MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.59218/makrjms.2023.10.78.81

OPEN ACCESS

Key Words
PCO, Nd Yag posterior capsulotomy effect on IOP, macular thickness

Corresponding Author
Shifa Oosman,
Department of Ophthalmology, Deccan College of Medical Sciences, Hyderabad, India

Author Designation
[1]Assitant Professor
[2]Professor
[3,4]Resident

Received: 25 September 2023
Accepted: 7 October 2023
Published: 8 October 2023

Citation: Sheetal Baldava, Siddharth Karan, Abdul Jabbar Khazi and Shifa Oosman, 2023. Observational Study of the Effect of ND-YAG Posterior Capsulotomy on Intraocular Pressure, Refraction & Macular Thickness in Posterior Capsular Opacification. Res. J. Med. Sci., 17: 78-81, doi: 10.59218/makrjms. 2023.10.78.81

Observational Study of the Effect of ND-YAG Posterior Capsulotomy on Intraocular Pressure, Refraction and Macular Thickness in Posterior Capsular Opacification

[1]Sheetal Baldava, [2]Siddharth Karan, [3]Abdul Jabbar Khazi and [4]Shifa Oosman

[1-4]Department of Ophthalmology, Deccan College of Medical Sciences, Hyderabad, India

ABSTRACT

(1) To determine the effect of Nd Yag posterior capsulotomy in pseudophakic eye on IOP and macular thickness, (2) To corelate between posterior capsular opacity and visual acuity before and after Nd Yag posterior capsulotomy and (3) To determine the duration of cataract extraction and development of posterior capsular opacity. A prospective observational study was done for the period of six months from December 2022 to May 2023 at the Department of Ophthalmology at Deccan college of medical sciences, Hyderabad. Visual acuity was recorded, detailed slit lamp examination, Kryer et al. grading system for PCO was done, IOP was measured by Goldmann applanation tonometry, detailed fundus examination with 90D, Nd Yag Q switched laser capsulotomy was done under topical anesthesia, power setting and number of exposures varied depending on thickness of posterior capsule opacity and macular thickness was measured SD OCT. BCVA, IOP andmacular thickness was measured on day 1, at one week and one month follow up. BCVA significantly improved post procedure after one week and one month. IOP and macular thickness increased post procedure but did not required any medical intervention. Time of onset of PCO after cataract surgery varied significantly, average period in our study was 3.5 years.

INTRODUCTION

PCO occurs in 20-50% of patients within 2-5 years of cataract surgery. Although the incidence of PCO is reported to have declined in recent years, there is no definitive data and the reported decrease may represent only a later onset of PCO. Posterior capsule opacification (PCO, secondary cataract, after cataract) is a postsurgical complication following extracapsular cataract surgery (ECCE) and intraocular lens (IOL) implantation. In the normal crystalline lens, the LECs are confined to the anterior surface at the equatorial region and the equatorial lens bow. This single row of cuboidal cells can be divided into two different biological zones. The anterior-central zone (corresponding to the zone of the anterior lens capsule) consists of a monolayer of flat cuboidal, epithelial cells with minimal mitotic activity. The second zone is important in the pathogenesis of "pearl" formation[1].

Although, cataract is the most common cause of blindness in the world, after-cataract (PCO or secondary cataract) is an extremely common cause as well. The eradication of PCO following ECCE has major medical and financial implications: Nd: YAG laser secondary posterior capsulotomy, can be associated with significant complications. Potential problems include IOL optic damage/pitting, postoperative intraocular pressure (IOP) elevation, cystoid macular oedema, retinal detachment and IOL subluxation[2].

Explanations for the rise in intraocular pressure following Nd:YAG laser capsulotomy include the deposition of debris in the trabecular meshwork, trabeculitis as a consequence of the radiating “shock waves”, neurovascular mechanisms, pupillary block and inflammatory swelling of the ciliary body or iris root associated with angle-closure[3].

Various factors such as age and PCO thickness may affect the required power for Nd: YAG laser to rupture an opacified capsule. While Nd: YAG laser capsulotomy may significantly influence the ability of a vitreoretinal surgeon to visualize the peripheral fundus in patients at risk of retinal detachment (RD) on one hand, it may itself lead to RD and cystoid macular edema (CME), on the other. The precise mechanisms leading to retinal breaks and RD after laser capsulotomy are not known. Many investigators believe that laser energy induces vitreous liquefaction, posterior vitreous detachment or both, which might create new breaks or enable pre-existing asymptomatic breaks to progress to RD[4]. The impact of Nd: YAG laser energy per se on the rate of complications has not been studied extensively and a causal relation has not been established.

MATERIALS AND METHODS

This study was performed after approval of local ethics committee of Deccan college of medical sciences. It was a prospective observational study. Informed consents of all the patients were taken after explaining them about the study. A total of 38 pseudophakic eyes were included in this study from December 2022 to May 2023 at the Department of Ophthalmology at Deccan college of medical sciences. Patients were enrolled if there was reduction in corrected distance visual acuity (CDVA) by two or more Snellen lines, glare disabilities or monocular diplopia. As a rule, patients with PCO were considered for capsulotomy after a minimum period of 3 months following uneventful cataract surgery. Patients with history of retinal detachment (RD) in the fellow eye, peripheral retinal degenerations, retinal breaks, past history of vitreoretinal surgery, diabetic retinopathy and follow up less than 9 months were excluded.

PCO was graded according to Kruger *et al.*[5] grading system of 0-3: were 0 = absent, 1 = very mild, 2 = moderate, 3 = dense white.

The preoperative protocol included recording visual acuity, BCVA, IOP measurement by applanation tonometry after one hour, one week and one-month. The pupils were dilated with tropicamide 0.5% and phenylephrine 10% drops. Fixation of IOL was noted in each case. Spectral domain OCT for macular thickness was done before procedure, one week and one month after Nd Yag capsulotomy and the posterior pole was examined with a 90 diopter (D) lens while the peripheral retina was evaluated by binocular indirect ophthalmoscopy using a 20 D lens with scleral indentation to exclude eyes with retinal pathologies which were not included in this study.

A Q-switched Nd: YAG laser system, with wavelength of 1064 nm and pulse length of <4 ns (2-3 ns) was employed for this study. Nd: YAG laser capsulotomy was performed. Before starting the procedure, one drop of 4% xylocaine was instilled into the conjunctival cul-de sac. The pupils were fully dilated and the aim was to create a capsulotomy of about 4 mm in size. A central cruciate pattern in an upward-downward direction was used[6]. The aiming beam was focused slightly posterior to the posterior capsule. The optical center of the IOL was matched with the center of the opening. Power setting and number of exposures were varied depending on the thickness of the posterior capsule. An attempt was made to keep these numbers to minimum. The average power setting was 2.29 mj and the average number of shots required was 12.

Inclusion criteria: Patients those who went for ECCE, SICS with PC IOL implantation at least 3 months post op whose surgeries went uneventful and who’s with visual acuity less or equal to 6/9 on LogMAR chart. Exclusion criteria: Patients with preexisting corneal pathologies like corneal edema, patients with glaucoma, preexisting retinal pathologies like myopic

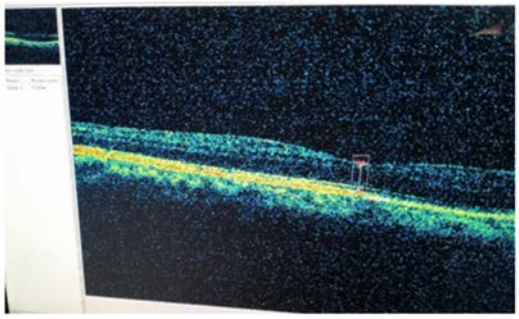

Fig. 1: Macualr thickness of a patient at 1st visit: 0.202 mm

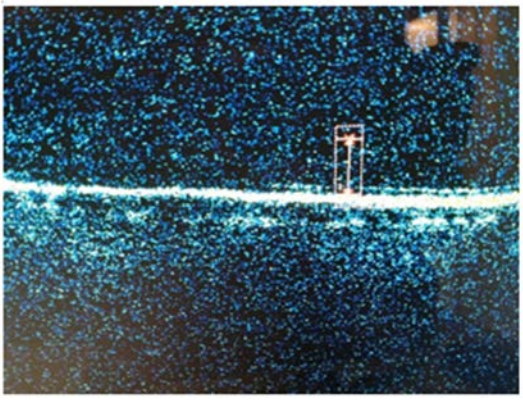

Fig. 2: Macular thickness at one week: 0.220 mm

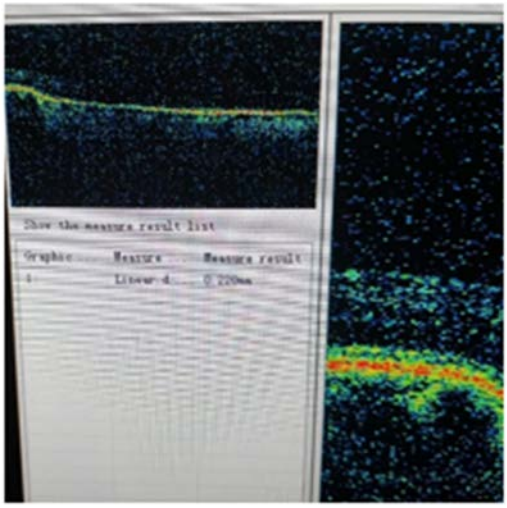

Fig. 3:IOP raised in 47.3% at 1 week and 36.8% at one month

degeneration, old cystoid macular edema and optic atrophy were excluded from the study. Patients age less 30 yrs were excluded from the study.

RESULTS

Total of 34 patients, 38 eyes, mean age was 68.2 years (+/- 5 years) and 4 were male and 30 were female.

Table 1: Visual acuity

Visual acuity	1st visit	2nd visit	3rd visit
6/6		14	20
6/9	6	10	10
6/12	4	8	2
6/18	10	4	4
6/24	4	2	2
6/36	6		
6/60	8		

Table 2: Duration of development of PCO post cataract surgery

Duration since cataract surgery	No. of patients developed PCO
<6 m	2
6 m-1 year	6
2 year	6
3 year	6
4 year	6
5 year	-
6 year	10
7 year	2

Table 3: Macular thickness

Macular thickness (mm)	1st visit	2nd visit	3rd visit
0.150-0.175	6	2	
0.176-0.200	8	12	12
0.201-0.225	6	6	6
0.226-0.250	18	18	20

Table 4: IOP fluctuations

IOP (mmHg)	1st visit	2nd visit	3rd visit
10-12	12	6	8
13-15	12	12	12
16-18	12	16	16
19-21	2	2	2

Nd Yag posterior capsulotomy in PCO patients have significant improvement in their visual acuity both at one week and one month post procedure (Table 1).

Mean duration of development of PCO in our study 3.5 years post cataract surgery. Maximum patients in between 5-6 years post cataract surgery (Table 2).

Macular thickness increased in 57.8% of the total eyes from base line at one week and one month post procedure but didn't require any medical intervention (Fig. 1-4 and Table 3).

DISCUSSIONS

The reported incidence of PCO is 20.7% at 2 years and 28.5% at 5 years after cataract surgery[7]. PCO is the most frequent cause of diminished visual acuity after extra-capsular cataract surgery[3]. Nd:YAG laser capsulotomy is the standard treatment of PCO[8].

All our patients underwent capsulotomy with the complaint of DOV. Aron-Rosa *et al.*[9] reported an immediate improvement in visual acuity in 94% of cases treated by capsulotomy. In a review by Weiblinger *et al*.[10] overall visual acuity improved in 83-94% and decreased in 3.5-6% of cases. Most common age group to develop PCO was in between 50-60 years. Average mean period for development of PCO after surgery was 3.5 years but maximum cases in our study was between 5-6 years post cataract surgery.

Nd:YAG capsulotomy can lead to complications like spike in IOP, lens damage, change in refraction,

macular edema, retinal tear and retinal detachment[11]. The most common complication of Nd:YAG laser posterior capsulotomy is increased IOP. In our study there was slight raise in IOP in 47.3% at 1 week and 36.8% at one month. But all the recording were with in normal limits which didn't require any IOP lowering medication during any point of the study.

Ari *et al*.[12] observed significant increase in macular thickness following Nd:YAG capsulotomy and that the increment was higher in patients who received higher energy. Karahan *et al.*[13] found significant increment in central macular thickness after Nd:YAG capsulotomy at 1 week which decreased to preoperative levels at 4 weeks irrespective of the capsulotomy size. Raza[14] reported CME in 3% of 550 patients treated with Nd:YAG laser capsulotomy for pseudophakic and aphakic PCO. Macular thickness increased in 57.8% of the total eyes from base line at one week and one month post procedure but didn't require any medical intervention.

CONCLUSION

BCVA improves significantly after Nd:YAG laser posterior capsulotomy in otherwise healthy pseudophakic eyes with PCO. Increase in IOP and macular thickness is common after Nd:YAG laser capsulotomy, which usually does not require any medical intervention. Mean duration to develop PCO was maximum after 3.5 years of cataract surgery. Mean age as 50-60 years.

REFERENCES

1. Font, R.L. and S. Brownstein, 1974. A light and electron microscopic study of anterior subcapsular cataracts. Am. J. Ophthalmol., 78: 972-984.
2. Holweger, R.R. and B. Marefat, 1997. Intraocular pressure change after neodymium: YAG capsulotomy. J. Cataract. Refrac. Surg., 23: 115-121.
3. MacEwen, C.J. and G.N. Dutton, 1986. Neodymium: YAG laser in the management of posterior capsular opacification complications and current trends. Trans. Ophthalmol. Soc. U.K. (1962)., 105: 337-344.
4. Powell, S.K. and R.J. Olson, 1995. Incidence of retinal detachment after cataract surgery and neodymium: YAG laser capsulotomy. J. Cataract. Refrac. Surg., 21: 132-135.
5. Kruger, A.J., J. Schauersberger, C. Abela, G. Schild and M. Amon, 2000. Two year results: Sharp versus rounded optic edges on silicone lenses. J. Cataract. Refrac. Surg., 26: 566-570.
6. Murrill, C.A., D.L. Stanfield and M.D.V. Brocklin, 1995. Capsulotomy. Optom. Clin., 4: 69-83.
7. Nakazawa, M. and K. Ohtsuki, 1983. Apparent accommodation in pseudophakic eyes after implantation of posterior chamber intraocular lenses. Am. J. Ophthalmol., 96: 435-438.
8. Pandey, S.K. D.J. Apple, L. Werner, A.J. Maloof and E.J. Milverton, 2004. Posterior capsule opacification: A review of the aetiopathogenesis, experimental and clinical studies and factors for prevention. Indian. J. Ophthalmol., 52: 99-112.
9. Aron-Rosa, D.S., J.J. Aron and H.C. Cohn, 1984. Use of a pulsed picosecond ND: YAG laser in 6, 664 cases. Am. Intra. Ocular. Implant. Soc. J., 10: 35-39.
10. Weiblinger, R.P., 1986. Review of the clinical literature on the use of the ND:YAG laser for posterior capsulotomy. J. Cataract. Refrac. Surg., 12: 162-170.
11. Steinert, R.F., C.A. Puliafito, S.R. Kumar, S.D. Dudak and S. Patel, 1991. Cystoid macular edema, retinal detachment, and glaucoma after ND: YAG laser posterior capsulotomy. Am. J. Ophthalmol., 112: 373-380.
12. Ari, S., A.K. Cingü, A. Sahin, Y. Çinar and I. Çaça, 2012. The effects of ND: YAG laser posterior capsulotomy on macular thickness, intraocular pressure, and visual acuity. Ophthalmic. Surg. Lasers. Imaging. Retina., 43: 395-400.
13. Karahan, E., I. Tuncer and M.O. Zengin, 2014. The effect of ND: YAG laser posterior capsulotomy size on refraction, intraocular pressure, and macular thickness. J. Ophthalmol., 2014: 1-5.
14. Raza, A., 2007. Complications after ND: YAG posterior capsulotomy. J. Rawalpindi. Med. Coll., 11: 27-29.