



ORIGINAL RESEARCH PAPER	Ophthalmology
COMPARISON BETWEEN TWO LASER CAPSULOTOMY TECHNIQUES : CRUCIATE V/S CIRCULAR	KEY WORDS: ND:YAG laser, posterior capsule opacification, cruciate capsulotomy, circular capsulotomy, intraocular pressure, visual outcomes, complications.

Dr. Divyanshu Gupta	Post Graduate Student (Batch 2023)Ophthalmology, ASCOMS&HOSPITAL, Jammu.
Dr. Vipul Khajuria	Post Graduate Student (Batch 2023)Ophthalmology, ASCOMS&HOSPITAL, Jammu.
Dr. Kanavdeep Kapoor	Senior Resident, Department of Ophthalmology ASCOMS & HOSPITAL Jammu.
Dr. Renu Hashia Dhar	Prof & Head Department of Ophthalmology ASCOMS & HOSPITAL Jammu.
Dr. Diksha sharma	M.P.H.(pursuing), Public Health Scholar, School of Public Health, AIIMS Jodhpur.

ABSTRACT	This study investigates the efficacy and safety of two Nd:YAG laser capsulotomy techniques—cruciate and circular—in treating posterior capsule opacification (PCO). Conducted as a prospective, randomized controlled trial at a tertiary eye care center in Jammu & Kashmir from June to August 2024, the study enrolled 50 patients diagnosed with PCO. Patients were divided into two groups: Group A underwent cruciate capsulotomy, while Group B received circular capsulotomy. The results indicated that while the cruciate technique was associated with fewer complications, including intraocular pressure (IOP) spikes, the circular technique yielded superior visual outcomes. Complications such as intraocular lens (IOL) pitting, uveitis, and cystoid macular edema (CME) were more prevalent in the circular group. Statistical analysis revealed no significant association between the pattern of PCO laser and the occurrence of floaters. The findings suggest that both techniques have distinct advantages and disadvantages, emphasizing the need for individualized treatment plans based on clinical judgment to optimize patient outcomes.
----------	---

INTRODUCTION Posterior capsule opacification (PCO) is a severe consequence of cataract surgery and also complications with visual disability. However, the incidence of PCO has decreased with the evolution in surgical techniques, a variety of intraocular lens (IOL) materials and designs, and the selective use of pharmacologic agents (Bhargava, Rahul, et al. 2015). Treatment of PCO: PCO can be treated either by surgical removal or through ND:YAG LASER capsulotomy. Among the intracapsular power modulation techniques available, Nd: YAG laser capsulotomy has been accepted as the ideal method because of its non-invasive nature of handling PCO and its efficacy in restoring visual acuity (Das, Narain, et al. 2021). One of the techniques in Nd: YAG laser capsulotomy is a cruciate slice with criss-crossed folds for its ease of use and reduced energy. Nevertheless, it has been related to uncommon complications as suturing irregular borders of DM may allow IOL mobilization. On the other hand, the circular technique gives a round tear which represents the lens architecture, this makes opens in better posterior capsule opening as well. It is essential to assess both anterior and posterior chamber parameters before and after Nd:YAG laser capsulotomy since the procedure can cause complications such as increased intraocular pressure (IOP), corneal damage, uveitis, macular holes, retinal detachment, and changes in the refractive index (Shin, Min Ho et al. 2018). Laser capsulotomy can be performed using various patterns, including cruciate, can-opener, inverted U, or circular. Many experts advocate the cruciate pattern, starting from the periphery to minimize the risk of lens pitting (Siddappa SN, Mahalingu DS, et al. 2020).	METHODOLOGY The present study was designed to contribute to the ongoing discussion among ophthalmologists who may be in a dilemma on which is the best technique of Nd:YAG laser for PCO treatment and provides data to make their choice informed. METHODS: A prospective, randomized controlled trial was carried out at the tertiary eye care center of ASCOMS and H, Jammu & Kashmir between June 2024 to August 2024. This trial was approved by the Institutional Ethics Committee, and 50 patients with posterior capsular opacity (PCO) were enrolled after obtaining written informed consent. A comprehensive clinical history was obtained from each patient containing information like the date of cataract surgery, the period of scrub time between cataract surgery & when the vision problem started, any inquiry for glaucoma, her prevailing systemic illnesses, surgical background any anterior diseases of eyes. All patients were subjected to a complete eye examination of both eyes, which included detailed history of each condition, general physical examination, testing of visual acuity with Snellen chart on presentation, slit-lamp biomicroscopy for anterior segment examination including cornea and lens as well as non-contact tonometry (Topcon CT80 Non-Contact Tonometer) for measurement of intraocular pressure (IOP) followed by ophthalmoscopic evaluation of the retina; direct ophthalmoscopy and indirect binocular ophthalmoscopy; biomicroscopic fundus examination with 90 D lens. For the cruciate capsulotomy technique, the initial laser shot was directed superiorly at the 12 o'clock position, along the tension lines, progressing downward to the 6 o'clock position. Shots were then placed at the edges of the capsule opening and extended laterally towards the 3 and 9 o'clock positions. For the circular pattern, the shots began at the 6 o'clock
--	---

position, forming a circular opening with a diameter of 4-5 mm. The laser's aiming beam was focused slightly behind the posterior capsule, aligning the IOL's optical center with the center of the capsulotomy opening. The energy was initially set at 1 mJ and increased by 0.5 mJ as needed to create the capsular opening.

Post-procedure care included Tab Acetazolamide 250 mg twice daily, Moxifloxacin with Dexamethasone eye drops four times daily, and Nepafenac eye drops twice daily, depending on the degree of inflammation or elevated intraocular pressure (IOP). No anti-glaucoma medications were administered prior to capsulotomy.

Inclusion Criteria:

- Patients with vision loss due to posterior capsular opacity (PCO).
- Patients who had undergone cataract surgery with a post-operative visual acuity reduction of at least 3 lines on Snellen's chart.
- A minimum of three months between cataract surgery and the onset of PCO.

Exclusion Criteria:

Were applied to subjects who were less than five years old and those who had subluxated intraocular lenses or had severe ocular conditions such as glaucoma, corneal opacities, retinal diseases such as diabetic retinopathy, age-related maculopathy, or other conditions such as retinal detachment. Likewise, the inclusion of patients who were reported to have mental impairment or neurological debilities and were non-compliant was not considered.

RESULTS:

Over the three-month study period from June 2024 to August 2024, 50 patients with posterior capsular opacity were enrolled. The patients were divided into two groups: Group A underwent cruciate capsulotomy, while Group B underwent circular pattern capsulotomy.

Table 1: Comparison Of Different Patterns Of PCO Capsulotomy With Post-laser Vision.

Pattern of PCO	Post-Laser Vision	2/60 - 6/60	6/36 - 6/18	6/18 - 6/6	Total
Circular		3 (12.0%)	10 (40.0%)	12 (48.0%)	25
Cruciate		3 (12.0%)	11 (44.0%)	11 (44.0%)	25
Total		6 (20.0%)	21 (42.0%)	23 (46.0%)	50

The P value is 0.841 which is more than 0.05 indicating there is no significant association between the pattern of PCO laser and post-laser vision

Table 2: Comparison Of Different Patterns Of PCO Capsulotomy With Complications

Complications	Circular (n, %)	Cruciate (n, %)	Total (n, %)
Nil	15 (60.0%)	18 (72.0%)	33 (66.0%)
IOP spikes	5 (20.0%)	7 (28.0%)	12 (24.0%)
IOL pitting	3 (12.0%)	0 (0.0%)	3 (6.0%)
CME	1 (4.0%)	0 (0.0%)	1 (2.0%)
Uveitis	1 (4.0%)	0 (0.0%)	1 (2.0%)
Ant Hyaloid Rupture	0 (0.0%)	0 (0.0%)	0 (0.0%)
Total	25 (100.0%)	25 (100.0%)	50 (100.0%)

The p value is 0.0 which is statistically significant and shows a significant association between PCO Laser and complications

Table 3 : Comparison Of Different Patterns Of PCO Capsulotomy With Floaters

Pattern of PCO	Floaters Yes (n, %)	Floaters No (n, %)	Total (n, %)
Circular	8 (16.0%)	17 (34.0%)	25 (100%)
Cruciate	3 (6.0%)	22 (44.0%)	25 (100%)
Total	11 (22%)	39 (28%)	50 (100%)

P value 1 which is greater than 0.05 hence there is no significant association between the pattern of PCO laser and floaters.

The circular layers of laser shots help avoid the visual axis as much as possible and minimize the incidence of internal ocular lens pitting, which usually causes glare, light scattering, and disturbances in vision. This procedure causes the least damage in the area adjacent to the IOL's visual axis and the corresponding capsulotomy performed is large enough to enhance contrast sensitivity and lessen the problems associated with glare. Patients treated with the circular pattern for the capsulotomy considerably improved their visual acuity as compared to patients managed with the cruciate technique.

In place of this author, patients who received the circular pattern for the capsulotomy encountered complications: IOL pitting in 6%, uveitis in 2%, and cystoid macular edema (CME) in 2%. The latter pattern was associated with higher spikes of intraocular pressure (IOP) which occurred in 28% of patients, indicating its risks relative to the circular technique.

CONCLUSION

The cruciate operative technique Nd: YAG posterior laser capsulotomy is safer. However, patients who underwent the circular capsulotomy technique had better visual outcomes. In the case of complications, IOL pitting, uveitis, and CME were most popularly found in the circular pattern group; whereas IOP spikes were common in the cruciate group.

Both the circular and cruciate Nd: YAG laser capsulotomy techniques present some advantages and disadvantages in their application. Thus, this implies that the selection of the best technique for the treatment of posterior capsule opacification (PCO) should be individualized, using clinical judgment to determine the best approach to meeting the patient's needs.

REFERENCES

1. Bhargava R, Kumar P, Phogat H. Comparison of Cruciate versus Circular Nd Capsulotomy Techniques in Treatment of Posterior Capsular Opacification. *Journal of Cataract & Refractive Surgery*. 2014;40(9):1482-1490.
2. Das, Narain, et al. "Effects of Neodymium-Doped Yttrium Aluminium Garnet (Nd: YAG) Laser Capsulotomy on Visual Outcomes From a Lower-Middle Income Country." *Cureus* vol. 13,9 e17895. 11 Sep. 2021, doi:10.7759/cureus.17895
3. Minz B, Dewan T, Rao C. A Comparative Study of Two Nd Laser Capsulotomy Techniques: Cruciate Versus Circular. *Ophthalmology and Eye Diseases*. 2016;8:73-77.
4. Siddappa SN, Mahalingu DS, Anjenappa R, Joy TS. Two different patterns and outcomes of neodymium YAG capsulotomy. *Int J Clin Exp Ophthalmol*. 2020;4: 012-014.