Original Article

Comparison Between 0.5% Timolol Maleate And 0.2% Brimonidine Tartrate In Controlling Increase In Intraocular Pressure After Neodymium: Yttrium-Aluminium-Garnet Laser Iridotomy

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ABSTRACT

AIM: To compare the effectiveness of prophylactically given 0.5% Timolol maleate and 0.2% Brominidine tartrate in controlling increase of intraocular pressure after Nd:YAG laser iridotomy.

MATERIALS AND METHODS: 70 patients in two equal groups were studied at Department of Ophthalmology, Jinnah Hospital, Lahore from 01-07-2011 to 31-12-2012. It was a Quasi experimental study, non–probability purposive sampling was done. Group A was experimental group which received 0.2% Brimonidine tartrate and group B was control group which received 0.5% Timolol maleate 1 hour before the laser treatment.

RESULTS: In our study the mean age was calculated to be 46.38 ± 7.56 years, out of 70 patients, male patients were 54.29% (n=19) in Group-A and 60% (n=21) in Group-B, while female patients were 45.71% (n=16) in Group-A and 40% (n=14) in Group-B, mean intraocular pressure was recorded as 20.54 ± 2.43 in Group-A and 18.31 ± 2.15 in Group-B respectively, comparison of effectiveness in both groups was recorded as 34.29% (n=12) in Group-A and 71.43% (n=25) in Group-B. 65.22% (n=23) in Group-A and 28.57% (n=10) in Group-B did not show efficacy, p value was calculated as 0.002 which shows significant difference in both groups.

CONCLUSION: We concluded that 0.5% Timolol maleate is more effective than 0.2% Brominidine tartrate in controlling increase in intraocular pressure following Nd:YAG laser iridotomy.

KEYWORDS: Intra ocular pressure, Nd:YAG laser iridotomy, 0.5% Timolol maleate, 0.2% Brimonidine tartrate.

INTRODUCTION:

During the past few years a number of investigators have reported that a transient intraocular pressure (1OP) rise may follow any anterior segment laser surgery such as argon laser trabeculoplasty, argon or YAG laser iridotomy, or YAG laser capsulotomy. This rise in IOP appears to be unrelated to the type of therapy, the type of laser used, the total amount of energy delivered, bleeding, or cellular debris that occurs during treatment, or to the degree of inflammation after treatment. The IOP rose despite the use of topical ocular hypotensive or non-steroidal anti-inflammatory agents.

Treatments available for angle closure glaucoma include lowering of IOP by drugs, Laser iridotomy & surgical iridectomy. When medical treatment fails, Laser peripheral iridotomy (LPI) is preferred over surgical iridectomy, because it reduces the risk of suprachoroidal detachment and expulsive hemorrhage if intra ocular pressure is high.[1-3] LPI can be performed with an argon laser, or with a neodymium:yttrium-aluminum-garnet (Nd:YAG) laser. It is performed on outdoor basis nowadays and is a painless procedure with pulse energy between 2 to 8 mJ with either Q-switched or mode locked system.[2] The Nd:YAG laser emits radiation at a wavelength of 1064 nm.[4]

One of the common undesired outcomes of Nd:YAG laser iridotomy is transient elevation of intraocular pressure within 1 to 3 hours of treatment due to obstruction of trabecular meshwork by debris scattered after laser treatment.[2,3] In the absence of any prophylactic therapy, this rise can significantly affect eyes with preexisting glaucomatous damage.[3,4,5] It is appropriate to prophylactically treat this pressure rise with anti-glaucoma medications.[5,6]

Studies have been carried out in the western world comparing the efficacy of Brimonidine versus Apraclonidine.[5,6]In controlling the IOP rise after anterior segment laser surgery, but since Apraclonidine is not available in our country, we are comparing efficacy of Timolol versus Brimonidine as these two drugs are not compared in the past and also, they are freely available in Pakistan.

Results available for controlling IOP rise after Nd:YAG laser capsulotomy are 93.4% with Timolol and 68.3% with Brimonidine.[5, 6, 7] After Nd:YAG laser iridotomy there is a possibility of more IOP rise, so on basis of this we assume that effectiveness of both the drugs will remain 70% for Timolol and 40% for Brominidine.

MATERIALS AND METHODS:

This study was conducted at Department of Ophthalmology, Jinnah Hospital, Lahore from 01-07-2011 to 31-12-2012, a total no of 70 patients, divided in two equal groups were studied. It was a quasi-experimental study, non-probability purposive sampling was done. Sample size of 70 cases (35 in each group) was calculated with 80% power of test, 5% level of significance and assumed percentage of effectiveness in both groups i.e. 70% in Timolol group versus 40% on Brimonidine group in controlling increase of IOP after Nd:YAG laser iridotomy. Group A was experimental group which received 0.2% Brimonidine tartrate and group B was control group which received 0.5% Timolol maleate 1 hour before the laser treatment. Inclusion criteria for selection was, patients with all ages, both eyes, both genders, bilateral narrow angles, defined by irido-trabecular contact greater then 180 degrees on gonioscopy, pigment dispersion syndrome, shallow anterior chamber e.g. nanophthalmos, hyperopic eyes and secondary angle closure with pupillary block as assessed on slit lamp examination were included in the study. Patients having history of trauma to eye, uveitis, any eye surgery, steroid intake, neovascular glaucoma as assessed on gonioscopy and patient who cannot sit on slit lamp were excluded from the study.

DATA COLLECTION PROCEDURE:

70 consecutive patients meeting the mentioned criteria were referred from outpatient department (OPD) for Nd:YAG laser iridotomy. Nd:YAG laser is an ionizing infrared radiation and is the standard modality for laser iridotomy. Patient profile including name, age, sex, residential address and hospital registration number was noted. An informed consent was taken where the procedure of Nd:YAG laser iridotomy and the intervention using two different topical antiglaucoma medications and their side effects were explained. These patients were equally divided in two groups A and B, using random number table. Group A was experimental group which received 0.2% Brimonidine tartrate and group B was control group which received 0.5% Timolol maleate 1 hour before the laser treatment. Baseline IOP of patients in both, control and experimental group, was measured and noted before instilling these topical medications. Gonioscopy, number of shots and total laser energy was recorded. Efficacy in terms of IOP control less then or equal to 5mmHg was recorded at 60 minutes, 120 minutes and 180 minutes after Nd:YAG laser iridotomy.

DATA ANALYSIS:

Data was entered and analyzed using computer software SPSS version 17.0. Quantitative variables such as age and IOP were presented as mean and ± standard deviation. Qualitative variables such as gender and effectiveness (controlled raise of IOP less then or equal to 5mmHg from baseline) in both groups were presented as percentages and frequencies. The two groups were compared for effectiveness using chi-square test. P value less then or equal to 0.05 was considered as significant.

RESULTS:

A total of 70 cases (35 in each group) fulfilling the inclusion/exclusion criteria were enrolled to compare the effectiveness of prophylactically given 0.5% Timolol maleate and 0.2% Brimonidine tartrate in controlling increase of intraocular pressure after Nd:YAG laser iridotomy.

TABLE 1: GENDER DISTRIBUTION (n=70)

Gender	Group-A (n=35)		Group-B (n=35)	
	No. of patients	%	No. of patients	%
Male	19	54.29	21	60
Female	16	45.71	14	40
Total	**35**	**100**	**35**	**100**

Gender distribution shows that 54.29% (n=19) in Group-A and 60% (n=21) in Group-B were males while 45.71% (n=16) in Group-A and 40% (n=14) in Group-B were females. (Table 1)

TABLE 2: AGE DISTRIBUTION (n=70)

Age (in years)	Group-A (n=35)		Group-B (n=35)	
	No. of patients	%	No. of patients	%
30-40	7	20	9	25.71
41-50	17	48.57	14	40
51-60	11	31.43	12	34.29
Total	**35**	**100**	**35**	**100**

Mean ± SD: 46.38 ± 7.56 years

Age distribution of the patients was done which shows that 20% (n=7) in Group-A and 25.71% (n=9) in Group-B were between 30-40 years, 48.57% (n=17) in Group-A and 40% (n=14) in Group-B were between 41-50 years and 31.43% (n=11) in Group-A and 34.29% (n=12) in Group-B were between 51-60 years, mean and SD was calculated as 46.38 ± 7.56 years. (Table 2)

TABLE 3: MEAN INTRAOCCULAR PRESSURE IN BOTH GROUPS (n=70)

Mean ± SD IOP (mm)	Group-A (n=35)	Group-B (n=35)
	20.54 ± 2.43	18.31 ± 2.15

Mean intraocular pressure in both groups was recorded as 20.54 ± 2.43 in Group - A and 18.31 ± 2.15 in Group - B. (Table 3)

TABLE 4: COMPARISON OF EFFECTIVENESS IN BOTH GROUPS (n=70)

Effectiveness	Group-A (n=35)		Group-B (n=35)	
	No. of patients	%	No. of patients	%
Yes	12	34.29	25	71.43
No	23	65.71	10	28.57
Total	**35**	**100**	**35**	**100**

p =0.002

Comparison of effectiveness in both groups was recorded as 34.29% (n=12) in Group-A and 71.43% (n=25) in Group-B while 65.22% (n=23) in Group-A and 28.57% (n=10) in Group-B did not show efficacy, p value was calculated as 0.002 which shows significant difference in both groups. (Table 4)

TABLE 5: STRATIFICATION OF EFFECTIVENESS ACCORDING TO GENDER (n=70)

Gender	Group-A (n=12)		Group-B (n=25)	
	No. of patients	%	No. of patients	%
Male	7	58.33	15	60
Female	5	41.67	10	40
Total	**12**	**100**	**25**	**100**

Stratification of effectiveness according to gender shows that out of 12 cases in Group-A 58.33% (n=7) were male and 41.67% (n=5) were females, while in Group-B, out of 25 cases, 60% (n=15) were males and 40% (n=10) were females. (Table 5). P=0.923 i.e. >0.05 indicating there is no significant association between gender and effectivity.

DISCUSSION:

After cataract glaucoma is the second leading cause of blindness and visual loss.[1] It affects up to 2% of those over the age of 40 years globally, and up to 10% over the age of 80. On a worldwide basis primary angle closure glaucoma constitutes up to half of the cases.[1] It has been predicted that by the year 2020, 80 million people will have glaucoma, and approximately 11 million of them will be blind in both eyes. Half of this blindness will be the result of primary angle closure glaucoma (PACG).[8]

To adopt a procedure as a prophylactic treatment in a population-wide setting for asymptomatic people requires strong evidence that the benefits outweigh the harm.[9] Although LPI generally is considered safe, almost no long-term data have been reported on patients treated with prophylactic LPI, and short-term complications are known to occur. Laser peripheral iridotomy can cause an acute and (usually) transient post-treatment rise in intraocular pressure (IOP) in some patients.[10, 11] Although previous studies indicate that the incidence of IOP spikes is reduced greatly in eyes pretreated with ocular hypotensive agents, [10, 12, 13] the

frequency and severity of IOP elevation after prophylactic LPI remains uncertain.

LPI either acts by eliminating pupillary block by allowing the aqueous to pass directly from the posterior chamber into the anterior chamber, by passing the pupil in patients suffering from angle closure glaucoma or is performed prophylactically on asymptomatic individuals with narrow angles, on patients with nanophthalmos, small eyes and those with pigment dispersion.[14, 16] It is also done on the fellow eye in patients having angle closure in one eye, as the probability is 50% in the second eye.[1, 2]

During the past few years a number of investigators have reported that a transient intraocular pressure (1OP) rise may follow any anterior segment laser surgery such as argon laser trabeculoplasty, argon or YAG laser iridotomy, or YAG laser capsulotomy. This rise in IOP appears to be unrelated to the type of therapy, the type of laser used, the total amount of energy delivered, bleeding, or cellular debris that occurs during treatment, or to the degree of inflammation after treatment. The IOP rises despite the use of topical ocular hypotensive or non-steroidal anti-inflammatory agents.

Iridotomies created using pulsed Nd:YAG lasers use plasma formation and consequent photodisruption, instead of coagulation of proteins created by continuous wave lasers such as argon, diode, and frequency-doubled YAG machines. In a study by Jiang Y, the overall mean IOP in treated eyes was slightly higher at 1 hour after LPI as compared with the baseline level (17.5 ± 4.7 mmHg vs. 15.6 ± 2.7 mmHg) and decreased to 15.6 ± 3.4 mmHg at 2 weeks after treatment.[17] The results in our study reveal that mean intraocular pressure in both groups was recorded as 20.54 ± 2.43 in Group-A and 18.31 ± 2.15 in Group-B, comparison of effectiveness in both groups was recorded as 34.29% (n=12) in Group-A and 71.43% (n=25) in Group-B, while 65.22% (n=23) in Group-A and 28.57% (n=10) in Group-B did not show efficacy, p value was calculated as 0.002 which shows significant difference in both groups.

Our results must be seen in the context of its limitations, however the findings of the study are in agreement with other studies showing that controlling IOP rise after Nd:YAG laser capsulotomy are 93.4% with Timolol and 68.3% with Brimonidine[5, 7, 12] but after Nd:YAG laser iridotomy there is a possibility of more IOP rise, so on basis of this it was assumed that effectiveness of both the drugs remain 70% for Timolol and 40% for Brimonidine. If Timolol is discontinued after long-term application, its effects will remain for at least 2 weeks.[18] Discontinuation for up to 4 weeks may be required for complete disappearance of the Timolol effect. Timolol can be detected in the aqueous humor up to 5 days after withdrawal, and even 42 days after withdrawal the drug can still be present in pigmented ocular tissues.Very few studies are conducted on this issue, however, more trials should be conducted, so that the results may be further strengthened and the effective drug may be used in future.

CONCLUSION:

We concluded that 0.5% Timolol maleate is more effective than 0.2% Brimonidine tartrate in controlling increase in intraocular pressure following Nd:YAG laser iridotomy.

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