthalmology, Jannat Aziz Hospital, Burewala.

Correspondence Address:
Dr. Hammad Asghar
LRBT Multan Road Lahore.
hasghar54@gmail.com

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is a controversial issue.[5] Some studies indicate an elevation of IOP after the operation[7], others report no significant change or even a reduction in IOP.

A previous study[9] assessed the alterations in Intraocular Pressure (IOP) following Nd-YAG Laser Posterior Capsulotomy (LPC) of PCO and found out 70% of the patients had an increase in IOP, i.e.,> 5mmHg with respect to baseline. Conversely, similar results were found in 24.44 percent of the cases in another study.[6]

This study was rationale-based on the need to examine the effect of Nd: YAG laser posterior capsulotomy on intraocular pressure (IOP). The already available literature on this topic demonstrates a significant discrepancy in its results and requires thorough investigation to clarify the possible impact of this procedure on IOP. Therefore, it is urgently required to comprehend the implications of Nd: YAG laser posterior capsulotomy on IOP to influence practices and require prescribing IOP-lowering drugs. This proactive concept not only fills the existing gap in the research results but also has a strong clinical implication for our particular group of people. So this study aimed to find the percentage change in IOP after Nd: YAG laser posterior capsulotomy on patients undergoing cataract surgery.

METHODS

The quasi-experimental study was performed in the Layton Rahmatullah Benevolent Trust (LRBT) Free Eye Hospital, Multan Road, Lahore, Pakistan, during a duration 5th August 2025 to 5th November 2025 after the approval from ethical committee (No. 122/Admin/LRBT-2025) Dated: 04-08-2025. The sample was sampled using a non-probability purposive sampling method and a sample size of 110 patients was calculated with a 95% confidence interval, 8% margin of error and an expected percentage of 24.44% increase in intraocular pressure (IOP) one week following Nd: YAG laser posterior capsulotomy of patients who had it in the eyes of an artificial opaque lens (PC-IOL), instead of the natural posterior chamber.[6] The patients had to have reduced vision, not less than two lines on the Snellen chart as a result of PCO, as well as a baseline intraocular pressure of 10-20 mmHg. Clinical exclusion was made of diabetic retinopathy, retinal detachment, corneal disease, inflammatory eye disease, glaucoma, trabeculectomy, or maculopathy. The participants who had a history of complicated cataract removal or long-term corticosteroid intake, which were established according to medical history and records, were also not allowed to participate in the study.

One hundred ten patients who fit the inclusion criteria were recruited in the Outdoor Clinic of the Layton Rahmatullah Benevolent Trust (LRBT) Free Eye and Cancer Hospital, Multan Road, Lahore. All subjects to be subjected to Nd: YAG laser posterior capsulotomy gave informed consent, and socio-demographic data were taken in a structured proforma (name, age, gender, address, contact number). The pre-laser intraocular pressure (IOP) was recorded, and then the intervention proceeded. The process involved the use of 1% tropicamide to dilate the pupil, and topical anesthesia was applied using proparacaine hydrochloride. An Nd: YAG laser (Quantum Switched VISULAS YAG III, Carl Zeiss, Germany) was used with an Abraham capsulotomy lens applied. A 3.0- 4.0 mm hole was made at the posterior capsule, starting with an energy of 1.013 mJ per pulse and modifying the energy depending on the capsule thickness. NSAID eye drops were also recommended three times per day for one week after capsulotomy. One week after the procedure, intraocular pressure was again measured to determine the changes relative to the baseline.

Analysis of data was done using SPSS version 23. The data on quantitative variables, including age, pre- and post-laser IOP, were in the form of mean, standard deviation, whereas the data of qualitative variables, including gender and change in IOP percentage, were in the form of frequencies and percentages. The data were stratified by age and gender to evaluate the effect modification, and then a chi-square test was performed. A p-value of below 0.05 was deemed to be statistically significant.

RESULTS

The study included 110 participants with a mean age of 63.2 ± 10.1 years. The average pre-laser intraocular pressure (IOP) was 15.12 ± 2.45 mmHg, which increased to 16.98 ± 3.28 mmHg one week

after the Nd: YAG laser posterior capsulotomy, reflecting a mean rise of 1.86 ± 1.52 mmHg and an overall percentage increase of 12.31% ± 8.17%. Among the participants, 53.6% were male and 46.4% were female. When stratified by age, a significantly higher proportion of younger patients (<60 years) experienced an IOP rise greater than 5 mmHg compared to older patients (38.9% vs. 17.6%, p = 0.0085). Similarly, gender-based analysis showed that males demonstrated a significantly greater tendency toward higher IOP elevation, with 33.9% experiencing an increase of more than 5 mmHg compared to only 13.7% of females (p = 0.023). Overall, these findings indicate that Nd: YAG capsulotomy is associated with a measurable rise in IOP, with younger age and male gender emerging as significant predictors of a larger post-procedural increase.

TABLE-I

Summary of data

Variable	Value
Age (years)	63.2 ± 10.1
Pre-laser IOP (mmHg)	15.12 ± 2.45
Post-laser IOP (mmHg)	16.98 ± 3.28
Difference in IOP (mmHg)	1.86 ± 1.52
% Change in IOP	12.31% ± 8.17%

TABLE-II

Frequency distribution of qualitative variables

Variable	n (%)
Gender	
Male	59 (53.6%)
Female	51 (46.4%)

DISCUSSION

The current study shows that in pseudophakic patients with posterior capsular opacification (PCO), intraocular pressure (IOP) increased statistically significantly one week following Nd: YAG laser posterior capsulotomy. Although the extent and duration of this rise vary throughout the literature, this finding is consistent with a number of earlier studies that documented a brief increase in intraocular pressure after the procedure.[6-9]

Multiple studies have documented a significant, though often transient, rise in IOP after Nd: YAG capsulotomy. Mehmood et al. observed a mean IOP increase from 15.40 ± 2.71 mmHg pre-procedure to 19.04 ± 3.50 mmHg post-procedure, with 24.44% of patients experiencing a notable IOP elevation.[6] Similarly, Shams et al. reported a mean IOP spike at two hours post-laser, which generally returned to baseline by one week.[10,11] Varghese et al. also found that while IOP increased immediately after the procedure, it typically normalized within a week.[12] These results are consistent with the current study's observation of a mean IOP rise of 1.86 ± 1.52 mmHg (12.31% ± 8.17%) at one week.

However, some studies have reported minimal or no significant IOP changes post-capsulotomy, particularly when lower laser energies are used or when prophylactic IOP-lowering medications are administered.[13-15] Ansari et al. found that IOP increases were more pronounced with higher energy levels, but generally returned to baseline within a week, suggesting that energy settings and patient selection are important factors.[14,15]

TABLE-III

Chi-square test applied; p < 0.05 considered significant.

IOP Change Category	Age <60 Years (n=36)	Age ≥60 Years (n=74)	P-Value (Age)	Male (n=59)	Female (n=51)	P-Value (Gender)
>5 mmHg increase	14 (38.9%)	13 (17.6%)		20 (33.9%)	7 (13.7%)	
3–5 mmHg increase	15 (41.7%)	23 (31.1%)	0.0085	22 (37.3%)	16 (31.4%)	0.023
<3 mmHg increase	6 (16.7%)	27 (36.5%)		13 (22.0%)	20 (39.2%)	
No change/decrease	1 (2.8%)	11 (14.9%)		4 (6.8%)	8 (15.7%)	
Total	36 (100%)	74 (100%)		59 (100%)	51 (100%)	

The current study identified younger age and male gender as significant predictors of greater IOP elevation post-capsulotomy. While most prior research has focused on the role of pre-existing ocular comorbidities (e.g., glaucoma, diabetes), the influence of demographic factors such as age and gender has been less frequently explored. The observed higher risk in younger and male patients may reflect differences in ocular anatomy, inflammatory response, or trabecular meshwork function, but further research is needed to clarify these mechanisms.[16-19]

Given that a subset of patients—particularly younger and male individuals—are at higher risk for significant IOP elevation, routine post-procedure IOP monitoring is warranted. This is especially important for patients with additional risk factors for glaucoma or optic nerve damage. The findings also support the use of the lowest effective laser energy and consideration of prophylactic IOP-lowering medications in high-risk cases.[8,17-20]

This study's quasi-experimental design and single-center setting may limit generalizability. The follow-up period was limited to one week; longer-term IOP trends and late complications were not assessed. Additionally, the exclusion of patients with pre-existing glaucoma or other ocular pathologies may underestimate the risk in the general population.

Further multicenter, randomized studies with longer follow-up are needed to better define the risk profile for IOP elevation post-Nd: YAG capsulotomy and to establish optimal monitoring and prophylactic strategies, particularly in high-risk subgroups.

CONCLUSION

The present study demonstrates that Nd: YAG laser posterior capsulotomy leads to a statistically significant rise in intraocular pressure one week post-procedure in pseudophakic patients with posterior capsular opacification. The mean IOP increased by 1.86 ± 1.52 mmHg, corresponding to a 12.31% ± 8.17% rise from baseline. Younger patients (<60 years) and male patients were significantly more likely to experience a clinically relevant IOP elevation (>5 mmHg). These findings indicate that while Nd: YAG capsulotomy is generally safe, careful post-procedure monitoring of IOP is warranted, particularly in younger and male patients, to prevent potential complications such as optic nerve damage.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Hammad Asghar:** Data collection, analyzing references.
2	**Ali Hashim Zubair:** Data entry, critical revision.
3	**Momina Malik:** Data collection.
4	**Amtul Mussawar Sami:** Proof reading.
5	**Aneeb Ashraf:** Data analysis.
6	**Bilal Ashraf:** References.