Original Article

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A Clinical Profile of PCO & Outcome Following Yag Capsulotomy in Hospital Patients

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Abstract

Background and Objective: To study the clinical profile of posterior capsular opacification (PCO) and outcome following Nd:YAG Laser capsulotomy. *Methods:* A total of 100 eyes presenting with PCO to Ophthalmology OPD, KBNIMS Kalaburagi who fulfils inclusion and exclusion criteria were taken for the study for the period from November 2015 to December 2016 as a time bound study. Nd: YAG Laser capsulotomy was done. The postoperative follow up was done 1hr, 4hr, 24hr, 1wk, 4wk, 6wk, after laser and observed for any complications. *Results:* Among the 100 cases 43 were males and 57 were females. Majority of cases have pearls (80%) type of PCO. After the procedure 86% of patient got vision between 6/9 to 6/6 while 14% of patients had vision between 6/60 to 6/12. Complications like intraocular pressure spikes (10%), aqueous flare and floaters (4%), IOL pitting (3%), cystoid macular edema (1%) were seen. *Interpretations & Conclusion:* Nd: YAG Laser capsulotomy is a safe and effective method to treat PCO.

Keywords: Posterior Capsular Opacification; Nd: Yag Laser Capsulotomy.

Introduction

Cataract is defined as opacification of the crystalline lens or its capsule of the eye that impairs vision. It is by National Survey, out of 1% prevalent blindness; cataract formed the major cause of about 62.6%. It was also reported to be 50-80% responsible for of the bilateral blindness in India [1]. Reduction in the prevalence of blindness from 1.1% (2001-02) to 1% (2006-07)was observed in a Rapid Survey on Avoidable Blindness conducted under NPCB during 2006-07) Cataract extraction is the most common surgical procedure. With advancement of this procedure worldwide from 'couching the lens' to the ICCE, ECCE (Conventional SICS and phacoemulsification), noticeable decrease by 25% in the blindness amongst Indians has been reported by WHO [1,2]. The visual results reported to be are quite promising and fortunately with rare incidents of post-operative complications like, endophthalmitis and suprachoroidal haemorrhage.Only 1 amongst 1000 patients were reported to be affected many series [2,3]. With preservation of posterior capsule of lens allows placement of PCIOL and prolapse of vitreous into AC is also prevented. The risk of several complications, including vitreous loss and subsequent vitreous detachment and cystoid macular edema is also reduced [3].

Clinically significant reduction in visual acuity, impaired contrast sensitivity, glare disability and monocular diplopia occurs due to the left out posterior capsule opacification forming a dark cloud in, known as Posterior capsule opacification (PCO) [3]. Unfortunately, it is the most commonly occurring delayed complication of ECCE and phacoemulsification, occurring in about 50% patients, that necessitates a posterior capsulotomy with Neodymium: Yttrium-Aluminum Garnet (Nd:YAG) LASER. However, this complications are reduced by noticeable difference of 20.7% from 28.5% at 5 years after cataract surgery with more advancement in surgical skills, procedure and appropriate IOL designs [3.4].

Nd: YAG LASER is a pulsed instrument which can be used to photodisrupt the opacified posterior

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capsule. Nd: YAG LASER posterior capsulotomy is a rapid, safe, easy to perform, relatively less invasive, painless procedure, than surgical capsulotomy which may be associated with higher incidence of complications.

Even though laser capsulotomy is easy to perform, it carries risks. In addition to intraocular lens pitting, cystoid macular oedema and transient elevation of intraocular pressure, disruption of the anterior vitreous face and increased incidence of retinal detachment are some of the complications associated [4,5,6].

The present study was being carried out at Khaja Bandanawaz Teaching and General Hospital, during the period from November 2015 to December 2016. Patients treated with Nd:YAG LASER capsulotomy were followed up over a period of 6 weeks.

Objectives:

1. To study the clinical profile of posterior capsular opacification
2. To study the visual outcome of Nd:YAG LASER Capsulotomy
3. To study the intraocular pressure changes following Nd:YAG LASER Capsulotomy
4. To observe other complications following Nd:YAG LASER Capsulotomy

Materials and Method

The present study was hospital based Prospective, observational study conducted amongst 100 eyes of 100 patients after considering the following inclusion and exclusion criteria. All patients having confirmed PCO on slit lamp examination with vision <6/9 and after the interval of atleast 3months of surgery coming to KBNT & GH were included. Results were subjected to appropriate Statistical test like 't' Test or Chi Square to test the significance.

However patients with compromised general medical health, post-operative complications like corneal scars, irregularities or edema interfering vision, Posterior capsular opacification associated with active intraocular inflammation, Posterior capsular opacification associated with cystoid macular edema and/or other complications that are likely to reduce the visual acuity. An uncooperative patient who is unable to remain still or hold fixation during the procedure with inadvertent damage to adjacent intraocular structures, increased intraocular pressure, Diabetic retinopathy or any other retinal disease, High Myopia, Eyes with decentred or displaced intraocular lens, pregnant ladies or any other contraindications for Nd:YAG LASER were excluded.

Preoperative preparation

Afterexamination, of anterior segment of eye by Slit lamp biomicroscopy, all the patients were classified and graded according to Sellman & Lindstrom [7] recording, pearls and fibrosis separately as follows:

1. Grade 0- non visible at all.
2. Grade 1- Visible but none reaching to IOL edge.
3. Grade 2- At IOL edge.
4. Grade 3- Well inside IOL edge but visual axis clear.
5. Grade 4- Across visual axis.

Posterior segment was examined by direct and indirect method using ophthalmoscopy.

All patients coming with diminished vision due to posterior capsular opacification following cataract surgery will be analyzed as follows:

a). A detailed clinical history will be taken which shall include date of cataract surgery, interval between cataract surgery and onset of defective vision, history of Examination of posterior segment of eye by ophthalmoscopy (direct and indirect).

b). Measurement of pre procedure intraocular pressure by Applanation tonometry.

c). Size and location of pupil.

d). Pupillary dilatation.

e). Details of Nd:YAG LASER capsulotomy regarding the energy and number of shots given.

Procedure:

1. Nd: YAG LASER capsulotomy. After adequate topical anesthesia, patient was made to sit at the YAG laser set up with chin rested against the chin rest, Peyman or Abraham contact lens was used to stabilize the eye. Peyman or Abraham contact lens was used to improve the laser beam optics, and facilitate accurate focusing. The Abraham contact lens increases the convergence angle to 24 from 16 decreases the area of laser at the posterior capsule to 14 µm from 21 µm, and increases the beam diameter at both the cornea and the retina. The Abraham

contact lens must be used with care because it is a modified posterior pole lens, if the Nd: YAG laser is not sent through the lens button, but rather the peripheral "carrier" portion of the lens, the Nd: YAG laser may be focused on the retina and cause damage [8].

The minimal amount of energy necessary to obtain breakdown and rupture the capsule is desired. In most cases capsule can be opened by using 1-2 mJ/pulse.

The capsule was examined for wrinkles that indicate tension lines. Shots placed across tension lines results in the largest opening per pulse because the tension causes the initial opening to widen.

In the cruciate pattern, the first spot was placed superiorly and peripherally at 12 O' clock position and extended towards 6 O' clock. Then to complete the cross, shots were extended from the center to 3 O' clock and 9 O' clock. Laser spots unavoidably hit the IOL because of the close apposition of capsule and lens. Some ophthalmologists recommends a Christmas tree approach, in this the first spot starts at 12 O' clock and is swept down to words 4:30 and 7:30; this will avoid the risk of central lens damage [7].

Postoperative:

1. Topical NSAIDs and topical steroids to be given.
2. Anti glaucoma drugs, Tab Acetazolamide 250 mg BD was advised when needed.
3. Intraocular pressure measurement with Applanation Tonometer - 1st and 4th hourly after capsulotomy.
4. Visual acuity and IOP measurement after 24 hours.
5. Follow up of patients on 1st day, 1st week, 4th week and 6th week.
6. During the follow up patients were examined for complications like hyphema, aqueous flare, IOL pitting, IOL crack, iritis, raise in IOP, vitritis, RD, CME, iris bleed and reopacity.

Results and Discussion

Descriptive and inferential statistical analysis has been carried out in the present study. The results were analyzed by using SPSS version 18. Results on continuous measurements were presented on Mean±SD and results on categorical measurements were presented in Number (%). Significance was assessed at 5% level of significance. Chi-square test was used to find the significance difference of study parameters between the two groups.

During the study period 100 eyes of 100 pseudophakic persons with PCO, who attended OPD, were assessed for PCO and consent was taken. The following observations were made

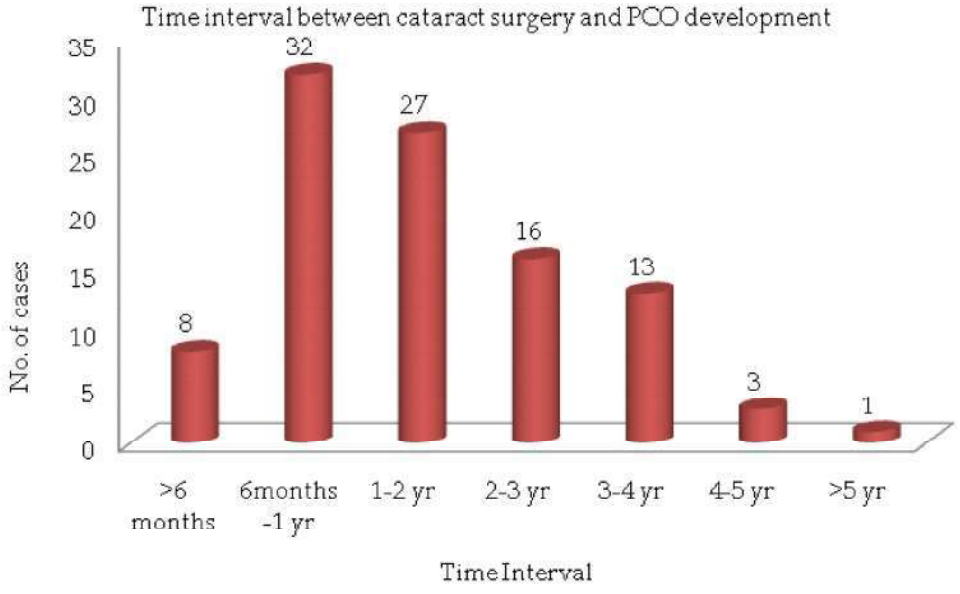

Table 1: Distribution of best corrected visual acuity before YAG Laser

Best corrected visual acuity	No. of eyes	Percentage (%)
PL	1	1
Hand movements	-	-
Counting fingers	2	2
6/60	16	16
6/36	32	32
6/24	28	28
6/18	21	21
6/12	-	-
6/9	-	-
6/6	-	-
Total	100	100

Table 2: Distribution of best corrected visual acuity after YAG Laser

Visual acuity	No. of cases (n)	Percentage (%)
6/6	59	59
6/6p	12	12
6/9	15	15
6/12	07	07
6/18	04	04
6/24	02	02
6/36	0	0
6/60	01	01
Counting fingers	0	0
Total	100	100

Table 3: Comparison of visual acuity before and after laser

Visual acuity	No. of cases before laser n (%)	No. of cases after laser n (%)	Chi-square value	P value
6/6	0	59(59)	175.00	<0.001
6/6p	0	12(12)		
6/9	0	15(15)		
6/12	0	07(07)		
6/18	21(21)	04(04)		
6/24	28(28)	02(02)		
6/36	32(32)	0		
6/60	16(16)	01(01)		
CF	02(02)	0		
HM	0	0		
PL	01(01)	0		
Total	100	100		
Inference	There is significant difference for the distribution for the cases before and after laser.			

Table 4: Type of PCO

Grades	Pearls	Fibrosis	Mixed	Percentage (%)
Grade 0 - Non visible at all.	-	-	-	-
Grade 1- Visible but none reaching to IOL edge.	-	-	-	-
Grade 2- At IOL edge.	-	-	-	-
Grade 3-Well Inside IOL edge but visual axis clear.	-	-	-	-
Grade 4- Across visual axis.	80	19	1	100

Table 5: Complications

Complications	No. of cases (n)	Percentage (%)
Intraocular pressure spikes	10	55.55
Aqueous Flare and Floaters	04	22.23
IOL pitting	03	16.67
Cystoid macular edema	01	05.55
Total	18	100

Table 6: Intraocular pressure

Intraocular pressure	Prelaser	1st hr	4th hr	24 hr
21-27mmhg	-	-	8	-
27-35mmhg	-	-	2	-

Discussion

Posterior capsular opacification (PCO, Secondary cataract, after cataract) is a one of the most common long term complication following various types of ECCE and IOL implantation.

Nd: YAG laser therapy presents the advantage of a noninvasive, effective, relatively safe technique to manage intact posterior capsule that opacify post operatively.

The present study of 100 eyes, 43 males and 57 females who were of 10n years and aboveunderwent YAG laser capsulotomy as treatment for PCO in department of ophthalmology, KBNIMS, Kalaburagi.

The mean time interval between cataract surgery and PCO development in our study was 6 months to 1 year in 32 patients (32%), 27 (27%) patients developed PCO in 1-2 years, 16 (16%) patients had time interval of 2-3 years and 13 (13%) 3-4 years before development of PCO, 3 (3%) patients developed in 4-5 years, one patient (1%) developed PCO more than 5 years and eight developed PCO on less than 6 months. In our study the time interval between surgery and development of PCO ranged from less than 6 month to more than 5 years. Apple et al reported that the time interval between surgery and PCO development varied widely with the range from 3 months to 4 years after surgery [9].

However, the mean time interval between cataract surgery and Nd: YAG laser posterior capsulotomy was 2.5 years as reported by various authors [10].

In our study the energy level used was ranged from 1 to 3 mJs. While few authors have reported the energy level required ranged from 1.5 to 5 mJs and mean was 3.2 mJs [10] & the laser power settings required is between 1 to 2.5 mJs or if mode is locked then between 3 to5 mJs [11].

Improvement in visual acuity on comparison with other studies the improvement in visual acuity was observed to be almost similar in all the groups except Skolnick et al. and Mirza Shafiq et al., where they had little less in improvement. (i.e. More than 2 or more lines in Snellen's visual acuity chart)

Out of 100 eyes, maximum number of 99 (99%) eyes in our study, showed improvement in the range of 6/24 to 6/6. Four eyes showed improvement of 6/18, two eyes showed BCVA 6/24, seven eyes showed eyes showed BCVA 6/12, fifteen eyes showed improvement of 6/9. Fifty nine eyes showed an improvement of 6/6. After applying chi-square $p<0.001$ was obtained, which is statistically highly significant.

Intraocular pressure fluctuation after Nd: YAG capsulotomy has been well documented in earlier studies. In our study, eight eyes showed fluctuation of IOP in the range of 21-27mm of Hg and two eyes showed fluctuation in IOP in the range of 27-35 mm of Hg during the follow up in 1 hr, 4th hr, 1 week, 1 month and 3 months.

With topical use of 0.5% Timolol eye drops the frequency and magnitude of intraocular pressure rises could be reduced significantly.

	Hossain MI et al [12]	Tariq M Aslam et al [13]	Skolnick et al [14]	Mirza Shafiq et al [15]	Wasserman et Al[16]	Wajeeha Rosool et al [17]	Present Study
No. of cases	500	26	212	500	367	200	100
Improvement in vision	96%	95%	89.7%	92%	87.5%	96%	98%

In a prospective study, complications of laser capsulotomy on 104 eyes subjected to Nd: YAG capsulotomy for the treatment of PCO transient rise in IOP in 46.2% eyes was noted [18]. The changes in IOP in eyes treated with capsulotomy were significantly higher than those in non capsulotomy eyes at each time interval following capsulotomy was reported in a study [19].

The present study showed IOL pitting in 3 (3%) patients. Few authors found prevalence of 7% for IOL Damage during Nd: YAG laser posterior capsulotomy highest in group 3 than in group 1 (4.49%), group 2 (4.1%) and group 4 (1.27%) [20].

The present study showed the signs of iritis in four eyes out of 100 eyes of 100 patients in the follow up of 1 hr and 1 week following Nd: YAG posterior capsulotomy. In a prospective study, complications of laser capsulotomy on 104 eyes subjected to Nd: YAG capsulotomy for the treatment of PCO was studied and iritis was observed in 27.9% eyes [18] while only 1% was observed in similar different study [21].

Complications of Nd: YAG AG laser capsulotomy- on comparing with other studies

This study also showed the effectiveness and minimal complications of Nd: YAG laser posterior capsulotomy in contrast to previous documented studies. Nd: YAG laser is the effective and universally accepted procedure for removal of posterior capsular opacity.

Complications	Hossain MI et Al [12]	Skolnick et al (14)	Wajeeha Rosool et al [17]	Juhas et al (22)	Present study
Transient rise of IOP	4%	6.8%	0.5%	1.4%	10
IOL Pitting	2%	--	16%	40.3%	3
Moderate Iritis	--	0.8%	2%	-	4
CME	--	--	0.5%	--	1
Disruption of anterior hyaloids face	6%	--	1%	3.8%	--
Retinal detachment	--	1.5%	--	--	--

Conclusion

Posterior capsular opacification is the commonest delayed cause of visual impairment in pseudophakic eyes.

Multiple factors have been studied like gender, age, type of PCO, time interval between cataract surgery and PCO development, energy level. Visual improvement after YAG laser was in the range of 6/6 to 6/24. This outcome is also associated with minimum complications such as fluctuation in intraocular pressure, iritis and IOL pitting during the follow up period of the study.

Statistically significant visual outcome in terms of improved visual acuity was noted after Nd: YAG laser capsulotomy. Hence, in conclusion Nd: YAG laser capsulotomy proved to be highly effective in improving visual acuity in eyes with PCO. Nd: YAG laser capsulotomy is easy, non-invasive outpatient procedure, less time consuming and causes less discomfort.

From present study of YAG Laser capsulotomy for posterior capsular opacification in the department of ophthalmology KBNIMS, Kalaburagi, We conclude that improvement in visual acuity is excellent after Nd: YAG laser capsulotomy. It is relatively noninvasive and can be performed as an OPD based procedure.

Although this procedure is safe, it is associated with complications like transient intraocular pressure rise, pitting of the intraocular lenses, mild iritis, which are not vision threatening and they are transient. Therefore this treatment modality is cost effective and safe.

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