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VisualoutcomeandcomplicationsfollowingNd:YAGlasercapsulotomyinposteriorcapsularopacification In Pseudophakic Adult Patients- A prospective observational study:

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Abstract:
Background:*Posterior capsular opacity (PCO) develops following cataract surgery between 2 months and 5 years after extracapsular cataract extraction with posterior chamber intra ocular lens implant.The IOL design (oversized IOL with steep posterior vault to prevent PCO) and a smooth anterior capsulorrhexis, which may generate more centripetal force along the margin and thus constrict the opening, may cause IOL displacement. Like the can-opener method, laser posterior capsulotomies create an irregular opening that cannot constrict. Thus, anterior capsule contraction may force the IOL posterior toward the vitreous.In this study, we investigated the effect of Nd:YAG capsulotomy on visual outcome and complications of Nd:YAG laser treatment for posterior capsular opacification in pseudophakiceyes.*
Material and methods:*Current study was a Hospital based prospective observational (follow -up) study, conducted in pseudophakic patients suffering from posterior capsular opacification during the period of study in ophthalmology department of SMS Medical College and Hospital, Jaipur. A total 100 eye from 100 participants were included in the study. Patients aged >40 years with follow-up of more than six months post-Nd:YAG laser capsulotomy were included while active ocular pathology i.e. uveitis, inflammation, glaucoma, retinal pathology, any media opacity and corneal opacities preventing focussing of laser were excluded from the study.Data analysis was done using licensed SPSS software version 21.0 (Chicago, Illinois). A p-value <0.05 was considered as statistically significant.*
Results:*This study revealed that a statistically IOP was increased from 1 hour to 4 hour. IOP at 1 hour was 20.3±3.5 and at 4 hour was 22.5±4.9. Alsoastatistically significant BCVA was increased after the capsulotomy. After capsulotomy, maximum 45% participants had BCVA 6/9 followed by 38% who had 6/12. Most common early complication was found to be IOP rise in 25% patients followed by corneal burn in 20% patients (Figure 1) and most common late complication was found to be iritis in 6% patients followed by CME in 5% patients.*
Conclusion:*Our study concluded that visual outcome after the capsulotomy in PCO patients were significantly improved however complications are concerned.*
Keywords:*Posterior capsular opacity,Nd:YAG Lasercapsulotomy,pseudophakic etc.*

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I. Introduction:

Cataract extraction is the most frequently performed surgical procedure in patientsover65yearsofage.Thedevelopmentofcataractsurgeryhasledtheworldfromtheuncertain time of 'couching the lens' to the ICCE, ECCE (Conventional SICS andphacoemulsification). InECCEandphacoemulsification,withpreservationofposteriorcapsuleoflensallowsplacement of PCIOL and prevents prolapse of vitreous into anterior chamber(AC). It also reduces theriskofseveralcomplications,includingvitreouslossandsubsequentvitreousdetachmentandcystoidmacularoedema.

Sometimes,theleftoutposteriorcapsuleopacifiesbyformingadarkcloudin,knownasPosteriorcapsuleopacification(PCO).[1]

Posterior capsular opacity (PCO) develops following cataract surgery between 2 months and 5 years after extracapsular cataract extraction with posterior chamber intra ocular lens implant. The prevalence of PCO was

reported to be 8.3 – 33.7%.[2]

PCO is characterized by proliferation, transformation and migration of the germinative zone of cuboidal epithelial cells of lens which form plaque on the non-epithelial posterior capsule. It results in decreased vision, glare, and other symptoms mimicking that of original cataract.[3-4]

Thiscanleadtoclinicallysignificantreductioninvisualacuity,impairedcontrastsensitivity,glaredisabilityandmonoculardiplopia.InfactthisisthemostcommonlyoccurringdelayedcomplicationofECCEandphacoemulsification,occurringinabout50%patients,whichnecessitates a posterior capsulotomy with Neodymium:Yttrium-Aluminum Garnet(Nd:YAG) LASER. It is treated by a non-invasive procedure, laser capsulotomy i.e. Neodymium- yttrium aluminium garnet laser (Nd: YAG). It causes reduction in visual acuity (VA) and contrast sensitivity by obstructing the view or by scattering the light that is perceived by patients as glare.[5]

Several studies have found displaced IOLs after laser posterior capsulotomy, suggesting that the complication may be related to capsulotomy size. The IOL design (oversized IOL with steep posterior vault to prevent PCO) and a smooth anterior capsulorrhexis, which may generate more centripetal force along the margin and thus constrict the opening, may cause IOL displacement.[6] Like the can-opener method, laser posterior capsulotomies create an irregular opening that cannot constrict. Thus, anterior capsule contraction may force the IOL posterior toward the vitreous.[7]

In this study, we investigated the effect of Nd:YAG capsulotomy on visual outcome and complications of Nd:YAG laser treatment for posterior capsular opacification in pseudophakic eyes.

II. Material and methods:

Current study was a hospital based prospective observational (follow -up) study, conducted in pseudophakic patients suffering from posterior capsular opacification during the period of study in ophthalmology department of SMS Medical College and Hospital, Jaipur. A total 100 eye from 100 participants were included in the study. Patients aged >40 years with follow-up of more than six months post-Nd:YAG laser capsulotomy were included while active ocular pathology i.e. uveitis, inflammation, glaucoma, retinal pathology, any media opacity and corneal opacities preventing focussing of laser were excluded from the study.

A complete history and detailed examination was done. Fundus examination and visual acuity were measured. Grading of PCO was done as follow-

Grade 0- No evidence of PCO seen before and after pupillary dilatation to a minimum of 6 mm . With a direct ophthalmoscope a clear view of optic disc,blood vessels and nerve fiber layer is obtained

Grade 1- No central PCO seen. PCO seen only with the pupil dilatation to a minimum of 6 mm. With a direct ophthalmoscope a clear view of optic disc,blood vessels and nerve fiber layer is obtained. Few discrete epithelial pearls

Grade 2- PCO is present in the central visual axis,detectable is an undilated pupil. With a direct ophthalmoscope there is a mild obscuration of fundus details,in that the optic nerve head is clearly seen but the RNFL and blood vessels are not clearly visible. Multiple discrete epithelial pearls.

Grade 3- PCO is present in the central visual axis with an undilated pupil. With direct ophthalmoscope there is marked obscuration of fundus details,in that even the margins of the optic nerve head are not clearly defined because of the PCO.Multiple coalescent epithelial pearls.

Procedure:

Timolol 0.5% 1 drop was instilled 1 hour before in the eye which is undergoing laser capsulotomy. Dilatation of the pupil was done with tropicamide 0.8% and phenylephrine 5% drops. All capsulotomies were performed under topical anaesthesia with 0.5% proparacaine.

The patient is introduced to the equipment in a reassuring way. The head was gently placed in front of the laser on chin rest & head strap was applied. Contact lens was applied and areas were noted where the lens capsule was thinnest and were the capsule appeared to be under tension. A thin tense lens capsule is desirable because flap of the capsule will separate when the capsule is photo disrupted. Setting of .8 millijoules of power were delivered in a single pulse mode. The power was increased until this occurred. In a pseudophakic eye with the secondary membrane in close proximity to the posterior surface of the optic ,the laser was defocused. Cruciate openings were made beginning at 12 o" clock periphery and progressing to a 6 o'clock position. Intraocular pressure was recorded every 1 hr, 4 hrs after capsulotomy and the patient is sent home to come for follow up after 1 week, 1 month, 3 month and 6 months. The patient was given the eyedrop Nepafenac thrice daily for 1 week, Timolol0.5%,1 drop twice a day for 1 week, Prednisolone acetate for post capsulotomy qid 1 week, Moxifloxacin qid 1 week and oral acetazolamide 250 mg qid for 5 days only when IOP is not controlled with above medication.

Data analysis was done using licensed SPSS software version 21.0 (Chicago, Illinois). Descriptive statistics were used to calculate frequencies of categorical variables, and measures of central tendencies and dispersion were used to describe continuous variables. Independent t-test was used to compare the continuous

variable and chi-square test was used for categorical variables. A p-value <0.05 was considered as statistically significant. Approval from Institutional Ethical Committee of SMS Medical College &Hospital, Jaipur was taken before the start of the study.

III. Results:

In this study, mean age of study participants was 63.9±9.2 years, maximum 43% were in age of 61-70 years followed by 27% in age of 51-60 years, 58% were female and 42% were male participants. 52% were operated of right eye PCO andmaximum 55% were belong to PCO grade II followed by 37 % belongs to grade III. (Table 1)

This study revealed that a statistically IOP was increased from 1 hour to 4 hour. IOP at 1 hour was 20.3±3.5 and at 4 hour was 22.5±4.9. (Table 2). Alsoastatistically significant BCVA was increased after the capsulotomy. After capsulotomy, maximum 45% participants had BCVA 6/9 followed by 38% who had 6/12. (Table 3). Most common early complication was found to be IOP rise in 25% patients followed by corneal burn in 20% patients (Figure 1) and most common late complication was found to be iritis in 6% patients followed by CME in 5% patients. (Figure 2)

Table 1: Baseline characteristics of study participants (N=100):

Variable	Frequency	Percent
Age (Mean±SD)	63.9±9.2 years	
Age group:		
40-50years	8	8.0
51-60 years	27	27.0
61-70	43	43.0
>70	22	22.0
Gender:		
Female	58	58.0
Male	42	42.0
Side of eye:		
LE PCO	48	48.0
RE PCO	52	52.0
Lens type:		
Hydrophobic	45	45%
Hydrophilic	55	55%
PCO grading:		
I	8	8%
II	55	55%
III	37	37%

Table 2: Comparison of IOP (mmhg) at different time interval

	IOP at 1 hour after surgery	IOP at 4 hour after surgery	p-value
Mean ± SD	20.3±3.5	22.45±4.9	0.0001
Mean difference (CI)	-2.15(-3.04- -1.260		

Figure 1: Distribution of participants according to early complications after capsulotomy

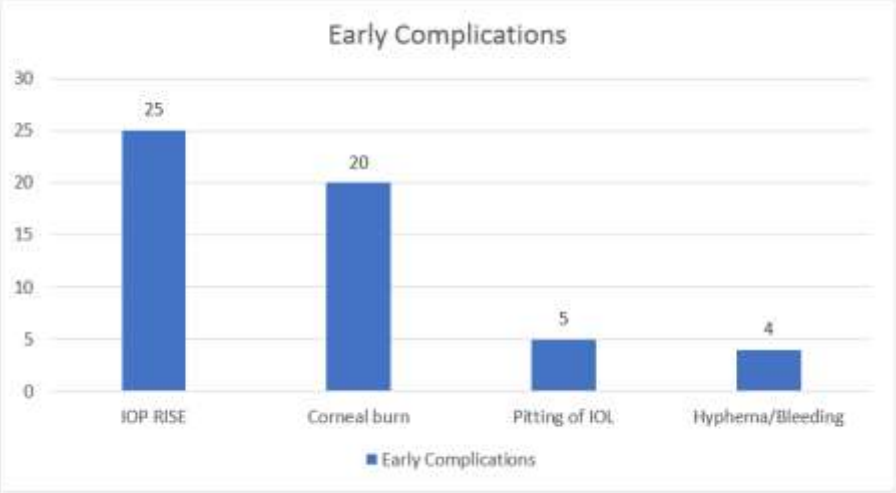

Figure 2: Distribution of participants according to late complications after capsulotomy

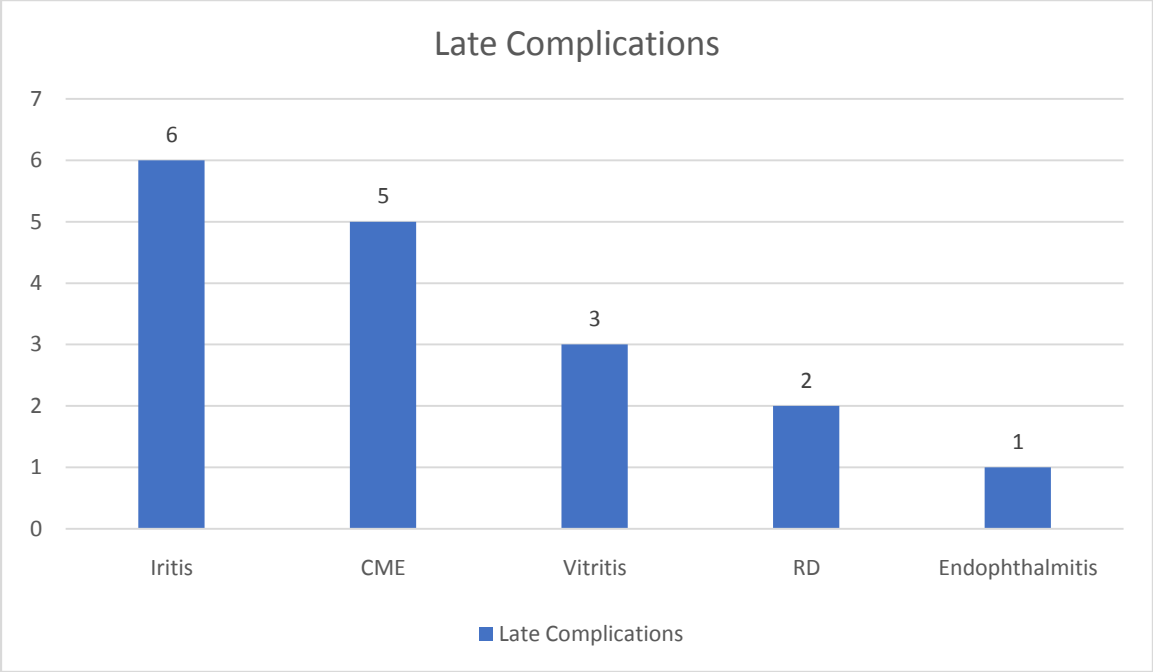

Table 3: Comparison of BCVA before and after Nd:YAG Laser capsulotomy

BCVA	Before Nd:YAG Laser Capsulotomy		After Nd:YAG Laser Capsulotomy	
	Frequency	Percent	Frequency	Percent
6/9	0	0	45	45.0
6/12	3	3.0	38	38.0
6/18	28	28.0	11	11.0
6/24	18	18.0	6	6.0
6/36	26	26.0	0	0
6/60	23	23.0	0	0
FC	2	2.0	0	0
Total	100	100.0	100	100.0
p-value	0.0001			

IV. Discussion:

Nd:YAG LASER is a pulsed instrument which can be used to photodisruptthеopacified posterior capsule. Nd:YAG LASER posterior capsulotomy is a rapid, safe,relativelylessinvasiveandpainlessprocedure,thansurgicalcapsulotomywhichmaybeassociatedwithhigher incidenceofcomplications.

Current study was done among the 100 participants with 100 eye with the mean age of study participants was 63.9±9.2 years and female preponderance (58%). A similar study was done by Sarkar P et al[8] and included a total 60 eyes from 100 participants which supported the current study and had female preponderance (58.3%).However study by Hasan et al[9] and Tayyab et al[10]. showed that it had male preponderance.

In our study, a statistically significant BCVA was increased after the capsulotomy. After capsulotomy, maximum 45% participants had BCVA 6/9 followed by 38% had 6/12, however 6 participants still had BCVA 6/24. Sarkar P et al[8] showed the improvement in 91.7% participants. According to Mohammad Younas Khan et al[11], 70% of patients had visual acuity of 6/36, while 44.8% had visual acuity of hand movements to finger counting. Visual acuity of 6/18 or greater was attained in 60.2% of patients after Nd:YAG laser capsulotomy, while 12% recovered to 6/9 and 3.4% achieved 6/6.95 In a study by MA Khanzada et al[12], 31 eyes (6.20%) out of 500 patients did not demonstrate visual improvement due to diabetic retinopathy.In the study by Awan et al[74], 96% of non diabetic patients improved from two to five lines on the Snellen chart, whereas 92% of diabetics improved from two to five lines on the Snellen chart. It was also noted that VA had not deteriorated more in any situation. Following Nd:YAG laser capsulotomy, 91.5% of patients improved their vision from 6/18 to 6/6.Our findings also differed slightly from those of Ejaz Ahmad et al[14], who found that out of 120 eyes treated for Nd:YAG laser posterior capsulotomy, 70 improved from 6/18 to 6/6 (58.34%), whereas 30 improved from counting fingers to 6/24 (25%).

In this study, in early complications, 25% participants had IOP rise , corneal burn in 20%, pitting IOL in 5% and bleeding in 4%. Late complication were iritis (6%), CME (5%), Vitritis (3%), RD (2% and endophthalmitis (1%). A statistically IOP was increased from 1 hour to 4 hour. IOP at 1 hour was 20.3±3.5 and at 4 hour was 22.5±4.9.

So current study showed a fluctuation in IOP from 1 hour to 4 hour which ranged from 10 to 32 mmhg.Our findings were similarly to those of Awan et al[13], who found that two (8%) diabetic patients (4% of the overall research population) experienced persistently increased IOP 24 hours following Nd:YAG laser treatment, eventually leading to glaucoma.Aurangzeb Shaikh et al[14] discovered a transitory elevation in IOP on the same day (up to 3 mm Hg) following laser capsulotomy, however it was limited within the normal range of 15 mm Hg. At one week, 15 (4%) individuals had an increase in IOP (maximum 6 mm Hg greater than normal range) (out of 314 patients).Our findings were analogous to those of C.F. Chung[16], who discovered a transitory IOP spike greater than 5 mm Hg in four of 56 patients treated with Nd:YAG laser posterior capsulotomy. Slomovic and Parrish discovered that 55% of patients (out of 66) had significantly elevated IOP after YAG laser therapy,100 which differed slightly from our findings.[17]Mahtab AlamKhanzada et al[12] found 9.4% (30 eyes) of 320 individuals to have IOL pitting. None of them took into account considerable visual impairment. In a study of 86 eyes, Hasan KS et colleagues[18] discovered IOL pitting in 19.8% of patients. Our findings differ from those of the Gore V.S. research. In his examination of 200 patients, he discovered that 9 (4.5%) acquired IOL pitting, 3 (1.5%) produced IOL cracks, and 3 (1.5%) developed IOL decentration. With simply pitting of the IOL, there was no reduction or disruption in visual acuity, although 1.5% of patients with cracks in the IOL failed to improve more than 6/18.[19]According to C.F. Chung[16], one patient (male, 68 years) had cystoid macular edema after Nd:YAG posterior capsulotomy, which was confirmed by fluorescein angiography one week after capsulotomy. This patient got panretinal photocoagulation for diabetic retinopathy more than a year before the capsulotomy.

V. Conclusion:

Our study concluded that visual outcome after the capsulotomy in PCO patients were significantly improved however complications are concerned.

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