

Effect of prophylactic topical Brimonidine 1% in prevention of intraocular pressure spikes following Nd : YAG laser posterior capsulotomy in a hospital based study

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ABSTRACT

Aim: To evaluate the effect of topical Brimonidine 1% in prevention of intraocular pressure spikes after Nd: YAG laser posterior capsulotomy .

Materials and Methods:

The study was conducted in the outpatient Department of Ophthalmology at GMC Baramulla, over a period of one year from July 2020 to July 2021. It was a prospective, randomized, single blind; placebo controlled study which included post-operative cataract patients with diminished vision, diagnosed as having posterior capsular opacification after uncomplicated cataract surgery and underwent Nd: YAG laser posterior capsulotomy.

190 patients were recruited in our study and divided into two groups of 95 each. Group A received one drop of topical Brimonidine prior to laser and second right after laser. Group B patients received one drop of artificial tears (Lubricant) prior to laser and second right after laser. Follow up was done at one hour , three hours , day one and day three, for intraocular pressure, visual acuity and slit lamp examination .

Results:

In group A, fall in mean IOP was seen at 1 hour, 3 hours, (8% fall in IOP) and mean IOP remained less than the base line at day 1, on the day 3 it approached almost the base line.

In group B rise in IOP from base line was present in 1 hour, peak of IOP elevation (27.17% rise in IOP) was present at 3 hours .Mean IOP remained almost same at day 1 and started decreasing after that approaching baseline, on day 3, the difference in mean IOP at 1 hour,3 hours and day 1 between 2 groups was statistically significant ($P<0.05$). IOP reached baseline in both groups at day 3. No ocular systemic side effects were seen in either group.

Conclusion:

As the post laser IOP rise generally reached its peak during first 3 hours after laser treatment under ideal circumstances. Any drug used to prevent this complication must reach its maximum effectiveness at the same time. Topical brimonidine reaches near maximum effectiveness 30 minutes after administration. The maximum Intra ocular pressure reduction is attained within two to three hours. Thus prophylactic use of topical brimonidine 1% produces maximum hypotensive effect to coincide with the potential IOP spike.

Introduction

Even though Cataract surgery has evolved in past few decades not only from ICCE to ECCE but from small incision cataract surgery to Femto Second Laser assisted Phacoemulsification still visually significant Posterior Capsule Opacification (PCO) is the most common late complication of the surgery.

Despite the use of new IOL materials and IOL's with sharp edged designs still PCO is very common. ⁽¹⁻⁴⁾ Nd: YAG Laser Capsulotomy has been used successfully to treat PCO. ⁽⁵⁾ Various complications such as Retinal Detachment, temporary increase in IOP, Uveitis, IOL damage and CME (Cystoid muscular oedema) ⁽⁶⁻⁸⁾ may occur.

The most frequently reported complication of Post Laser is increase in IOP. ⁽⁹⁾ Although the IOP elevation is usually transient and occurs within 1st three hours, it may cause loss of vision or visual field especially in patients with Glaucoma. ⁽⁹⁾

Many drugs have been used for the prophylaxis of IOP rise after Nd: YAG Laser posterior capsulotomy in various studies like topical Apraclonidine (0.5 – 1%), Brimonidine, Timolol (0.5%), Levobunolol, carbonic anhydrase inhibitors and generally any increase in IOP after Nd: YAG Laser use can be brought under control. ⁽¹⁰⁻¹³⁾

The aim of the present study was to analyse the effect of topical brimonidine use on IOP and changes in IOP after Nd: YAG laser Capsulotomy. (Table 1, Table 2)

Materials and Methods

The study was conducted in the outpatient department of ophthalmology of GMC Baramulla, over a period of one year from July 2020 to July 2021. It was a prospective, randomized, single blind; placebo controlled study which included post-operative cataract patients with diminished vision, diagnosed as having posterior capsular opacification after uncomplicated cataract surgery and underwent Nd: YAG laser posterior capsulotomy.

190 patients were recruited in our study and divided into two groups of 95 each. Group A received 1 drop of topical Brimonidine prior to laser and second right after laser. Group B patients received 1 drop of artificial tears (Lubricant) prior to laser and second right after laser. Follow up was done at one hour, three hours, day one and day three, for intraocular pressure, visual acuity and slit lamp examination.

The clearance was taken from the institutional Ethical Committee for the study in reference. Nature of the Study was explained and informed consent was taken from all the patients enrolled in the Study.

Inclusion Criteria:

1. Patients with diminution of vision following PCO after cataract surgery (SICS & Phacoemulsification)
2. Patients of more than 18 years of age.

Exclusion Criteria:

1. Pre exsistant Glaucoma and patients on anti glaucoma medication.
2. History of ocular trauma or surgery of Retina , Glaucoma or cornea
3. Uveitis or any active inflammation.
4. Other intra operative or post operative complication.
5. High Myopia
6. Pregnant and nursing mothers
7. Known contraindication or hypersensitivity to Brimonidine.

Statistical Analysis:

Data was collected and entered in Microsoft Excel Worksheet and statistical analysis was performed by using Graph Pad Prism Version 5 expressed as mean \pm SD and analysed using appropriate statistical technique taking a P Value of less than 0.05 as statistically significant.

Results:

The mean age in our study was 65.53 years. Mean age of the patients in Group A was 65 and in Group B was 61.89. Group A consisted of 51.8 % males and 40.42 % females and Group B consisted of 52.63% males and 47.37 % females.

Table 1: Age distribution in group A and B

AGE GROUP(YEARS)	GROUP A		GROUP B	
	N	%	N	%
<50	3	3.15	1	1.05
51-60	19	20.00	40	42.10
61-70	57	60.00	49	51.57
71-80	16	16.84	5	5.26
TOTAL	95	100.00	95	100.00

TABLE 2: Sex Distribution

	GROUP - A		GROUP - B	
	N	%	n	%
MALES	49	51.58	50	52.63
FEMALES	46	48.42	45	47.37

Table3: Age difference between the two groups

GROUP	AGE RANGE (years)	MEAN \pm S.D (years)
A	50-73	65 \pm 6. 091
B	46-78	61.89 \pm 5.61

$P = 0.933$ (>0.05). Hence the difference in age between the two groups was not significant.

Pre Laser mean IOP in Group A was 15.96 and in Group B was 14.88 with P Value more than 0.05 and the difference of IOP between the two groups was not statistically significant at baseline.

In group A, IOP Fall of less than 5 occurred in 70 patients and more than 5mmHg in 5 patients, IOP remained unchanged in 5 patients. IOP elevation from baseline less than 5mmHg was seen in 9 patients. IOP spikes of more than 5mmHg was seen in 6 patients and IOP spike of more than 10 mmHg was not seen in any patient.

Table 4: Change in IOP in Group A over time

FALL IN IOP		NO CHANGE	RISE IN IOP	
<5	70		5	<5
\geq 5	5	\geq 5		6
\geq 10	0	\geq 10		0
TOTAL	95			

Table 5: Change in IOP in Group B over time

RISE IN IOP	
<5	56
≥5	23
≥ 10	6
NO CHANGE	10
TOTAL	95

Table 6: In group A, fall in IOP from the baseline was seen according to the table given below.

GROUP A	
TIME	PERCENTAGE FALL IN IOP
1 HOUR	3.20
3 HOURS	8.00
DAY 1	1.61
DAY 3	0.43

Table 7: In group B, rise in IOP from the baseline was seen according to the table given below.

GROUP B	
TIME	PERCENTAGE RISE IN IOP
1 HOUR	11.78
3 HOURS	27.17
DAY 1	15.38
DAY 3	1.69

In Group B, rise in IOP of less than 5 mmHg was seen in 56 patients and more than 5mmHg was seen in 23 patients. IOP spikes more than 10 mmHg was seen in 6 patients. IOP remained at Pre Laser level in 10 patients.

Table 8: Pre Laser Intraocular Pressure

	GROUP A			GROUP B		
	RANGE	MEAN	S.D.	RANGE	MEAN	S.D.
BASE LINE	12-21	15.96	± 2.38	10-22	14.88	±2.74

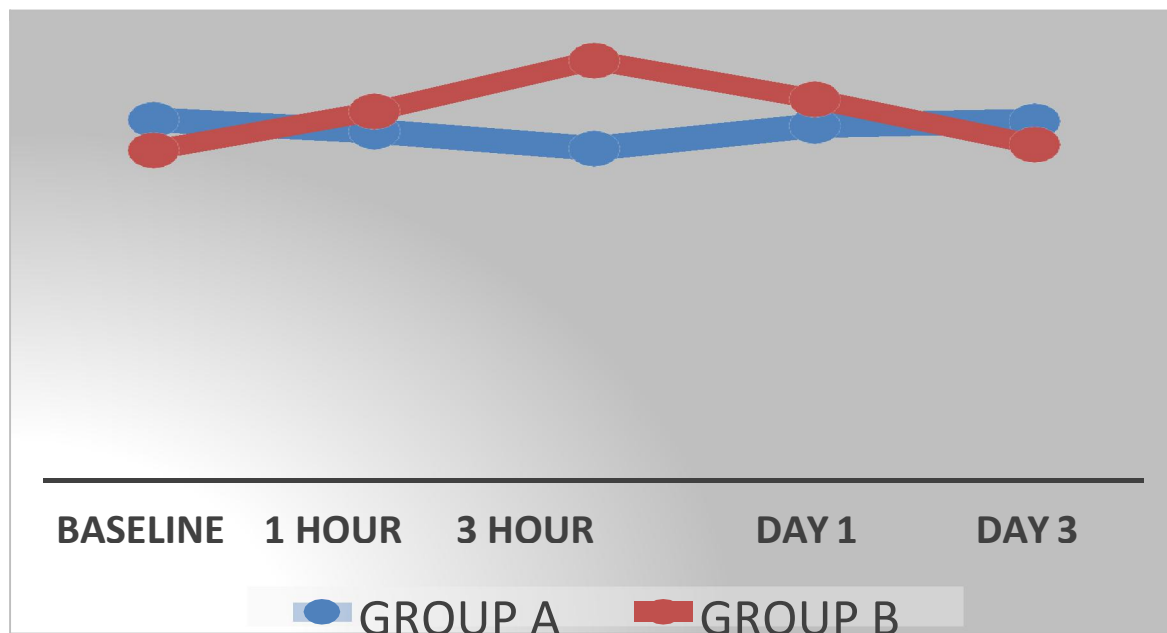
In group A, fall in mean IOP was seen at 1 hour, 3 hours,(8% fall in IOP) and mean IOP remained less than the base line at day 1, on the day 3 it approached almost the base line.

In group B rise in IOP from base line was present in 1 hour, peak of IOP elevation (27.17% rise in IOP) was present at 3 hours .Mean IOP remained almost same at day 1 and started decreasing after that approaching baseline, on day 3, the difference in mean IOP at 1 hour,3 hours and day 1 between 2 groups was statistically significant (P<0.05). IOP reached baseline in both groups at day 3. No ocular systemize side effects were seen in either group.

Table 9: Post Laser Intraocular Pressure

	GROUP A			GROUP B			P value
	RANGE	MEAN	S.D.	RANGE	MEAN	S.D.	
BASELINE	12-21	16.12	±2.33	10-22	14.76	± 2.74	0.5483
1 HOUR	10-21	15.61	±2.43	11-26	16.50	± 3.60	0.0001
3 HOURS	10-22	14.83	± 2.59	12-30	18.77	± 4.17	0.0001
DAY 1	11-21	15.86	± 2.39	10-25	17.03	± 3.31	0.0017
DAY 3	12-21	16.05	±2.20	10-20	15.01	± 2.56	0.629

Figure 1:- Mean intraocular pressure in group A and B at baseline and follow-up.



Discussion:

PCO is the most common complication of cataract surgery and may reduce visual acuity contrast sensitivity and stereoscopic vision. Its treatment comprises of Nd: YAG Laser Posterior Capsulotomy. Although it is a safe procedure but it is not entirely complication free and may sometimes result in number of complications that includes transient immediate rise of IOP, Ocular inflammation, cystoids macular oedema, IOL pitting, IOL subluxation, risk of Retinal detachment and endophthalmitis. Transient increase in IOP is a very frequent complication of Nd : YAG laser posterior capsulotomy and may be serious. Intra ocular pressure control is of utmost importance in Nd: YAG Laser Capsulotomy and various IOP lowering agents have been used prophylactically in an attempt to prevent this IOP rise.

Pollock IP et al 1988 ⁽¹⁴⁾ demonstrated Apraclonidine to be effective for prevention of post Laser IOP elevation. Chen Tc et al 2001 ⁽¹⁵⁾ demonstrated that brimonidine is as efficacious as Apraclonidine to prevent these elevations. Singh et al ⁽¹⁶⁾ stated that with prophylactic use of Brimonidine, they saw a significant decrease in IOP values when compared to control group. There are also studies in literature reporting that the significant changes were not detected in IOP values after laser capsulotomy e.g Yazici et al ⁽¹⁷⁾ and Ozkurt et al ⁽¹⁸⁾.

In our study, the group where prophylactic brimonidine was applied, Post Laser 1st hour, 3 hour and 1st day IOP values were significantly lower compared to the Pre Laser values and control group values. Also prophylactic use of topical brimonidine 1% produces maximum hypotensive effect to coincide with the potential IOP spike.

Conclusion:

Laser Posterior Capsulotomy can be used as safe method to treat PCO. As the post laser IOP rise generally reached its peak during first 3 hours after laser treatment under ideal circumstances. Any drug used to prevent this complication must reach its maximum

effectiveness at the same time. Topical brimonidine reaches near maximum effectiveness 30 minutes after administration. The maximum Intra ocular pressure reduction is attained within two to three hours. Thus prophylactic use of topical brimonidine 1% produces maximum hypotensive effect to coincide with the potential IOP spike. The prophylactic treatment to prevent a complication is worthwhile when this complication is commonly anticipated, when it has serious sequel and when such a prophylactic treatment is safe and effective.

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