OPEN ACCESS
ISSN: 3106-4264

Original Article
DOI: 10.55735/5pwms454

HJBHS
The Healer Journal of Biomedical and Health Sciences

Journal homepage: www.healerjournal.com

Impact of Nd-YAG Laser Capsulotomy on Visual Acuity and Intraocular Pressure

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Submitted: 18-12-2025
Revised: 12-01-2026
Accepted: 27-01-2026
Published: 30-03-2026

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ABSTRACT

Background: Posterior capsular opacification is a common problem after cataract surgery that causes blurred vision. Nd-YAG laser capsulotomy is used to improve vision, but its effects on visual acuity and short-term changes in eye pressure need evaluation. **Objective:** To evaluate the impact of Nd-YAG laser capsulotomy on visual acuity and intraocular pressure. **Methodology:** A comparative cross-sectional study was conducted from October to December 2023 at the College of Ophthalmology and Allied Vision Sciences, Mayo Hospital, Lahore. A convenience sampling technique was used to recruit 40 patients aged 50 years, and posterior capsular opacification with reduced visual acuity was included in this study. The patients having corneal diseases, retinal diseases, diabetic retinopathy, glaucoma, and any other pathology were excluded. Before performing any test, the procedure was explained, and informed consent was taken. Visual acuity was measured and recorded using an ETDRS chart both prior to and following a 30-minute YAG laser capsulotomy. Intraocular pressure was then assessed using a non-contact air puff tonometer, and the results showed that intraocular pressure values greater than 20mmHg suggest a post-laser spike in intraocular pressure. The mean and standard deviation were used to calculate quantitative variables, whereas frequency and percentages were used to quantify qualitative factors. The Wilcoxon Signed Ranks test was used to compare pre-procedure and post-procedure results. **Results:** All patients initially had visual acuity 1.0 log MAR, with 37 having intraocular pressure 10-21mmHg and 3 having intraocular pressure <10mmHg. After 30 minutes, visual acuity improved significantly in all patients, while post-intraocular pressure and p-values did not show significant results. The comparison between 30 minutes and 15 days was statistically significant for both intraocular pressure and visual acuity ($p<0.001$). Overall, the results showed improvement in visual acuity with a temporary rise in intraocular pressure. **Conclusion:** Post-laser visual acuity was enhanced, and intraocular pressure elevation in severe posterior capsular opacification appeared to be a transient phenomenon that was linked to the mechanical energy and laser shots administered during the procedure.

Keywords: Capsular opacification, Intraocular pressure, Nd-YAG laser capsulotomy, Neodymium-doped yttrium aluminum garnet laser, Visual acuity

How to cite the article: Saddique N, Asghar MA, Iqbal S, Khan Z, Rasheed U. Impact of Nd-YAG Laser Capsulotomy on Visual Acuity and Intraocular Pressure. The Healer Journal of Biomedical and Health Sciences. 2026; 2(1): 1-7.

INTRODUCTION

Posterior capsular opacification (PCO) is a common postoperative complication of cataract surgery, occurring in almost 10% to 50% of cases. After surgery, residual lens epithelial cells within the capsular bag proliferate in the central and posterior regions. These cells undergo fibrotic transformation and differentiate into myofibroblasts, leading to capsule thickening and cellular entrapment. The resulting matrix contraction causes light scattering, which ultimately impairs visual quality.[1] PCO is associated with surgical techniques, intraocular pressure (IOL) design, materials, and IOL, not in association with the capsule.[2] Once visual acuity is reduced and everyday activities are disrupted, early capsulotomies are not advised. Treating patients too late might potentially negatively impact their eyesight. People who have good visual acuity and opacification but complain of visual disturbance during daily activities are evaluated using a slit lamp and may be candidates for YAG laser capsulotomy.[3,4]

The meticulous assessment of PCO grading assumes paramount significance in the context of its treatment and management. YAG laser capsulotomy can result in several problems, including IOL rupture during the procedure, increased intraocular pressure following laser surgery, cystoid macular oedema, retinal detachment, and IOL subluxation. Considering its risks, it is a successful treatment for PCO that improves visual acuity (VA) and CS and lessens photophobia, glare issues, and blurriness. [5] There are two types of visual functions: light scattering, which is assessed by the large angle domain, and visual acuity and contrast sensitivity, which were evaluated by the small angle domain.[6]

The pressure inside the anterior and posterior chambers of the eye, known as IOP is maintained by the outflow of aqueous humor down the inner wall of Schlemm's canal and the juxtacanalicular area of the trabecular meshwork.[7] a change in the anterior chamber angle (the aqueous humor drainage channel) following YAG capsulotomy increases IOP a study found that PCO develops four to five years following cataract surgery.[8] Immediate post-YAG laser capsulotomy IOP measurement is crucial to avert complications; it temporarily rises above normal values and returns to normal within 2 to 3 days, as observed in this study.[9] The study aimed to investigate the impact of Nd-YAG laser capsulotomy on IOP and VA pre-post-treatment. It assessed alterations and statistically significant changes to gain valuable insights, potentially informing clinical practices and enhancing patient care strategies.

METHODOLOGY

This comparative cross-sectional study was conducted from October to December 2023 at the College of Ophthalmology and Allied Vision Sciences, Mayo Hospital, Lahore. A convenience sampling technique was used to estimate the sample size, which was 40, with a confidence level of 95% and a precision of 0.10. Patients aged 50 years or older and with PCO and reduced VA were included in this study. The patients having corneal diseases, retinal diseases, diabetic retinopathy, glaucoma, and any other pathology were excluded from the study. Before performing any test, the procedure was explained, and informed consent was taken. VA was measured and recorded using an ETDRS chart both prior to and following a 30-minute YAG laser capsulotomy.

IOP was then assessed using a non-contact air puff tonometer, and the results showed that IOP values greater than 20mmHg suggest a post-laser spike in IOP. Readings were assessed against follow-up measurements taken after 15 days. Participants ranged in age from fifty to seventy. A self-designed Performa on their diagnosis, ocular history, and pre-post VA, pre-post IOP values was used to gather all demographic data. A single subject's eye was examined. The statistical package for the Social Sciences (SPSS) version 25.00 was used to analyse the data after it was collected. Patient's age, gender, IOP, and visual acuity were inspected in the descriptive study. To determine the significance, the Wilcoxon Signed Ranks test was used. The mean and standard deviation were used to calculate quantitative variables, whereas frequency and percentages were used to quantify qualitative factors. The t-test was used to assess the significance. A p-value of less than 0.05 was deemed significant.

RESULTS

Out of the forty patients, three had an IOP of less than 10mmHg, 37 had an IOP of 10-21mmHg and all had a VA of 1.0 log MAR. VA and IOP were measured using a log MAR chart air puff tonometer, accordingly. The majority of the participants (52.5%) showed visual acuity

improvement ≥6 lines (≥0.6 log MAR) out of 40 patients after 30 minutes, whereas 47.5% had visual acuity improvement <6 lines (≤0.6 log MAR). After 15 days, 25% of participants showed an improvement in VA of lines (≤0.6 log MAR), whereas the majority of participants (75.0%) had VA improvement of≥6 lines (≥0.6 log MAR). 87.5% of subjects had IOP values ≤20 mmHg (normal range 10-20mmHg) after 30 minutes, while 12.5% had IOP values ≥20mmHg. Except for one patient, IOPs were within normal limits after 15 days.

Table 1 below shows a gender-based comparison of VA at different time points. At baseline (pre-procedure), mean VA was identical (1.00±0.00) in males and females. A significant improvement in VA was observed after 30 minutes and further at 15 days in both genders, but the mean values are slightly lower in females compared to males. Within-group comparisons showed statistically significant differences between pre-procedure and post-procedure measurements over the time constraints for both males and females ($p<0.001$). Overall, results showed a marked and sustained improvement in VA regardless of gender.

Table 2 presents the gender-based comparison of IOP at different time points, like baseline, post-procedure 30 minutes, and 15 days. IOP was slightly higher in males than in females. A significant rise was observed in both genders in IOP after 30 minutes ($p<0.001$), followed by a reduction at 15 days, approaching baseline values. The change from pre-procedure to 15 days was not statistically significant in both genders, whereas the comparison between 30 min and 15 days showed a significant difference in both groups ($p<0.001$).

In Table 3 comparison of VA across different age groups at various time points is shown. Pre-procedure VA was the same in all age groups (1.00±0.00). A significant improvement was observed in VA after 30 minutes and at 15 days in the 50–60 and 61–70 years age groups, with statistically significant differences ($p<0.05$). In contrast, changes in the 71–80-year age group were not statistically significant throughout time intervals.

Comparison of IOP among different age groups at various time points is shown in Table 4. Pre-procedure intraocular pressure was comparable across all age groups. After 30 minutes in the 50-60 and 61–70 year age groups ($p<0.05$), a significant increase in IOP was observed. On the other hand, the change in the 71–80-year group was not statistically significant. By 15 days, IOP values declined towards baseline levels, with no significant difference compared to pre-procedure measurements in any age group.

Overall comparison of VA and IOP at different time intervals is shown in Table 5. Mean VA showed a statistically significant improvement after 30 min and more improvement at 15 days compared to baseline values ($p<0.001$). Moreover, IOP showed a significant increase at 30 min ($p<0.001$), followed by a reduction at 15 days, with no significant difference from baseline. The comparison between 30 min and 15 days was statistically significant for both IOP and VA ($p<0.001$). Overall, the procedure resulted in sustained improvement in VA with a temporary rise in IOP.

DISCUSSION

Forty PCO patients, ages ranging from fifty to eighty, are included in this study. Women made up the majority of participants (57.5%). In our study, VA was also improved compared to their pre-laser visual acuity values on the Log MAR chart that satisfied the patients. Changes in refractive media and vision loss follow a rise in IOP, which can cause glaucoma and hypertension.[10] Another study from 2022 found that following YAG laser capsulotomy, there were no significant changes in visual acuity, spherical equivalent, anterior chamber depth, or

Table 1: Gender based comparison of visual acuity

	Mean ± SD			p-values	
	Male	Female		Male	Female
Pre-procedure	1.00±0.00	1.00±0.00	Pre-procedure – after 30 min	<0.001	<0.001
After 30 Minutes	0.63±0.20	0.50±0.18	Pre-procedure – after 15 days	<0.001	<0.001
After 15 days	0.49±0.23	0.36±0.23	Post procedure 30 min-15 days	<0.001	<0.001

Table 2: Gender based comparison of IOP

IOP (mmHg)	Mean ± SD			p-values	
	Male	Female		Male	Female
Pre-procedure	12.35±2.67	11.65±1.55	Pre-procedure – after 30 min	<0.001	<0.001
After 30 Minutes	16.88±3.41	15.43±2.45	Pre-procedure – after 15 days	0.073	<0.445
After 15 days	13.00±3.14	11.39±1.59	Post procedure 30 min-15 days	<0.001	<0.001

Table 3: Comparison between age groups and VA

Age (years)	Mean ± SD			p-values			
	50-60	61-70	71-80		50-60	61-70	71-80
Pre-procedure	1.00±0.00	1.00±0.00	1.00±0.00	Pre-procedure – after 30 min	<0.001	0.005	0.180
After 30 Minutes	0.53±0.18	0.58±0.24	0.75±0.07	Pre-procedure – after 15 days	<0.001	0.005	0.180
After 15 days	0.38±0.20	0.46±0.28	0.65±0.07	Post procedure 30 min-15 days	<0.001	0.004	0.157

cylindrical error. Additionally, there was no impact on ocular metrics or the subjective eye condition.[11]

After a month and a year of follow-up, this study found improvements in spherical equivalent and corrected distance visual acuity (CDVA) before and after laser surgery. [12] Patients' intraocular conditions are impacted by both early and late PCO treatment. According to the study's findings, the best indicators of successful YAG laser capsulotomy are improvements in corrected distance visual acuity and intraocular pressure.[13] The growth and migration of remaining epithelial cells in the visual axis pathway cause posterior capsule opacification, often known as secondary cataract or after cataract, which impairs visual acuity.[14] PCO is also more common in several other ocular diseases, such as uveitis and dry eye.[15]

A study found that the cell growth densities of ECCE, intracapsular opacification, and phacoemulsification with capsular extraction were 31.6%, 16.1%, and 7.7%, respectively.[16] A prior study revealed that multifocal IOLs had more Nd-YAG laser capsulotomies than monofocal ones during a nearly one-year follow-up. Due to optical aberrations and light distortions, CDVA was restricted. It was associated with prior visual quality rather than a decline in vision.[17] According to earlier studies, VA improvement was seen in 65% to 100% of individuals. Despite having strong visual acuity, many PCO patients had issues with CS and glare sensitivity. The degree of PCO affected improvements in VA and some other metrics.

Before laser capsulotomy, glare sensitivity issues worsened with PCO; however, with laser capsulotomy, there was a reasonable improvement in visual capabilities due to a decrease in light scattering. The ETDRS chart showed an average improvement of 11 letters following VA. The primary objective of a successful Nd-YAG laser capsulotomy was to improve visual acuity.[18] In our study, we excluded the corneal pathologies, retinal pathologies, glaucoma, and any other pathologies, such as diabetic retinopathy. In this way, it was easy to observe the refractive parameter changes in posterior capsular opacification patients.

In contrast to a prior study, our investigation revealed that the increase in IOP following YAG laser capsulotomy was not directly attributed to the laser procedure itself. Rather, our findings pointed towards a distinct factor, the shedding of the posterior flap during YAG laser capsulotomy. This shed flap was identified as a potential cause for elevated IOP, as it obstructed the trabecular meshwork, impeding the normal outflow of aqueous humor. We also concluded from our study that when visual acuity improved, IOP values increased above normal range values. All PCO patients had pre-laser mean VA values of 1.00, which improved to 0.56 after 30 minutes of Nd-YAG laser capsulotomy. After 30 minutes of

Table 4: Comparison between age groups and IOP

Age (years)	Mean ± SD			p-values			
	50-60	61-70	71-80		50-60	61-70	71-80
Pre-procedure	11.81±1.70	12.17±2.59	12.50±4.95	Pre-procedure – after 30 min	<0.001	0.002	0.180
After 30 Minutes	16.58±3.47	15.43±2.45	18.00±7.07	Pre-procedure – after 15 days	0.583	0.305	0.157
After 15 days	12.75±3.65	11.39±1.59	13.50±4.95	Post procedure 30 min-15 days	<0.001	0.003	0.180

Table 5: Overall comparison

	Mean ± SD		p-values		
	VA	IOP		VA	IOP
Pre-procedure	1.00±0.00	11.95±2.09	Pre-procedure – after 30 min	<0.001	<0.001
After 30 Minutes	0.56±0.20	16.05±2.94	Pre-procedure – after 15 days	<0.001	0.750
After 15 days	0.42±0.23	12.07±2.47	Post procedure 30 min-15 days	<0.001	<0.001

posterior capsulotomy, the average IOP increased to 16.05, and after 15 days, it was 12.07 mmHg. IOP showed a significant difference from baseline to after 15 days. Following YAG capsulotomy, changes in the anterior chamber angle, which serves as the drainage pathway for aqueous humor, were observed, leading to an elevation in IOP. The study suggests that this alteration in the anatomical structure post-capsulotomy may contribute to an increased resistance to the outflow of aqueous humor, consequently impacting IOP levels.

Furthermore, the research highlights a noteworthy finding related to PCO, indicating that its development typically occurs within the range of 4 to 5 years after cataract surgery. This temporal insight into the onset of PCO underscores the importance of long-term monitoring and management strategies in post-cataract surgery patients, aiding clinicians in optimizing treatment plans and enhancing patient outcomes over an extended period.[19] Although the precise mechanism of IOP elevation following rapid YAG laser capsulotomy has not yet been established, it may be caused by structural alterations in ciliary processes and PCO fragments that obstruct the IOP drainage channel. Measurement of IOP immediately after YAG laser capsulotomy is necessary to prevent severe complications. Similar to this study, IOP increased above pre-laser levels after 30 minutes. After laser capsulotomy, IOP was restored to normal levels in two to three days.[19]

A study found that the cell growth densities of ECCE, intracapsular opacification, and phacoemulsification with capsular extraction were 31.6%, 16.1%, and 7.7%, respectively. Hydrophobic and hydrophilic IOLs were implanted in a trial to reduce the risk of subsequent cataract.[20] In our study, complications like IOP were not so obvious. But in our study, only adults were included above the age of 50 years. Similar to this, our study's clinical test findings demonstrated that patients' VA and everyday activities improved to a satisfactory degree following PCO therapy with Nd-YAG laser capsulotomy, which was our primary goal. The present study also showed that intraocular pressure increased above normal values following laser capsulotomy, although normal levels were attained using anti-glaucoma pressure drugs, as seen after a 15-day follow-up.

CONCLUSION

Based on the overall findings of the Nd-YAG laser capsulotomy procedure, this process resulted in a significant and sustained improvement in VA across genders and age groups. More improvements were seen in younger patients. Within 30 minutes of post-laser intervention, there was a noticeable increase in IOP, potentially linked to the mechanical energy released during the procedure. However, reassuringly, this elevation tended to normalize within 15 days with the usage of anti-elevating pressure drugs. The severity of

PCO and the number of laser shots administered may contribute to the extent of IOP increment, suggesting a nuanced relationship between these factors.

Clinicians must consider the dynamic interplay of PCO severity, laser shots, and the transient nature of IOP changes when evaluating patients after post-Nd: YAG laser capsulotomy. After cataract surgery, those who have trouble performing daily tasks should get their eyes examined as soon as possible to prevent problems. People who have had cataract surgery for more than five years should manage their diabetes, which is the primary cause of PCO. To avoid difficulties, IOP should be maintained and examined before and after Nd-YAG laser capsulotomy. People with PCO should be informed about the advantages of Nd-YAG laser capsulotomy as well as the risks of receiving therapy too soon or too late.

DECLARATIONS

Consent to participate: Written consent was obtained from all patients. All methods were performed following the relevant guidelines and regulations.
Availability of data and materials: Data will be made available upon request. The corresponding author will submit all dataset files.
Competing interests: None.
Funding: No funding source involved.

AUTHOR CONTRIBUTIONS

NS: Conducted data collection and performed data analysis.
MAA: Prepared and reviewed the results section.
SI: Drafted the manuscript, including the abstract, introduction, materials, and methodology sections.
ZK & UR: Contributed to manuscript writing and assisted in data collection.
All authors had read and approved the final manuscript.

REFERENCES

1. Wormstone IM. The human capsular bag model of posterior capsule opacification. Eye (Lond). 2020; 34(2): 225–31. https://doi.org/10.1038/s41433-019-0680-z
2. Hecht I, Dubinsky-Pertzov B, Karesvuo P, et al. Association between intraocular lens diopter and posterior capsular opacification. Clinical & Experimental Ophthalmology 2020; 48(7): 889–94. https://doi.org/10.1111/ceo.13821
3. Liu Z, Hou Z, Ge S, et al. Vision function of pseudophakic eyes with posterior capsular opacification under different speed and spatial frequency. International Ophthalmology 2020; 40(12): 3491–500. https://doi.org/10.1007/s10792-020-01536-9
4. Ling R, Borkenstein EM, Borkenstein AF. Evaluation of Nd: YAG laser capsulotomy rates in a real-life population. Clinical Ophthalmology (Auckland, NZ) 2020; 14: 3249–57. https://doi.org/10.2147/OPTH.S276329
5. Fang Y, Xixia D, Jin L, et al. Relationship of posterior capsular opacification and capsular bend type investigation based on swept-source optical coherence tomography. Current Eye Research 2020; 45(1): 17–23. https://doi.org/10.1080/02713683.2019.1645183
6. Lu C, Yu S, Song H, et al. Posterior capsular opacification comparison between morphology and objective visual function. BMC Ophthalmology 2019; 19(1): 40. https://doi.org/10.1186/s12886-019-1051-z
7. Roark MW, Stringham JM. Visual performance in the "real world": contrast sensitivity, visual acuity, and effects of macular carotenoids. Molecular Nutrition & Food Research 2019; 63(15): e1801053. https://doi.org/10.1002/mnfr.201801053
8. Wu S, Tong N, Pan L, et al. Retrospective analyses of potential risk factors for posterior capsule opacification after cataract surgery. Journal of Ophthalmology 2018: 9089285. https://doi.org/10.1155/2018/9089285
9. Diagourtas A, Petrou P, Georgalas I, et al. Bleb failure and intraocular pressure rise following Nd: Yag laser capsulotomy. BMC Ophthalmology 2017; 17(1): 18. https://doi.org/10.1186/s12886-017-0408-4
10. Magno BV, Datiles MB, Lasa MS, et al. Evaluation of visual function following neodymium: YAG laser posterior capsulotomy. Ophthalmology 1997; 104(8): 1287–93. https://doi.org/10.1016/s0161-6420(97)30146-8
11. Pai HV, Pathan A, Kamath YS. A comparison of posterior capsular opacification after implantation of three different hydrophobic square edge intraocular lenses. Indian Journal of Ophthalmology 2019; 67(9): 1424–27. https://doi.org/10.4103/ijo.IJO_219_19

12. Tan Y, Zhang J, Li W, et al. Refraction shift after nd: YAG posterior capsulotomy in pseudophakic eyes: a systematic review and meta-analysis. Journal of refractive surgery (Thorofare, N.J.: 1995) 2022; 38(7): 465–73. https://doi.org/10.3928/1081597X-20220516-01
13. Moshirfar M, Basharat NF, Seitz TS, et al. Refractive changes after Nd: YAG capsulotomy in pseudophakic eyes. Clinical Ophthalmology (Auckland, N.Z.) 2023; 17: 135–43. https://doi.org/10.2147/OPTH.S395605
14. Lee CY, Lu TT, Meir YJ, et al. Refractive changes following premature posterior capsulotomy using neodymium:yttrium-aluminum-garnet laser. Journal of Personalized Medicine 2022; 12(2): 272. https://doi.org/10.3390/jpm12020272
15. Fişuş AD, Findl O. Capsular fibrosis: a review of prevention methods and management. Eye (London, England) 2020; 34(2): 256–62. https://doi.org/10.1038/s41433-019-0723-5
16. Chen HC, Lee CY, Sun CC, et al. Risk factors for the occurrence of vision-threatening posterior capsule opacification. Journal of Translational Medicine 2019; 17(1): 209. https://doi.org/10.1186/s12967-019-1956-6
17. Fernández J, García-Montesinos J, Martínez J, et al. Posterior capsular opacification evaluation through contrast sensitivity defocus curves with two multifocal intraocular lenses of similar material. Graefe's Archive for Clinical and Experimental Ophthalmology 2021; 259(10): 2995–3002. https://doi.org/10.1007/s00417-021-05262-5
18. Ursell PG, Dhariwal M, Majirska K, et al. Three-year incidence of Nd: YAG capsulotomy and posterior capsule opacification and its relationship to monofocal acrylic IOL biomaterial: a UK real-world evidence study. Eye (London, England) 2018; 32(10): 1579–89. https://doi.org/10.1038/s41433-018-0131-2

19. Wormstone IM, Wormstone YM, Smith AJO, et al. Posterior capsule opacification: What's in the bag? Progress in Retinal and Eye Research 2021; 82: 100905. https://doi.org/10.1016/j.preteyeres.2020.100905
20. Achiron A. Intraocular pressure spikes following neodymium-doped yttrium aluminum garnet laser capsulotomy: current prevalence and management in Israel. Journal of Current Glaucoma Practice 2017; 11(2): 63–66. https://doi.org/10.5005/jp-journals-10028-1225