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Intraocular Pressure Variation After Nd:yag Laser Posterior Capsulotomy

Opthalmology

KEYWORDS :

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ABSTRACT

Study of Intraocular Pressure(IOP) of 80 eyes undergoing ND YAG laser posterior Capsulotomy.

Aim: To study the intraocular pressure variation after ND- YAG laser posterior Capsulotomy.

To determine the various factor affecting the IOP changes like Age, Sex, Lens status , Laser parameters like energy, pulse and size of capsulotomy.

To optimise the IOP change to preserve the desirable visual acuity.

Method: All patients underwent Applanation Tonometry prior to and after ND-YAG laser Capsulotomy at specific time interval.

Result: IOP variation after ND-YAG capsulotomy is not related to age and sex. During the first 3 hour after procedure IOP rose from baseline but is not affected till 6 weeks. Aphakic eyes showed more rise in IOP compared to Pseudophakic.

Number of pulses , mean energy and size of capsulotomy had no effect on IOP.

Tab Acetazolamide and topical Timolol Maleate half an hour before and after Capsulotomy postoperatively were found to be effective against control of IOP.

Conclusion: ND YAG capsulotomy is an easy procedure but it does carries a finite risk of serious complications like exaggeration of glaucoma, retinal detachment, Csytoid Macular Edema . Rise in IOP within first 3 hours is an invariable phenomenon requiring Prophylactic anti glaucoma medications like oral Acetazolamide and local Timolol Maleate. Patient should be kept under observation for long period to detect late onset glaucoma especially in case where IOP rise was >or equal to 5mm in first 3 hour.

INTRODUCTION:

Cataract surgery has been evolved in past few decades not only from ICCE to ECCE but from small incision surgery to Femto second laser assisted phaco-emulsification surgery .But till today we are unable to prevent "AFTER cataract /SECONDARY cataract" ie "POSTERIR CAPSULAR OPACIFICATION(PCO)"

Posterior capsular Opacification is the major cause of diminished vision after successful cataract surgery .Previously surgical discision of the posterior capsular opacification was the only treatment available. Now , with the advent of NeoDymium: Yttrium –Aluminum-Garnet(ND-YAG)Laser the treatment has become fast, cost effective with immediate visual recovery. The procedure is simple but associated with some rare complications. This study aims to review the intraocular pressure elevation seen after ND-YAG laser Capsulotomy. It is one of the frequent (>30%) and catastrophic complication of the YAG laser surgery.

MATERIALS AND METHODS

The study was conducted on 80 eyes of 80 patients who underwent Q-Switched ND:YAG laser Capsulotomy at BYL Nair hospital and TNMC, Mumbai.

Inclusion criteria:

Age more than 40 years.

ECCE with or without Intraocular lens implantation (ACIOL or PCIOL).Presence of PCO.Clear cornea. IOP between 10-24 mm of Hg.

Exclusion criteria:

History of trauma.
History of Glaucoma.
Presence of corneal opacity.
History of Uveitis.
Myopia.

Systemic illness like Hypertension and Diabetes mellities

Patients were thoroughly evaluated and the following data were recorded prior to YAG Capsulotomy- Visual acuity for distant and near, IOP (mm of Hg) by Applanation Tonometry, Dilated Slit Lamp Biomicroscopic examination, Dilated fundus examination. Post ND:YAG laser IOP was recorded at 1 hour,3 hours,24 hours,1 week and 6 weeks.

Written informed consent was taken. Pupil was dilated with 1% Homatropine eye drops. Half an hour before the study, medications were administered to the patients randomly-

Topical Normal Saline (NS –placebo) - 20 patients

Topical Timolol Maleate (0.5%) -20 patients

Topical Pilocarpine Nitrate (2%) -20 patients

Tablet Acetazolamide (125mg) -20 patients.

After putting local Anaesthetic eye drop(Proparacaine hydrochloride 0.5 %),with or without Capsulotomy lens ,3-3.5 mm ideal central Capsulotomy with inferiorly based capsular flap was performed with minimum energy and fundamental mode.

Post ND YAG laser slit lamp examination was carried out to assess the size and position of Capsulotomy, presenceof cells/flare/capsular remnants, pits on IOL. The topical

medications like Normal Saline/ Timolol Maleate / Pilocarpine each in 20 patients were repeated immediately. Tablet Acetazolamide was not repeated after the procedure.IOP was noted at 1hour, 3 hour, 24 hour, 1 week and 6 weeks post procedure.

OBSERVATION AND RESULTS:

80 eyes were included in this study. The IOP variation post operatively was recorded at different time interval till duration of 6 weeks.

Table 1: AGE –SEX DISTRIBUTION

AGE	MALE	%	FE-MALE	%	TOTAL	%
<60 Year	7	19.44	6	13.64	13	16.25
60-69 year	19	52.78	26	59.09	45	56.25
>70 year	10	27.78	12	27.27	22	27.5
Total	36	100	44	100	80	100

Chi-sq=0.366357 d.f. =2 p =0.832619(insignificant)

Table 1 shows, this study included 36 males and 44 females and the IOP was insignificant with gender.

Table 2: NUMBER OF PATIENTS WITH PHAKIC STATUS

PHAKIC STATUS	NO OF PTS
Aphakic	11
ACIOL	16
PCIOL	53

Table 2 shows, the Phakic status of 80 patients selected in the study. The study included 11 aphakic eyes,16 ACIOL eyes and 53 PCIOL eyes.

TABLE 3: PHAKIC STATUS VS IOP VARIATION

PHAKIC STATUS	BASELINE IOP	IOP at 1 Hrs	IOP at 3 hrs	IOP at 24 hrs	IOP at 1 wk	IOP at 6 wks
Aphakic	15.9	20.89	21.08	17.19	16.45	16.17
ACIOL	18.4	21.49	21.26	18.95	18.84	19.33
PCIOL	17.09	19.06	18.95	16.97	17	17.05
Total	17.19	19.8	19.71	17.39	17.29	17.38

Unpaired T test for baseline Vs post procedure readings-in all eyes

	1 hr	3 hrs	24 hrs	1 wk	6 wks
t-value	4.5634806	3.923196	0.384115	0.180558	0.350148
p-value	1.82E-05	0.000187	0.70198	0.856763	0.727209
significance	Highly Significant	Significant	insignificant	Insignificant	insignificant

The mean IOP in Aphakic patients was 15.9 mm of Hg, in ACIOL patients 18.4 mm of Hg and in PCIOL patients 17.09 mm of Hg. The average baseline IOP of all patients was 17.19 mm of Hg. This IOP was found to rise in 1 hour to 19.8 mm of Hg (p=1.82E-05,highly significant by unpaired T test) and3hr to 19.71 mm of Hg (p=0.000187,significant by unpaired t test). However at 24 hours,1 week and 6 weeks though IOP was elevated it was not significant .This means immediate post procedure till 3 hours intraocular pressure was found to rise significantly.

TABLE 4: MEAN IOP in APHAKIC & PSEUDOPHAKIC EYES in mm of Hg

	Baseline	At 1 hr	At 3 hrs	At 24 hrs	At 1 wk	At 6 wks
Aphakic	15.9	20.89	21.08	17.19	16.45	16.17
Pseudophakic	17.39	19.62	19.49	17.41	17.4	17.55

Paired T-Test for IOP in Aphakic Vs Pseudophakic eyes

	1 hr	3 hrs	24 hrs	1 wk	6 wks
t-value	2.802772	2.95244	2.439974	1.605335	0.586595
p-value	0.006389	0.004011	0.17051	0.112623	0.559238
significance	significant	Significant	insignificant	Insignificant	insignificant

Table 4 shows that Aphakic patients had significant rise in IOP after ND YAG Capsulotomy during immediate post operative period till 3 hours than patients with IOL implantation.

TABLE 5: MEAN IOP in mm of Hg in ACIOL and PCIOL EYES

	BASELINE	AT 1 hr	AT 3 hrs	AT 24 hrs	AT 1 wk	AT 6 wks
ACIOL	18.4	21.49	21.26	18.95	18.84	19.33
PCIOL	17.09	19.06	18.95	16.97	17	17.05

Paired T-test in ACIOL & PCIOL eyes

	1 hr	3 hrs	24 hrs	1 wk	6 wks
t-value	1.58403	0.249068	0.736977	0.696691	1.974768
p-value	0.250234	0.803963	0.463435	0.48815	0.051975
significance	insignificant	Insignificant	insignificant	insignificant	insignificant

Table 5 suggests that IOP variation after ND YAG Capsulotomy has no significance on type of IOL implanted

TABLE 6: SEX Vs IOP RISE AT 3 Hrs

	<5 mm Hg	5-9.9 mm Hg	>10 mm Hg	Total
MALE	25	10	1	36
FEMALE	31	11	2	44
TOTAL	56	21	3	80

Chi-sq=0.696376 p=0.705966 d.f.=2 Insignificant

Table 6 shows there is no correlation between sex and rise in IOP at 3 hour reading

TABLE 7: AGE Vs IOP RISE at 3 Hrs

	<5 mm Hg	5-9.9 mm Hg	>10 mm Hg	Total
<60 yr	5	4	1	10
60-69 yr	39	7	1	47
>70 yr	14	8	1	23
Total	58	19	3	80

Chi-sq = 4.050621 p=0.131953 d.f. = 4 Insignificant

Table 7 shows that age has no correlation with the change in IOP at 3 hours post operatively

TABLE 8 : DRUGS Vs IOP VARIATIONS (Mean)

Drug	Baseline	At 1 hr	At 3 hrs	At 24 hrs	1 wk	6 wks
Normal saline(NS)	15.53	21.18	21.59	16.44	16.17	16.1
Timolol maleate(0.5%)	17.79	19.34	18.72	17.06	17.22	17.68
Pilocarpinenitrate(2%)	16.78	19.89	19.95	17.87	17.44	17.1
Acetazolamide (125 mg)	18.42	18.35	16.92	17.79	17.92	18.25

Paired-T test for NS Vs other drugs

	1 hr	3 hrs	24 hrs	1 wk	6 wks
t- value	5.215406	3.40573	2.97543	2.76955	2.085234
P value	1.19E-06	0.001045	0.0039352	0.007071	0.0404511

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significance	HIGHLY SIGNIFICANT	SIGNIFICANT	SIGNIFICANT	SIGNIFICANT	INSIGNIFICANT

In Table 8, paired T test was used for IOP variation seen at various time intervals with different medications.

It was noted that in patients whom normal saline was used as topical placebo medication, up to 3 hours, IOP was found to be elevated from baseline level of 15.53 mm of Hg to 21.59 mm ofHg(p=0.001)with significant change.At1 hour time IOP change was highly significant(p= 1.19E-06)from the baseline value. From 24 hours onwards till 6 weeks postoperatively the IOP was found to be higher than baseline, but this rise was not significant.

Patients in whom Timolol Maleate topical 0.5% and Pilocarpine Nitrate topical 2% was used showed rise in IOP till 3 hours postoperatively but IOP was found to be minimally lower from baseline after 24 hours till 6 weeks.

Acetazolamide has got encouraging results with actually decreasing the baseline IOP in first 3 hours. From 24 hours onwards it showed no significance on the IOP variation

TABLE 9 : MEAN ENERGY Vs IOP CHANGES(MEAN)

MEAN ENERGY	BASELINE	At 1Hr	At 3 Hrs	At 24 Hrs	At 1 wk	At 6 wks
<2 mJ	17.16	19.71	19.28	17.63	17.54	17.50
>2 mJ	17.21	19.86	20.04	16.78	16.67	16.87

By unpaired T test

	Baseline	1 hr	3 hrs	24 hrs	1 wk	6 wks
t-value	0.0679876	0.1639216	0.693166	0.6719176	0.678593	0.6619945
p-value	0.9850916	0.9918426	0.978835	0.9873748	0.981872	0.9851448
significance	insignificant	insignificant	insignificant	insignificant	insignificant	insignificant

Table 9 suggest that mean energy less than 2 mJ or more than 2 mJ at any time interval has no effect on IOP variation with any of the drug used.

TABLE 10: NUMBER OF PULSES Vs IOP CHANGES(MEAN)

NO OF PULSES	BASELINE IOP	IOP AT 1 HR	IOP AT 3 HRS	IOP AT 24 HRS	IOP AT 1 WK	IOP AT 6 WKS
<25	17.70	19.82	19.41	17.95	17.82	17.86
25-49	17.29	20.14	19.26	17.39	17.39	17.56
50-74	16.01	19.21	20.97	14.42	13.95	13.92
>75	17.84	20.06	18.60	17.86	18.02	18.11

Chi-sq= 1.233304 p=0.999999 d.f.=15 Insignificant

As per table 10, The number of pulses applied for the ND YAG laser posterior Capsulotomy has no significance on the IOP changes(p=0.99)

TABLE 11: TOTAL ENERGY Vs IOP CHANGES(MEAN)

TOTAL ENERGY (mJ)	BASELINE IOP	IOP AT 1 HR	IOP AT 3 HRS	IOP AT 24 HRS	IOP AT 1 WK	IOP AT 6 WKS
0-49	17.33	19.61	18.98	17.68	17.51	17.48
50-99	17.76	20.91	20.00	17.55	17.61	17.90
100-149	15.3	19.35	21.27	16.03	15.79	15.73
>150	18.18	19.2	18.88	17.85	17.73	17.73

Chi-sq= 0.762939 p= 1 d.f. = 15 Insignificant

Table 11 suggest that the total energy applied for the Capsulotomy even if lower or higher than 100 mJ has no significance on the IOP rise seen post operatively

TABLE 12: DRUGS Vs IOP VARIATION AT 1 HR IN NO OF EYES

Drugs	<5 mmHg	5-9.9 mm of Hg	>10 mm of Hg	Total
Normal saline(NS)	9	9	2	20
Timolol maleate (0.5%)	15	5	0	20
Pilocarpine nitrate(2%)	14	5	1	20
Acetazolamide(125 mg)	18	2	0	20
Total	56	21	3	80

Chi-sq=11.3809591 p= 0.77292449 d.f.= 6 insignificant

For IOP <5 and > 5 mm of Hg: Chi-sq=10.00002463 p= 0.018566135 d.f.=3

As per Table 12, it is observed that when all the drugs were compared with the IOP variation at 1 hour the change was insignificant

TABLE 13: DRUGS Vs IOP VARIATION AT 3 HRs IN NO OF EYES

Drugs	<5 mmHg	5-9.9 mm of Hg	>10 mm of Hg	Total
Normal saline(NS)	6	11	3	20
Timolol maleate (0.5%)	17	3	0	20
Pilocarpine nitrate(2%)	15	5	0	20
Acetazolamide(125 mg)	19	1	0	20
Total	57	20	3	80

Chi-sq=27.12674943 p= 0.000136918 d.f.= 6 significant

For IOP <5 and > 5 mm of Hg: Chi-sq=27.00667828 p=5.73566E-06 d.f.=3 Significant

As per Table 13, it is observed that at 3 hours the IOP variation seen after administration of various drugs is significant (p=5.73566E-06)

TABLE 14: NORMAL SALINE Vs TIMOLOL(IOP VARIATION AT 1 HR AND 3 HR IN NO OF EYES)

Drugs	<5mm Hg at 1 hr	<5mm Hg at 3 hr	5-10mm Hg at 1 hr	5-10 mm Hg at 3 hr	>10mm Hg at 1 hr	>10 mm Hg at 3 hr
Normal saline (NS)	9	6	9	11	2	3
TIMOLOL MALEATE (0.5%)	15	17	5	3	0	0

At 1 hrs: Chi-sq=4.642859337 P=0.098133295 D.F.=2 insignificant

At 3 Hrs: Chi-sq=12.83210394 p=0.00163494 d.f.=2 significant

As per Table 14,at 1 hour, the IOP variation seen in placebo(NS)

medication and Timolol (0.5%) was not significant(p=0.098). While at 3 hours patients in NS group showed significant rise in IOP as compared to the Timolol group(p=0.00163494)

TABLE 15: NORMAL SALINE Vs PILOCARPINE(IOP VARIATION AT 1 HR AND 3 HR IN NO OF EYES)

Drugs	<5mm Hg at 1 hr	<5mm Hg at 3 hr	5-10mm Hg at 1 hr	5-10mm Hg at 3 hr	>10 mm Hg at 1 hr	>10 mm Hg at 3 hr
Normal saline(NS)	9	6	9	11	2	3
PILOCARPINE NITRATE(2%)	13	15	6	5	1	0

At 1 hrs: Chi-sq=3.603919003 P=0.16497509 D.F.=2 insignificant

At 3 Hrs: Chi-sq=9.10711935 p=0.010529532 d.f.=2 significant

As per TABLE 15, the mean IOP elevation in NS group and Pilocarpine group did not differ statistically at 1hour as well as3 hours(P=0.16497509, insignificant at 1 hr and at 3 Hrs p=0.010529532 less significant)

TABLE 16: NORMAL SALINE Vs ACETAZOLAMIDE (IOP VARIATION AT 1 HR AND 3 HR IN NO OF EYES)

Drugs	<5mm Hg at 1 hr	<5mm Hg at 3 hr	5-10mm Hg at 1 hr	5-10mm Hg at 3 hr	>10mm Hg at 1 hr	>10 mm Hg at 3 hr
Normal saline(NS)	9	6	9	11	2	3
ACETAZOLAMIDE (125 mg)	18	19	2	1	0	0

At 1 hrs: Chi-sq=9.454540432 P=0.008850576 D.F.=2 significant

At 3 Hrs: Chi-sq=18.08839224 p=0.000117783 d.f.=2 significant

Table 16 shows that the rise in IOP in NS group was found to be significantly higher than Acetazolamide group post operatively at 1 hour and 3hours(P=0.008850576 & p=0.000117783 respectively).So Acetazolamide was found to be effective in lowering the IOP rise after ND-YAG laser posterior capsulotomy.

Table 17: SIZE OF CAPSULOTOMY Vs IOP RISE AT 1 HR AND3 HRS IN NO OF EYES

SIZE OF CAPSULOTOMY	At 1 hr	At 3 hr	Total
<4 mm	22	7	29
>4mm	34	17	51
Total	56	24	80

At 3 hrs: chi-sq= 1.892169 p=0.388258 d.f.= 1 insignificant

As per table 17, Size of Capsulotomy less than or more than 4 mm has no correlation with rise in IOP at 3 hour(p=0.388258)

CONCLUSION:

ND-YAG laser capsulotomy is the best treatment modality for improving vision which is decreased as a result of Capsular Opacification. ND YAG Capsulotomy , though is an easy procedure but it does carries a finite risk of serious complications like exaggeration of glaucoma, retinal detachment, CME. Rise in IOP within first 3 hours is an invariable phenomenon requiring Prophylactic anti glaucoma medications like oral Acetazolamide and local Timolol Maleate. Patient should be kept under observation for long period to detect late onset glaucoma especially in case where IOP rise was >or equal to 5mm in first 3 hour.

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