CORRELATION OF FUNDUS CHANGES IN RELATION TO REFRACTIVE ERROR IN PATIENTS WITH MYOPIA- A CLINICAL PROSPECTIVE STUDY

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ABSTRACT

BACKGROUND

Retina is unique among the complex element of the central nervous system and the special senses. It may be readily viewed during life and it is sufficiently transparent, so that alterations within and adjacent to it may be observed in vivo. The peripheral retina owing to its thinness comparing to that of the central part, poorly-developed retinal cells, absence of large blood vessels, relatively insensitive to light, less resistance to traction, forms a seat for various lesions, which are potentially dangerous for the vision. It is in myopia that we meet the most frequent and the most obvious anomalies in the fundus changes, which bear some relation to the degree of myopia and appeal to be concerned with it either as a cause or effect or perhaps both.

The aim of our study is to correlate fundus changes in relation to refractive error in patients with myopia.

MATERIALS AND METHODS

In our study, 100 cases of myopic (<--6D:50 cases; >-6D:50 cases) patients were selected. Detailed evaluation done. History of refractive error includes duration, age at which spectacles were worn for the first time. Time of last change of spectacles, family history of myopia, history of other symptoms like progressive loss of vision, defective vision related to day or night, sudden loss of vision, flashes and floaters. Anterior segment was examined followed by the recording of initial visual acuity and the best corrected visual acuity was noted. IOP was measured for all the cases using Schiotz tonometry. Axial length was measured in all the cases. Fundus examined with direct ophthalmoscope, indirect ophthalmoscope, 3 mirror and 90D lens. B-scan was done in few cases. The media, disc, vessels, macula and the surrounding retina were examined. The periphery was examined with indentation method. The various fundus features and pathological lesions in different degrees of myopia were noted.

RESULTS

Females were comparatively more affected. Highest incidence was seen in the younger age group. 73 patients showed various fundus changes. Most commonly seen were tessellated fundus (41%). 36% of cases showed vitreous floaters. Commonly, temporal crescents were seen. Few cases showed stippled appearance of the macula. Axial length is comparatively increased in higher degrees of myopia. Peripheral retinal degenerative changes are common in moderate to higher degrees of myopia. Early onset vitreous degeneration was seen in myopes. Though the peripheral degeneration changes was comparatively higher in >-6D cases, some of the degenerative changes like lattice, chorioretinal atrophic changes, white with pressure and white without pressure, retinal detachment, posterior staphyloma and retinal hole were also seen in <-6D cases.

CONCLUSION

Degenerative changes were seen in all degrees of myopia though comparatively lower in lesser degrees of myopia. All cases, myopia must be examined meticulously with indirect ophthalmoscope to rule out any peripheral degenerative changes. Early diagnosis and prompt treatment of retinal degeneration could prevent disabling visual loss due to myopia.

KEYWORDS

Myopia, Degeneration, Fundus, Ophthalmoscope.

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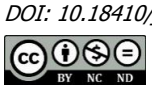

BACKGROUND

Eye is the most important sense organ of the human body. The primary responsibility of the visual function is carried out by retina. Pathological changes of retina can cause irreversible blindness. Myopia causes impaired visual acuity among school children as well as in adults. Retinal degeneration and retinal detachment is also commonly seen in myopia patients.[1]

The retina is unique among the complex element of the central nervous system and the special senses. It may be

readily viewed during life and it is sufficiently transparent, so that alteration within and adjacent to it may be observed in vivo.

For these and other reasons related to its structure, organisation and function, the retina has been of ever increasing importance in science as a whole and in the field of ophthalmology.

Consistence with this growing importance, methods of viewing the retina have steadily improved during more than a century since the principal of ophthalmoscopy was presented by Von-Helmholtz. As a result, current techniques of ophthalmoscopy and biomicroscopy facilitate clinical examination of the entire retina in detail.

Interpretations of the findings, however, depend on accurate and detailed knowledge of retinal topography, anatomical relationships, common developmental variations and degenerations that commonly affect the peripheral retina.

The peripheral retinal owing to its thinness comparing to that of the central part, poorly-developed retinal cells, absence of large blood vessels, relatively insensitive to light, less resistance to traction forms a seat for various lesions, which are potentially dangerous for the vision.[2]

The fundus changes in the myopic eye are variable, often severe and many times disabling as far as visual acuity is concerned. Ophthalmologists have long known that in general, an increase in peripheral chorioretinal degeneration takes place with an increase in refractive myopia. Myopes show decreased scleral rigidity. This is due to excessive stretching and thinning of sclera.[3] Rigidity is normal up to -3.0 to -5.0 Dioptres. After this, a decrease is seen.

In myopia, vitreous degeneration is common. The initial structural change is liquefaction. Pockets of fluid vitreous is seen in the formed gel. Later, this fluid will escape and causes collapse of vitreous and posterior vitreous detachment. Higher degree of myopia, early the onset of vitreous degeneration. Another characteristic feature is the changes seen in the optic disc. In myopes, shallow cupping is seen. This is due to an increase in the area of posterior scleral foramen.[4] Here, there is pathological stretching of posterior segment of globe. This causes falling short of choroid or retinal pigment epithelium at the disc. The sclera is thus exposed. Myopic crescents are seen in moderate-to-high degree of myopia.

If super traction is present, it will give an impression of temporal tilting. Small crescents are seen in moderate myopes. Large crescents and annular crescents are common in high myopia. In the peripheral retina, there may be degenerative changes. In myopia, there may be lattice degeneration, white without pressure, pigmentary degeneration and paving-stone degeneration.[5] Except in paving-stone degeneration, there can be associated retinal breaks. Paving-stone degeneration is due to atrophy of the retinal pigment epithelium from focal ischaemia when the arterial supply to a single lobule of choroidal circulation is occluded. This predisposes a myopic eye to retinal detachment. Detachments are common in eyes with a refractive error of -4.0 to -6 Dioptres.

Pathological myopia also called as malignant myopia is determined by hereditary and postnatal factors. Myopia of -8.0 Dioptre more is considered pathologic. The posterior sclera shows severe thinning, either in the temporal side or nasal side. Some laws due to the reparative effects, the scleral coats can be thick. In such cases, axial length was within normal limits and showed lower grades of myopia. The extreme thinning of posterior sclera in high myopia can be due to simple stretching and marked reduction of posterior scleral mass. High myopia shows anterior segment changes. The cornea is thinner than normal. Anterior chamber is of greater depth. The chamber angle also shows presence of mesodermal elements. Vitreous degeneration and presence of floaters is a usual feature.[6] In high myopes, vitreoretinal degeneration and traction can cause retinal and posterior vitreous detachment. Myopic degeneration usually makes their initial appearance in the crescent margin. In severe cases, entire peripapillary area can be involved.

Aim of the Study- To study fundus changes in relation to refractive error in patients with myopia and also to study the incidence of various degenerations in the retinal periphery in myopic patients.

MATERIALS AND METHODS

100 asymptomatic myopic patients (<-6D:50 cases; >-6D:50 cases), who have come for refractive error correction without any complaints of flashes or floaters to the Outpatient Department of our Government Tiruvannamalai Medical College from the period of September 2017 to December 2017 were taken as the study group.

Detailed history of refractive error elicited with regard to duration, age at which spectacles were worn for the first time, last change of spectacles, family history of myopia, history of other symptoms like progressive loss of vision, defective vision related to day or night, sudden loss of vision, flashes and floaters.

Anterior segment was examined followed by the recording of initial visual acuity and the best corrected visual acuity was noted. IOP measured using Schiotz tonometry. Axial length measured using A-scan. Dilatation done using homatropine 2% in young patients and phenylephrine 10% in adults. Fundus examined with direct ophthalmoscope, indirect ophthalmoscope, 3 mirror and 90D lens. B-scan was done in few cases.

Inclusion Criteria- All age group, both sexes.
Exclusion Criteria- Patients with history of trauma, pre-existing retinal pathology.

RESULTS

In our study, the incidence of myopia was higher in the younger age group. 43% of the individuals were in the age group of 11-20 years and minimum being 3% in the age group more than 60 years. The incidence of myopia was higher among females[7] accounting for 53% and males accounting for 47%.

Only 6% of the cases had positive family history and reduced incidence maybe due to lack of awareness mainly in low socioeconomic group. In our study, 91 patients had bilateral myopia and 9 individuals showed unilateral myopia.

Number of Cases	Cases with Fundus Changes
100	74
Table 1. Incidence of Fundus Changes in Myopia	

Out of 100 patients examined, 74 patients had fundus changes.

Sl. No.	Fundus Change	Number of Cases <-6D	Number of Cases >-6D	Total
1.	Lattice degeneration	7	19	26
2.	Chorioretinal degeneration	2	2	4
3.	White with pressure/ white without pressure	8	12	20
4.	Retinal tear	1	7	8
5.	Retinal detachment	3	7	10
6.	Posterior staphyloma	1	6	7
7.	Paving-stone degeneration	2	3	5
8.	Posterior vitreous detachment	1	2	3
9.	Snail track degeneration	1	3	4
10.	Retinal hole	1	3	4
11.	Retinitis pigmentosa	0	3	3
Table 2. Incidence of Various Types of Fundus Changes				

In our study, 26 patients manifested with lattice degeneration (19 patients had refractive power of more than 6D). Out of 26 cases of lattice degeneration examined, superotemporal quadrant[8] is most commonly affected with 16 cases. This is probably due to excessive stretching and increased vascularity of this area.

14 cases with lattice degeneration belonged to the age group of 11-40 years. Out of 4 cases of snail track degeneration, males outnumbered females accounting for 3 cases. Out of 13 cases of white without pressure, 11 cases were found to be in 2nd and 3rd decades.

Second common degeneration noted in our study was white with pressure and white without pressure.[9] 3 cases of retinitis pigmentosa was noted in our study. In our study, 4 cases found to have chorioretinal degenerative changes like atrophic patches and scars with 5 cases in the range of >-6D. 7 cases found to have posterior staphyloma with 6 cases falling under >-6D range. All cases of posterior staphyloma were seen in young individuals. Female preponderance is seen in posterior staphyloma.

Degeneration	Number of Cases <-6D	Number of Cases >-6D	Total
Lattice degeneration	2	4	6
Retinal tear	1	1	2
Snail track degeneration	0	1	1
White with pressure	0	1	1
Table 3. Incidence of Retinal Detachment			

Out of 10 cases of retinal detachment, 6 patients have lattice degeneration, 2 patients had retinal tear and 1 patient had snail tract degeneration. All these changes were common in all degrees of myopia.[10]

Refractive Power	Number of Cases
<-6D	**14**
>-6D	**27**
Table 4. Incidence of Tessellation with Myopic Status	

Though 41 cases out of 100 cases has tessellated fundus, 27 cases comes under the higher degrees of myopia[11,12] and 14 cases had power of <-6D. This clearly indicates that retinal changes can occur in any degree of myopia.

DISCUSSION

In our study, 100 cases of myopia were studied. Females were commonly affected 53%. The highest incidence was seen in the younger age group (0-30 years) 70%. It is of interest to note that majority of these cases falls under the student's community. This maybe because they were symptomatically aware of the refractive error. While only 6% of cases had a family history of myopia, majority of the cases did not have a significant family history. Reduced incidence maybe due to lack of awareness mainly in low socioeconomic group. 7% of cases had unilateral myopia. All these cases falls under more than -6D group. Four of these cases were associated with lattice degeneration. Interestingly, 2 cases of unilateral myopia is associated with posterior polar cataract.

Axial length is found out to be increased in higher degrees of myopia. This is due to the elongation of the globe. Out of 100 cases examined, 72% showed various fundus changes. Retinal background showed a tessellated appearance in 41% of cases. This tessellation was not much in mild degrees of myopia. In higher degrees, gross tessellation was noted. This is due to thinning of retinal pigment epithelium, which exposed the underlying choroid secondary to elongation of the globe.

Vitreous floaters were seen in 36% of eyes. This is due to vitreous degeneration in myopes. Commonly temporal crescents were seen. There was also shallow cupping of the disc. These changes were probably due to elongation of the globe. In few cases, macula showed stippled appearance. This is due to thinning of the retina.

The various studies done showed that onset of vitreous degeneration and degree of myopia had close association. In this study, young patients with moderate-to-higher degree of myopia had vitreous degeneration. Peripheral retinal degeneration changes are common in moderate-to-higher degrees of myopia. Common types seen were lattice degeneration (23%), white without and white the pressure (20%), chorioretinal degeneration (12%), retinal tear (3%) and snail track degeneration (4%). Majority of the above degenerative changes is associated with retinal detachment, which is seen in 8% of cases. 7 out of 8 cases, RD seen in higher degrees of myopia.

Lattice degeneration is more commonly seen in superotemporal quadrant. This is probably due to excessive stretching and increased vascularity of this area. On the edge of lattice, vitreous adhesion is commonly seen and this accounts for the association of retinal detachment with lattice. White without pressure is significant, since it indicates some amount of thinning and vitreoretinal adhesion in this area. Retinal degenerative changes were associated with retinal breaks in 8% of cases. In eyes with chorioretinal degeneration, there were no associated retinal breaks or detachment. This is due to firm adhesion between retina and choroid.

Young patients with moderate-to-high degree of myopia showed high incidence of retinal detachment. This was due to vitreous degeneration, lattice degeneration and breaks. Here, there was gross decrease in vision and the retinal breaks could not be localised. The other eye showed degenerative changes associated with high degree of myopia. These patients belonged to illiterate low socioeconomic group and probably were not aware of the seriousness of loss of vision. Two patients had cataractous lens and the fundus details could not be made out. B scan was done and this showed retinal detachment. The other eye showed refractive error of -24D and -7D and associated degenerative changes. 9% of patients had lenticular opacity. Common type seen was posterior polar cataract. Three cases in the high degree of myopia had associated retinitis pigmentosa changes.

CONCLUSION

In a study of 100 myopic patients, 74% showed various fundus changes. Younger age group is most commonly affected. Though retinal degenerative changes are more commonly seen in moderate-to-higher degrees, in some cases, it was degenerative changes were present in lower degrees of myopia also. So, it is must to do indirect ophthalmoscopy in all cases of myopia to rule out peripheral degenerative changes.

In cases without any degenerative changes, best glass is advised. In cases with degenerative changes without retinal detachment, prophylactic cryo is applied. In cases with retinal detachment, cryo applied and explant done. For the cataract associated cases, SICS with PCIOL done. Periodic follow up is advised in necessary cases.

Since, the degenerative changes seen in all degrees of myopia, though comparatively lower in lesser degrees of myopia, all cases of myopia must be examined meticulously with indirect ophthalmoscope irrespective of myopic status.

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