

**Complication Following Nd:YAG Laser Posterior Capsulotomy For Posterior Capsular Opacification – A Study
From Government Medical College , Jammu, J&K, North India.**

Satinder Kumar¹, Angli Manhas^{2*}, Rameshwar S Manhas³, Dinesh Gupta⁴

¹Resident Scholar, Department of Ophthalmology, Government Medical College, Jammu, J&K, India.

²Senior Resident, Department of Ophthalmology, Government Medical College, Jammu, J&K, India.

³Senior Resident, Department of Psychiatry, Government Medical College, Jammu, J&K, India.

⁴Professor & Head, Department of Ophthalmology, Government Medical College, Jammu, J&K, India.

Correspondence Author: Angli Manhas, Senior Resident, Department of Ophthalmology, Government Medical College, Jammu, J&K, India.

Type of Publication: Original Research Paper

Conflicts of Interest: Nil

Abstract

Background: Noninvasive procedure that is used in the treatment of posterior capsular opacification (PCO) is Neodymium yttrium aluminum garnet (Nd:YAG) laser capsulotomy. Since the advent of YAG in 1981 its application & acceptance in the management of PCO was well appreciated due to the non surgical & non invasive approach against needling which was mainstay in PCO management prior to YAG.

Aim : To see complications following Nd:YAG laser capsulotomy for PCO.

Materials & Methods: The present prospective study involved 100 eyes having posterior capsular opacification after extracapsular cataract extraction & undergone Nd:YAG laser capsulotomy.

Results: Uveitis was seen in 96% cases within 1hr which reached upto 2% on 7th day post laser followed by rise of IOP in 47% while pitting of IOL was seen in 5%.

Conclusion: Nd-YAG laser posterior capsulotomy is the safest, non-invasive & most effective procedure in the management of PCO with fewer complications which can be managed by proper medication.

Keywords: Cataract, ECCE, Nd:YAG laser, posterior capsular opacification, uveitis, IOP.

Introduction

Cataract is the main cause of curable blindness worldwide whereas Posterior Capsule Opacification (PCO) is the second most common cause of blindness. PCO is the most common complication in patients undergoing Extracapsular Cataract Extraction with Posterior Chamber Intraocular Lens implantation (ECCE+PCIOL). PCO usually occurs in about 18%-50% of patients within two years after the surgery. PCO is caused by the proliferation and migration of residual lens epithelial cells which causes fibrotic changes & wrinkling of the posterior capsule.^[1] The posterior capsular opacification is one of the most common nonrefractive cause of decrease in postoperative vision, decrease in field of view during therapeutic and diagnostic procedures, cause uniocular diplopia.^[2] The PCO develops in months to years postoperatively & can be effectively treated by Nd:YAG laser posterior capsulotomy. The use of Nd:YAG laser for posterior capsulotomy has replaced the procedure surgical capsulotomy due to reason being noninvasive, safe and can be performed as outpatient procedure. The photo

disruptive property of Nd:YAG laser is used to disrupt the posterior lens capsule in order to create an opening in it.^[3] The present study had been conducted to see the complications of Nd:YAG laser in patients who developed posterior capsular opacification (PCO) after extra capsular cataract extraction (ECCE) with posterior chamber IOL surgeries & undergone Nd:YAG laser posterior capsulotomy .

Material and method

After due clearance from Institutional Ethics Committee ref. no. IEC/2015/91 dated 21-01-2015, the present study was conducted over a period of 1 year in the out patient department of upgraded department of Ophthalmology, Government Medical College, Jammu, on patients who had 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 & 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, RD.

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 : Brimonidine 0.2% was instilled before laser. 10% phenylephrine or 1% tropicamide eye drops was used to dilate pupil. Patients were informed about painless nature of procedure. Capsulotomy was performed using Q-switched Nd:YAG laser, with 1.0mj or less power setting to commence treatment & increased as required, series of shots aimed at the visual axis was applied to create an adequate central opening in the capsule around 4mm. Patients were examined 1hour, 3 hours, day1 ,day3 & day7 after posterior capsulotomy. Patients were kept on Timolol 0.5% eye drops twice a day & antibiotic–steroid eye drops 4 times a day for 1 week. Cases were carefully followed & looked up for incidence of rise in intraocular pressure, uveitis, cystoid macular edema and other complications.

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.

Observation & Results

In the present study, following observations were made;

Maximum 96% patients had anterior segment reaction, followed by IOP rise in 47% of patients. (Table no.1)

90% patients had anterior segment reaction within 1hr while on 7th day post Nd:YAG laser only 2 % pt had anterior segment reaction. (Table no. 2)

Maximum rise of IOP was seen 3hrs post YAG laser which returned to baseline level 7th day post laser. (Table no. 3)

Rise in IOP of <5mmHg was seen in 38 pts while only 2 pts had IOP rise \geq 10mmHg. (Table no.4)

Discussion

Nd:YAG laser is a economical, convenient, fast, non invasive procedure done on OPD basis with immediate results and generally considered safer but it still carries a low but finite risk of complications which are rare & rarely sight threatening.^[4]

Uveitis was seen in 96% cases within 1hr while on 7th post laser day only 2% had aqueous reaction in present study. Ganvit S et al. reported aqueous flare in 37% of cases.^[5] Raza A found mild uveitis in 39 cases in his study.^[6] VS Gore in a study found that 33.5% of patient had iritis after YAG capsulotomy.^[4]

In the present study, rise in IOP was seen in 47% patients (<5mmHg was seen in 38%, \geq 5-10 mmHg pressure rise was seen in 7% while \geq 10mmHg in 2%) while 34% showed fall & 19% showed no change in IOP . As the brimonidine 0.2% was instilled before laser, so pressure rise was minimal. The maximum IOP elevation was noted at around 3hrs after laser which returned to baseline 7th post laser day in present study. The pressure rise following Nd:YAG laser treatment occur because of the deposition of debris in the trabecular mesh work, pupillary block and inflammatory swelling of the ciliary body or iris root associated with angle closure.^[7] Gimbel HV et al. have demonstrated that IOP elevation after laser procedures commonly occurs in the first 3 hrs.^[8] Channell

MM et al. reported that upto 95% of eyes had an increase of \geq 5mm Hg and 59% had an increase of \geq 10mm Hg in 24 hrs after Nd:YAG laser posterior capsulotomies. All eyes in which IOP increased more than 5mm Hg showed the increase within the first 48 hours.^[9] Keates RH et al. in a study concluded that only 5.7% of subjects experienced an intraocular pressure rise to 30mm Hg or greater. Return to the preoperative IOP level occurred in 89% of subjects in the first 24hrs to one week.^[10] Stark WJ et al. showed out of a total patient population of 17,911 that 28% had an IOP increase of over 30mm from pretreatment values.^[11] Kraff MC et al. observed significantly greater rise in IOP one hr after Nd:YAG laser treatment in the aphakic patients than in the pseudophakic patients (8.2mmHg vs 3.5mmhg respectively).^[12] Flohr MJ et al. noted a transient immediate postoperative intraocular pressure elevation in over 75% of eyes after Nd:YAG laser capsulotomy and one-third had an IOP elevation greater than 10mmHg over the preoperative IOP.^[13] Liesegang TJ et al. in a study reported the IOP was increased in 51% of the eyes two to five hrs after YAG laser.^[14] Wasserman EL et al. in a study reported the average maximum induced IOP rise was 1.4mm Hg and this occurred within one hour of the capsulotomy.^[15] Richter CU et al. reported that mean IOP peaked by 3hrs with a mean increase of 13mmHg , remained elevated by 5mm Hg at 24hrs but returned to baseline by 1week.^[16] Vander Feltz van der Sloot D et al. observed that serious elevation of IOP rise occur after Nd:YAG laser capsulotomy.^[17] Yeom HY et al. demonstrated that with brimonidine 0.2% IOP spikes of 5-10mm Hg were seen in 5.7% and \geq 10mmHg in 2.9% patients and IOP elevations <5mmHg in 22.9%.^[18] According to a study by Oner V et al. IOP elevations of \geq 5mm Hg occurred in 7.3% of patients and IOP elevations of \geq 10mmHg occurred in 2.4% of patients treated with brimonidine.^[19]

In the present study there was no case of retinal detachment. This could be because of the absence of risk factors in this study. Keates RH et al. reported 0.4% retinal detachment.^[10] Steinert RF et al. reported 0.89% cases of RD after laser.^[20] Ranta P et al. in their study on 341 patients 2.0% developed RD after laser.^[21]

In the present study no patient developed cystoid macular oedema post YAG laser. This could be because patients undergone Nd:YAG laser capsulotomy 3 months after cataract surgery. The possible mechanism of CME is still unclear but it is suggested that prostaglandin released from anterior segment in response to YAG laser reaches the retina through vitreous alters the permeability of paramacular capillaries resulting in development of CME, displaced vitreous in AC cause continuous iris irritation around the pupil margin may promote CME but if Nd:YAG laser capsulotomy is delayed after cataract surgery by 90 days it allows full recovery of the blood aqueous barrier and can reduce the rate of cystoids macular edema.^[7] Keates RH et al. reported CME in 2.3%.^[10]

Pitting of IOL in the present study was seen in 5 cases because of uncooperativeness of patients. Other rare complications like corneal stromal scarring, macular hole, endophthalmitis did not occur in present study.

Table no. 1 Complications following Nd:YAG laser capsulotomy.

Complication	No. of patients	Percentage (%)
IOP rise	47	47
Uveitis	96	96
Pitting of IOL	5	5
Cystoid macular oedema	0	0
RD	0	0

RD-retinal detachment, IOP-intraocular pressure

Table no. 2 Aqueous reaction (uveitis)

Time	Aqueous reaction		
	C++f+	C+f+	Nil
1 hr	52	44	4
3 hr	31	65	4
Day 1	0	96	4
Day 3	0	25	75
Day 7	0	2	98

c-cells & f-flare

Table no. 3 Intraocular Pressure

Time	Range	Mean±SD
Baseline	10-20	15.78±2.41
1 hr	10-22	16.28±2.97
3 hr	10-24	16.66±3.33
Day 1	10-22	16.48±2.76
Day 3	10-22	16.26±2.49
Day 7	10-20	15.96±2.41

Table no. 4 Change in IOP

Fall in IOP (%)	No change(%)	Rise in IOP(%)
<5 = 34	19	<5 = 38
≥5 = 0		≥5 = 7
≥10 = 0		≥10 = 2
34	19	47

IOP- Intraocular Pressure

Conclusion: Thus, it can be concluded that Nd:YAG laser capsulotomy is a closed-eye, safe, non-invasive and effective method to treat PCO with few complications which can be reduced by minimizing energy & number of precisely focussed shots with proper medication, follow-up & thus becomes management of choice for PCO.

Acknowledgement: Thanks from the core of my heart to GOD and my parents for their blessings.

Declaration:

Funding: No funding sources

Conflict of interest: None declared

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

References

1. Sirisha G, Chowdary NL. Visual outcome of Nd-YAG laser capsulotomy in posterior capsule opacification. *J.Evolution Med.Dent.Sci.*2016;5(29):1479-1482.
2. Manhas A, Kumar S, Manhas RS, Gupta D. Pattern Of Posterior Capsular Opacification–A Study Done At Government Medical College, Jammu, J&K, North India. *IJSR.*2017;6(11):1-2.
3. Kumar S, Manhas A, Gupta D, Kumar D. 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.
4. VS. Gore. The Study of Complications of ND:YAG Laser Capsulotomy. *International Journal of Bioinformatics Research.*2012;4(2):265-268.
5. Ganvit S, Shah M, Parmar U, Shah A , Joshiyara P, Pandya N. Visual outcome and complications following Nd:YAG laser posterior capsulotomy. *Int J Int Med Res.* 2015;2(2):31-35.
6. Raza A. Complications after Nd:YAG Posterior Capsulotomy. *JRMC.*2007;11(1):27-29.
7. Khanzada MA, Jatoti SM, Narsani AK, Dabir SA, Gul S. Is the Nd: YAG Laser a Safe Procedure for Posterior Capsulotomy? *Pak J Ophthalmol* 2008; 24(2):73-78.
8. Gimbel HV, Van Westenbrugge JA, Sanders DR, Raanan MG. Effects of sulcus vs capsular fixation on YAG-induced pressure rises following posterior capsulotomy. *Arc Ophthalmol* 1990;108:1126-1129.
9. Channell MM and Beckman H. Intraocular pressure changes after neodymium-YAG laser posterior capsulotomy. *Arch Ophthalmol.*1984;102:1024-1026.
10. Keates RH, Steinert RF, Puliafito CA, Mazwell SK. Long term follow-up of Nd:YAG laser posterior capsulotomy. *J Am Intraocul Implant Soc.*1984;10:164-168.
11. Stark WJ, Worthen D, Holladay JT, Murray G. Neodymium:YAG laser. *Ophthalmology.*1985;92:209-212.
12. Kraff MC, Sanders DR, Lieberman HL. Intraocular pressure and the corneal endothelium after neodymium:YAG laser posterior capsulotomy. Relative effects of aphakia and pseudophakia. *Arch Ophthalmol.* 1985;103:511-514.
13. Flohr MJ, Robbin AL, Kelly JS. Early complications following Nd:YAG laser posterior capsulotomy. *Ophthalmology.*1985;92:360-363.
14. Liesegang TJ, Bourne WM, Ilstrup DM. Secondary surgical and neodymium-YAG laser discussions. *Am J Ophthalmol.*1985;100:510-519.
15. Wasserman EL, Axt JC, Sheets JH. Neodymium:YAG laser posterior capsulotomy. *J Am Intraocul Implant Soc.*1985;11:245-248.
16. Richter CU, Arzeno G, Pappas HR, Arrigg CA, Wasson P, Steinert RF. Prevention of intraocular pressure elevation following neodymium-YAG laser posterior capsulotomy. *Arc Ophthalmol.*1985;103:912-915
17. Vander Feltz van der Sloot D, Stilma JS, Boen-Tan TN, Bezemer PD. Prevention of IOP rise following Nd:YAG laser capsulotomy with topical timolol and indomethacin. *Doc Ophthalmol.*1988;70:209-214.
18. Yeom HY, Lee JH, Hong YJ, Seong GJ. Brimonidine 0.2% versus brimonidine purite 0.15% prophylactic effect on IOP elevation after Nd:YAG laser posterior capsulotomy. *J Ocul Pharmacol Ther.*2006;22:176-

181.

19. Oner V, Alakus MF, Tas M, Turkyilmaz K, Iscan Y. Fixed combination brimonidine-timolol versus brimonidine for treatment of intraocular pressure elevation after neodymium:YAG laser posterior capsulotomy. *J Ocul Pharmacol Ther.*2012;28:576-580.
20. Steinert RF, Puliafito CA, Kumar SR, Dudak SD, Patel S. Cystoid macular edema, retinal detachment, and glaucoma after Nd:YAG laser posterior capsulotomy. *Am J Ophthalmol.*1991;112:373-380.
21. Ranta P, Tommila P, Kivela P. Retinal breaks and detachment after Neodymium:YAG laser posterior capsulotomy. *J Cataract Refract Surg* 2004;30:58-66.