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Glaucoma characteristics evaluation in myopia – A clinical study

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ABSTRACT

Introduction: Glaucoma is the leading cause of irreversible blindness, one of the risk factor recognised being high myopia. Intra ocular pressure may be normal in myopic patients, with optic nerve head glaucoma characteristics. Eye ball elongation and optic nerve head tilting may be present in patients with high myopia that will represent field defects mimicking glaucoma. Treating patients with myopia having suspected aspects of glaucoma may be a challenge but even more challenging is the diagnosis of glaucoma in myopic patients.

Aims: To evaluate the association of glaucoma features with myopia. To create the awareness regarding the long term follow up.

Materials and Methods: Patients in the age group of 15 to 45 years who had attended our institution over a period of one year who fulfilled the inclusion and exclusion criteria were subjected for this study. Fifty four patients who were diagnosed to have moderate or high degree myopia were selected for this analytical study. They were subjected to vision, ocular examination, tonometry and results obtained were analysed.

Results: In our study moderate myopes constituted 55.5% and high myopes were 44.5%. The mean Intra ocular pressure and the mean corrected Intra ocular pressure in high myopes were observed to be higher than in moderate myopia. It was observed that higher prevalence of glaucoma was observed in high myopes.

Conclusion: There is a clinically as well as statistically significant difference between mean Intra ocular pressure and mean corrected Intra ocular pressure. So mean corrected Intra ocular pressure should be measured. From our study, there is a clear indication that there is increased prevalence of glaucoma in high myopes.

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1. Introduction

Glaucoma is the leading cause of irreversible blindness among the world population,^{1,2} one of the risk factors identified for this is high myopia. Patients with high myopia have a higher risk of glaucoma because of changes in optic nerve head.

Patients with high myopia will have eyeball elongation and optic nerve head tilting that will have field defects which may mimic glaucoma and treating patients with myopia with suspected Optic Nerve Head features of glaucoma is a challenge and even more challenging is the diagnosis of

glaucoma in a myopic patient. In a myopic patient normal may be the Intra Ocular Pressure with the optic nerve head simulating the glaucoma features.

There is a possibility that myopic patients are associated with higher risk for glaucoma.³ Glaucoma evaluation involves many aspects like Intra Ocular Pressure levels, features of optic nerve head changes, Retinal Nerve Fibre layer and visual field changes. It is to be understood that optic disc in myopic patients might be more vulnerable to pressure changes due to their connective tissue patterns.

There is a tendency for lamina cribrosa to be deformed with increased axial length of the eyeball in myopic patients which may contribute to increased vulnerability to damage. This study was conducted to evaluate the association of

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glaucoma features with myopia and to create the awareness regarding the long term follow up.

2. Aims

To evaluate the association of glaucoma features with myopia. To create the awareness regarding the long term follow up.

3. Materials and Methods

Patients in the age group of 15 to 45 years who had attended our institution over a period of one year who fulfilled the inclusion and exclusion criteria were subjected for this study. Inclusion criteria were (i) unilateral or bilateral myopia patients in the age group of 15 to 45 years, (ii) myopia in the range of -3.00 D to -6.00 D, (iii) moderate and more than -6.00 D- high myopia. Patients below 15 years and above 45 years, those not having clear media and patients having retinal degeneration not related to myopia were excluded from the study.

Fifty four patients who were diagnosed to have moderate or high degree myopia were selected for this analytical study. Patients were enquired about their occupation, symptoms, spectacle usage and frequent change of spectacles. Clinically patients were subjected to visual acuity - both unaided and aided, refraction, slit lamp examination, tonometry with Goldman applanation tonometer, pachymetry, gonioscopy, fundus examination and automated perimetry. Refractive power in the range of -3.00 D to -6.00 D spherical equivalent was considered as moderate myopia and more than - 6.00 D spherical equivalent was considered as high myopia. Intra ocular pressure was measured by using standard Goldmann applanation tonometer and readings less than 21.00 mmHg was taken as normal intra ocular pressure.

The corrected intra ocular pressure was derived after measuring the central corneal thickness and using adjustment corrections to the measured intra ocular pressure.

Asymmetry of the cup disc ratio, notching in the supra temporal or infra temporal rim, localised loss of retinal nerve fibre layer and disc haemorrhage were considered as optic disc changes in glaucoma. Ophthalmoscopic features of temporal crescent, peripapillary atrophy, and optic disc tilting and tigeroid fundus are to be considered as features of myopia. Visual field charting was done taking into account necessary care to sustain adequate fixation. Visual field defects were considered glaucomatous when:

1. Nasal step respected horizontal meridian.
2. Arcuate defect extended from blind spot.
3. Paracentral scotoma was found in Bjerrum's area.
4. Advanced field defect.

4. Observation and Results

Among the 54 cases, moderate myopia was seen in 30 patients and 24 patients were found to be with high myopia. The ratio between the two myopic conditions being 1.25:1

In the age group of 15 -30 years, 17 patients were having moderate myopic status while 13 were high myopes. In 31 - 45 years group, 13 were moderate myopes whereas 11 were having high myopic status.

Table 1: Age wise Distribution

Age	Moderate myopes	High myopes
15 – 30 Yrs.	17	13
31 – 41 Yrs.	13	11

In the moderate myopic group of 30 patients 14 were males and 16 were females and in the high myopia of 24 patients, 13 were males and 11 were females.

Table 2: Sex wise Distribution

Sex	Moderate myopia	High myopia
Male	14	13
Female	16	11

In moderate myopia, the mean intraocular tension observed was 17.7mmHg in right eye and 17.4mm Hg in left eye. Intraocular tension measured highest in both the eyes was 21.0mmHg

In high myopia group, the mean intraocular tension recorded was 17.8mmHg in right eye and 18.20mmHg in left eye. Intraocular tension recorded highest in right eye was 23.0 mmHg and in the left eye 28.0mmHg

Table 3: Mean intraocular pressure distribution

Refractive status	Right eye	Left eye
Moderate myopia	17.7 mm Hg.	17.4 mm Hg
High myopia	17.8 mm Hg	18.2 mm Hg

The mean corrected Intra Ocular Pressure recorded in the right and left eye of moderate myopic group was 18.3mmHg, the Intra Ocular Pressure recorded highest in this group was 22.0mmHg.

In high myopic group the mean corrected Intra Ocular Pressure in the right eye was 18.6mmHg and in the left eye was 18.9mmHg. The Intra Ocular Pressure measured highest in this group was 23.0mmHg in the right eye and 28mm Hg in the left eye

Table 4: Mean corrected intraocular pressure- distribution

Refractive status	Right eye	Left eye
Moderate myopia	18.3 mm Hg	18.3 mm Hg
High myopia	18.6 mm Hg	18.9 mm Hg

In the moderate myopic group, the variation between mean Intra Ocular Pressure and mean corrected Intra Ocular

Pressure was 0.60mmHg in the right eye and 0.84mHg in the left eye which was considered statistically significant.(P value less than 0.001)

In high myopic group, the variation between the mean Intra Ocular Pressure and mean corrected Intra Ocular Pressure was 0.75 mm Hg in both eyes which was considered statistically significant (P value < 0.001)

4.1. Optic disc changes

In moderate myopic group of 30 patients myopic fundus picture was seen in 9 patients while glaucomatous optic nerve head changes seen in 5 patients.⁴

In high myopic group of 24 patients, myopic fundus picture was observed in 14 patients and glaucomatous optic nerve head changes seen in 10 patients.⁵ Asymmetry of optic disc cup ratio was the most frequently observed finding.⁶

4.2. Visual field abnormalities

All the patients – 54 patients, 108 eyes - were subjected to perimetric analysis. Within the moderate myopic group of 60 charts, 5 had enlarged blind spot, 1 had centrocaecal scotoma and 2 had paracentral scotoma.

Within the high myopia group of 48 charts, 13 had enlarged blind spot, 1 had nasal step and arcuate scotoma was seen in 2 charts.

4.3. Diagnosis

In moderate myopic group ocular hypertension was seen in 10 patients and 7 were branded as glaucomatous suspect.

In high myopic group ocular hypertension was seen in 1 patient, 12 were branded as glaucoma suspect and open angle glaucoma was found in 1 patient.

5. Discussion

In our study group, moderate myopes constituted 55.5% and 44.5% by high myopes. In the moderate myopic group of 30 patients 31.5% belonged to 15 to 30 years of age and 24.0% represented 31 to 45years of age. Similarly 24.0% represented 15 to 30 years of age and 20.4 % belonged to 31 to 45 years of age in high myopes.

The mean IOP in high myopic group was found to be higher than seen in moderate myopic group. Similarly the mean corrected IOP seen in high myopes were observed to be higher than observed in moderate myopia. But from our study, we observed a statistically significant difference between mean IOP and mean corrected IOP in moderate myopes and high myopes.

In the moderate myopic group optic disc normal appearance was seen in 53.3% myopic fundus picture⁷ in 30% and glaucomatous optic nerve head changes in 16.6%.⁸

Table 5: Mean and mean corrected iop in moderate myopes

Paired sample t test Group	IOP (RE)	Right Eye	IOP (LE)	Left Eye	Mean	Std. Deviation	T	P value
Moderate Myopes	Corrected mean IOP (RE)		Corrected mean IOP (LE)		17.67	1.52	- 4.267	0.000
	Corrected Mean IOP (LE)				18.27	1.76	- 5.221	0.000

Table 6: Mean and mean corrected IOP in high myopes

Paired sample t test						
Group			Mean	Std. Deviation	T	P value
High Myopes	Right Eye	IOP (RE)	17.83	2.20	- 4.338	0.000
		Corrected mean IOP (RE)	18.58	2.19		
	Left Eye	IOP(LE)	18.17	2.87	- 4.338	0.000
		Corrected Mean IOP (LE)	18.92	2.90		

Table 7: Optic disc changes

Optic disc finding	Moderate myope	High myope
Normal	16	-
Myopic fundus	9	14
Glaucomatous optic disc	5	10
1. Cup disc ratio asymmetry	5	10
2. Supratemporal or inferior notching	-	1
3. Localized RNFL loss	4	6
4. Disc Haemorrhages	-	1

Table 8: Visual field changes

Visual Field Defect	Moderate Myopes (60 charts)	High Myopes (48 charts)	Total (108)
Normal	46	18	64
Enlarged blind spot	5	13	18
Generalized depression sensitivity	4	6	10
Rim artefacts	2	3	5
Central & Caecocentral scotomas	1	2	3
Nasal step		1	1
Paracentral scotoma	2	3	5
Arcuate visual field defects	-	2	2

In the high myopic group 41.6% was found to have glaucomatous optic nerve head change and the most commonly observed optic nerve head changes was the asymmetry of the optic disc cup ratio.

In the study of 108 perimetric charts the most commonly observed field defect was enlarged blind spot.⁹ In the high myopic group of 48 perimetric charts, enlarged blind spots were seen in 27.1%, nasal step 2.1%, 6.25% with paracentral scotoma and 4.16% with arcuate scotoma.

From our study we observed a higher prevalence of glaucoma and glaucomatous suspects in high myopic group as compared with the group of moderate myopes.¹⁰

6. Conclusion

There is a statistically significant difference between mean IOP and mean corrected IOP and this is also clinically significant. Hence the need for taking measurements of mean corrected IOP. This study also points to the fact that in high myopic group optic disc damage is more profuse. Enlarged blind spot was the most frequently observed field defect in high myopic group.

The number of samples may be small in our study but there is a clear indication that there is increased prevalence of glaucoma in high myopia

7. Source of Funding

None.

8. Conflicts of Interest

All contributing authors declare no conflict of interest.

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