CLINICAL PROFILE OF POSTERIOR CAPSULAR OPACIFICATION AND VISUAL OUTCOME AFTER ND:YAG LASER CAPSULOTOMY

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***Abstract*—**

Purpose: To evaluate the clinical profile of posterior capsular opacification (PCO) and assess visual outcomes following Nd:YAG laser posterior capsulotomy.

Methods: A prospective observational study was conducted on 70 eyes diagnosed with PCO after cataract surgery. Comprehensive ophthalmic evaluation included PCO morphology, intraocular lens (IOL) type, and pre- and post-procedure best-corrected visual acuity (BCVA). Nd:YAG capsulotomy was performed using standard technique, and visual improvement and complications were analyzed.

Results: Fibrous PCO was most common (42.85%), and PMMA IOLs showed higher incidence compared to acrylic lenses. Most cases required low laser energy, with transient intraocular pressure elevation in 35.71% of patients. Visual improvement of two Snellen lines occurred in 54.28% of cases, confirming Nd:YAG capsulotomy as safe and effective.

Conclusion: Nd:YAG laser capsulotomy provides significant visual rehabilitation for PCO. Judicious energy use and timely intervention are essential to minimize complications and optimize outcomes.

***Index Terms*: Posterior capsular opacification, Nd:YAG laser capsulotomy, cataract surgery, visual outcome, intraocular lens, fibrous PCO, Elschnig pearls, PMMA, acrylic IOL, intraocular pressure. (*Keywords*)**

I. INTRODUCTION (HEADING 1)

Cataract surgery is among the most commonly performed ophthalmic procedures worldwide and generally provides excellent and sustained visual rehabilitation. Despite advances in surgical techniques and intraocular lens (IOL) design, posterior capsular opacification (PCO) remains the most frequent delayed complication following otherwise uncomplicated cataract surgery. PCO, often termed secondary cataract, results from the proliferation, migration, and metaplasia of residual lens epithelial cells over the posterior capsule.

PCO may develop months to years after cataract extraction and leads to gradual opacification of the visual axis, manifesting clinically as reduced visual acuity, glare, monocular diplopia, and decreased contrast sensitivity. The incidence and severity of PCO are influenced by several factors, including patient age, surgical technique, postoperative inflammatory response, and the material and edge design of the implanted IOL.

Nd:YAG (neodymium-doped yttrium aluminum garnet) laser posterior capsulotomy is the treatment of choice for visually significant PCO. It is a safe, effective, and non-invasive outpatient procedure that results in rapid restoration of visual function. However, the procedure is associated with potential complications such as transient elevation of intraocular pressure (IOP), cystoid macular edema, retinal detachment, damage to the IOL, and anterior segment inflammation. The final visual outcome following Nd:YAG capsulotomy depends on the type and density of PCO, total laser energy delivered, pre-existing ocular pathology, and appropriate patient selection. A thorough clinical evaluation and timely intervention are therefore essential for achieving optimal outcomes.

II. AIMS

To evaluate the clinical profile of posterior capsular opacification and assess the visual outcome following Nd:YAG laser posterior capsulotomy.

III. OBJECTIVE

1. To study the clinical manifestations and morphological patterns of posterior capsular opacification.
2. To assess the visual outcome following Nd:YAG laser posterior capsulotomy.
3. To evaluate the complications associated with Nd:YAG laser posterior capsulotomy.

IV. METHODOLOGY

This prospective observational study was conducted over a period of one year at a tertiary care ophthalmology center. A total of 70 eyes of 70 patients diagnosed with posterior capsular opacification following cataract surgery were included in the study Written informed consent was obtained from all participants, and the study adhered to the tenets of the Declaration of Helsinki.

All patients underwent a comprehensive ophthalmic evaluation, which included detailed history taking, slit-lamp biomicroscopy to assess the type and morphological pattern of PCO, documentation of the type of posterior chamber intraocular lens implanted, and measurement of pre-procedural best-corrected visual acuity (BCVA) and intraocular pressure (IOP).

Nd:YAG laser posterior capsulotomy was performed using a standard technique. Laser parameters, including the number of laser shots and total energy delivered, were recorded for each patient.Post-procedure evaluation included assessment of BCVA and IOP. Patients were followed up to monitor visual improvement and the occurrence of any procedure-related complications. Visual outcomes and complications following Nd:YAG laser capsulotomy were analyzed.

A] INCLUSION CRITERIA:

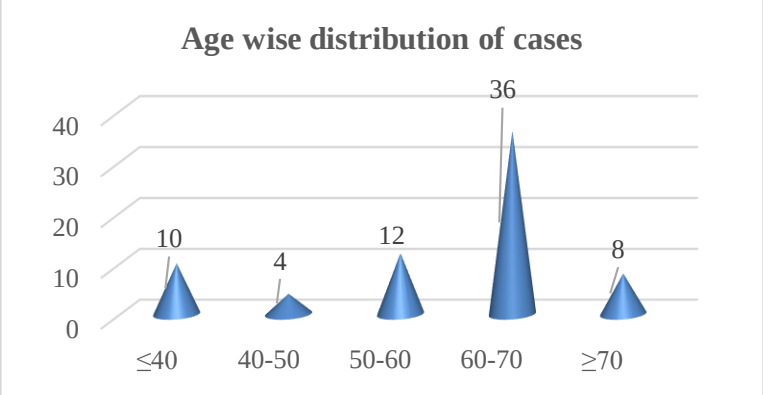
1. Patients of all age groups and either gender diagnosed with posterior capsular opacification.
2. Patients who provided informed consent and underwent Nd:YAG laser posterior capsulotomy.

B] EXCLUSION CRITERIA

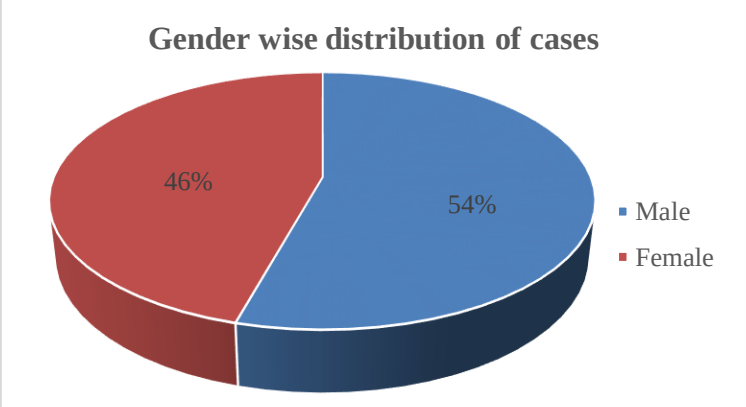
Patients with co-existing posterior segment pathology or other ocular diseases that could independently affect visual acuity.

V. RESULTS

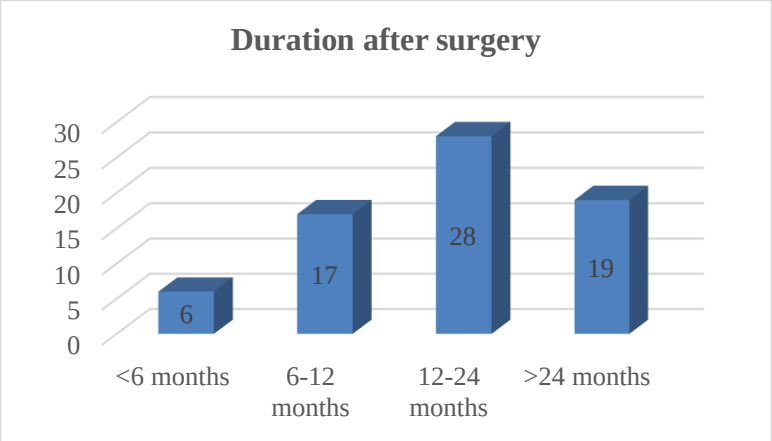
Age	*Number of patients*	*Percentage (%)*
≤40	10	14.28%
40-50	4	5.71%
50-60	12	17.14%
60-70	36	51.42%
≥70	8	11.42%
Total	70	100%



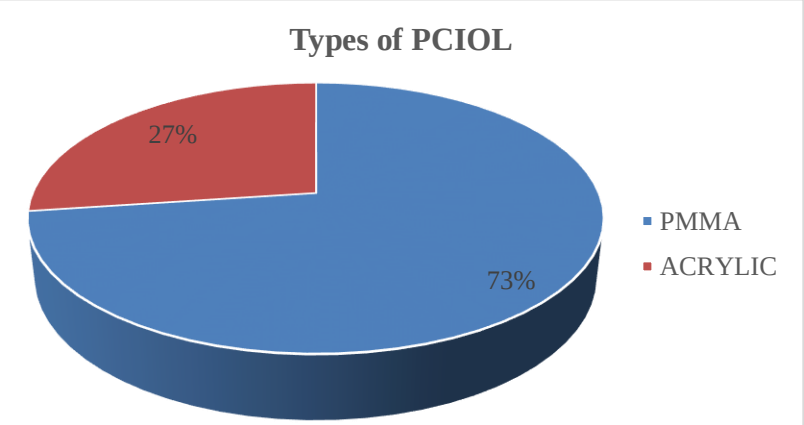
Gender	*Number of patients*	*Percentage (%)*
Male	**38**	**54.28%**
Female	**32**	**45.71%**
Total	**70**	**100%**



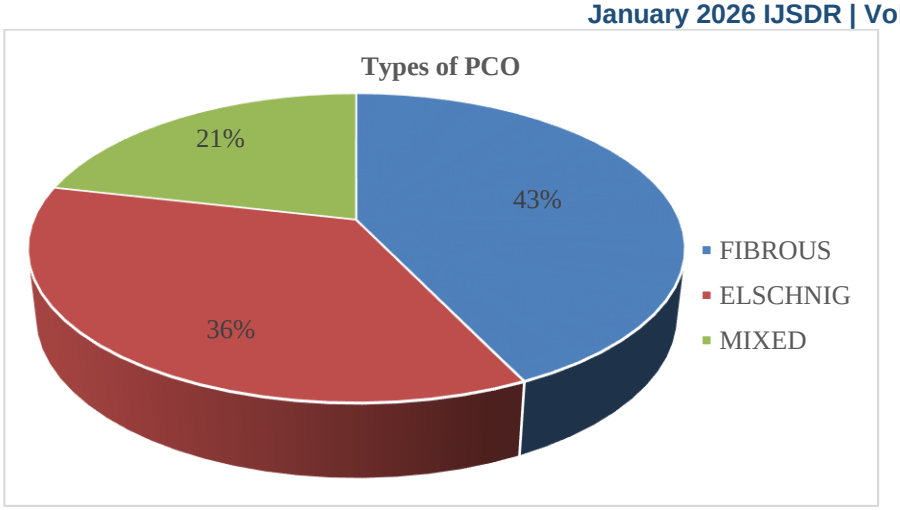
Duration after surgery	*Number of patients*	*Percentage (%)*
<6 months	**6**	**8.57%**
6-12 months	**17**	**24.28%**
12-24 months	**28**	**40%**
>24 months	**19**	**27.14%**
Total	**70**	**100%**



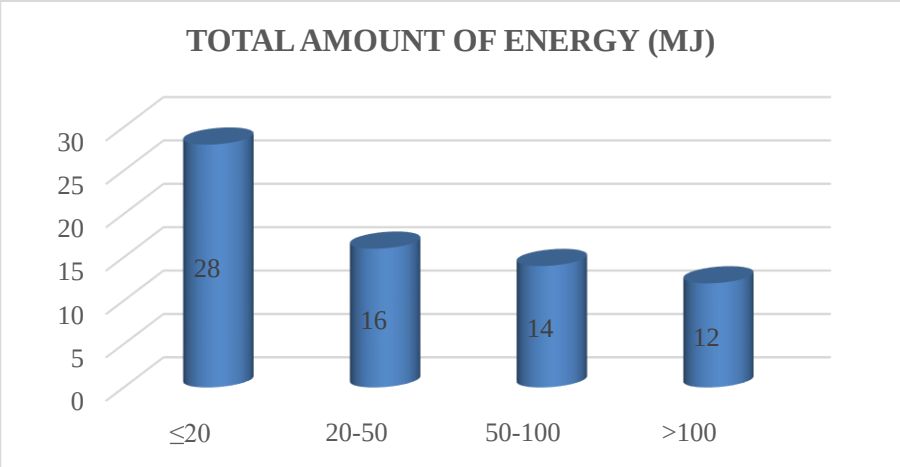
Types of PCIOL	*Number of patients*	*Percentage (%)*
PMMA	**51**	**72.85%**
ACRYLIC	**19**	**27.14%**
TOTAL	**70**	**100%**



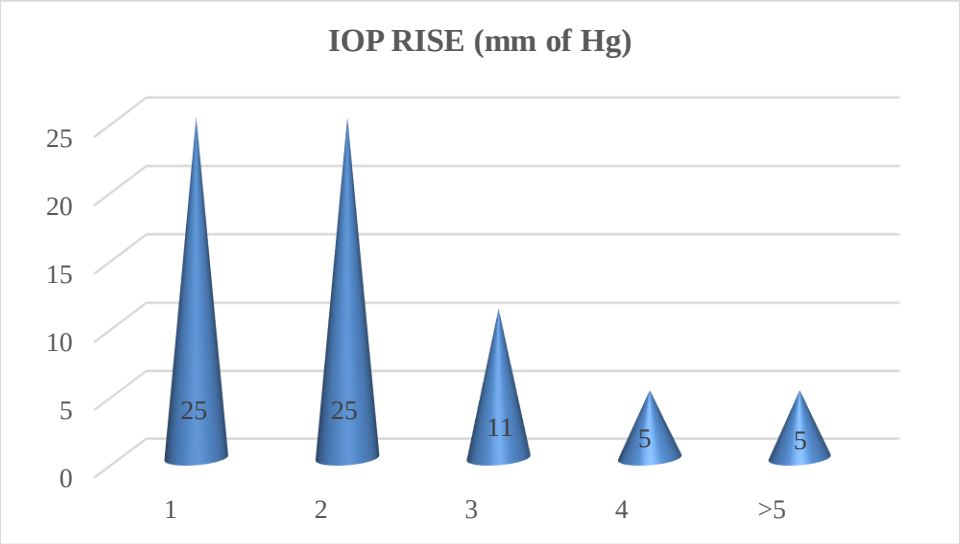
Types of PCO	*Number of patients*	*Percentage (%)*
FIBROUS	**30**	**42.85%**
ELSCHNIG	**25**	**35.71%**
MIXED	**15**	**21.42%**
TOTAL	**70**	**100%**



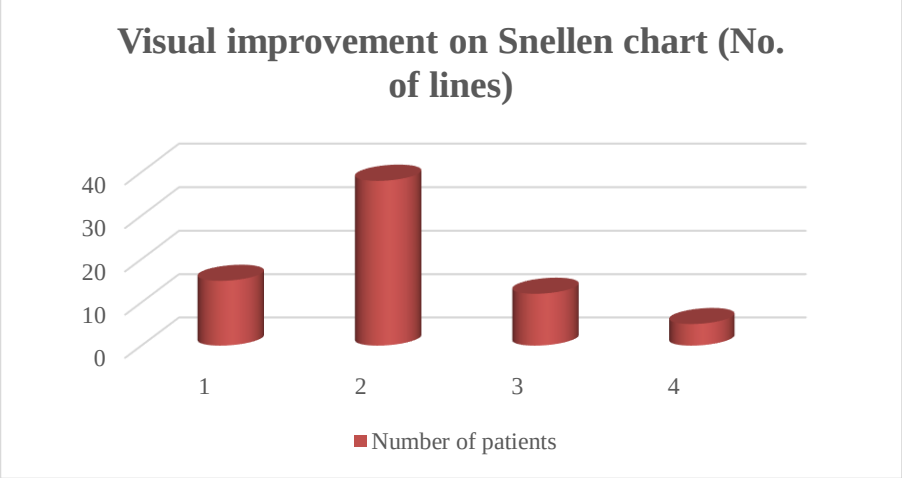
TOTAL AMOUNT OF ENERGY (MJ)	*Number of patients*	*Percentage (%)*
≤20	**28**	**40%**
20-50	**16**	**22.85%**
50-100	**14**	**20.00%**
>100	**12**	**17.14%**
TOTAL	**70**	**100%**



IOP Rise(mm of Hg)	Number of patients	Percentage (%)
1	**25**	**35.71%**
2	**25**	**35.71%**
3	**11**	**15.71%**
4	**5**	**7.14%**
>5	**4**	**5.71%**
Total	**70**	**100%**



Visual improvement on snellen chart(No. of lines)	Number of patients	Percentage (%)
1	**15**	**21.42%**
2	**38**	**54.28%**
3	**12**	**17.14%**
4	**5**	**7.14%**
TOTAL	**70**	**100%**



VI. DISCUSSION

The present study demonstrated a male predominance, with the majority of patients presenting in the fifth and sixth decades of life. Posterior capsular opacification most commonly developed within one to two years following cataract surgery, consistent with observations reported in previous studies.

A higher incidence of PCO was observed in eyes implanted with polymethyl methacrylate (PMMA) intraocular lenses. This finding may be attributed to the predominance of round-edged and hydrophilic lens designs, which are known to be associated with increased lens epithelial cell migration compared to sharp-edged hydrophobic acrylic IOLs.

Fibrous PCO was the most frequently encountered morphological pattern, followed by Elschnig pearls. Most cases required relatively low total laser energy for successful capsulotomy, suggesting that early intervention allows effective treatment with conservative energy settings. Eyes requiring higher laser energy were predominantly those with dense fibrous or mixed types of PCO.

A transient rise in intraocular pressure was observed in a subset of patients, although the majority experienced only mild and self-limiting elevation. Visual acuity improved by one to three Snellen lines in most patients following Nd:YAG capsulotomy, highlighting the effectiveness of the procedure in visual rehabilitation. Careful patient selection, appropriate laser settings, and close post-procedural monitoring are essential to minimize complications and optimize outcomes.c.

VII. CONCLUSION

Fibrous posterior capsular opacification was the most common morphological type observed in the present study. Eyes implanted with PMMA intraocular lenses demonstrated a higher incidence of PCO, whereas hydrophobic acrylic IOLs were associated with a comparatively lower risk. Nd:YAG laser posterior capsulotomy proved to be a safe, simple, and effective non-invasive procedure for the management of visually significant PCO.

However, higher total laser energy was associated with a greater rise in post-procedural intraocular pressure, emphasizing the importance of judicious energy use and routine IOP monitoring. Early diagnosis and timely intervention play a key role in achieving optimal visual outcomes following Nd:YAG laser capsulotomy.

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