

A Hospital Based Prospective Study of Association between Intraocular Pressure and Myopia

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Abstract

Introduction: Myopia or near-sightedness is a refractive error in which rays of incident light from infinity are focused in front of retina with accommodation being at rest. It is a condition in which close objects are seen clearly, but objects farther away appear blurred. Myopia occurs if the eyeball is too long or the cornea, the clear front cover of the eye, has too much curvature. As a result, the light entering the eye is not focused correctly and distant objects look blurred. **Materials and Methods:** This is an observational study done in the department of Ophthalmology over a period of 24 months. 278 eyes of 200 patients were included for the study. Informed consent was taken from all the patients. All of them underwent a complete ocular examination including slit lamp examination, dilated fundus examination, retinoscopy and refraction. BCVA (Best corrected visual acuity) was assessed using Snellen's visual acuity chart. Intraocular pressure was measured by Goldmann applanation tonometer by the same investigator in all cases. Patients with astigmatism >1Dioptre (D) and hyperopia >+0.50 DS (Dioptre Sphere), Patients with family history of Glaucoma, history of trauma or surgery in the eye, patients on any topical medications and those with corneal dystrophy and myopic macular degeneration were excluded from the study. **Results:** A total of 200 patients (278 eyes) were included in the study. Mean age of the patients was 32 years (ranging from 11 years to 47 years). The study included 88 females and 112 males. There was no significant difference in gender distribution among the four diagnostic groups. The refractive error among the included eyes ranged from +0.50 DS to -9.00 DS. There was no statistically significant difference in Intraocular pressure between low myopia and emmetropia patients but the IOP in moderate (Group-2) and severe myopia(Group-3) was found to be higher compared to emmetropic patients. The results was statistically significant with a 'P' value < 0.05. **Conclusion:** There is statistically significant correlation between intraocular pressure and myopia with intraocular pressure being higher in moderate and high myopic groups than in emmetropia or in low myopia, thereby increasing the risk of glaucoma in these patients.

Keywords: Myopia, retinoscopy, refraction, hyperopia, BCVA.

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Introduction

Myopia or near-sightedness is a refractive error in which rays of incident light from infinity are focused in front of retina with accommodation being at rest. It is a condition in which close objects are seen clearly, but objects farther away appear blurred. Myopia occurs if the eyeball is too long or the cornea, the clear front cover of the eye, has too much curvature[1]. As a result, the light entering the eye is not focused correctly and distant objects look blurred. A common sign of myopia is difficulty with the clarity of distant objects like a movie or TV screen or the chalkboard in school going children. The severe myopia (high degree myopia) has more likely to develop eye disorders in later life. These might include: 1) Retinal detachment- the retina begins to pull away from the blood vessels that supply it with oxygen and nutrients; if left untreated, retinal detachment can cause permanent vision loss; 2) Glaucoma- pressure builds up inside the eye which, if left untreated, can also pose a threat to vision; 3) Cataracts- opacities present in the lens; 4) Macular degeneration- the central section of the retina (the macula) becomes damaged, leading to some loss of central vision[2]. All these are causes for avoidable blindness. Myopia is one of the most common treatable ocular condition. In most cases, normal vision could be restored with eyeglasses or contact lenses and refractive surgeries. Intra ocular pressure (IOP) is the fluid pressure inside the eye. Intraocular pressure plays an important role in the pathogenesis of glaucoma and has been hypothesized to be one of the several factors implicated in the pathogenesis of glaucoma[3-5]. Few studies has shown that myopia is important risk factor for POAG.[6,7] Most population based study in adults have found significant relation between IOP and myopia[8,9]. Although some dispute still exist in few clinical based studies. This study aims to find out the association between intraocular pressure

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and myopia in an adult healthy population containing emmetropes, low myopes, moderate myopes and high myopic individuals.

Material and methods

This is an observational study done in the department of Ophthalmology over a period of 24 months. 278 eyes of 200 patients were included for the study. Informed consent was taken from all the patients. All of them underwent a complete ocular examination including slit lamp examination, dilated fundus examination, retinoscopy and refraction. BCVA (Best corrected visual acuity) was assessed using Snellen's visual acuity chart. Intraocular pressure was measured by Goldmann applanation tonometer by the same investigator in all cases. Patients with astigmatism >1Dioptre (D) and hyperopia >+0.50 DS (Dioptre Sphere), Patients with family history of Glaucoma, history of trauma or surgery in the eye, patients on any topical medications and those with corneal dystrophy and myopic macular degeneration were excluded from the study.

278 eyes of 200 patients were divided into four groups.

Group-0 included Emmetropic patients with refraction ranging from +0.50 to -0.50 DS.

Group-1 included low myopia ranging from -0.75 DS to - 3.00 DS.

Group-2 included moderate myopia from -3.00 DS to - 5.00 DS.

Group-3 included high myopia >-5.00 DS.

Data analysis

Values were presented as mean in standard deviation. Statistical Analysis were conducted using a commercial software (SPSS ,Software Version 13.0, SPSS Inc Chicago). One way of analysis of variables (ANOVA) was used for determining whether the values of a particular variable differed between the 3 diagnostic groups. The level of statistical significance was set to P <0.05.

Results

A total of 200 patients (278 eyes) were included in the study. Mean age of the patients was 32 years (ranging from 11 years to 47 years). The study included 88 females and 112 males. There was no significant difference in gender distribution among the four diagnostic groups. The refractive error among the included eyes ranged from +0.50 DS to -9.00 DS.

Table 1: Distribution of refractive error among the different study groups.

Study population	Distribution	Percentage (%)
Group - 0	126	45.32
Group - 1	120	43.16
Group - 2	22	7.91
Group - 3	10	3.59

Group-0 – Emmetropia included 126 eyes, Group-1 low myopia included 120 eyes, Group-2 -moderate myopia included 22 eyes and Group-3 – high myopia included 10 eyes (Table 1). The mean Intraocular pressure recorded in group- 0 was 12.76 mm Hg (SD: 2.18), Group-1 was 12.33 mm Hg (SD: 2.44), Group-2 was 15.00 mm Hg (SD: 2.25) and Group-3 18.5 mm Hg (SD: 0.7) (Table 2).

Table 2: Mean intraocular pressure among the four groups.

Study Groups	Frequency	Mean IOP	SD
0	126	12.7623	2.18787
1	120	12.3387	2.44756
2	22	15.0065	2.24926
3	10	18.5174	.69402
Total	278	12.9534	2.58151

Table 3: Multiple comparisons of intraocular pressure of emmetropic patients with low myopic, moderate myopic and high myopic patients.

(I) Emmetropia	(J) Myopia	Mean Difference (I-J) in IOP	SD Error	Significance
0	1	.432	.375	1.00
	2	-2.54	.679	.004
	3	-5.86	.954	.000

There was no statistically significant difference in Intraocular pressure between low myopia and emmetropia patients but the IOP in moderate (Group-2) and severe myopia(Group-3) was found to be higher compared to emmetropic patients. The results were statistically significant with a 'P' value < 0.05 (Table 3).

Discussion

In this study, we found a positive correlation between intraocular pressure and increasing degree of myopia. The findings were consistent with several previous reports[6-8]. Several studies have reported that the myopic patients especially in the high myopic group showed higher Intraocular pressure than controls. Myopia is associated with open angle glaucoma in white adults, with approximately threefold significantly increased odds in moderate to high myopes[7]. In present study we observed that the intraocular pressure was significantly higher not only in the high myopic group but also in the moderately myopic groups compared to emmetropia and low myopic groups. It is possible that this and other glaucoma genes may be represented more frequently in persons with myopia. The other possible causes for the association of myopia and ocular hypertension were explained by various studies. Nesterov A et al postulated that, in myopic eyes the ciliary body is in relatively posterior position in relation to canal of Schlemm so that it has less mechanical advantage in widening the spaces in the trabecular meshwork during accommodation. Fluorescein angiographic studies have suggested a reduced choroidal blood flow in myopes, and the amplitude of the ocular pulse is lower in myopes than in emmetropes or hypermetropes. The circulation to optic disc in myopic eye is also reduced and therefore myopics are more susceptible to raised IOP as suggested by Edward S Perkins and Charles Phelps. Morphologic optic nerve head changes often associated with myopia can mimic or mask glaucomatous changes complicating diagnosis and monitoring. The main limitation of this study would be that the axial length, corneal curvature and central corneal thickness were not measured. Therefore the role of these factors in the refraction related mechanical changes of the cornea is not known. These factors may influence the correlation between myopia, IOP and biomechanical properties of cornea[8,9]

Conflict of Interest: Nil

Source of support: Nil

Conclusion

There is statistically significant correlation between intraocular pressure and myopia with intraocular pressure being higher in moderate and high myopic groups than in emmetropia or in low myopia, thereby increasing the risk of glaucoma in these patients.

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