

# Visual Outcome Following Neodymium: Yttrium-Aluminium-Garnet Laser Posterior Capsulotomy For Posterior Capsular Opacification - A Study Done At Government Medical College, Jammu, J&K, North India

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## ABSTRACT

**Aims, settings & design:** The present prospective study was conducted to see visual outcome following Nd: YAG laser capsulotomy on 100 ophthalmology patients who developed PCO after extracapsular cataract extraction, over a period of 1 year, between November 2013 to October 2014 in upgraded department of Ophthalmology, Government medical college, Jammu.

**Materials & Methods:** The present study involved 100 patients who developed posterior capsular opacification after extracapsular cataract extraction. Both pre and post Nd: YAG laser capsulotomy visual acuity was estimated in all patients.

**Results:** The best corrected visual acuity of 6/6 was achieved in 41(41%) patients while 6/12 – 6/9 in 42 (42%) patients on day 7<sup>th</sup> following Nd-YAG laser capsulotomy.

**Conclusion:** Nd-YAG laser posterior capsulotomy is the safest, non-invasive & most effective procedure in the management of PCO with good visual outcome.

**Keywords:** Cataract, ECCE, posterior capsular opacification, Nd: YAG laser, visual acuity.

## INTRODUCTION

The posterior capsular opacification is not actually the opacification of capsule, rather due to proliferation and migration of retained cells on the posterior capsular surface an opaque membrane develops. Capsular opacification is described most commonly in terms of lens epithelial cell growth that forms pearls or fibrosis. <sup>[1]</sup> The most frequent late complication of cataract surgery is posterior capsular opacification. <sup>[2]</sup> Optic material and type of implant edge has significant influence on the development of PCO. Capsular fold behind

the IOL optic area more frequently presented by one piece acrylic hydrophobic IOL group than those in the three piece IOL group. IOL's which entirely fill the capsular bag, are expansible full sized hydrogel IOL where no space is left for the proliferation and movement of the epithelial cells, in these type of IOL's lower incidence of posterior capsular opacification formation have been reported. <sup>[3]</sup> When the lens epithelial cells retained in capsular bag following surgery, PCO development occurs. <sup>[4]</sup> The PCO causes gradual deterioration of visual acuity, decrease

contrast sensitivity and glare. [5] The PCO develops in months to years postoperatively. The use of Nd:YAG Laser for posterior capsulotomy has replaced the procedure surgical capsulotomy as it is less invasive, safe and can be performed as outpatient procedure. [6] Due to tremendous rise in number of extra capsular cataract extraction (ECCE) with posterior chamber IOL surgeries, the present study had been conducted to see the visual outcome following Nd:YAG laser due to reason that large number of patients were coming to our institute for posterior capsulotomy.

## MATERIALS AND METHODS

The present study was conducted over a period of 1 year from November 2013 to October 2014 in the Out Patient Department of Upgraded Department of Ophthalmology, Government Medical College, Jammu, after due clearance from Institutional Ethics Committee, on patients who had decreased visual acuity due to posterior capsule opacification after extracapsular cataract extraction & underwent Nd:YAG laser capsulotomy. The informed written consent from all the patients were undertaken before inclusion in the current study. All principal of bioethics were followed in totality as per ICMR and CDSCO advocated good clinical practice guidelines. The data was recorded by independent observer.

**Inclusion Criteria:** All cases of posterior capsule opacification having evidence of posterior capsular thickening / opacification on Slit lamp examination.

**Exclusion criteria:** Patients <8yrs age, less than 3 months interval between cataract surgery and development of posterior capsular opacification, cases with post-op complications like endophthalmitis, uncooperative subjects e.g. patients with mental retardation & neurological problems, PCO in aphakic eyes, any active ocular infection, corneal pathology sufficient to cause difficulty in assessment of PCO, patients having combined procedure

(Trabeculectomy with pc-iol), eyes with subluxated intraocular lens.

After meeting the inclusion & exclusion criteria patients were worked out in detail in the department of Ophthalmology as under:

(1) Detailed history pertaining to personal data, ocular symptoms were recorded.

(2) The patients were subjected to a routine general physical examination.

(3) Systemic examination.

(4) Every patient underwent a detailed ophthalmic examination as (a) External eye examination: includes examination of eyelids, conjunctiva, cornea, iris, pupil, lens. (b) Visual acuity and best corrected visual acuity was obtained by Snellen chart (c) Slit lamp examination: to visualize the anterior segment of the eye. (d) fundus examination to evaluate: optic disc, macula & peripheral retina (e) Baseline intraocular pressure measurement by Goldmann applanation tonometer.

**Nd:YAG laser capsulotomy procedure:** Capsulotomy was performed using Q-switched Nd:YAG laser. Before capsulotomy put 4% topical xylocaine in the selected eye, with patient secured in the slit-lamp-mounted laser, the red helium–neon beam was focussed on the posterior capsule, when properly focused, the two aiming beams merged into one, an initial laser power setting of 1.0mj or less was used to commence treatment, the power setting was increased as required. Capsulotomies were performed by applying a series of shots aimed at the visual axis so as to create an adequate central opening in the capsule.

**Post capsulotomy Care:** The patients were instilled artificial tear drops and were advised to instill antibiotic – steroid drops 4 times a day for 1 week & then stopped by tapering drug weekly, timolol 0.5% bd given for 1 week, patients were re-evaluated post-laser for visual acuity at 1<sup>st</sup> day, 3<sup>rd</sup> day and 7<sup>th</sup> day.

**Statistical analysis:** Analysis of data was done using statistical software MS Excel / SPSS version 17.0 for windows. Data presented as percentage (%) & mean (SD) as discussed appropriate for quantitative and

qualitative variables. Statistical significance was evaluated using student ‘t’ test. A p value <0.05 was considered as statistically significant and p value of <0.01 was considered statistically highly significant.

## OBSERVATION & RESULTS

The present study was carried over a period of 1 year, on 100 patients who had decreased visual acuity due to posterior capsule opacification after extracapsular cataract extraction & underwent Nd:YAG laser capsulotomy in the upgraded department of ophthalmology, GMC Hospital, Jammu. In the present study, following observations were made;

Table no. 1 shows that before capsulotomy 73% had visual acuity 6/60-6/36 followed by 17% had 6/24-6/18 and on 7<sup>th</sup> day after laser capsulotomy 57% had

visual acuity 6/24-6/18 followed by 30% who had 6/12-6/9. The improvement in visual acuity was highly significant.

Table no. 2 shows that pre-laser best corrected visual acuity of 6/60-6/36 was seen in 67%, 6/24-6/18 in 22% & 6/12-6/9 in 1% while on 7<sup>th</sup> day post-laser best corrected visual acuity of 6/12-6/9 was seen in 42% & 6/6 in 41% patients. The improvement in best corrected visual acuity was highly significant.

Table no.3 shows that after Nd:YAG laser posterior capsulotomy, the BCVA (logMAR) <0.3 was achieved in 73% of patients. The mean pre-laser BCVA (logMAR) was 0.78±0.18 (mean±SD) while mean post-laser BCVA (logMAR) was 0.20±0.26. The p-value was highly significant (P-value<0.0001).

**Table no. 1 Pre and post Nd: YAG laser visual acuity**

Visual acuity(V/A)	Baseline/prelaser (number of patients)	Postlaserday1 (number of patients)	Postlaserday3 (number of patients)	Postlaserday7 (number of patients)
<6/60	10	1	1	1
6/60-6/36	73	13	10	10
6/24-6/18	17	58	57	57
6/12-6/9	0	28	31	30
6/6	0	0	1	2

Nd: YAG laser—Neodymium:Yttrium-Aluminium-Garnet laser

**Table no. 2 Pre and post Nd: YAG laser best corrected visual acuity**

Best corrected visual acuity(V/A)	Baseline/prelaser (number of patients)	Postlaser day 7 (number of patients)
<6/60	10	1
6/60-6/36	67	8
6/24-6/18	22	8
6/12-6/9	1	42
6/6	0	41

Nd: YAG laser-- Neodymium:Yttrium-Aluminium-Garnet laser

**Table no. 3 Pre and post Nd: YAG laser best corrected visual acuity(logMAR)**

BCVA(logMAR)	Pre-laser (number of patients)	Post-laser (number of patients)
≥ 0.9	25	3
0.6< 0.9	62	7
0.3<0.6	13	17
<0.3	0	73
Total	100	100

BCVA(logMAR) Pre-laser (mean±SD) 0.78±0.18  
 BCVA(logMAR) Post-laser (mean±SD) 0.20±0.26  
 p-value <0.0001(H.S.) H.S is Highly Significant  
 BCVA is best corrected visual acuity

## DISCUSSION

The posterior capsular opacification is the most common complication of uncomplicated cataract surgery. Posterior

capsular opacification can be effectively treated with Nd:YAG laser capsulotomy.

Nd:YAG Laser is a photo disruptive laser which causes disruption of tissue by producing extreme heat with acoustic shock wave at the focused site. This property of Nd:YAG Laser is used to disrupt the posterior lens capsule in order to create an opening in it. This causes significant improvement in visual acuity. All though recent modifications in surgical techniques, IOL material and designs have reduced PCO rate, it is still a significant problem following cataract surgery. [6]

Improvement in visual acuity was excellent in the present study. Before capsulotomy maximum patients presented with best corrected visual acuity in the range of 6/60-6/36 (67%). After capsulotomy V/A improvement was observed. BCVA improved to 6/6 in 41%, 6/12-6/9 in 42%.

Terry AC et al reported an improvement in visual acuity of one or more Snellen lines in 45 eyes and an improvement of 3 or more Snellen lines in 33 eyes. [7] Aron-Rosa DS et al also reported an immediate improvement in visual acuity in 94% of cases treated by capsulotomy. [8] Keates RH et al studied safety and efficacy of Nd:YAG laser for posterior capsulotomy & out of 526 subjects who were treated with the laser, 87.8% had improved vision with 82.9% achieving a visual acuity of 20/40 or better. [9] Other authors in 1985 also reported improvement in visual acuity following capsulotomy. [10-15] Cullom RD & Schwartz LW found mean gain of 2 Snellen lines. [16] Claesson M et al showed that the visual acuity was improved in all 13 patients after capsulotomy in range between 0.16-1.0. [17] Magno BV et al found Nd:YAG capsulotomy significantly improves visual acuity. [18] Skolnick KA et al in a study of 212 eyes Snellen visual acuity was obtained at least 1 week after capsulotomy. The BCVA in 43.3% eyes improved by 3 or more lines, 20.3% by 2 lines, 24.15% by 1 line, 9% did not improve & 1.45 had decreased Snellen visual acuity. [19] Cheng CY et al in his study on 29 patients found improvement in visual acuity after Nd:YAG laser capsulotomy. [20] Langrova H et al conducted a study on 20 patients and found BCVA was significantly lower in patients of posterior capsular opacification when compared to control group ( $p < 0.001$ ). [21] Polak M et al conducted a study on 28 patients and found improvement in visual acuity in 89% cases. The BCVA of 0.8-1 was obtained in 72% eyes & 0.25-0.5 in 22%. [22] Wang J et al conducted a study on 67 cases and found post laser improvement of visual acuity in all cases. [23] Aslam TM et al found mean improvement of distant visual acuity was  $0.32 \pm 0.29$   $p$ -value  $< 0.0001$ . [24] Menon GJ et al conducted a study on 60 patients & found median spatial acuity (LogMAR) improved from 0.34 to 0.16 ( $p < 0.001$ ). [25] Awan MT et al in his study compared the improvement of visual acuity of diabetic and non-diabetic

patients after Nd:YAG laser capsulotomy & found VA improvement in 92% diabetic & 96% in non-diabetic. [26]

Posterior Capsule Opacification (PCO) is the most common visually disabling consequence of modern cataract surgery worldwide and has important medical, social & economic implications. It can be managed safely as an outpatient procedure by Neodymium-YAG laser posterior capsulotomy. [6] In present study the indications were optical but it can be performed for therapeutic purpose. Before performing capsulotomy other causes of diminution of vision e.g. RD, CME, pre-existing glaucoma, retinal degenerations should be ruled out. Patient education is of vital importance in this procedure. His confidence and co-operation is of great value in performing the procedure. Nd:YAG Laser procedure can improve visual acuity among patients with posterior capsular opacification & the results of Nd:YAG laser capsulotomy were comparable to those reported in literature.

## CONCLUSION

As visual acuity reflects most accurately the degree of PCO and Nd:YAG laser provides an easy method of opening a posterior capsule without opening globe. Thus, it can be concluded that Nd:YAG laser capsulotomy is a closed-eye, safe, non-invasive and effective method to treat PCO with good visual outcome and avoids all the complications associated with surgical capsulotomy and local anaesthesia.

## ACKNOWLEDGEMENT

Thanks from the core of my heart to GOD and my parents for their blessings. My special thanks to Dr. Dinesh Kumar HOD, PSM, GMC Jammu for statistical analysis.

### Declaration:

**Funding:** No funding sources

**Conflict of interest:** None declared

**Ethical approval:** The study was approved by the institutional ethics committee

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How to cite this article: Kumar S, Manhas A, Gupta D et al. Visual outcome following neodymium: yttrium-aluminium-garnet laser posterior capsulotomy for posterior capsular opacification - a study done at government medical college, Jammu, J&K, North India. *Int J Health Sci Res.* 2017; 7(11):101-106.

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