Original Research Article

Visual outcome after ND: YA Glaser posterior capsulotomy in pseudophakic patient

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Abstract

Background: Posterior capsular opacification (PCO) also called as "after cataract" is a common complication following extra capsular cataract surgery with or without posterior chamber intraocular lens implantation.An opaque membrane develops as retained cells proliferate and migrate on the posterior capsular surface. **Material and Methods:** The study included a total of 100 eyes of 100 patients who were diagnosed to have posterior capsular opacification and were fulfilling all the inclusion and none of the exclusion criteria. After that they were taken for a detailed clinical examination. All patients underwent Nd: YAG laser capsulotomy and were followed up at 1 week, 1 month and at 3 months. At every follow-up detailed examination was done. BCVA and any complications were noted. **Results**: Of the 100 patients, 45 (45%) were male and 55 (55%) were female. Majority of the patients were in the age group 61-70 years. The average time interval between cataract surgery and Nd-YAG laser capsulotomy was between 2-4 years. In the type of PCO seen, 84 (84.0%) patients were having Elsching pearls type of PCO, 8 (8.0%) patients were having fibrous type of PCO and 8 (8.0%) patients were having Sommering ring type of PCO. The pre laser visual acuityin more than 62% of eyes was 6/60 to FC while 38% had visual acuity of 6/36 to 6/18. Visual acuity of 6/18 or better was achieved in 27% of eyes while 73% recovered to 6/12 to 6/6. None of these eyes showed further deterioration in visual acuity. The highest energy requirement was in the Fibrous PCO s0.89 ± 0.15 J, followed by Sommering Ring PCO 0.70 ± 0.17 J and least energy was in Elsching pearls 0.47 ± 0.24 J. The comparison of mean energy between the type of PCO was found to be statistically significant (P<0.05), showing that the mean energy was varying between the types of PCO. **Conclusion:** Neodymium-YAG capsulotomy for PCO is rewarding procedure inadults and has good visual outcome.

Keywords: Posterior capsular opacification, Nd-YAG, Visual outcome

Introduction

Cataract is the main cause of avoidable blindness [1]. Despite some recent advances in the field of cataract potential drug treatments, surgery is still acknowledged to be the most effective treatment option [2]. Despite the meticulous surgery and removal of the cataractous lens, the lens epithelial cell stillposes a threat to the long-term outcome of the surgery. Postoperative opacification of initially clear posterior capsules occurs frequently in patients after the surgery. Time for opacification is highly variable varying from months to years in adults. The most convenient way of the removal of the posterior capsule opacification is toclearing the visual axis by creating a central opening in the opacified posterior capsule using Nd – YAG laser [3]. It is a solid-state laser with a wave length of 1064 nm that can disrupt ocular tissues by achieving optical breakdown with a short, high-power pulseresulting in ionization, or plasma formation that causes acoustic and shock waves that disrupt tissue.

Contraindications to laser capsulotomy can be divided into absolute and relative. Corneal scars, irregularities, or edema that interfere with target visualization or make optical breakdown unpredictable and inadequate stability of the eye are absolute contraindications while

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glass intraocular lens, known or suspected cystoid macular edema, active intraocular inflammation, high risk for retinal detachment are relative contraindications.

Purpose

Primary: To study the visual outcome post capsulotomy after the cataract surgery
Secondary: To assess the energy required in ND: YAG for different types of the PCO

Material and Methods

Consent from ethical committee for the study was taken. The procedures followed were in accordance with the ethical standards committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 2000. The present study was a cross sectional study and included 100 patients attending outpatient Department of Ophthalmology from January 2017 to January 2018 and willing to provide their voluntary written informed consent. Consent from each patient was taken before the procedure.

Pre laser work up: Each patient was thoroughly evaluated with the help of slit lamp. Best corrected visual acuity (BCVA) was noted along with IOP. Both the pupils were dilated using a short acting mydriatic drug (0.8% tropicamide and 5% phenyephrine) and then the patient was made to sit for 30 minutes. After 30 minutes the dilatation of the pupil was assessed along with complete slit lamp examination. On slit lamp the type of PCO was assessedand 5-step photography was done, followed by fundus examination with VOLK 90D orindirect 20D lens.

Procedure: Topical anaestheticwas instilled in the eye tobe lasered. The patient was made to sit on ZEISS ND: YAG laser machine. The Abraham yag capsulotomy lens was fixed on the eye with the help of viscoelastic. The energy of the laser was fixed and then shots were taken and modified according to type of PCO.

Post laser work up and follow up: After the procedure, the patient was made to sit for 10 to 15 minutes. Post Yagprocedure topical beta blocker was instilled into the lasered eye and then the patient was asked to come for follow-up after 1 week.

The patient was sent home with a topical antibiotic drop along with a mild steroid (dexamethasone) to be instilled 4 times a day for 1 week.

Along with this a beta blocker was added to be instilled twice a day for 1 week. At 1 week follow-up the IOP and BCVA of the patient was recorded.

All the data was recorded in a customized proforma designed for the study purpose.

Results

In our study 100 patients were studied which included 55 (55.0%) females and 45 (45.0%) males, showing a female preponderance. There were 7 (7.0%) patients in the age group 30-40 years, 14 (14.0%) patients were in the age group 41-50 years, 31 (31.0%) patients were in the age group 51-60 years, 36 (36.0%) patients were in the age group 61-70, 10 (10.0%) patients were in the age group 71-80 years and 2 (2.0%) patients were in the age group >80 years.Majority of the patients were in the age group 61-70 years(36%).

84 (84.0%) patients were having Elsching pearls type of PCO (Figure 1), 8 (8.0%) patients were having fibrous type of PCO (Figure 2) and 8 (8.0%) patients were having Sommering ring type of PCO (Figure 3). Majority of the patients were having Elsching pearls type of PCO [Figure 4].

The mean age in Elsching pearls was 60.36 ± 11.46 years, in Fibrous it was 60.50 ± 10.66 years and in the Sommering Ring it was 56.75 ± 14.46 years. The comparison was found to be statistically not significant (P>0.05). There was comparable distribution of males and females in relation to type of PCO (P>0.05).

The time interval between cataract surgery and Nd-YAG laser capsulotomy was noted. 25 (25.0%) patients had duration from surgery from 1-2 years, 62 (62.0%) patients had duration from surgery from 2-4 years and 13 (13.0%) patients had duration from surgery of more than 4 years. Most of the patients had duration from surgery between 2-4 years (62%).

In 38 (38.0%) patients the pre-YAG vision was 6/36 to 6/18 and in 62 (62.0%) patients the pre-YAG vision was FC to 6/60. Post YAG, in 73 (73.0%) patients the Post-YAG vision was 6/12 to 6/6 and in 27 (27.0%) patients the Post-YAG Vision was 6/36 to 6/18. Majority of the patients were having Post-YAG Vision of 6/12 to 6/6. [Figure 5].

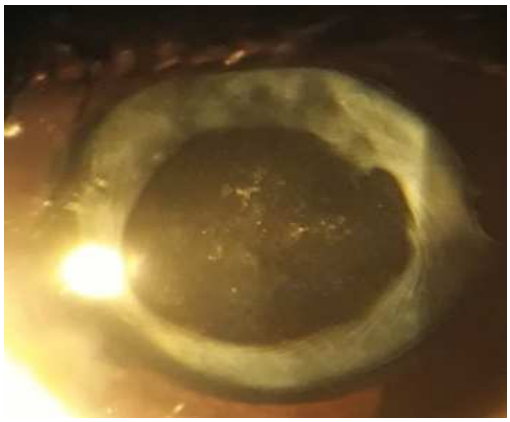

Figure-1: Elsching's pearls

Figure-2: Fibrous type

Figure-3: Sommering ring

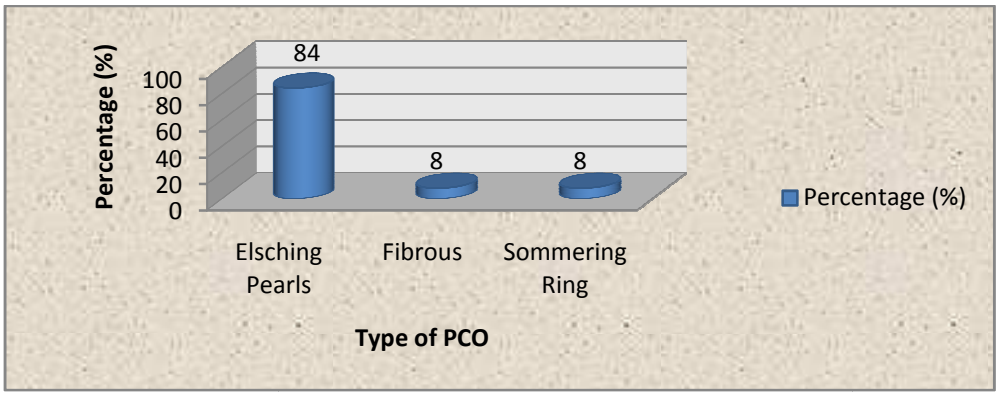

Figure-4: Distribution according to the type of PCO

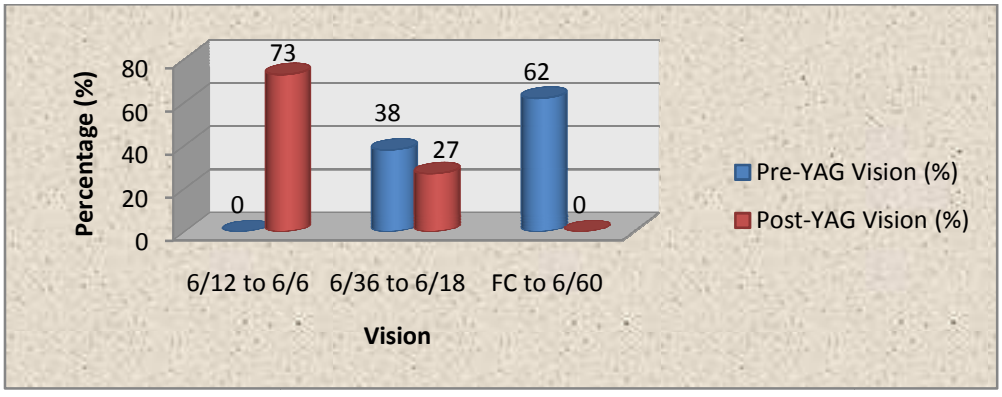

Figure-5: Comparison of pre and post-YAG vision

Table-1: Comparison of mean IOP in before and after YAG treatment in relation to PCO

Type of PCO	IOP	No.	IOP [Mean ± SD]	't' value	P value
Elsching Pearls	Pre YAG IOP	84	16.79 ± 2.03	2.053, df=83	0.043*
	Post YAG IOP	84	16.18 ± 2.43		
Fibrous	Pre YAG IOP	8	16.25 ± 3.28	2.049, df=83	0.080, NS
	Post YAG IOP	8	14.00 ± 1.07		
Sommering Ring	Pre YAG IOP	8	15.00 ± 2.39	-	-
	Post YAG IOP	8	15.00 ± 2.39		
Overall	Pre YAG IOP	100	16.61 ± 2.21	2.587, df=99	0.011*
	Post YAG IOP	100	15.91 ± 2.42		

The comparison of mean IOP before and after YAG treatment in relation to type of PCO was done using paired't' test. The mean Pre YAG IOP in Elsching Pearls was 16.79 ± 2.03 mm Hg, while post YAG IOP was 16.18 ± 2.43 mm Hg. The difference was found to be statistically significant (P<0.05), showing that there is a significant decrease in the Post YAG IOP in comparison to the Pre YAG IOP in the Elsching Pearls. The mean Pre YAG IOP in Fibrous was 16.25 ± 3.28 mm Hg, while post YAG IOP was 14.00 ± 1.07 mm Hg. The difference was found to be statistically not significant (P>0.05), showing a comparable Post YAG IOP in comparison to the Pre YAG IOP.The mean Pre YAG IOP in Sommering Ring was 15.00 ± 2.39 mm Hg, while post YAG IOP was 15.00 ± 2.39 mm Hg. The difference could not be calculated as the difference of the standard deviation of pre and post YAG IOP was found to be zero. The mean overall Pre YAG IOP was 16.61 ± 2.21 mm Hg, while post YAG IOP was 15.91 ± 2.42 mm Hg. The difference was found to be statistically significant (P<0.05), showing that there is a significant decrease in the overall Post YAG IOP in comparison to the overall Pre YAG IOP [Table 1].

Table-2: Comparison of mean energy in relation to type of PCO

Type of PCO	Number	Mean ± SD	F value	P value	Post-hoc Tukey		
					Elsching Pearls – Fibrous	Elsching Pearls – Sommering Ring	Fibrous – Sommering Ring
Elsching Pearls	84	0.47 ± 0.24	14.732	0.000*	0.000*	0.021*	0.242, NS
Fibrous	8	0.89 ± 0.15					
Sommering Ring	8	0.70 ± 0.17					
Total	100						

The mean energy in Elsching pearls was 0.47 ± 0.24 J, in Fibrous it was 0.89 ± 0.15 J and in the Sommering Ring it was 0.70 ± 0.17 J. The highest energy was in the Fibrous PCO. The comparison of mean energy between the type of PCO was found to be statistically significant (P<0.05), showing that the mean energy was varying between the types of PCO. There was significantly lower energy in Elsching Pearls in comparison to the Fibrous and Sommering Ring PCOs (P<0.05), while no statistically significant difference seen between Fibrous and Sommering Ring (P>0.05). [Table 2]

Table-3: Comparison of mean number of YAG shots in relation to type of PCO.

Type of PCO	Number	Mean ± SD	F value	P value	Post-hoc Tukey		
					Elsching Pearls – Fibrous	Elsching Pearls – Sommering Ring	Fibrous – Sommering Ring
Elsching Pearls	84	107.56 ± 17.18	2.923	0.059, NS	0.360, NS	0.094, NS	0.851, NS
Fibrous	8	99.38 ± 9.94					
Sommering Ring	8	95.00 ± 3.46					
Total	100						

The mean number of YAG shots in Elsching pearls was 107.56 ± 17.18, in Fibrous it was 99.38 ± 9.94 and in the Sommering Ring it was 95.00 ± 3.46. The comparison of mean number of YAG shots between the type of PCO was found to be statistically not significant (P>0.05), showing that the mean number of YAG shots was comparable in relation type of PCO. [Table 3]

Discussion

Age and sex- A total of 100 patients were studied who presented with PCO post cataract surgery between the ages of 30 to those over 80 years, with most the patients 36% falling between the ages of 61-70 years. The sex distribution was a 55% female to 45% male ratio with female preponderance.

Opacification post-surgery- The Neodymium- YAG laser has become popular non-invasive technique of creating a posterior capsulotomy to create an opening in the posterior lens. Its safety and efficacy can be argued but it has established its place as a standard treatment for PCO replacing surgical capsulotomy. The time period between cataract extraction and performing Neodymium-YAG laser capsulotomy at average was 2-4 years in our study while it was reported as 2.49 years by Hasan et al [4], and 24 months in another study by Kundi NK et al [5]. Emery, Wilhelmus, and Rosenberg [6] found opacification in 28% of their patients with 2-3 years of follow-up. Late opacification of the posterior capsule after 3-5 years has been reported to be approximately 50%.

Visual Acuity post treatment- According to our findings the Post- YAG Vision in 73.0% patients was 6/12 to 6/6 and in 27.0% patients the Post-YAG Vision was 6/36 to 6/18. Majority of the patients were having Post-YAG Vision of 6/12 to 6/6. In a study by Bilal Bashir et al[4] the post treatment visual acuity was 6/6 in 12 (40%), 6/9 in 9 (30%) patients, 6/12 in 6 (20%) patients and 6/18 in 2 (6.66%) and 6/24 in 1(3.33%) patients. A study conducted by Younas Khan et al[8] showed post-YAG Visual acuity of 6/18 or better was achieved in 60.2% of eyes while 12.0% recovered to 6/9 and 3.4% achieved 6/6.

Types of PCO- In our study, according to type of PCO studied, 84.0% patients had Elsching pearls type of PCO, 8.0% patients were having fibrous type of PCO and 8.0% patients hadSommering ring type of PCO. Hence, majority of the patients were having Elsching pearls type of PCO. However a study by Younas Khan et al [8] showed Capsular fibrosis (62%) was the predominant type of PCO. The relative incidence of different types of PCO showed that the capsular fibrosis was the predominant type of PCO as compared to Hasan, et al [4] who reported Elschnig's pearls in pseudophakic and secondary fibrosis in aphakic eyes.

Complications- Elevated IOP is recognized as the most common, although usually transient, complication following Nd: YAG laser capsulotomy. This is similar to a study done by Gopinath et al [9] where they found increased IOP in 30% patients, but the rise was mostly in the range of 21-27 mm Hg. However in our study we found the mean overall Pre YAG IOP was 16.61 ± 2.21 mm Hg, while post YAG IOP was 15.91 ± 2.42 mm Hg. There is a significant decrease in the overall Post YAG IOP in comparison to the overall Pre YAG IOP.

YAG shots, energy used- Only few cases in required high energy levels, probably this may correlate with the learning curve. Once the surgeon get experienced the energy level required can come down, the other reason may be the fixation of eyes required during the process, if the patient moves the eye, the energy level will be more, as the shots are wasted, hence fixating lens should be used to decrease the level of energy and shots [10]. The mean energy in Elsching pearls was 0.47 ± 0.24 J, in Fibrous it was 0.89 ± 0.15 J and in the Sommering Ring it was 0.70 ± 0.17 J. The highest energy was in the Fibrous PCO. In the comparison of number of YAG shots in relation to type of PCO. The mean number of YAG shots in Elsching pearls was 107.56 ± 17.18, in Fibrous it was 99.38 ± 9.94 and in the Sommering Ring it was 95.00 ± 3.46.

Conclusion

Nd: YAG laser capsulotomy is asafe and effective method to treat PCO. It is non-invasive and avoids all the complications associated with surgical capsulotomy such as endophthalmitis and wound related problems and local anaesthesia such as perforation and haemorrage etc. Majority of the patients were in the age group 61-70 years.

Elsching's pearls were present in maximum patients. Majority of patients had significant improvement in visual acuity with 73% having visual improvement between 6/6 to 6/12. There is a significant decrease in the overall Post YAG IOP in comparison to the overall Pre YAG IOP. Corneal oedema and iritis were seen as post laser complications.

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