

A clinical study on visual outcome and complications following Nd:YAG laser capsulotomy in patients with posterior capsular opacification

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Abstract

Background: Posterior Capsular Opacification is a common complication following cataract surgery. This study was conducted with the aim to assess efficacy and safety of Nd:YAG laser capsulotomy for treatment of PCO. **Methods:** This hospital based prospective study was conducted in Ophthalmology department from January 2014 to January 2019 in 265 patients having PCO. **Results:** Patients showed good improvement in visual acuity after undergoing Nd: YAG laser capsulotomy. Complications associated with the procedure were minimal and transient. **Conclusion:** Nd:YAG laser capsulotomy was found to be an effective and safe treatment modality for management of posterior capsular opacification.

Key Words: Intraocular pressure, Nd: YAG laser, Posterior Capsular Opacification, Visual Acuity

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INTRODUCTION

Posterior Capsular Opacification is the most common delayed complication of cataract surgery. The incidence of PCO was reported to be 20.7% at 2 years and 28.5% at 5 years after cataract surgery¹. Since the use of Nd: YAG laser for posterior capsulotomy, the procedure has been gradually replacing the surgical capsulotomy as it is less invasive and can be performed as an outpatient procedure. Nd: YAG laser capsulotomy showed itself to be an effective alternative to surgical dissection avoiding

complications such as endophthalmitis and vitreous loss. The basic principle of Nd: YAG LASER is photo-disruption. The neodymium: yttrium-aluminium-garnet (Nd: YAG) laser is a solid-state laser with a wavelength of 1064 nm that can disrupt ocular tissues by achieving optical breakdown with a short, high-power pulse. Optical breakdown results in ionization, or plasma formation, in the ocular tissue. This plasma formation then causes acoustic and shock waves that disrupt tissue. Fankhauser performed first YAG laser capsulotomy². The procedure caught on quickly because the alternative was surgical dissection of the posterior capsule, which is a more inherently invasive procedure. This study was conducted with the aim to study visual outcome after Nd: YAG laser capsulotomy and to study the intra and post – procedure complications of Nd: YAG laser capsulotomy.

MATERIALS AND METHODS

This hospital based prospective study was conducted in Department of Ophthalmology, Mamata General Hospital, Khammam, during the period of January 2014

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to January 2019. The study included a total of 265 eyes of 265 patients who fulfilled the inclusion criteria. Once diagnosed to have posterior capsular opacification, patients were subjected to a detailed clinical examination. All patients underwent Nd:YAG laser capsulotomy.

Inclusion Criteria:

- 1) Evidence of PCO
- 2) Age above 35 years

Exclusion Criteria:

- 1) Patients presenting with any other media opacity like corneal opacity.
- 2) Retinal disease accounting for visual loss.

- 3) Patients who are unable to fixate adequately for the procedure.

PCO grading was done according to Madurai Intraocular lens Study³. All patients with grade 2 and grade 3 PCO were subjected to Nd:YAG laser posterior capsulotomy.

Post Laser Follow-up:

Intraocular pressure was recorded every 1 hour, 4 hours, 24 hours, 1 week, 1 month, 3 months and 6 months. Patients were given following treatment: Topical Timolol maleate 0.5% twice a day for 1 week. Topical antibiotic and steroid eyedrops QID for 1 week. Oral Acetazolamide 250mg BD for 3 days only if IOP is not controlled with above medication.

OBSERVATIONS AND RESULTS

Table 1: Age Distribution: Maximum patients were in the age group of 51- 60 years

Age	No. of Patients	Percentage
31-40	14	5.28%
41-50	52	19.62%
51-60	84	31.69%
61-70	72	27.16%
71-80	43	16.22%
Total	265	100%

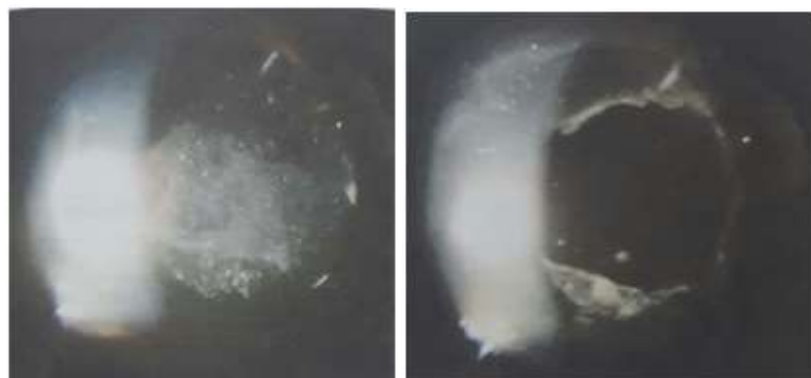
Sex Distribution: Out of 265 patients in this study group, 137 were males and 128 were females

Table 2; Duration between Cataract Surgery and Nd:YAG laser capsulotomy

Time Interval	No. of Patients	Percentage
6months- 1 year	53	20%
>1year- 3 years	166	62.64%
>3years-5 years	42	15.4%8
>5years	4	1.50%
Total	265	100%

Table 3: Types of PCO

Type Of PCO	No. of patients	Percentage
Elschnig's Pearls	53	20%
Fibrous Type	124	46.79%
Mixture of Elschnig's pearls and fibrous type	88	33.20%
Total	265	100%



Grade 2: Fibrous Type PCO Post Nd:YAG laser capsulotomy

Table 4: Number of Shots Required

No. of shots	No. of Patients	Percentage
0-10	0	0%
11-20	10	3.77%
21-30	95	35.84%
31-40	99	37.35%
41-50	53	20%
51-60	8	3.01%
Total	265	100%

Table 5: Laser energy per pulse

Energy per pulse in mJ	No. of patients	Percentage
1-1.5	109	41.13%
1.6-2	124	46.79%
>2	32	12.07%
Total	265	100%

Table 6: Total Energy

Total Energy in mJ	No. of Patients	Percentage
<30	35	13.20%
30-60	108	40.75%
61-90	88	33.20%
91-120	31	11.69%
121-150	2	0.75%
>150	1	0.37%
Total	265	100%

Table 7: Grading of Pre- procedure and post- procedure BCVA

Grading of BCVA	Pre- Procedure		Post- Procedure	
	No. of Patients	Percentage	No. of Patients	Percentage
Good 6/6-6/18	38	14.33%	228	86.03%
Borderline <6/18-6/60	155	58.49%	37	13.96%
Poor <6/60	72	27.16%	0	0%
Total	265	100%	265	100%

Table 8: Improvement in Visual Acuity

Improvement	No. of Patients	Percentage
No improvement	0	0%
1 Line	6	2.26%
2 Lines	16	6.03%
3 Lines	36	13.58%
>3 Lines	207	78.11%
Total	265	100%

Table 9: Complications following Nd: YAG laser capsulotomy

Complications	No. of Patients	Percentage
IOL pitting	12	4.52%
Raised IOP	2	0.75%
Iritis	6	2.26%
CME	0	0%
RD	0	0%
Hyphaema	0	0%
Total	20	7.54%

DISCUSSION

Posterior capsular opacity is one of the major complications of cataract surgery. The use of Nd:YAG laser which is entirely non-invasive procedure has simplified the treatment of PCO. Nicula *et al*⁴ found in their study that capsular fibrosis was the most common type of PCO that was present in 86% cases. In present study, fibrous type of PCO was the most common type seen in 124 (46.79%) cases, closely followed by mixture of Elschnig's pearls and fibrous type in 88 (33.20%) cases while Elschnig's pearls type of PCO was seen in 53 (20%) cases. The laser energy used for capsulotomy depends directly to density of posterior capsular opacification. In the present study, total amount of laser energy required varied from 22mJ to 154mJ. Most of the patients received total energy of 30-60 mJ. The total energy used by Wajeeha *et al*⁵ was in the range of 6.6-163.2mJ. The total amount of laser energy used was comparatively more in patient with moderate and thick fibrous type of PCO, which is in accordance with the previous studies. Result of various studies shows that YAG laser capsulotomy is one of the best method of treatment of posterior capsule opacification. Though it had its associated complication and risk but in comparison to visual outcome, complication rates are very less. Keates R.H. *et al*⁶ reported improvement in visual acuity in 87.2 % cases, with 82.9 % achieving a visual acuity of 6/12 or better and cumulative complication in the laser treated population were very low (CME 2.3%, Secondary glaucoma 3.6%, retinal detachment 0.4%, overall rate 4.8%). Similarly, the present study also shows good improvement in visual acuity with 91.69% cases showing improvement of 3 lines or more on Snellen's chart. Complications were seen in only 20 (7.54%) cases, with 2 (0.75%) patients having transient rise of IOP, 12 (4.52%) cases having IOL pitting and 6 (2.26%) cases having iritis. Various studies have examined the relationship between Nd:YAG laser posterior capsulotomy and development of retinal detachment. In a study by Rosa *et al*⁷, showed an incidence retinal detachment in post laser patients as 0.08%. In the present study there was no case of retinal detachment. The development of cystoid macular edema after Nd:YAG laser posterior capsulotomy has been demonstrated in many studies. The incidence of cystoid macular edema according to Winslow *et al*⁸, was 0.55% and they attributed this occurrence to vitreous instability secondary to hyaluronic acid and prostaglandin diffusion through the compromised posterior capsule. Jampol hypothesized that UV-A light may generate free radicals, facilitating prostaglandin production and including

inflammation and ultimately cystoid macular edema⁹. In the present study, no patient had CME. Post Nd:YAG laser capsulotomy, IOL pitting was noted among 19.8% cases in Hassan *et al* study¹⁰ and 11.7% in Haris *et al* study¹¹. In the present study, IOL pitting was seen in 12 (4.52%) cases. Gore *et al*¹² reported that 33.5% of patients had iritis after Nd:YAG laser capsulotomy. In the present study, iritis was seen in 6 (2.26%) cases. Other rare complications like corneal stromal scarring, macular holes, endophthalmitis did not occur among participants in this study.

CONCLUSION

The present study depicts the Nd:YAG laser capsulotomy as a good, successful treatment of PCO, because it was found to be non-invasive, effective mode of treatment of PCO with lesser complications and it does not require hospitalization.

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