

A study to determine visual outcome and complications following ND-YAG laser therapy in posterior capsular opacification

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ABSTRACT

Background : ND-YAG laser posterior capsulotomy is a rapid safe and relatively less invasive and painless procedure, than surgical dissection which may be associated with higher incidence of complications.

Objectives : To determine visual outcome and complications following ND-YAG laser therapy in posterior capsular opacification.

Materials & Methods: It is a study conducted on patients presenting with Posterior capsular opacification (PCO) after cataract surgery who attended ophthalmology outpatient department at Karnataka Institute of Medical Sciences, Hubli during a period from January 2014 to November 2015. Institutional Ethics Committee permission was taken. Detailed history was noted and local examination was carried out. Best corrected visual acuity was noted with the help of Snellen's chart. All patients with grade II and III PCO were subjected to ND-YAG laser capsulotomy.

Results: It was observed that PCO was more common in the age group of 61-70 years. It was observed that pearl type of PCO was more common than fibrous type. Grade II PCO was more common than grade III. Post operatively best corrected visual acuity improved for almost all patients showing the efficacy of the intervention applied. Only 20% of patients developed complications.

Conclusion: Improvement in the visual acuity was excellent after ND-YAG laser capsulotomy. It is relatively non invasive and can be performed as an outpatient department based procedure. Although this procedure is safe, it is associated with complications like transient intra ocular pressure rise, pitting of intra ocular lens, mild iritis, which are not vision threatening and they are transient. Therefore this treatment modality is cost effective and safe.

Keywords: Visual acuity, capsulotomy, non-invasive, effective, safe

INTRODUCTION

Cataract is defined as opacification of the crystalline lens of the eye that impairs vision. It is by far the most common curable cause of low vision and blindness worldwide. In India, cataract forms the major cause of blindness.¹

Cataract extraction is the most frequently performed surgical procedure in patients over 65 years of age. The development of cataract surgery has led the world from the uncertain time of couching the lens to ICCE (intra capsular cataract extraction), ECCE (extra capsular cataract extraction). From around 1.2 million cataract surgeries per year in the decade of 1980, the cataract surgical output increased to 3.9 million per year by 2003. Recent data from World Health Organization (WHO) shows that there is a 25% decline in the blindness prevalence in India.²

The visual results of cataract surgery are at present very good and serious complications such as endophthalmitis and supra-choroidal-hemorrhage are fortunately very rare affecting less than 1 in 1000 patients in many series. In ECCE and phacoemulsification, with preservation of posterior capsule of lens allows placement of posterior chamber intra ocular lens and prevents prolapsed of vitreous into anterior chamber. It also reduces the risk of several complications including vitreous loss and subsequent vitreous detachment and cystoids macular edema. Sometimes, the left out posterior capsule, opacifies by forming a dark cloud; known as posterior capsule opacification (PCO). This can lead to clinically significant reduction in visual acuity, impaired contrast sensitivity, glare disability and monocular diplopia. In fact this is the most commonly occurring complication of ECCE and phacoemulsification occurring in about 50% of patients. PCO is the most common delayed complication of cataract surgery.³ The incidence of PCO was reported to be 20.7% at two years and 28.5% at 5 years after cataract surgery.⁴

This necessitates a posterior capsulotomy with neodymium doped yttrium aluminum garnet (ND-YAG) laser. ND-YAG laser is a pulsed instrument which can be used to photo-disrupt the opacified posterior capsule. ND-YAG laser

posterior capsulotomy is a rapid safe and relatively less invasive and painless procedure, than surgical dissection 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, cystoids macular edema and transient elevation of intra-ocular pressure, disruption of the anterior vitreous face and increased incidence of retinal detachment are some of the complications associated.

Hence present study was conducted to determine visual outcome and complications following ND-YAG laser therapy in posterior capsular opacification.

MATERIALS AND METHODS

It is a study conducted on patients presenting with PCO after cataract surgery who attended ophthalmology outpatient department at Karnataka Institute of Medical Sciences, Hubli during a period from January 2014 to November 2015. Institutional Ethics Committee permission was taken. All patients having PCO with visual acuity less than 6/9 on Snellen's chart after small incision cataract surgery (SICS) or phacoemulsification.

PCO associated with corneal scars, irregularities or edema that interferes with target visualization, PCO associated with active intra-ocular inflammation, PCO associated with cystoids macular edema or other complications that is 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 intra-ocular structures were excluded in the present study.

50 eyes of patients with PCO visiting to Ophthalmology OPD, KIMS, Hubli who fulfill the inclusion and exclusion criteria were included in the study.

Detailed history was noted and local examination was carried out. Best corrected visual acuity was noted with the help of Snellen's chart. All eyes have undergone the slit lamp examination and direct ophthalmoscopy. Based on the findings of slit lamp examination and direct ophthalmoscopy, grading of PCO was done. PCO was graded into grade 0, grade I, grade II and grade III as per the protocol followed in Madurai Intraocular lens study IV.⁵

Pre operative baseline intra ocular pressure was taken by applanation-tonometer, and was recorded at least one hour before the procedure.

All patients with grade II and III PCO were subjected to ND-YAG laser capsulotomy. The procedure to be done and complications associated with it were explained to all patients and informed consent was taken. All eyes were dilated with tropicamide 1% eye drops one hour prior to laser therapy and topical 4% xylocaine was instilled to each eye under study. All the capsulotomies were done using NIDEK YC-1600 ophthalmic YAG laser system.

Since ND-YAG laser beam is an invisible infrared ray (wavelength 1064 nm); the red semiconductor laser (wavelength 633) is used as aiming beam for YAG laser. The laser system was so designed that aiming beam becomes coaxial with YAG laser beam and target for alignment is where the 2 alignment spots converge into one spot (dual beam focusing system). All capsulotomies were done as per the standard procedure.

Post operatively, 0.5% timolol eye drops were administered topically to minimize intraocular pressure spikes. All the eyes were examined at 1, and 4 hour. Intra ocular pressure was taken by applanation-tonometer. Patient was prescribed 0.1% nepafenac eye drops QID tapered over one week. Best corrected visual acuity was noted with the help of Snellen's chart. Patients were followed till 6 months for occurrence of any complications.

Data was recorded and analyzed using proportions.

RESULTS

Table 1 shows age and sex wise distribution of study subjects. It was observed that PCO was more common in the age group of 61-70 years. The youngest patient was 14 years old female patient and the eldest was a 85 year old male patient.

Table 1: Age and sex wise distribution of study subjects

Age Group (Yrs)	Male	Female	Total
< 30	02	01	03 (6%)
31-40	00	00	00
41-50	03	03	06 (12%)
51-60	06	06	12 (24%)
61-70	11	11	22 (44%)
71-80	02	03	05 (10%)
> 80	02	00	02 (04%)
Total	26	24	50 (100%)

It was observed that pearl type of PCO was more common than fibrous type. Grade II PCO was more common than grade III [Table 2].

Table 2: Distribution of study subjects as per the type and grade

		Number of eyes	Percentage
Type	Fibrous	11	22
	Pearl	39	78
Grade	I	00	00

	II	38	76
	III	12	24

The preoperative best corrected visual acuity in most of the patients was worse than 6/24. Post operatively best corrected visual acuity improved for almost all patients showing the efficacy of the intervention applied [Table 3].

Table 3: Distribution of best corrected visual acuity

Visual acuity	Per operative		Post operative	
	Number	Percentage	Number	Percentage
Hand movements	01	02	00	00
Counting fingers	15	30	00	00
6/60	08	16	03	06
6/36	08	16	02	04

6/24	09	18	03	06
6/18	07	14	01	02
6/12	02	04	12	24
6/9	00	00	16	32
6/6	00	00	13	26
Total	50	100	50	100

Only one case showed high intraocular pressure who was a known case of glaucoma and the post operative spike of intraocular pressure was controlled by anti-glaucoma medication [Table 4].

Table 4: Distribution of pre and post operative spike of intraocular pressure

intraocular pressure	Per operative		After 1 Hour		After 4 Hours		After 24 Hours	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
< 12	04	08	04	08	02	04	06	12
12-16	36	72	38	76	41	82	38	76
16-20	10	20	07	14	06	12	05	10
20-22	00	00	01	02	00	00	01	02
> 22	00	00	00	00	01	02	00	00
Total	50	100	50	100	50	100	50	100

The patients were followed for a period of 6 months. Out of 50 eyes treated, only one patient had acute rise of IOP as he was known case of glaucoma and with anti-glaucoma medication, his pressure returned to base line over a period of one month. 8 eyes developed IOL pitting. This was not visually significant and did not produce any glare or image distortion. They were left alone without any further treatment. One patient developed iritis, which was treated with topical steroids and cyclopegics, iritis resolved subsequently [Table 5].

Table 5: Distribution of study subjects as per the complications

Complications	Number	Percentage
IOL pitting	08	16
Rise of IOP	01	02

Iritis	01	02
No complications	40	80
Total	50	100

DISCUSSION

Posterior capsular opacification (PCO) is one of the most common long term complications following various types of ECCE and IOL implantation. ND-YAG laser therapy presents the advantage of a non-invasive, effective, relatively safe technique to manage intact posterior capsule that opacify post operatively.

In the present study of 50 eyes comprising of 27 males and 23 females underwent ND-YAG. The youngest patient was

14 years old female and the oldest was 85 years old male. Laterality wise 52 eyes were right sided and 48 were left sided.

In the present study, the pulse energy used for capsulotomy was ranging from 1.8 mJ to 8.2 mJ. Most of the laser procedures were done using energy between 2.0 to 2.4 mJ. The total energy (i.e. power x no. of pulses) used was ranging from 32.4 mJ to 140.8 mJ, most of the procedures were done using total energy between 61-90 mJ as compared to Wajeehja Rasool et al⁶ in whose study, the average pulse energy used for capsulotomy was 2 mJ+0.77 ranging from 1.1 to 4.8 mJ, the mean total energy used was 54.5+26 ranging from 6.6 to 163.2 mJ, and the results were almost similar.

In the present study, improvement of vision was seen in 98% of the study participants. Similar findings were also reported by other studies but slightly lesser than that reported in the present study. Hossain MI et al⁷ in their study observed that 96% of the patients had improvement in the vision after intervention. Tariq M et al⁸ reported that 95% of patients had improvement in the vision. Though they studied only 26 patients, they used the Bailey Lovie distance 10logMAR visual acuity for measurement instead of Snellen's chart and they considered both glare and contrast sensitivity in their study. Wajeeha R et al⁶ found that after their intervention, 96% of patients had better vision. Skolnick et al⁹ observed improvement of vision among their study subjects to a lower side of about 89.7%. Mirza S et al¹⁰ who studied 500 eyes, reported the vision improvement among 92% of patients.

There was no significant difference in intra ocular pressure before and after ND-YAG laser capsulotomy in the present study. This was due to the use of timolol 0.5% eye drops prophylactically to blunt the transient intra ocular pressure rise usually observed after ND-YAG laser capsulotomy. Only one patient had significant rise of intra ocular pressure but he was a known case of glaucoma and was managed appropriately. With topical use of 0.5% timolol eye drops, the frequency and magnitude of intra ocular pressure rise can be reduced significantly.

In the present study, the common complications observed after ND-YAG laser capsulotomy, were damage to intra ocular lens in the form of pitting, transient rise of intra ocular pressure.

The risk of damage of intra ocular lens in the present study was significantly high compared to the study of Hossain MI et al⁷ but comparable to that of Wajeeha Rasool et al.⁶ The incidence of transient rise of intra ocular pressure was almost similar to that reported by Wajeeha Rasool et al⁶ but Hossain MI et al⁷ reported slightly higher incidence of transient rise of intra ocular pressure.

CONCLUSION

Improvement in the visual acuity was excellent after ND-YAG laser capsulotomy. It is relatively non invasive and can be performed as an outpatient department based procedure. Although this procedure is safe, it is associated with complications like transient intra ocular pressure rise, pitting of intra ocular lens, mild iritis, which are not vision threatening and they are transient. Therefore this treatment modality is cost effective and safe.

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