



STUDY OF VISUAL OUTCOME AFTER NEODYMIUM YTTRIUM ALUMINUM GARNET LASER THERAPY FOR POSTERIOR CAPSULAR OPACITY

Dr. Abha Gahlot	Dept. of Ophthalmology, School of Medical Sciences & Research, Sharda University
Dr. Divya Singh	Dept. of Ophthalmology, School of Medical Sciences & Research, Sharda University
Dr. Holmes Naorem	Dept. of Ophthalmology, School of Medical Sciences & Research, Sharda University
Dr. Arpit Gupta	Dept. of Ophthalmology, School of Medical Sciences & Research, Sharda University

ABSTRACT **Background:** Posterior capsular opacification (PCO) is the commonest late post-operative complication of cataract surgery which is effectively treated with posterior capsulotomy by Neodymium yttrium aluminum garnet (Nd:YAG) laser therapy. The present study was performed with the objective of evaluating the visual outcome in PCO after Nd:YAG laser therapy. **Methodology:** It was a prospective interventional study conducted on 100 patients attending OPD of the department of Ophthalmology of a tertiary hospital in Greater Noida during the period of October 2021 to January 2023. All the patient diagnosed with PCO following cataract surgery with PCIOL implantation above the age of 40 years were included and Nd:YAG laser capsulotomy was performed. **Results:** The study comprised of 100 patients, 42 males, and 58 females, with female to male ratio of 1.4:1 (female preponderance). The best corrected visual acuity (BCVA) post capsulotomy was 6/18 to 6/6 in 92% of the patients. 6% of patients presented with complications & were treated medically. **Conclusion:** Nd-YAG capsulotomy is a non-invasive, effective, relatively safe and economical procedure for the management of posterior capsular opacity.

KEYWORDS : Posterior Capsular Opacification; Nd-YAG; Capsulotomy; Cataract.

INTRODUCTION

Posterior capsular opacification (PCO) is the most frequently occurring late postoperative complication associated with decreased vision following small incision cataract surgery. The incidence of development of PCO is around 25 to 50%, usually occurring between 2 months to 5 years following the initial surgery. PCO in paediatric age group is a major problem where the incidence approaches to almost 100%.^(1,2)

PCO usually develops over years and leads to a slow and gradual decrease in visual acuity. As soon as the center of the posterior capsule (around the visual axis) is affected visual acuity can be significantly impaired, however, there is no effective method to prevent it. PCO can be prevented by primary or treated by secondary posterior capsulotomy, but these procedures carry a lot of disadvantages with them. While Nd:YAG (Neodymium yttrium aluminum garnet) laser posterior capsulotomy presents the advantages of a non-invasive, effective, relatively safe technique and hence is currently the procedure of choice for the management of PCO.

PCO is effectively treated by Nd:YAG laser posterior capsulotomy. Nd:YAG laser provides the advantage of cutting the lens capsule, capsular membrane, strands, and adhesions without surgical intervention, thereby avoiding and minimizing infection, wound leaks, and other complications of intraocular surgery. Thus, Nd:YAG laser capsulotomy is a non-invasive, effective, and relatively safe technique.⁽³⁾

The present study was done with the objective of determining the visual outcome after Nd:YAG laser therapy in posterior capsular opacity, and also to observe any complication following Nd:YAG laser capsulotomy.

MATERIAL & METHOD

Study Period: 15 months

Study Area: School of Medical Sciences and Research, Greater Noida, U.P

Study Design: Prospective interventional study

Sample Size: 100

Source of Data: Patients attending the OPD of Dept. Of Ophthalmology, SMS&R Greater Noida, Uttar Pradesh.

Method Of Collection Of Data

Study was performed on 100 eyes of patients attending the OPD of Sharda Hospital, who came with chief complains of post-operative diminution of vision or glare and clinically diagnosed to have PCO and had undergone cataract surgery in Sharda Hospital or elsewhere.

Inclusion Criteria

All patients above the age of 40 years and diagnosed clinically with PCO following cataract surgery with PCIOL implantation.

Exclusion Criteria

- Patients presenting with any other media opacity like corneal opacity
- Retinal disease accounting for visual loss
- Patients who are unable to fixate adequately for the procedure
- Patients who could not come for follow up
- Un-cooperative and unwilling patients

All patients underwent a detailed eye examination, after proper informed written consent.

After proper evaluation 0.8% Tropicamide and 5% Phenylephrine eye drop were instilled into the lower fornix 30 minutes and 10 minutes before the procedure to achieve mydriasis. A drop of 0.2% Brimonidine one hour prior and a drop 0.5% Proparacaine eye drop just before the procedure was instilled in the cul-de-sac of the lower conjunctival fornix.

Using 1 to 2mJ per pulse from Q switched Nd:YAG laser a sufficient opening in the posterior capsule was made, minimal energy of 1mJ was used with increment of 0.5mJ; in calcitrant condition upto 4.5 mJ was used. Capsulotomy was preferably started in an existing area of separation between posterior capsule and IOL, further areas of separation was achieved by placing the shots in a cruciate pattern starting from 12 'o'clock and progressing towards 6 'o' clock in a clockwise direction. Residual posterior capsular flaps if noted in the pupillary area were directly fired with laser shots to cut them so that they retract and fall back towards the periphery. Post procedure, patient was given 1% Prednisolone eye drops for control of inflammation and 0.2% Brimonidine eye drops for control of increase in IOP. Detailed evaluation was done at follow-up visits at 1 week, 1 month and 3 months.

STATISTICAL ANALYSIS

All the data was collected in Microsoft excel sheet and data was analysed using the SPSS v21 operating on Windows 10. All the demographic details were presented as frequency and percentage tables, bar charts and pie charts. The continuous variables were expressed as mean, standard deviations in table. The comparison of the discontinuous variables was compared using chi-square distribution. The p-value of <0.05 was considered statistically significant.

RESULTS

The study comprised of 100 patients, 42 were males and 58 females, with female to male ratio of 1.4:1 (female preponderance). Most of the patients (58%) were in the age-group of 51-60 years and most

developed PCO 31-42 months and 19-30 months period after cataract surgery, 38% & 32% respectively. The laterality of the affected eye was found to be 52% with left eye and 48% with the right eye. The majority of the PCO in the study were Elchnig's pearls (78%) while the remaining were of fibrous type. Prior to the Nd:YAG laser, best corrected visual acuity (BCVA) of the patients were less than 6/60, 6/60 to 6/24 and 6/18 in 36%, 58% and 6% patients respectively (table 1). Following Nd:YAG laser capsulotomy, the BCVA was improved to 6/6 to 6/18 in 92% and 6/24 to 6/60 in 8% of the patients, with none having worse than 6/60 vision (table 1). Majority of the patients (96%) had no complications and only a few (4%) had complications like lens pitting, raised IOP and iritis, which were all managed efficiently (table 2).

Table 1: Best corrected visual acuity (BCVA) before & after Nd:YAG capsulotomy

Best corrected visual acuity (BCVA)	Before Nd:YAG capsulotomy		After Nd:YAG capsulotomy	
	Frequency	Percentage	Frequency	Percentage
Less than 6/60	36	36	0	0
6/60 to 6/24	58	58	8	8
6/18 to 6/6	6	6	92	92

Table 2: Complications of Nd:YAG laser capsulotomy

Complications	Frequency	Percentage (%)
NIL	94	94
Corneal burn	0	0
IOP pitting	2	2
Iritis	1	1
Raised IOP	3	3
Cystoid macular edema	0	0
Retinal detachment	0	0
Endophthalmitis	0	0

DISCUSSION

Ram J et al.,⁽¹⁴⁾ in their study of YAG capsulotomy in patients ranging from 41 to 85 years of age reported a mean duration of around 30 months for the development of PCO with significant visual impairment while Dangel et al.,⁽⁴⁾ reported an average opacification period after cataract extraction to be 27 months. The results of our study coincides with the analysis carried out by Ram J et al.⁽¹⁴⁾ with a mean duration of around 30 months.

The most common type of posterior capsular opacification was Elschning's pearls type (78%) with rest being fibrous PCO (22%). Similar findings were recorded by various other authors.^(14,28,29)

A significant improvement in the visual acuity of the patient post capsulotomy was observed in our study. These findings are in concordance with previous studies conducted to assess the visual outcome in patients who underwent Nd:YAG laser capsulotomy (table 3)

Table 3: Comparison of the visual outcome after Nd:YAG laser capsulotomy

	Less than 6/60	6/60 to 6/24	6/18 to 6/6
Our study	0	8	92
Mohan Ialgupta et al., ⁽⁵³⁾	3	35	62
Hussain et al.,	4	16	80
Jain S et al., ⁽⁵⁴⁾	7	61	30
Srinivas et al., ⁽⁵⁵⁾	0	8	92
Vyas VJ et al., ⁽⁴⁴⁾	4	18	78

In our study 6 (6%) patients showed complications. Out of these 6 patients, 3 patients had increased IOP, 2 patients showed IOL pitting and 1 patient had Iritis after Nd:YAG laser capsulotomy.

Rise in intraocular pressure was most probably due to presence of cells in anterior chamber blocking the trabecular meshwork. Various studies conducted earlier have also reported rise in IOP after Nd:YAG capsulotomy.^(8,10,11) Ajit K et al.,⁽¹⁹⁾ (2013) found raised intraocular pressure in 10% of cases treated with Nd:YAG laser. Shaikh A et al.,⁽²⁰⁾ (2010) found that laser was associated with rise in IOP in 34% cases. While Hussain MM et al.⁽²¹⁾ in their study found laser application was associated with rise in IOP in 1.6% cases. In our study only 3% cases had rise in IOP, a lower incidence as compared to studies conducted by Ajit K et al.,⁽¹⁹⁾ (2013) i.e 10% and Shaikh A et al.,⁽²⁰⁾ (2010) but higher as compared to study conducted by Hussain MM et al.,⁽²¹⁾ i.e 1.6% cases.

In present study, 1% case developed Iritis after Nd:YAG laser

capsulotomy manifested due to presence of cells and flare in anterior chamber on slit lamp examination. A study conducted by Ajit et al.,⁽¹⁹⁾ found Iritis in 2.2% cases while study conducted by Gore VS et al.,⁽²²⁾ (2012) concluded that Nd:YAG laser capsulotomy was associated with Iritis in 33.5% cases. The present study showed slightly lower incidence with 1% of Iritis than study conducted by Ajit et al.,⁽¹⁴⁾ (2.2%) and Gore VS et al.,⁽²²⁾ (33.3%) respectively.

In present study, intraocular lens pitting was seen in 2 (2%) cases, this was seen in case of thick PCO with more number of shots. However, there was no decrease or disturbance in visual acuity of any patients due to it. Ajit et al.⁽¹⁴⁾ (2013) noted IOL pitting in 4.5% cases and Khanzada MA et al.,⁽²³⁾ (2008) found IOP pitting in 5.4% cases. Our study shows slightly lower incidence of IOL pitting (2%) as compared to other studies.

Complications were managed accordingly within one week. IOP returned to normal level after using addition of 0.5% Timolol eye drops twice a day for one week. Iritis was managed using 1% Prednisolone and 2% Homatropine eye drop for one week.

In the present study, no patients developed retinal detachment. Two mechanisms proposed for producing RD include inadvertently produced peripheral retinal tear and retinal traction caused by vitreous displacement. A retinal detachment can occur early, or more than a year later, after laser capsulotomy.⁽⁸⁾

Posterior capsulotomy with ND YAG laser provides many advantages over primary or secondary capsulotomy surgery. Opacification of the posterior capsule is the most common late complication after cataract surgery worldwide and can be safely handled by ND YAG laser posterior capsulotomy as an outdoor procedure to boost the visual acuity. With immediate results, it is very economical, convenient, quick and non-invasive OPD procedure.

CONCLUSION

PCO is the commonest late complication after cataract surgery worldwide and it can be managed safely as an outdoor procedure by ND YAG laser posterior capsulotomy improving the visual acuity. It is very economical, convenient, fast and non-invasive OPD procedure with immediate results. The post operative results are highly satisfactory and the complication rate is very low.

Although mostly safe, ND YAG laser capsulotomy carries risks like corneal burn, IOL pitting, anterior Uveitis, IOP spikes, anterior hyaloid membrane rupture, cystoid macular edema, endophthalmitis and retinal detachment. Thorough pre and post laser evaluation on subsequent follow ups and proper technique of ND YAG capsulotomy is highly essential to greatly reduce the chances of complications.

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