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Posterior Segment Changes in High Myopic Patients- An Observational Study

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ABSTRACT

Background & Objectives: Myopia or short-sightedness is a type of refractive error. Myopia can be classified by aetiology and by its clinical presentation. Here, the aim of this study was to observe changes occurring in the posterior segment of eye - vitreous, choroid & retina in high myopic patients and also to evaluate any correlation between the degree of myopia, axial length and the visual acuity.

Methodology: A hospital-based study was conducted on 150 patients between March 2016 to March 2017. A detail demographic data, ocular history and family history was collected from patients. Ocular examination was carried out by different ocular tests. Statistical analysis was performed by using JMP Pro version 12.0.1 & Shapiro-Wilk Goodness of Fit test.

Results: Majority of cases of myopia were observed in the age group of the third decade. Highly myopic patients showed a high incidence of optic disc tilt (65%), peripapillary atrophy (72%), and retinal tessellation (65%). Study results also showed that the severity of myopia is correlated with axial length & visual acuity.

Conclusion: Study findings revealed that there is a strong correlation existed between the presence of parapapillary atrophy and high myopia. There was also a strong positive correlation between axial length and visual acuity.

Keywords: Myopia, Posterior Eye Segment, Peripapillary Atrophy, Axial Length, Visual Acuity

INTRODUCTION

From 1854 when von Graefe first described the association between myopia and axial length, to1988 when Takashi Tokoro first provided a definition of pathological myopia and a classification of chorioretinal atrophy in the posterior pole in pathologic myopia, to a century and a half later in 2012 when Ohno-Matsui and colleagues demonstrated the relationship between myopic retinochoroidal lesions with the scleral shape using 3D-MRI technology, the science of refractive errors and myopia, in particular, has come a long way. Uncorrected refractive errors account for almost 21% of the global burden of blindness [1] rising steadily from 19.9% in 1990. India, along with South Asia, shares a major part of this burden – 36% of blindness in South Asia is accounted for by uncorrected refractive errors. [1]

Myopia can be classified by aetiology and by its clinical presentation. Pathological myopia forms a major component of the uncorrected refractive errors. The prevalence of pathological or degenerative myopia globally is unclear. A wide range has been reported, starting with a survey by Fuchs before 1960 that revealed the prevalence to be in the range of 0.2% - 9.6% [2] with a higher prevalence in the Middle Eastern population. More recent studies show the prevalence to be in the range of 1-5% with higher rates in Asians [1] and much lower in those from the United States, perhaps suggesting the influence of geography or ethnicity.

The study of the severest form of myopia, pathological or degenerative myopia, acquires a special significance given the high rates of myopia globally (80% worldwide in the general population) and the varied complications that can result in patients suffering from this dreaded condition. The numerous complications that can arise in pathological myopia include degenerative changes in the sclera, choroid and Bruch's membrane, damage to the retinal pigment epithelium and neural retina, glaucoma, retinal detachment, myopic maculopathy, myopic retinopathy, and premature cataracts. [3, 4]

The clinical presentation of pathological myopia is complicated by the numerous changes that occur in the posterior segment of the eye. Apart from the anticipated deterioration of vision, characteristic changes such as liquefaction, condensation, posterior vitreous disease, lacquer cracks, pigment epithelial atrophy, staphyloma, Fuch's spots, lattice degeneration, peripapillary changes, and many others are seen in typical cases of pathological myopia. The distribution, pattern, and frequency of occurrence of these features, however, can be varied in different populations.

Hence, the aim of this study was to observe changes occurring in the posterior segment of eye - vitreous, choroid & retina in high myopic patients; also, to evaluate a correlation between the degree of myopia, axial length, and the visual acuity. Also, there was no previous study has described these changes in a population from Central India.

METHODS

A cross-sectional study was conducted between March 2016 to March 2017 at Mahatme Eye Bank Eye Hospital, Nagpur, to observe the changes occurring in the posterior segment of eye (vitreous, choroid & retina in high myopic patients) and to evaluate a correlation between the degree of myopia, axial length, and visual acuity. Randomly selected 150 patients who fulfilled the inclusion and exclusion criteria were enrolled into the study after obtaining the written informed consent.

The study was initiated after obtaining the approval from Institutional ethics committee of the institute. A detailed explanation was given to all the participating patients regarding the study and their contribution to it.

Patients with Myopia > - 6 D, patients with Axial length of eyeball >26mm, all patients above 6 years were included in study. While patients with Myopia <- 6 D, Emetropic & hypermetropic, Axial length of eyeball <26mm, irregular astigmatism, index myopia, corneal lesions and lens defects, uveitis and infections of the eye, Retinal diseases not related to myopia, Keratoconus and patients below the age of 6 years were excluded.

A detailed history regarding ocular complaints like the blurring of vision headache, floaters, flashes of light any family history of similar complaints, etc has taken. After that general examination, systemic examination & detail ocular examination such as Non-contact Tonometry, Retinoscopy, A-Scan, Slit Lamp Examination, Direct & Indirect Ophthalmoscopy, B-Scan and Optical Coherence Tomography.

Data were reported in simple descriptive statistics (numbers and percentages). Data were tested for normal distribution using the Shapiro-Wilk Goodness of Fit test. All statistical calculations were done using JMP Pro version 12.0.1, © SAS Institute Inc and Microsoft Excel 2013.

RESULTS

A total of 150 patients were enrolled in this study. Majority of patients were from the age group of 21-30 (42.7%) (Figure 1). 42 % were males and 58 % were females. A slight female preponderance of high myopia was seen. It was found that, 18.7% of patients had a positive family history.

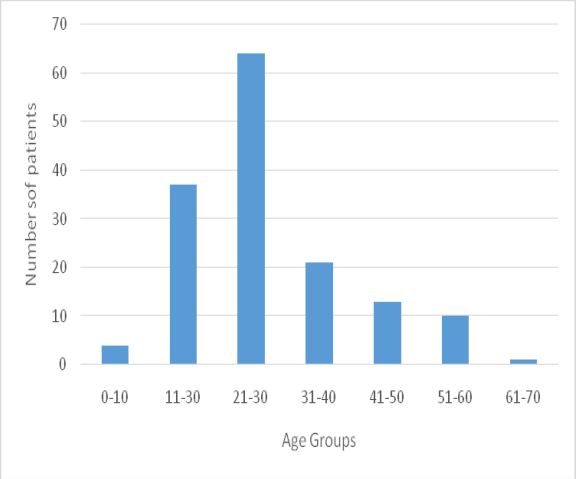

Figure 1: Age distribution of cohort

94% of patients were affected by bilateral myopia. Changes in the fundus of an eye were seen in 88.7% of patient's. Various vitreous changes have been seen in the posterior segment of an eye and posterior vitreous detachment was seen with high myopia (Table 1).

Table 1: Incidence of various types of posterior segment changes:

	Number of eyes	Percentage (%)
Vitreous Changes		
Liquefaction	86	28.7
Condensation	48	16.0
Posterior Vitreous Detachment	90	30.0
Degeneration	32	10.7
Opacities	12	4.0

In younger patients, the most common disc finding was peripapillary atrophy (72.7%) (Figure 2) while cases with lacquer cracks & chorioretinal atrophy were seen in 20.7% & 21% respectively (Figure 3).

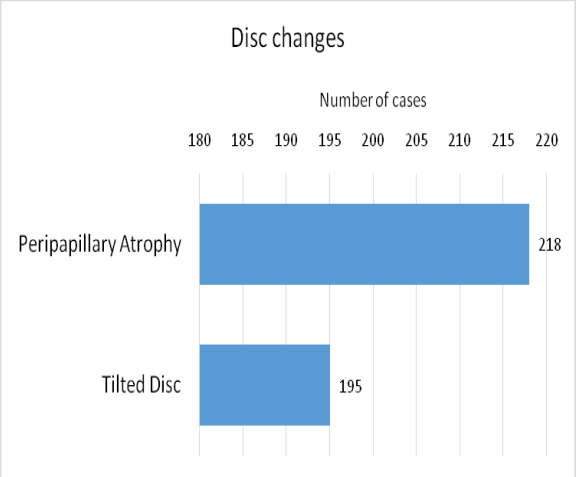

Figure 2: Disc Changes

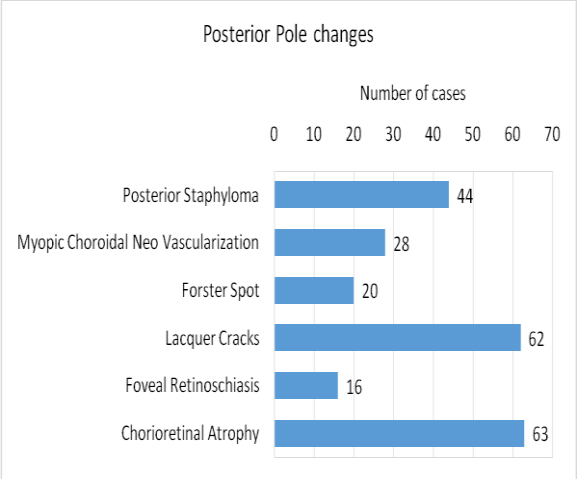

Figure 3: Posterior Pole Changes

Peripheral changes were common in moderate to higher degrees of myopia. As shown in Figure 4, commonly observed peripheral changes were tessellated fundus (65%), chorioretinal atrophy (38.3%) & lattice degeneration (38%). Also, there was a strong positive correlation between axial length and visual acuity (Pearson's correlation coefficient 0.69).

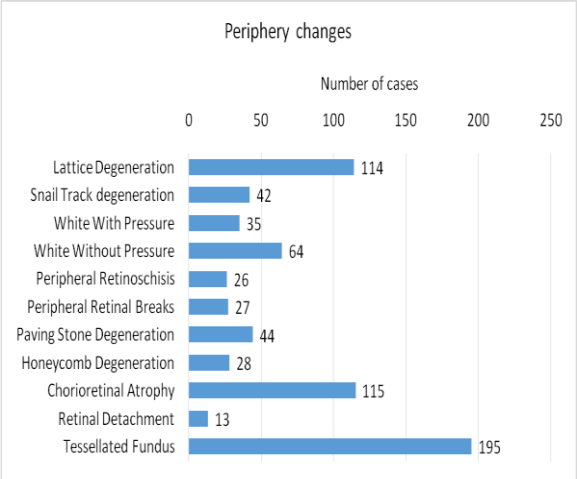

Figure 4: Periphery Changes

DISCUSSION

150 subjects who were having myopia enrolled in the study. All subjects fulfilling the inclusion criteria and willingness for participate in the study were enrolled.

In a study done by Venkatesan et. al, [5] the incidence of high myopia was seen highest in the 2nd decade. In contrast, in this study the incidence increased steadily up to the 3rd decade, declining thereafter. The

highest incidence (73%) was seen in the age group of 21–30 years. 6% of cases had unilateral myopia, similar to the 7% incidence seen in the study by Venkatesan, [5] while 18.7% of cases had a family history of myopia. This was much higher than in the study by Venkatesan et al (7%). [5]

In this study, highly myopic eyes showed a high incidence of optic disc tilt (65%), peripapillary atrophy (72%) and retinal tessellation (65%). Of 150 cases examined, 88.7% showed various fundus changes. In mild degrees of myopia, the severity of retinal background tessellation was not prominent and as myopia increased, gross tessellation was noted. This may be due to the thinning of the retinal pigment epithelium which exposes the underlying choroid secondary to elongation of the globe.

Tilting and shallow cupping of the disc were seen commonly in the cohort, these changes were also probably due to elongation of the globe.

A study was done by Richard M. Klein et al. [6] shows that the prevalence of lacquer cracks in pathologic myopia is 4.3%. However, a much larger percentage of patients with myopic macular degeneration develop lacquer cracks. In this study, lacquer cracks accounted for 20.7% of the high myopic population.

As per the study conducted by Manoj Shukla et al [7] on white with pressure eyes, the condition was seen in 27.6% of myopic eyes. In this study, the incidence was lower - white without pressure and white with pressure accounted for 21.3% and 11.7% respectively of high myopic patients.

Jose. M. Celorio et al [8] showed that out of 218 patients with myopia of 6D or more, 72 [33%] had lattice degeneration. This was close to the incidence of lattice degeneration (38%) in highly myopic patients in this study.

Peripheral retinal degeneration changes were common in moderate to higher degrees of myopia in a cross-sectional study, up to 61.7% of highly myopic eyes were found to have peripheral retinal change. The most common pathologies included optic nerve crescent (52.5%), white-without-pressure (51.7%), lattice degeneration (5.8%), microcystoid degeneration (5%), and pigmentary degeneration (4.2%). [9] High myopia was also suggested to be associated with bilateral rhegmatogenous retinal detachment, a condition of very severe visual morbidity. [10] Common types seen in this study were lattice degeneration (38%) white without pressure (21.3%) and white with pressure (11.7%) chorioretinal degeneration 9%, snail-track degeneration (14%). The majority of the above degenerative changes are associated with retinal detachment, seen in 4.3% of cases. All the cases of retinal degeneration were seen in cases of higher degrees of myopia.

Retinal degenerative changes were associated with retinal breaks in 9% of cases in this study. Eyes with chorioretinal breaks or detachments showed a high incidence of retinal detachment. This could be due to firm adhesion between retina and choroid in young patients with moderate to a high degree of myopia.

High myopia has been reported to be associated with idiopathic focal subretinal neovascularization. [11] There were 28 (9.3%) cases of choroidal neovascularization in our study.

The most common disc finding in this study was peripapillary atrophy, seen in 72.7% of cases while posterior staphyloma was seen in 14.7% cases. In contrast, in a study by Chang et al, [12] the most common myopia-related macular finding in adults with high myopia was staphyloma (23%), followed by chorioretinal atrophy (19.3%). There were few cases of lacquer cracks (n = 6, 1.8%), T-sign (n = 6, 1.8%), retinal hemorrhage (n = 3, 0.9%), active myopic choroidal neovascularization (n = 3, 0.9%), and no case of Fuchs spot. In our study, the most common disc finding associated with high myopia was peripapillary atrophy (81.2%), followed by disc tilt (57.4%). Lacquer cracks were seen in 20.7% of

patients and chorioretinal atrophy was seen in 59.3% of high myopic patients.

It was reported by O Malley PF et al [13] that paving stone degeneration is present in 22% of adult patients and is bilateral in 38% of them and prevalence increases markedly with increased age. In this study, paving stone degeneration was seen in 14.7% of the total high myopic population.

CONCLUSION

These study findings concluded that the younger age group is most commonly affected especially females. Fundal changes in myopia were observed to increase as the degree of error increased. There is a strong relation existed between the presence of parapapillary atrophy and high myopia. Also, there was a significant correlation between axial length and visual acuity.

Conflict of Interest - No

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