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A study of effect on intraocular pressure following Nd-YAG laser capsulotomy in patients with posterior capsular opacification

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Abstract:

Objective: To study the effect of Nd-YAG capsulotomy on intraocular pressure Material and Methods: A total of 100 eyes (87 patients) underwent Nd-YAG laser capsulotomy. Patients who had undergone uncomplicated phacoemulsification cataract surgery with implantation of foldable intraocular lenses were included and patients with associated ocular diseases were excluded. Intraocular pressure was measured with schiotz tonometer at 3hours, 1st day, 7th day, 1 month and 3 months following procedure. Results: In comparison to mean baseline pre Nd:YAG laser value of 16.07(+/-2.4), a rise in the intraocular pressure values after 3 hrs of laser was observed with mean value 18.14(+/-3.4) which showed a high statistical significance (p value =.000). Mean IOP on D1 was 17.18(+/-3.3), and D7 was

16.75(+/-3.02) with (p value.000 and .001) which was again statistically significant. The mean values of IOP at 1 month and 3 month follow up was found to be 16.20 (+/- 2.7) and 16.10(+/- 2.751) respectively, showing no statistical significance. (P value =.534 and.889). Conclusion: As per our study there are definite chances of rise of intraocular pressure especially within few hours following Nd-YAG capsulotomy, so IOP monitoring should be done in all patients undergoing Nd-YAG capsulotomy.

Key words: Nd-YAG-neodenium yettrium almunium garnite, Posterior capsular opacification

Introduction

Posterior capsular opacification (PCO) is the most common late post-operative complication of cataract surgery occurring in up to one-third of patients in a period of five years.[1] PCO is a major problem in pediatric cataract surgery where the incidence approaches 100%.[2] One of the crowning achievements of modern cataract surgery has been a gradual, almost unnoticed decrease in the incidence of this complication due to operative steps like hydrodissection enhanced cortical clean-up, posterior capsular polishing, performance of capsulorrhexis slightly smaller than the diameter of the IOL optic and in-the-bag implantation of IOL.[3] Several IOL related factors have also been studied for prevention of PCO which includes use of a biocompatible IOL to reduce stimulation of cellular proliferation, enhancement of contact between the IOL optic and posterior capsule and use of an IOL with a square, truncated optic edge. The visual symptoms produced by the PCO may mimic those of the primary cataract. Thus, PCO is often referred to as a "secondary cataract." Patients generally notice a slow decline in visual quality after the initial visual

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improvement following cataract surgery. Interval between surgery and PCO varies widely ranging from three months to four years after the surgery. PCO formation is an attempt by the eye to make a new lens from remaining lens material. The two morphologically distinct types of PCO are fibrosis and Elschnig's pearls which occur independently or in combination. In addition ECCE procedures may result in formation of Soemmering's ring. Visual symptoms do not always correlate to the observed amount of PCO. Some patients with significant PCO on slit lamp examination are relatively asymptomatic while others have significant symptoms with mild apparent haze, which is reversed by capsulotomy[4]. The current treatment of choice is Neodymium:Yttrium-Aluminum-Garnet (Nd:YAG) laser capsulotomy. It gives instantaneous results and can easily be administered in an out-patient setting. It is a noninvasive procedure that has completely replaced surgical capsulotomy.With this background our aim was to study the changes in intraocular pressure following Nd:YAG laser capsulotomy.

Methodology

This study was conducted at Northern Railway Central Hospital New Delhi. A prospective study was performed to evaluate the change in visual parameters including visual acuity, contrast sensitivity and intraocular pressure associated with Nd:YAG laser capsulotomy. The study was reviewed by both the ethical and scientific committee of the institute and was granted approval. Target population consisted of patients who visited Ophthalmology department of NRCH, New Delhi, between May 2010 and October 2011, with significant visual impairment due to posterior capsule opacification. A total of 100 eyes (87 patients) were enrolled for the study who underwent Nd:YAG laser capsulotomy. Patients who had

undergone uncomplicated phacoemulsification surgery with implantation of foldable intraocular lenses were included and patients with any other associated ocular disease were excluded in this study. Each patient was evaluated before undergoing laser capsulotomy to confirm that the visual loss was only due to PCO. Intraocular pressure recording was done with schiotz tonometer. Tonometry was performed at 3 hours, 1st day, 7th day, one month and 3months after capsulotomy. Post laser visual acuity and contrast sensitivity was recorded on 1st day, 7th day, 1 month and 3 months of procedure. Analysis of the study data was done with Microsoft Excel XP Windows 2007 (Microsoft, Seattle WA) and SPSS version 13.0 (SPSS inc., Chicago, IL) software. Comparison of difference of means at two point of time were made with a paired t-test. The data was further analyzed using Chi-square test and Wilcoxon signed ranks test. A value of $p < 0.05$ was considered statistically significant.

Results

Change in IOP after Nd:YAG Capsulotomy

In comparison to mean baseline Pre- Nd: YAG laser value of 16.07(+/-2.4), a rise in the intraocular pressure values after 3 hrs of laser was observed with mean value 18.14(+/-3.4) which showed a high statistical significance (p value =.000). Mean IOP on D1 was 17.18(+/-3.3), and D7 was 16.75(+/-3.02) with (p value.000 and .001) which was again statistically significant. The mean values of IOP at 1 month and 3 month follow up was found to be 16.20 (+/- 2.7) and 16.10(+/- 2.751) respectively, showing no statistical significance. (p value =.534 and.889).

Discussion

The study consisted of 100 eyes (87 patients) of whom 61 (61%) were males and 39 (39%) females. The age of patients ranged from 14 to 86 years with a mean of 63.42 years and median of 64.5 years. The incidence is directly linked to the incidence of cataract in this age group. Out of 100 cases in our study, 64% had Elschnig's pearls and 36% had fibrosis type of PCO. Javed EA[5] also found that Elschnig's pearl is the most common type. Saeed MK[6] found that 67% had pearls type and 33% had fibrosis type of PCO. In a study conducted by Dawood Z[7], 56.07% patients presented with Elschnig's pearls, 42.33% had capsular fibrosis and 1.60% had capsular wrinkling.

The time interval between cataract surgery and capsulotomy ranged between 6 months to > 5 years with maximum cases between 1 and 3 years (61%) and 18% within 1 year. Khanzada MA [8] found that the mean time interval between cataract surgery and Nd:YAG laser posterior capsulotomy was 2-5 years. Burq MA [9] found that majority of patients (93.3%) who underwent laser capsulotomy presented within 3 years after cataract surgery. In our study we could not find correlation between age and onset of capsular opacification owing to highest number (65%) of cases in the age groups 50-70 yrs and only 8 % of cases in the age group < 50 years.

Rise in intraocular pressure:

In comparison to mean baseline pre Nd:YAG laser value of 16.07(+/-2.4), a rise in the intraocular pressure values after 3 hrs of laser was observed with mean value 18.14(+/-3.4) which showed a high statistical significance (p value =.000). Mean IOP on D1 was 17.18(+/-3.3), and D7 was 16.75(+/-3.02) with (p value.000 and .001) which was again statistically significant. The mean values of IOP at 1 month and 3 month follow up was

found to be 16.20 (+/- 2.7) and 16.10(+/- 2.751) respectively, showing no statistical significance. (P value =.534 and.889).

About 17% cases in our study had significant rise in IOP (>5mmHg elevation from baseline) after 3hrs of capsulotomy. The contributing factors of rise of IOP could be dilated pupil, uveitis, entrapment of capsular fragments and debris from capsulotomy in the filtration angle. About 13% had >5mmHg elevation from pre-laser values on D1, out of which 8 patients had IOP within normal range. On D7, only 3% cases had >5mmHg elevation from pre-laser IOP. None of the patients had persistently elevated IOP at 1month and 3 months.

In an FDA cohort, the maximum elevation of IOP occurred between 1.5 and 4 hours after laser treatment. Of these eyes, 60% returned to an IOP of less than 22 mmHg by 24 hours with 90% of eyes achieving normalization of IOP by 1 week. Results by Slomovic and Parrish[10] mirrored the FDA's findings. Thus, 64% of eyes developed a maximum IOP rise by the second postoperative hour with 41% of eyes developing an IOP greater than 30 mm Hg. Ge and colleagues[11] evaluated long-term IOP fluctuations in eyes, an elevated IOP measured at 1 hour post procedure was a significant risk factor for chronically increased IOP. Ozkurt YB[12] found that there were no statistically significant differences between intraocular pressure measurements before laser capsulotomy and on the first day, first month and third month after laser. Holweger RR[13] found no significant IOP elevations within 24 hours after the Nd:YAG capsulotomy. All patients received one drop of apraclonidine hydrochloride 0.5% before and after capsulotomy. Shani L[14] in their retrospective study indicated that posterior capsulotomy with the Nd:YAG laser in otherwise healthy, pseudophakic eyes is usually not accompanied by immediate IOP elevation. Dawood Z[7] found temporary increase in intraocular pressure (5 mm Hg or more) in patients post Nd:YAG capsulotomy. Steinert RF[15] in their study observed

new onset of glaucoma in seven patients (0.78%) and five patients (0.56%) with preexisting glaucoma had persistent worsening of their glaucoma. Khanzada MA[8] found that about 4.68% patients developed rise in intraocular pressure (IOP). Saeed MK[6] in their study found that the rise in intraocular pressure was noticed in 6% of patients after Nd:YAG capsulotomy. Zaidi M[16] found that intraocular pressure only changes in patients who are predisposed to high intraocular pressure.

Conclusion

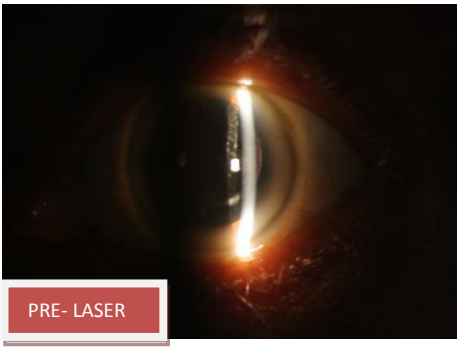
As per our study there is a definite chance of rise of intraocular pressure especially within few hours following Nd-YAG capsulotomy, so IOP monitoring should be done in all patients undergoing Nd-YAG capsulotomy**.**

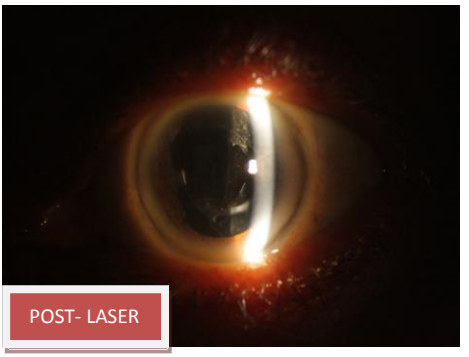
Table 1; Change in IOP(mmHg) after Nd:YAG Capsulotomy

	IOP PRE LASER	IOP 3 HRS	IOP D 1	IOP D 7	IOP 1MONTH	IOP 3MONTHS
No of eyes	100	100	100	100	100	100
Minimum	10	8	9	8	10	9
Maximum	21	25	24	24	23	22
Range	11	17	15	16	13	13
Mean	16.07	18.14	17.18	16.75	16.20	16.10
Std. Deviation	2.438	3.496	3.341	3.020	2.796	2.751
Median	16.00	17.50	17.00	16.00	16.00	16.00
Std. Error of Mean	.244	.350	.334	.302	.280	.275

IOP-intraocular pressure, D-days

Pictures:-





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