CHANGE IN INTRAOCULAR PRESSURE FOLLOWING HIGH ENERGY ND: YAG LASER POSTERIOR CAPSULOTOMY

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ABSTRACT

Objective: To determine the mean rise in intra ocular pressure in patients undergoing high energy Nd: YAG laser posterior capsulotomy.

Study Design: Descriptive case series study.

Place and Duration of study: The study was carried out at CMH Kharian Cantonment in 9 months, from Feb 2014 to Nov 2014.

Patients and Methods: Sixty eyes fulfilling the inclusion criteria were enrolled in the study by a non-probability purposive sampling. The base line IOP was measured with the help of Goldman Applanation Tonometer. The pupils were dilated by using 1% Tropicamide Eye drops, 1 drop repeated after every 10 minute. Proparacaine Hydrochloride Eye drops were used 1-2 times about 5 minutes before applying capsulotomy Lens (ABRAHAM CAPSULOTOMY YAG LENS) for topical Anesthesia.An opening of 3-4 mm was made in the posterior lens capsule, using Nd: YAG laser (VISULAS YAG III Carl Zeis Meditec AG Germany) ensuring use of least possible energy. Cumulative energy used was noted and entered in the study proforma. IOP was again assessed 4 hours after the procedure and entered in the study proforma. Mean rise in IOP was calculated.

Results: Raised IOP was noted in 37 (61.66%) out of total 60 cases and IOP remained unchanged in 20 (33.33%) cases. Mean pre procedure IOP was 15.80 ± 2.979mm of Hg and mean post procedure IOP was 17.78 ± 3.954 mm of Hg and *p*-value using paired t-test was found to be 0.000 which was statistically significant indicating that use of high energy is associated with rise in IOP.

Conclusion: There is significant rise in IOP associated with Nd: YAG laser posterior capsulotomy as evident from the statistical analysis. It is advisable to use minimum possible energy levels and all patients should undergo post procedure IOP check.

Keywords: High energy, Intraocular pressure, Posterior capsular opacification, Nd: YAG laser, Posterior capsulotomy.

INTRODUCTION

Phacoemulsification with posterior chamber intra ocular lens (PC IOL) implantation is a frequently performed surgical procedure for cataract and posterior capsular opacification (PCO) also known as after cataract is a most common late post-surgical complication[1] with PC IOL implantation having an incidence of 20% to 40% five years postoperatively[2] in adults and up to 100% in pediatric patients[3]. Neodymium: Yttrium Aluminum Garnet (Nd:YAG) laser posterior capsulotomy is a quick, relatively easy[4] and most convenient method[5] not requiring hospitalization[6] currently employed for treatment of PCO. However, Nd:YAG laser capsulotomy can cause certain complications, like cystoid macular edema, retinal detachment and elevation of intraocular pressure (IOP) after the procedure, which can be significant and can result in irreversible visual loss[7]. Rise in IOP is thought to be caused by clogging up of the trabecular meshwork by deposition of capsular fragments and debris at the angle[8]. Amount of Nd:YAG energy used for capsulotomies has a significant link with an increase in IOP levels. Higher pressures are associated with higher energy levels of Nd: YAG laser treatment. According to latest research mean rise in IOP is 3.83 ± 1.84 mmHg if low

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energy (<50mJ) is used (minimum 2 mmHg, maximum 8 mmHg); whereas in high energy category (>50mJ), mean rise in IOP is 5.51 ± 1.58 mmHg (minimum 2 mmHg, maximum 8 mmHg), which is statistically significant (*p*-value <0.001)[8]. In routine OPD practice, immediate post-procedural IOP check is not performed. In fact, it is carried out after 02 weeks and effect of total amount of laser energy used on rise in IOP following Nd:YAG capsulotomy is infrequently evaluated quantitatively. Since raised IOP after laser capsulotomy is a known complication[7], so by measuring post procedural IOP routinely can help in delineation of this less stressed but important aspect and aid in its prompt management will prevent irreversible visual loss.

PATIENTS AND METHODS

A descriptive case series study was conducted in the Department of Ophthalmology, Combined Military Hospital Kharian from 20th February 2014 to 25th November 2014. A total of sixty eyes of patients having posterior capsular opacification diagnosed on slip lamp examination were included in the study. The sample size was selected by taking population mean rise in IOP 5.51mmHg, Standard deviation 1.58 mmHg and absolute precision 79%[8]. The samples were selected through non probability purposive sampling. The sample included subjects from both genders between 10-70 years of age with posterior capsular opacification having pre-procedural IOP between 11-20 mmHg. Whereas, any patient having history of systemic Illness, glaucoma/filtration surgery, posterior segment surgery and diabetic retinopathy were excluded from the study. The patients were enrolled after written informed consent. Pre procedure base line IOP was measured with the help of GAT (Goldman Applanation Tonometer). About 1% Tropicamide eye drops were used for dilation of pupil, 1 drop repeated at 10 minutes three times in each eye. Topical anesthesia was provided by Proparacaine Hydrochloride eye drops about 1-2 drop 5 minutes before the procedure. An opening of 3-4 mm was made in the posterior lens capsule, using Nd:YAG laser (VISULAS YAG III Carl Zeis Meditec AG Germany) ensuring use of least possible energy. Cumulative energy used was noted and entered in the study proforma. The energy more than 50 mJ was taken as high energy. FIOP was again assessed 4 hours after the procedure and entered in the study proforma. Mean rise in IOP was calculated. Data was analyzed by SPSS 14.0. Mean and standard deviations were calculated for quantitative variables like age, pre and post procedure IOP and total energy used whereas the qualitative variables like gender was presented as frequencies and percentages. A *p*-value of <0.05 was taken as significant.

RESULTS

Out of 60 cases, 7 (11.66%) were aged less than 40 years and rest 53 (88.33 %) were more than 40 years as shown in table-II. Mean age was 50.00 ± 9.96 SD (minimum was 16 years and maximum was 67 years) as shown in table-I. There were 36 (60%) males and 24 females (40%) in total as shown in table-III. Mean pre procedure IOP was 15.80 ± 2.979 mm of Hg (minimum was 11 mm of Hg and maximum was 21mm of Hg). Mean post procedure IOP was 17.78 ± 3.954 mm of Hg (minimum was 14mm of Hg and maximum was 30mm of Hg) as shown in table-I. Out of total 60 patients raised IOP was noted in 37 (61.66%) cases and IOP remained unchanged in 20 (33.33%) cases. However a reduction in IOP was also noted in 3 (5%) cases. Paired t-test was used to compare pre and post procedural mean IOP keeping the confidence interval 95% and it showed that the *p*-value was 0.00 and by conventional criteria, this difference is considered to be statistically very significant. Post stratifi-cation paired t-test was used to compare pre and post procedure IOP levels in gender and age groups as shown in tables-II.

DISCUSSION

Posterior capsular opacification is a well-known and most frequent late complication following cataract surgery with PC IOL implantation. It has a significant influence on quality of life hindering day to day activities by decreasing

the visual acuity and increasing the glare. Recent advancements in IOL designs and materials along with improved surgical techniques have decreased the incidence of PCO formation but it remains the most frequently occurring complication as yet. IOP elevation following Nd: YAG laser has been reported in many local and international studies and a variable incidence has been reported in them. Burq MA showed that IOP was elevated in 48 out of 104 (46.2%) cases after Nd: YAG laser capsulotomy[9]. Waseem M, Khan HA demon-strated IOP rise in 53 out of 148 (35.81%) cases[8]. Findings of both studies are consistent with each other. Similar patterns were observed in international studies as well. Slomovic and Parrish documented a 55% IOP elevation rate following YAG laser therapy[10]. Flohr published that there is a transient immediate postoperative IOP elevation in over 75% of treated eyes, and one-third had an IOP elevation greater than 10 mmHg over the preoperative IOP, however there was no correlation with total amount of energy delivered according to his study[11]. Our study, which included only the patients under-going Nd: YAG laser capsulotomy with energy levels of more than 50 mJ, showed a significant elevation of IOP (>5mmHg) in 37 out of total 60 (61.66%) cases and IOP remained unchanged in 20 (33.33%) cases. Percentage of IOP elevation was higher as compared to other studies. We found that there can be a positive correlation between IOP elevation and total amount of energy delivered during Nd: YAG laser posterior capsulotomy as has already been reported by Waseem *et al*[8] as the 37 out of 60 patients have increased IOP and the amount of energy used was more than 50 as shown in table-I. A similar positive association between raised IOP and increased laser energy used during Nd: YAG laser capsulotomy was also documented by Channel and Beckman who found that IOP increase during the first 24 hours after treatment was 12.0 ± 6.9 mm Hg in the treated eyes versus 0.7 ± 3.5 mm Hg in the untreated eyes[12]. It is pertinent to mention here that because of lack of medical education and certain social as well as economic reasons, there is a tendency in our population to present late not only for YAG laser capsulotomy but cataract surgery as well. As a result our population tends to have thicker and more resilient posterior capsules. As

Table-I: Descriptive statistics for quantitative variables.

	N	Mean	Std. Deviation	*p*-value
Age (years)	60	50	9.964	
Pre-Procedure IOP (mmHg)	60	15.80	2.979	Paired t-test
Post Procedure IOP (mmHg)	60	17.78	3.954	<0.001
Mean IOP Change (mmHg)	60	2.00	2.240	
Total Energy (mJ)	60	53.640	2.795	

Table-II: Post Stratification *p*-value for Gender and Age groups.

Gender	Pre-procedural IOP (Mean ± SD)	Post-procedural IOP (Mean ± SD)	*p*-value
Males	15.50 ± 2.913	17.92 ± 3.945	<0.001
Females	16.25 ± 3.082	17.58 ± 4.042	<0.003
Age			
<40 years (11.66%)	15.29 ± 2.984	16.71 ± 2.628	<0.006
>40 years (88.33%)	15.87 ± 3.000	17.92 ± 4.094	<0.001

Table-III: Frequencies / percentages of qualitative variables.

	Frequency	Percentage (%)
Males	36	60
Females	24	40
Total	60	100

a result more laser energy is employed to carry out the said procedure that makes us more prone to complications related to Nd: YAG laser posterior capsulotomies, therefore our study points that there can be a positive association between the amount of total energy used and frequency of IOP elevation as the rise in IOP was noted in 37 cases where the cumulative energy used was more than 50mJ as shown in table-I. Mechanism of this IOP elevation is not clearly understood however the release of inflammatory cytokines secondary to high energy shockwaves delivered by laser shots is thought to affect the aqueous dynamics and subsequent rise in IOP levels.

CONCLUSION

To conclude, there is a significant elevation in mean IOP in the immediate post procedure period (4 hours) and there can be a positive association between the amount of total energy delivered during Nd: YAG laser posterior capsulotomy and mean IOP elevation in the immediate post procedure period (4 hrs). It is pertinent that patients must have a post-procedure IOP assessment so that they can be managed accordingly and it becomes even more significant in high risk cases.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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