



Original Research Article

Visual outcome following Nd: YAG laser capsulotomy in posterior capsular opacification in pseudophakic adult patients-a prospective observational study in a tertiary care centre

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ABSTRACT

Background: Posterior capsular opacification (PCO) is caused by proliferation of lens epithelial cells which causes fibrotic changes and wrinkling of the posterior capsule following extracapsular cataract extraction (ECCE). It results in decreased vision, glare, and other symptoms mimicking that of original cataract. PCO is treated by a non-invasive procedure, laser capsulotomy i.e. Neodymium yttrium aluminium garnet laser (Nd: YAG). Objective: To find out the visual outcome and complications following Nd:YAG laser capsulotomy.

Materials and Methods: The prospective observational study was conducted in the Department of Ophthalmology, Calcutta National Medical College, Kolkata during March 2014 to August 2015. 60 eyes of 60 consecutive pseudophakic adult patients (age > 40 years) with posterior capsular opacity, who fulfilled the inclusion and exclusion criteria were selected in the study.

Results: The study had female preponderance (58.3%). Most of the patients (42%) were 61-70 years old. Most of the patients had visual acuity of 6/18 prelaser capsulotomy and 6/9 post laser capsulotomy. 73.37% pre laser capsulotomy patients had visual acuity (VA) of 6/36 or better .91.6% post laser capsulotomy patients had VA of 6/18 or better. The mean pre and post laser capsulotomy visual functional score were 54.45 ± 36.44 and 94.16 ± 50.36 respectively.

Conclusion: Nd: YAG laser capsulotomy is safe, effective and a rewarding non-invasive procedure for visual improvement in PCO patients.

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1. Introduction

Cataract is the most common cause of curable blindness worldwide. Prevalence of blindness due to senile cataract is high in rural and urban Indian population.¹ Posterior capsular opacity (PCO) develops following cataract surgery between 2 months and 5 years after extracapsular cataract extraction with posterior chamber intra ocular lens implant. The prevalence of PCO was reported to be 8.3 – 33.7%.²

PCO is characterized by proliferation, transformation and migration of the germinative zone of cuboidal epithelial

cells of lens which form plaque on the non-epithelial posterior capsule.^{3,4} It results in decreased vision, glare, and other symptoms mimicking that of original cataract. It is treated by a non-invasive procedure, laser capsulotomy i.e. Neodymium- yttrium aluminium garnet laser (Nd: YAG). It causes reduction in visual acuity (VA) and contrast sensitivity by obstructing the view or by scattering the light that is perceived by patients as glare.⁵⁻⁷

PCO causes the deterioration of visual acuity, however, there is no absolutely effective methods to prevent it. Nd: YAG laser therapy presents the advantage of a non-invasive, effective, relatively safe technique to manage intact posterior capsule that opacify post operatively.

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Moreover, it does not require patient hospitalization. Various published articles on PCO estimate, a postoperative PCO incidence of 11.8% at 1 year, 20.7% at 3 years and 28.5% at 5 years. It is also a major problem in paediatric cataract where the incidence approaches 100% between two months and 5 year after the initial surgery.^{8,9} The actual gain in visual function and the quality of life following ND:YAG laser posterior capsulotomy in pseudophakic patients with PCO can be assessed in terms of improvement in visual function index.^{10,11}

2. Materials and Methods

The prospective observational study was conducted to evaluate the patients in the OPD, department of Ophthalmology, Calcutta National Medical College, Kolkata during March 2014 to August 2015 (one and half years). The patients were counselled and informed regarding the nature and outcomes of the study. Meticulous history taking and ocular examination were done to evaluate the severity of PCO, visual acuity and contrast sensitivity. 60 eyes of 60 adult patients (age >40 years) who were examined in the OPD, Department of Ophthalmology, Calcutta National Medical College, Kolkata, were included in this study. The patients were included depending upon the inclusion and exclusion criteria. The patients who were willing to participate, age >40 years, pseudo-phakic with posterior chamber intra ocular lens (IOL) implantation were included and who had PCO associated with ocular diseases and complications like retinal degenerations, glaucoma, Complicated and traumatic cataract and patient with significant media opacities e.g corneal opacity etc. were excluded.

Examination of each patient was done on presentation and best corrected visual acuity was recorded using Snellen's chart for distance and standard near vision chart. Intraocular pressure was measured by Goldman Applanation tonometer. Slit lamp examination was done to evaluate the anterior chamber and the nature as well as the density of the PCO. Patients who needed were prescribed glasses to give best corrected visual acuity in the better eye and were advised to wear the prescribed glass constantly. After 2 weeks, the patients were asked to attend the OPD when they were questioned about their performances in daily life activities, coarse and fine, as per the VF-14 index – quality of life (QOL) Questionnaire. Visual function indexing and scoring were done. The patients were then subjected to ND:YAG posterior capsulotomy in the affected eye. A minimum period of 4 months interval following cataract surgery was taken for ND:YAG posterior capsulotomy. The patients were followed up at 1st week, 3rd week, 3rd month and 6th month after capsulotomy to evaluate visual outcome or presence any complication. During these follow up visits, thorough examination was done with the help of Slit Lamp Biomicroscope and

Direct or Indirect Ophthalmoscope for anterior and posterior segment.

After three weeks, the patients were again subjected to VF-14 QOL Questionnaire. The questionnaire form was filled in accordingly and VF-14 indexing was done. VF-14 QOL Questionnaire consists of 14 questions relating to daily life activities including finer actions such as sewing to coarse actions like noticing traffic signal. For each activity, 4 points are allotted if the patient can perform the activity with ease, 3 points if the activity can be done with a little difficulty, 2 points allotted if the patient can do the activity with moderate difficulty, 1 point allotted if the patient can do the activity with great difficulty and zero point allotted if the patient cannot perform the activity at all.

2.1. Statistical analysis

Data recorded in predefined data sheet and statistical analysis was done by using Excel software package, window 7 home basic. The statistical analysis was done with percentage, proportion and paired-t test. The statistical significant was considered if p value <0.05.

3. Results

Most of the patients (42%) were between 61 to 70 years. (Table 1) The study had female preponderance (58.3%). (Table 2) Most of the patients had pre laser visual acuity of 6/18 and that of 6/9 after laser capsulotomy. 73.37% of the pre laser capsulotomy patients had visual acuity (VA) of 6/36 or better. 91.67% of post laser capsulotomy patients had VA of 6/18 or better. (Table 3). The post laser capsulotomy patients had improvement of visual acuity which was statistically significant ($p < 0.0001$). Two lines improvement of visual acuity in Snellen's chart was found in most of the patient (26.7%) after capsulotomy (Table 4).

The mean pre and post capsulotomy visual function score were 54.45 ± 36.44 and 94.16 ± 50.36 respectively. The difference of visual function score following post laser capsulotomy was statistically significant ($p < 0.001$). Gain in post capsulotomy visual function score was statistically highly significant. ($p < 0.0001$) There were some apparent differences in the age and gender wise results, but those differences were not statistically significant. The amount of gain was rather dependent upon the pre capsulotomy visual function status. Less satisfactory VF score was obtained in some cases where there was evidence of associated ocular diseases in posterior segment like temporal pallor of the disc, age related macular degeneration, Choroidal sclerosis, healed cystoid macular oedema and old chorioretinitis. There were very few cases of complications such as lens pitting, raised intraocular pressure and cystoid macular oedema noticed following laser capsulotomy (Table 5).

Table 1: Age wise distribution of patients

Age group	No of patient (n= 60)
41-50 years	14 (22%)
51- 60 years	16 (29%)
61-70 years	21(42%)
71- 80 years	08 (02%)

Table 2: Sex wise distribution of patients

Gender	No of patients (n=60)
Male	25(41.7%)
Female	35(58.3%)

Table 3: Comparison of BCVA between pre and post capsulotomy patients (After 3rd weeks follow up)

BCVA	Pre-capsulotomy n= 60	Post capsulotomy n= 60	P value
FC	2 (3.33%)	0	
6/60	14(23.3%)	0	
6/36	11(18%)	0	
6/24	13(21.66)	5(8.33)	<0.0001
6/18	15(25%)	3(5%)	
6/12	4(6.66%)	5(8.33%)	
6/9	1(1.66%)	25(41.66%)	
6/6	0	22(36.66%)	

Table 4: BCVA improvement after Nd: YAG capsulotomy in Snellen's line

BCVA improvement (Snellen's chart)	No of patients n= 60	P value
1 line	5 (12%)	
2 lines	16 (26.7%)	
3 lines	11(18.3%)	
4 lines	11 (18.3%)	<0,0001
5 lines	13 (21.7%)	
6 lines	2 (3.3%)	
7 lines	2 (3.3%)	

Table 5: Post capsulotomy complications after 3rd week follow up

Complications	No of patients (%)
Lens Pitting	1(1.67%)
Raised IOP	2 (3.34%)
Vitritis	1(1.67%)
CME	1(1.67%)
Corneal burn	0
Retinal detachment	1(1.67%)
IOL drop	0

Table 6: Distribution of comorbid ocular diseases

Comorbid ocular disease	Number of patients (n=60)
Optic atrophy	2 (03.33%)
Age related macular degeneration	3 (5%)
Cystoid macular edema	1(01.66%)
Choroidal Sclerosis	3 (5%)
Old chorioretinitis	1(01.66%)

4. Discussion

The non-invasive technique of Nd: YAG capsulotomy has become most popular for doing posterior capsulotomy and it has been established as a standard treatment for PCO replacing surgical capsulotomy.¹²⁻¹⁵ The study done by Hasan et al.¹⁶ and Tayyab et al.¹⁷ showed that it had male preponderance but our study had female preponderance. Polak M, Zarnowski, Zogorski Z¹⁸ had included 25 and 26 eyes respectively and visual outcome was 89% and 95% respectively and in our present study it was 91.67%.

The assessment of visual functions including visual acuity by various sophisticated devices, the ultimate gain by visual function following laser posterior capsulotomy can be judged by assessment of ability in daily life activities of an individual by health-related Quality Of Life (QOL) questionnaire method.^{19,20}

VF 14 QOL questionnaire was developed and used to assess the visual outcome following cataract surgery at Flinders Medical Centre, Adelaide, South Australia since 2005. VF 14 QOL questionnaire reflects the changes in self-reported satisfaction with vision. It was later adopted in the studies relating the assessment of visual function and health related QOL following ND: YAG Laser posterior capsulotomy in pseudophakic patients.²¹

In the present study the VF 14 QOL questionnaire was used but in a modified way to fit the socio-economic profile of the present set of patients. The questions related to outdoor games and driving were excluded from the questionnaire as per suggestion of Friedman et al. In the present study there was considerable improvement of BCVA, both for distance and near following posterior capsulotomy. BCVA for distance improved by 1-7 with a mean of 4 Snellen acuity lines. This result is more encouraging than that found in the study done by Terry et al.²² where the improvement was 1-2 Snellen acuity lines. The improvement of near vision was upto N 12 –N6. This finding corroborates with the results in the other previous studies.²³

As for the visual function indexing, the observation from the present study was quite satisfactory. The overall visual function score showed 76-100%, 51-75%, 26-50% and 3-25% improvement in 5 (10%) patients, 16 (27%) patients, 20 (33%) patients and 19 (32%) patients respectively. This result was quite comparable with the previous study reported by de Juan-Marcos et al in 2012.¹¹

Gain in post capsulotomy visual function score was statistically highly significant. There was some apparent difference in the result age and gender wise, but that difference was not statistically significant. The amount of gain was rather dependent upon the precapsulotomy visual function status. Less satisfactory VF score was obtained in some cases where there was evidence of pre-existing posterior segment pathologies like temporal pallor of the disc; age related macular degeneration, Choroidal sclerosis,

healed cystoid macular oedema and old chorioretinitis.

Complications with Nd: YAG laser capsulotomy is very minimal and transient which can be managed on outpatient basis in regular follow-up. Steinert, R.F., Puliafito, C. A. et al.²⁴ in 1991 studied 897 patients who underwent Nd: YAG laser capsulotomy. After laser therapy, 11 patients (1.23%) developed cystoid macular oedema (CME), 8 patients (0.89%) developed retinal detachment (RD) and 7 patients (0.78%) developed glaucoma. In the present study, the complications following post laser capsulotomy was extremely less. Out of 60 eyes studied, 1 patient (1.67%) had pitted lens, 2 patients (3.34%) developed glaucoma, 1 patient (1.67%) developed CME and 1 patient (1.67%) developed RD.

5. Conclusion

The posterior capsule opacification, which is a common delayed complication after cataract surgery worldwide, that can be managed safely, effectively, noninvasively as an outdoor procedure by Nd: YAG laser capsulotomy with remarkable improvement in visual outcome.

6. Ethical Approval from Authors

All the co-authors have seen and approved the final version of the manuscript and it is not currently under active consideration for publication elsewhere, has not been accepted for publication, nor has it been published/ reported earlier, in full or in part. All the authors have been personally and actively involved in substantive work leading to the report, and will hold themselves jointly and individually responsible for its content.

7. Source of Funding

None.

8. Conflict of Interest

None.

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