

# To Evaluate the Relationship of YAG Capsulotomy Size and Energy on Refraction, Intraocular Pressure and Macular Thickness in Post-Operative Patients of Cataract Surgery

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## ABSTRACT

**Background:** Posterior Capsule Opacification (PCO) - still the most common problem following cataract surgery. Neodymium: Yttrium -Aluminum-Garnet (Nd: YAG) laser capsulotomy is the standard treatment for PCO. This study was done to evaluate the relationship of YAG capsulotomy size and energy on refraction, intraocular pressure and macular thickness of post-operative patients of cataract surgery. **Methods:** An observational study carried out in Indira Gandhi Institute of Medical Science (IGIMS), Patna with 80 Pseudophakic patients having PCO for a duration of 9 months (January 2019 to September 2019). All patients, who met inclusion and exclusion criteria, were examined before Nd:YAG laser capsulotomy, then at 1week, 4week and 8 weeks after Nd:YAG laser capsulotomy. Patients were divided into 2 groups: Group 1: 40 patients in which Capsulotomy Size is <3.9mm and energy used in capsulotomy was 0.8-1.2mJ/pulse; Group 2: 40 patients Capsulotomy Size>3.9mm and energy used in capsulotomy was 1.3-2mJ/pulse. SPSS, statistical software, version 2.0 was used for statistical analysis. **Results:** In this study there is no relation between capsulotomy size with BCVA and spherical equivalent. However there was some amount of hyperopic shift but that was statistically insignificant. IOP rise was noticed 2 hrs after capsulotomy and it came back to preoperative value 4 weeks after capsulotomy. CME was noted after 2hours of capsulotomy, then it gradually came to preoperative values within 4 weeks. **Conclusion:** There was more raise of IOP in larger capsulotomy group, with hyperopic shift but does not show any statistical significance. OCT showed cystoid macular oedema more in group 2 patients, with large capsulotomy, much elevated levels 2 hours after capsulotomy which came to preoperative value within 4 weeks.

**Keywords:** Congenital Nasolacrimal duct obstruction, epiphora, probing.

## INTRODUCTION

Posterior Capsule Opacification (PCO) - still the most common problem following cataract surgery. Neodymium: Yttrium -Aluminum-Garnet (Nd: YAG) laser capsulotomy is the standard treatment for PCO. Nd: YAG laser is safe and effective. But may be associated with serious complications like retinal detachment, cystoid macular edema and rise in intraocular pressure.

### Aims:

To evaluate the relationship of YAG capsulotomy size and energy on refraction, intraocular pressure and macular thickness in post-operative patients of cataract surgery.

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## MATERIALS AND METHODS

It is a retrospective, observational study carried out in Indira Gandhi Institute of Medical Science (IGIMS), Patna between January 2019 to September 2019 with a sample size of 80 pseudophakic patients with posterior capsular opacification. Patients with uncomplicated cataract surgery with posterior chamber intraocular implantation were included in our study with a prior written informed consent from all patients. Patients with associated corneal opacity, glaucoma, retinopathies, maculopathies, refractive error > -6 D and +6D were excluded from the study. All patients were examined before Nd: YAG laser capsulotomy, then at 1week, 4weeks and 8 weeks after Nd: YAG laser capsulotomy.

All Patients underwent complete ocular examination; including best corrected visual acuity, refraction, slit lamp examination, IOP by applanation tonometry and 3D-OCT (Topcon) on all visits. Laser Procedure was carried out under eye drop Tropicamide 1% and Phenylephrine 2.5%. After capsulotomy

combination of Moxifloxacin with Prednisolone acetate 1% four times daily and Timolol maleate 0.5% two times daily for 7 days was given. Capsulotomy was done using APPA\_YAG ophthalmic Nd: Yag laser system.

Patients were divided into two groups based on the postoperative capsulotomy size. The size of the capsulotomy was measured at 1 week after Nd: YAG laser capsulotomy. The size of the posterior capsule opening was measured vertically and horizontally using the reticule on the slit-lamp and the average of these values was accepted as capsulotomy size. 80 patients were divided into 2 groups: Group 1 comprised 40 patients in which capsulotomy size was <3.9mm [Figure 1] and energy used in capsulotomy was 0.8-1.2mJ/pulse and of the 40 patients in Group 2, the capsulotomy size was >3.9mm [Figure 2] and energy used was 1.3-2mJ/pulse.

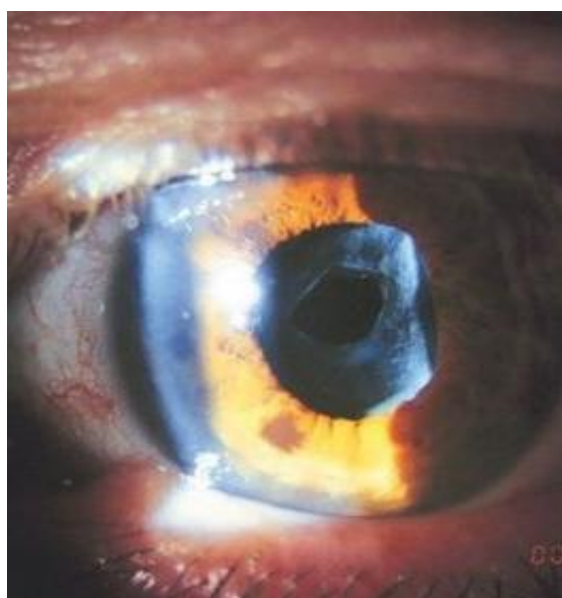


Figure 1: ?

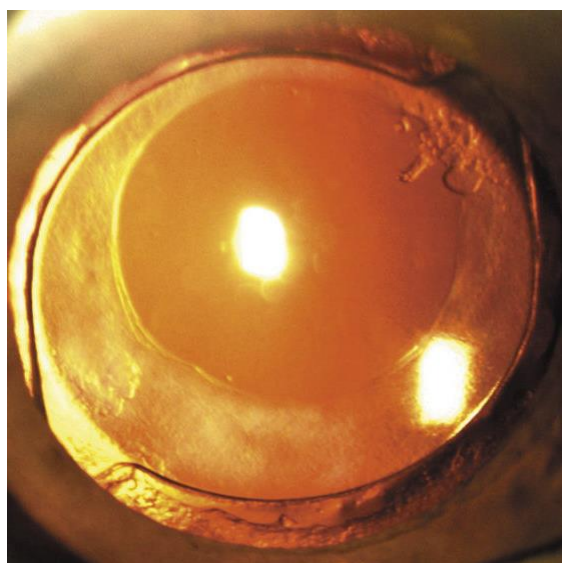


Figure 2: ?

SPSS, statistical software, version 2.0 was used for statistical analysis. The independent t -test was used for comparison of two groups and the paired t-test was used to detect intra group differences for repeated measurements. Comparison of groups for gender was carried out with chi-square test.

## RESULTS

Mean age and gender were not significantly different between two groups. Mean age was  $70.1 \pm 7.8$  years (range: 44–84) in group 1 and  $71.5 \pm 7.3$  years (range: 56–91) in group 2. In group 1, 12 patients were male and 08 patients were female; in group 2, 11 patients were male and 09 patients were female. Mean age and gender were not significantly different between two groups (p value: 0.478 and 0.143, respectively). Mean capsulotomy size was  $3.43 \pm 0.34$  mm (range: 2.5–3.8mm) in group 1 and  $4.56 \pm 0.47$  mm (range: 4.1–5.4mm) in group 2. Mean capsulotomy size was significantly larger in group 2 (P: 0.000).

**Table 1: BCVA & Refractive Error of Both Groups (Pre & Post Treatment)**

**BCVA: best corrected visual acuity; SE: spherical equivalent; Log MAR: logarithm of the minimum angle of resolution. It compares BCVA & SE between two groups at 1, 4 & 8 weeks and its found that, there is no significant relation between capsulotomy size with BCVA and SE.**

	Group 1	Group 2	P value
Capsulotomy size (in mm)	$3.43 \pm 0.34$	$4.56 \pm 0.47$	0.000
BCVA (Log MAR)			
Pretreatment	$0.61 \pm 0.15$	$0.66 \pm 0.18$	0.209
1 week	$0.15 \pm 0.10$	$0.17 \pm 0.13$	0.776
4 weeks	$0.325 \pm 0.12$	$0.403 \pm 0.12$	0.637
8 weeks	$0.350 \pm 0.16$	$0.460 \pm 0.12$	0.734
SE (diopters)			
Pretreatment	$-1.12 \pm 1.23$	$-1.26 \pm 1.26$	0.630
1 week	$-0.95 \pm 1.09$	$-0.89 \pm 1.06$	0.841
4 weeks	$-0.20 \pm 1.04$	$-0.29 \pm 1.02$	0.562
8 weeks	$-0.190 \pm 1.05$	$-0.31 \pm 1.05$	0.578

**Table 2: IOP & Macular Thickness Pre & Post Treatment in Both Groups**

**IOP: Intraocular pressure. It compares IOP & macular thickness between two groups at 1,4 & 8 weeks and it is found that there is no significant relation between capsulotomy size with IOP and macular thickness**

	Group 1	Group 2	P value
IOP (mmHg)			
Pretreatment	$15.44 \pm 2.73$	$15.37 \pm 3.61$	0.929
1 week	$16.33 \pm 2.42$	$17.40 \pm 3.26$	0.763
4 weeks	$15.13 \pm 2.68$	$15.25 \pm 3.95$	0.892
8 weeks	$14.83 \pm 2.10$	$15.71 \pm 2.30$	0.102
Macular thickness ( $\mu$ m)			
Pretreatment	$247.5 \pm 31.3$	$244.5 \pm 37.2$	0.689
1 week	$262.8 \pm 27.2$	$259.9 \pm 24.9$	0.654
4 weeks	$247.3 \pm 36.8$	$246.7 \pm 32.5$	0.875
8 weeks	$246.0 \pm 29.6$	$242.9 \pm 28.7$	0.665

**Table 3: It compares the amount of change in IOP, macular thickness between the two energy groups at 2 hr postoperatively and 1 month postoperatively from the preoperative level. Higher energy use was associated with significantly higher rise in IOP and macular thickness at 2 hr (P<0.001). This effect was not seen at 1 month for both IOP and macular thickness**

	Group I N=40	Group II N=40	P Value
IOP rise at 2 hour	0.36 ± 1.02	2.07 ± 1.14	<0.001
IOP rise at 1 month	15.13 ± 2.68	15.25 ± 3.95	0.892
Macular thickness rise at 2 hour	2.78 ± 4.89	8.95 ± 5.63	<0.001
Macular thickness rise at 1 month	247.3 ± 36.8	246.7 ± 32.5	0.945
Spherical Equivalent at 2hours	0.029 ± 0.22	0.03 ± 0.18	0.756
Spherical Equivalent at 1 month	0.04 ± 1.04	0.029 ± 1.02	0.312

## DISCUSSION

The reported incidence of PCO is 20.7% at 2years and 28.5% at 5years after cataract surgery.<sup>[1]</sup> PCO is the most frequent cause of diminished visual acuity after extra-capsular cataract surgery. Nd:YAG laser capsulotomy is the standard treatment of PCO. In this study there is no relation between capsulotomy size with BCVA and spherical equivalent. However there was some amount of hyperopic shift but that was statistically insignificant. In another study also the change in SE after Nd:YAG laser capsulotomy was statistically insignificant.<sup>[2]</sup> Theoretically, posterior movement of the IOL may cause a hyperopic shift.

Increased IOP was reported in 15% to 30% of patients in several studies.<sup>[3,4]</sup> Despite the prophylactic treatment, increased IOP was reported in 15% to 30% of patients in several studies.<sup>[5,6]</sup> Keates et al,<sup>[7]</sup> found elevation of IOP in 0, 6% of his patients, whereas Stark et al.<sup>[8]</sup> reported that the elevation of IOP was 1.0% after Nd:YAG capsulotomy. However, Shani et al.<sup>[9]</sup> could not find any elevation of IOP and postulated that healthy pseudophakic eyes do not generally show elevation of IOP after Nd:YAG laser capsulotomy. Ari et al.<sup>[10]</sup> also did not find any persistent rise in IOP. In the present study IOP rise was noticed 2 hrs after capsulotomy and it came back to preoperative value 4 weeks after capsulotomy.

One of the serious complications of Nd:YAG laser capsulotomy is that it leads to cystoid macular edema. Raza,<sup>[11]</sup> reported cystoid macular edema in 3% of patients treated with Nd:YAG laser capsulotomy for pseudophakic and aphakic posterior capsule opacification. Cystoid macular edema was noted after 2hrs of capsulotomy, then it gradually came to preoperative value within 4 weeks.

In conclusion, there was more raise of IOP more in larger capsulotomy group because of release of more inflammatory debris than in small capsulotomy group. There was hyperopic shift but does not show any statistical significance. OCT shows cystoid macular edema more in group 2 patients, much elevated level 2 hours after capsulotomy which came to preoperative value within 4 weeks. Larger capsulotomies shows retinal tear and subsequent retinal detachment.

## CONCLUSION

It was seen that the intraocular pressure is increased 2 hours after Nd:YAG laser capsulotomy which declined to preoperative levels at 1 week post Nd:YAG laser capsulotomy in both groups. Intraocular pressure rise in group 2 (with larger capsulotomy size) was higher than in group1. There was an increased macular thickness at 2 hours after Nd:YAG laser capsulotomy in both groups and the degree of macular thickening was similar.

Mean macular thickness decreased to preoperative levels at 4 weeks after Nd:YAG laser capsulotomy in both groups. The hyperopic shift found in large capsulotomy group was higher than small capsulotomy group but statistically insignificant.

### Limitations:

1. The sample was small and represents the results at a single center only.
2. The results were based on short-term follow-up period. Further follow-up might be required to determine the effect of capsulotomy size in Nd:YAG capsulotomy treatment.
3. Another limitation of our study- exact mechanism of hyperopic shift after Nd:YAG laser capsulotomy did not appear in our study.
4. Examination of IOL movement with ultrasound biomicroscopy after Nd:YAG laser capsulotomy might be very helpful to determine the cause of differences in SE after Nd:YAG laser capsulotomy.

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