ORIGINAL ARTICLE

To Compare the Prophylactic Role of Topical Apraclonidine, Brimonidine and Bimatoprost on IOP elevation following Nd:YAG Laser Posterior Capsulotomy

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Abstract

The aim of this study was to compare the effect of topical apraclonidine, brimonidine and bimatoprost on intraocular pressure (IOP) after Neodymium: yttrium aluminum garnet (Nd:YAG) laser posterior capsulotomy. A total of 75 patients studied were randomly divided into three groups of 25 patients each. Test drug was instilled 1 hour before the procedure and IOP was measured pre-laser and 1, 3 and 24 hours post-laser. Mean pre-laser IOP in all three groups was comparable (p=0.82). Statistically significant difference in mean post-laser IOP was noted 3 hours after the procedure (p=0.000). Mean change in IOP 3 hours after procedure was also significant (p<0.00001). On comparing the effects of Apraclonidine, Brimonidine and Bimatoprost, for their role in preventing post-laser IOP rise, Bimatoprost was found most efficacious.

Keywords

Neodymium, Yttrium, Aluminium, Garnet, Pre-laser, Post-laser

Introduction

After a successful cataract surgery, posterior capsule opacification (PCO) is the most common cause of diminution of vision.(1) PCO, apart from reducing the vision, also causes other subjective symptoms like glare, decreased contrast sensitivity. Currently, posterior capsulotomy using Neodymium:Yttrium-Aluminium-Garnet laser (Nd:YAG) is employed as treatment for PCO.(2 Most common and almost ubiquitous complication associated with Nd:YAG laser is raised intra ocular pressure (IOP).3 A variety of drugs have been used for prophylaxis of IOP rise after Nd:YAG laser posterior capsulotomy. The present study intends to investigate the clinical efficacy of three of the commonly used drugs in this procedure, viz Apraclonidine, Brimonidine & Bimatoprost.

Materials and Methods

The present study was conducted on 75 patients of PCO who underwent Nd:YAG laser posterior capsulotomy, in the Department of Ophthalmology, Rohilkhand Medical College and Hospital, Bareilly after due clearance from 'Institutional ethical committee'.

Exclusion criteria:

i.Patients below 18 years of age.

ii.Patients with pre-existing glaucoma and/or on anti-glaucoma medication.

iii.Patients with co-existing ocular diseases like uveitis or any other inflammation.

iv. Any unstable cardiovascular disease which may be adversely affected by an ?-adrenergic agonist, such as labile hypertension and history of stroke.

v. Patients with other complications following cataract surgery.

After taking an informed written consent, patients were randomly allocated into 3 study groups A, B and C.

Group A: 0.5% Apraclonidine

Group B: 0.2% Brimonidine

" Group C: 0.03% Bimatoprost

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Tested drug was instilled as a single drop given one hour prior to the procedure. IOP was measured before the procedure and at one hour, three hours and 24 hours after laser.

Statistical analysis

Multivariate analysis was performed employing ANOVA. A p-value < 0.05 was considered statistically significant.

Results

The present study was done on 75 patients of PCO and a male preponderance was noted in each group. No statistically significant difference in mean age of the patients was noted (*Table 1*). Pre-laser IOP levels were comparable in all the three groups. Employing the one way multivariate analysis using ANOVA test for the study groups, a highly statistically significant difference, p=0.005 and p=0.000 were noted in the mean IOP levels at first and third hours following capsulotomy respectively (*Table 2*).

Similar findings were noted in the pressure change (?P) analysis of different groups at different time periods also revealed highly statistically significant differences (p<0.00001) (*Table 3*).

Discussion

Nd:YAG laser capsulotomy is non-invasive, relatively safe, less time consuming, free from infections & improves vision instantaneously. The operation is fraught with the risk of early postoperative rise of intraocular pressure (IOP), which characteristically reaches a peak within first 3 hours. Post laser IOP spikes are a risk to the functionality of optic nerve and are a particular threat to the vision in old and glaucoma prone or glaucoma co-existent eyes.

Prophylactic use of anti-glaucoma preparations has therefore become the order of the day. Most workers

	GROUP A	GROUP B	GROUP C	F	P-VALUE
AGE (MEAN)	62.84	63.2	63.16	0.021	0.99
SEX					
MALES	68%	56%	60%		
FEMALES	32%	44%	40%		

TABLE 1: DEMOGRAPHIC DATA

PERIOD	GROUP A		GROUP B		GROUP C		F	P-VALUE
	MEAN	VARIANCE	MEAN	VARIANCE	MEAN	VARIANCE		
P_0	13.84	5.973	13.44	9.173	13.68	7.893	0.306	0.820
P_1	15.04	6.373	14	8	12.8	5	4.494	0.005
P_3	15.76	5.44	14.16	6.306	13.2	4.667	8.392	0.000
P_{24}	14.56	4.506	14.08	6.493	13.44	5.173	2.134	0.100
P_f	14.48	4.093	13.76	7.773	13.6	6	0.672	0.570

TABLE 2: PRE AND POST LASER MEAN IOP (mm Hg)

IOP at 1 hour before laser (P_0) and 1, 3, 24 hours (P_1, P_3, P_{24}) & 7 days (P_f) post-laser

PERIOD	GROUP A		GROUP B		GROUP C		F	P-VALUE
	MEAN	VARIANCE	MEAN	VARIANCE	MEAN	VARIANCE		
ΔP_1	1.2	3.667	0.56	3.506	-0.88	3.36	11.934	<0.00001
ΔP_3	1.92	2.82	0.72	3.62	-0.48	3.42	19.601	<0.00001
ΔP_{24}	0.72	1.626	0.64	1.24	-0.24	1.44	11.642	<0.00001
ΔP_f	0.64	1.24	0.32	0.56	-0.08	0.826	5.962	0.0009

TABLE 3: PRE AND POST LASER MEAN change in IOP (mm Hg)

IOP change at 1 hour (?P1), 3 hours (?P3), 24 hours (?P24) and on Day 7 (?Pf)

recommend the prophylactic drug instillation one hour prior to the procedure. (4,5) Some advocate use of drug both before and after laser application. (6,7) Our study has adopted the former approach of a single dose pretreatment drug instillation.

A variety of ocular hypotensive drugs have been tried to control significant rise of IOP. Cai JP et al studied the prophylactic effect of topical timolol on prevention of IOP elevation after Nd:YAG laser and found significant difference between treated and un-treated eyes. (8) Double masked studies comparing Brimonidine 0.2% with Apraclonidine 0.5% rated equal efficacies of these drugs in preventing IOP elevation. (9) However, a distinct advantage of Bimatoprost 0.03% in preventing post laser IOP elevation was suggested by Artunay *et al* when comparing results with Brimonidine 0.2%.(10) Oner V *et al* studied 105 patients and compared a fixed combination of brimonidine 0.2% and timolol 0.5% vs brimonidine tartrate 0.2% and showed that Brimonidine with Timolol is safe and effective than brimonidine tartrate 0.2%.(11) In an Indian study, 0.2% Brimonidine proved efficacious in controlling post capsulotomy IOP spikes in 80% of the subjects.(12)

A composite comparison of the three drugs Apraclonidine 0.5%, Brimonidine 0.2% and Bimatoprost 0.03% has hitherto not been attegmpted. Our study while comparing together clinical efficacies of these drugs ensured similarity of sample frame and sizes as well as patient characteristics and procedural uniformity. A sample size of 25 patients subjected to Neodymium:YAG capsulotomy was maintained for each of the studied groups. Minimal IOP variation with mean values below 1 mm Hg was seen following Brimonidine usage, IOP control was less effective with Apraclonidine, and with Bimatoprost, the mean IOP 1 hour after was laser was even less than pre-laser level and same effect was seen even after 24 hours of laser. Despite its intricate study design, the study faced certain obvious limitations. The small sample size of 25 for each group was not truly representative of the population. In addition, intra ocular pressure which was the main outcome measure of the study was subject to minor variations given the fact that other factors like sclera rigidity, refractive status, total laser energy delivered & environmental factors were not taken into account.

Conclusion

In present study an attempt was made to critically examine 3 classes of drugs that are currently in vogue for their prophylactic role in lasers; viz 0.5% Apraclonidine, 0.2% Briminodine & 0.03% Bimatoprost. The study noted a favourable response to IOP control following the use of all these drugs but in different degrees. Bimatoprost was however most efficacious in controlling IOP rise.

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