



TO STUDY THE EFFECT OF BLOOD PRESSURE REDUCTION WITH BETA BLOCKERS IN HYPERTENSION ON INTRAOCULAR PRESSURE

Ophthalmology

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ABSTRACT

Background Previous studies have shown an association between systemic hypertension and intraocular pressure (IOP). **Objectives:** To study the relationship between the blood pressure reduction with beta blockers in hypertension on intraocular pressure **Methods:** A cross sectional, observational study conducted at tertiary care hospital, Maharashtra. Ethical clearance was obtained before the start of the study. By purposive sampling and hospital admissions, 30 hypertensive patients on B blockers were studied. The IOP of each eye was measured once with a noncontact tonometer at presentation and 30days of follow up. The reduction in IOP with decreasing BP was studied. The study was conducted after ethics committee permission and obtaining informed consent **Results:** In our study the mean IOP was 14.83 ± 1.533 mmHg in the right eye and 14.883 ± 1.69 mmHg in the left eye. The mean IOP measured 30days of follow up after the patients became normotensive was 13.833 ± 1.583 mmHg in the right and 13.90 ± 1.583 in the left eye. There was decrease in the IOPs seen after BP reduction that was not statistically significant with P value > 0.05. **Conclusions:** The study findings show that with decrease in blood pressure iop decreases and this may thus help for the management of glaucoma patients with comorbidity like hypertension, and may further provide new insight into the pathophysiologic processes underlying increase in IOP.

KEYWORDS

Hypertension, Intraocular Pressure, Beta Blockers, Blood Pressure

INTRODUCTION

Intraocular pressure (IOP) is the fluid pressure of the eye. IOP is a measurement of the force by the aqueous humor on the internal surface area of the anterior eye. A change or fluctuation in this will surely change the IOP.^{1,2}

Intraocular pressure is carefully regulated, and any disturbances in this results in the development of pathologies such as glaucoma, uveitis, and retinal detachment. IOP is balance between the production and drainage of aqueous humor and basic understanding of the production and outflow of the aqueous humor is necessary. Aqueous humor is produced by the ciliary epithelium of the iris ciliary body pars within the posterior chamber of the anterior eye. Aqueous humor accumulates in the posterior chamber and flows through the pupil into the anterior chamber. The vast majority of aqueous humor drains through the trabecular meshwork at the angle of the anterior chamber and into the Schlemm canal, where it enters episcleral veins.^{1,2} A homeostatic mechanism helps in maintaining intraocular pressure. Homeostatic regulation of IOP, however, relies primarily on the regulation of aqueous outflow through the trabecular meshwork. The sympathetic nervous system directly effects the secretion of aqueous, with beta-2 receptors causing increased secretion and alpha-2 receptors causing decreased secretion.^{1,2,3} Intraocular pressure is usually measured by applanation tonometry. Pressures of between 11 and 21 mmHg are considered normal. When IOP is high above the normal range, there is an increased incidence of development of primary open-angle glaucoma.^{4,5,6}

IOP increases with increased systemic blood pressure so the relationship is seen to be parallel but it is also not well studied. This relation appears to be reasonably steady across the range of values of IOP and both systolic and diastolic blood pressures. The individual effects of systolic and diastolic blood pressure on IOP remain unclear and there are very few studies about it.^{3,4,5,6} Also subjects on antihypertensive medications are more likely to have glaucoma and so higher ocular perfusion pressure is protective from glaucomatous damage. It has been hypothesized in some studies that treatment of hypertension causes relatively increased risk of visual field deficits because of an gap in the understanding of relation of blood pressure to IOP.^{4,5,6,7}

MATERIALS & METHODS

Study Design:

A cross sectional, observational study conducted at tertiary care hospital, Maharashtra. By purposive sampling, 30 hypertensive patients on B blockers were studied. Study Duration: December 2023 to January 2024. The study was conducted after ethics committee permission and obtaining informed consent

Sampling size determination-

By purposive sampling, 30 hypertensive patients on B blockers were studied based on hospital data of admissions of 2 months

Inclusion criteria:

All males and females above 18 years of age who have been hypertensive for more than six months and taking beta blockers, those who consented to participate in the study Exclusion criteria: patients with comorbidities other than hypertension and not willing to participate.

Statistical analysis

The data was presented with the help of frequencies & percentages, graphs & charts along with descriptive statistics such as mean and Standard Deviation. Test of significance used was chi-square test All p value less than 0.05 was taken as significant.

RESULTS

Table 1 Demographic and other information of the study participants

Variables	Frequency	Percentages
Age group (years)		
31-40	5	16.66
41-50	12	40
51-60	7	23.33
>60	6	20
Gender		
Males	18	60
Females	12	40
Family history		
Yes	26	86.66
No	4	13.33
Visual acuity		
6/6	21	70
6/9	9	30
Blood pressure		
Decrease	28	93.33
No change	2	6.66

In our study 5 people belong to age group 31-40 years, 12 belong to age group 41-50 years, 7 belong to age group 51-60 years and 6 belong to age group >60 years. There were 18 males and 12 females. Blood pressure decrease was seen in 28 patients and no change in blood pressure in 2 patients after giving beta Blockers

In our study the mean IOP was 14.83 ± 1.533 mmHg in the right eye and 14.883 ± 1.69 mmHg in the left eye. The mean IOP measured 30days of

follow up after the patients became normotensive was 13.833 ± 1.583 mmHg in the right and 13.90 ± 1.583 in the left eye. There was decrease in the IOPs seen that was not statistically significant with P value > 0.05 .

DISCUSSION

Previous studies have shown an association between systemic hypertension and intraocular pressure (IOP)

Tiambeng C study was conducted to study the relationship between the decreases of the blood pressure (BP) and IOP in hypertensive patients and included total of 214 patients where 158 hypertensive and 56 normotensive patients were taken as study and control groups, respectively. In the study group, the mean IOP was 15.29 ± 4.05 mmHg in the right and 15.11 ± 3.78 mmHg in the left eyes. The mean IOP measured an hour after the patients became normotensive was 13.78 ± 4.06 mmHg in the right and 13.51 ± 3.82 in the left eyes. There was a statistically significant decrease in the IOPs with P value < 0.001 . On the other hand the mean IOP in the control group was 13.54 ± 3.51 mmHg in the right and 13.20 ± 3.33 mmHg in the left eyes. The mean IOP at appearance in the study and control groups was found to be significantly different with P value < 0.001 . Patients in the study group showed a significantly higher IOP compared to patients in the normotensive group.⁴

In our study the mean IOP was 14.83 ± 1.533 mmHg in the right eye and 14.883 ± 1.69 mmHg in the left eye. The mean IOP measured 30 days of follow up after the patients became normotensive was 13.833 ± 1.583 mmHg in the right and 13.90 ± 1.583 in the left eye. There was decrease in the IOPs seen after BP reduction that was not statistically significant with P value > 0.05 . This may indicate that hypertension when uncontrolled poses a risk for prolonged higher IOP that in turn can be considered as one of the risk factor for the glaucoma.

Behera G, study conducted to evaluate the effect of reducing blood pressure (BP) by atenolol and amlodipine on (1) intraocular pressure (IOP) and (2) ophthalmic artery blood flow (OAF) velocity in new hypertensives in prospective, observational cohort study. It was found that there was a significant decrease in IOP with both drugs; the effect was greater with atenolol which is beta blocker. On premedication IOP seen was 16.06 ± 2.13 mmHg and on day 30 it was 12.46 ± 1.94 (22.4%) after atenolol administration and it was statistically significant P value < 0.001 , while after administering amlodipine premedication IOP was 15.13 ± 2.55 mmHg and on day 30 IOP was 13.06 ± 2.14 (13.68%) and decrease was not statistically significant P value < 0.001 . A decrease of 0.5 mmHg in IOP with every 10 mmHg decrease in systolic BP was noted after oral atenolol. The study concluded that BP reduction by atenolol and amlodipine has caused decrease in IOP but reduction in IOP was greater with atenolol due to reduced blood flow.⁹

Similarly Klein study was conducted to investigate the relation between change in systemic blood pressures and change in intraocular pressure in a population based study and concluded that reduced systemic blood pressure is associated with reduced intraocular pressure.³

Khawaja AP study was the first population-based study to establish and quantify clinically significant differences in IOP among participants using systemic β -blockers or nitrates. Lower IOP observed in participants using statins or aspirin that was explained by simultaneous systemic β -blocker use.¹⁰

Chauhan study concluded that the IOP reduction was seen on patients with systemic hypertension with Atenolol and stoppage of therapy may cause glaucoma changes.¹¹

CONCLUSIONS

The study findings may thus help for the management of glaucoma patients with comorbidity like hypertension, and may further provide new insight into the pathophysiologic processes underlying increase in IOP. More research is needed confirm to This finding

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