ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
Index Copernicus Value: 68 . 16
PubMed - National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 5, Issue – 5, September - 2020, Page No. : 15 - 20

A clinical study to evaluate fundus changes in high myopia patients and their correlation with the axial length of the globe.

[1]Seema Rani, Medical officer, Emergency hospital, Vijaypur, Jammu, J&K, India.

[2] Angli Manhas, Senior Resident, Department of Ophthalmology, Government Medical College Jammu, J&K, India.

[3]Dinesh Gupta, Professor & Head, Department of Ophthalmology, Government Medical College, Jammu, J&K, India.

Corresponding Author: Angli Manhas, Senior Resident, Department of Ophthalmology, Government Medical College Jammu, J&K, India.

Citation this Article: Seema Rani, Angli Manhas, Dinesh Gupta, "A clinical study to evaluate fundus changes in high myopia patients and their correlation with the axial length of the globe.", IJMSIR- September - 2020, Vol – 5, Issue - 5, P. No. 15 – 20.

Type of Publication: Original Research Paper

Conflicts of Interest: Nil

Abstract

Background: Myopia is the second most common refractive error, it is a condition occurring as a result of increased global axial length or increased refractive power of anterior segment, with the former being more important.

Objectives: The objective of the study was to find out correlation between axial length of eye and degenerative fundus changes in myopic patients.

Materials & Methods: The present study is prospective study carried out at tertiary eye care hospital on 200 eyes of 100 patients having myopia of >6D.After meeting inclusion & exclusion crieteria detailed fundus examination along with axial length measurement.

Results: Out of 100 patients, majority i.e.64% belongs to younger age group <30years, females comprised 56%.The incidence of myopia was higher in the younger age group. Various myopic changes myopic crescents were found in 155(77.5%) eyes followed by peripapillary atrophy 78 (39%) etc There is a direct co-relation between the axial length and degenerative fundus changes.

Conclusion: The myopic fundus changes strongly correlated with increase in the axial length.

Keywords: Axial length, pathological myopia, degenerative fundus changes, slit lamp examination, retinoscopy

Introduction: Myopia/short sightedness is a condition occurring as a result of increased global axial length or increased refractive power of anterior segment, with the former being more important. It can affect almost all age groups, ethnic groups either sex and can even cause blindness.[1] Prevalence of myopia varies among different ethnic group being least in blacks and greater in Asians.[2] The average worldwide frequency of myopia is approximately 30%.[3] Higher degrees of myopia are known to be associated with higher incidence of chorioretinal degeneration (tessellated fundus, myopic crescent, Forster Fuchs fleck) and severity of complications like posterior staphyloma, lattice degeneration, retinal detachment, vitreous

changes and retinal tears. High myopia can have a profound effect on the visual acuity of the patient and can cause blindness.[1] It was generally held that the changes in fundus were due to the stretching of sclera. A high correlation was found between progression of myopia and greater axial length.[4] Interpretation of these findings, however, depends on an accurate & detailed knowledge of the retinal topography, anatomical variations and degenerations that commonly affect the posterior pole and peripheral retina. All these factors make it necessary to study the changes in the fundus of high myopic eye and correlate these changes with axial length of the globe, therefore the present study had been conducted.

Material and method: After due clearance from Institutional Ethics Committee ref. no. IEC/2018/611 dated 06-12-2018, the present study was conducted over a period of 1 year from November 2017 to October 2018 on patients attending OPD with complaint of diminution of vision for ocular examination at upgraded department of Ophthalmology, Government Medical College, Jammu. Informed consent were taken from all the patients/parents before inclusion in the study.

Inclusion criteria: Age>5 yrs of either sex willing to participate, diminution of vision due to refractive error, patient with normal corneal curvature.

Exclusion criteria: Patients with index myopia, patients with abnormal corneal curvature (Curvature myopia), other ocular pathologies like microophthalmos, retinopathy of prematurity, patients with uveitis and infections of the eye, patients with corneal lesions and lens defects, diminution of vision other than refractive error, myopia<6D, those who didn't gave consent.

After meeting inclusion & exclusion criteria patients were subjected to following protocol of examination- Detailed history regarding complaints, onset, duration, and past history of wearing spectacles. Preliminary examination of uncorrected and best corrected visual acuity by SNELLENS CHART. Detailed slit lamp examination and fundus examination with direct and indirect ophthalmoscopy was done . Keratometry readings were taken to assess whether corneal curvature was within normal range. Measurement of IOP by applanation tonometry was done. Retinoscopy was performed in all patients (cyclopentolate 1%)/ homatropine 2%). Post mydriatic test was performed after 3 days in all cases. After consent from selected patients/attendents/parents they were subjected to Ultrasound A-scan: procedure explained in brief. Axial length of each eye was measured. A mean of 5 readings was taken.

Statistical analysis: Analysis of data was done using statistical software MS Excel / SPSS version 20. Data presented as percentages. Chi-square test was used to assess statistical significance. A p value<0.05 was considered as statistically significant.

Observation & Results

In the present study, following observations were made; Table no. 1 shows that out of 100 patients, majority belongs to younger age group <30years i.e. 64%. Females comprised 56% whereas 44% were males.The incidence of myopia was higher in the younger age group.

Table no. 2 shows in 200 eyes regarding various myopic changes myopic crescents were found in 155(77.5%) eyes followed by peripapillary atrophy 78 (39%) etc

Table no. 3 shows relationship of axial length at various level with myopic changes like crescents, peripapillary

atrophy, chorioretinal atrophy, lacquer cracks, pavingstone degeneration, Fuch s spot, peripheral vitreous degeneration, lattice degeneration, macular hole, posterior staphyloma, retinal detachment. Crescent formation is directly related to increasing axial length ($p<0.001$).As the axial length increases chances of peripapillary atrophy increases ($P<0.001$), lacquer cracks shows direct relation with increasing axial length. This table also presents frequency of PVD at various axial lengths showing strong correlation with increasing axial length, incidence of lattice degeneration increases with increasing axial length

Discussion: Myopia is the second most common refractive error, it is a condition occurring as a result of increased global axial length or increased refractive power of anterior segment, with the former being more important.[1] About 161 million visually impaired people across the world caused by myopia and related ocular disorders as per report of WHO.[5] Various retinal degenerations found in myopia may cause irreversible blindness. Peripheral retina is prone for multifactorial degenerations like lattice degeneration, pigmentary changes and retinal breaks. The peripheral degenerations are secondary to its anatomical dehiscence like thinning, presence of poorly developed retinal cells, excessive stretching and increased vascularity.[6]

In the present study out of 100 patients, majority belongs to younger age group <30years i.e. 64%. Females comprised 56% whereas 44% were males.The incidence of myopia was higher in the younger age group. Venkatesan MJ et al reported maximum myopia prevalence (45%) in the age group of 11-20 years followed by 21% in the corresponding age group of 21-30 years.[6] Females predilection also reported by most studies.[6,7,8]

Regarding various myopic changes in the present study myopic crescents were found in 155(77.5%) eyes followed by peripapillary atrophy 78(39%) etc Venkatesan MJ et al, in their clinical analysis of fundus changes in myopia, reported 41% tessellations in retinal background. [6] Bansal AS et al when commenting on the peripheral retinal status of 54 eyes of highly myopic children below 10 years of age reported that nearly one third of them had peripheral retinal degeneration.[9] Foster PJ et al reported peripheral retinal changes in 61.7% highly myopic eyes.[10]

It has been seen in the present study that myopic changes in the fundus like crescents, peripapillary atrophy, chorioretinal atrophy, lacquer cracks, pavingstone degeneration, Fuch s spot, peripheral vitreous degeneration, lattice degeneration, macular hole, posterior staphyloma, retinal detachment are directly related to axial length at various level.(Table no.3). Crescent formation is directly related to increasing axial length ($p<0.001$), chances of peripapillary atrophy increases as axial length increases($P<0.001$), lacquer cracks shows direct relation with increasing axial length. PVD (peripheral vitreous degeneration) frequency at various axial lengths, shows strong correlation with increasing axial length, incidence of lattice degeneration increases with increasing axial length, macular hole showed strong correlation with increasing axial length. incidence of posterior staphyloma is increases with increasing axial length, Incidence of retinal detachment has strong correlation with axial length but other factors like peripheral retinal degeneration, age of patient also showed important role. Although these results do not conclusively rule out abiotrophy in the pathogenesis of myopic fundus changes, the significant correlation of crescent formation, chorioretinal atrophy, and posterior

staphyloma with increased axial length is strongly suggestive of some element of biomechanical effect. The occurrence of these myopic changes in patients with the connective- tissue diseases of Marfan's syndrome and Ehlers-Danlos syndrome also tend to indicate the involvement of biomechanical factors.Curtin BJ et al in his study evaluated axial length measurements and fundus changes of the myopic eye & found that fundus changes have been consequences of increased axial elongation of the globe with the attendant mechanical tissue strain and vascular changes which occur secondary to process of stretching.[11] Lam et al in a study to investigate the correlation between the retinal lesions and the severity of myopia or axial length and observed that the most common peripheral retinal finding was pigmentary degeneration (51.2%), followed by lattice degeneration in 12.2% and retinal holes in 7.5% of eyes.[12] Akbani M et al. conducted a study to know the relationship of posterior chorioretinal degeneration with axial length and found that they are directly related to an increase in axial length of all myopic eyes, specifically after the length of 25 mm and maximum incidence is observed after the length of 30 mm.[13]

Limitations: The study did face certain limitations that influenced the validity of some of its findings. Information derived through the study of a limited number of hundred cases could not be extrapolated for generalization, considering large subject of myopic population.

Conclusion: From the present study it has been concluded that crescent formation, chorioretinal atrophy, posterior staphyloma are directly related to increased axial length but age also plays an important role. Fuch's spots and lacquer cracks, although occurring in eyes of greater axial length but morphology of these lesions also changes with age.Thus, myopic fundus changes strongly correlate with increase in axial length.

Recommendations: Myopia is affecting increasing number of people, shift towards younger, currently assumed a status of enormous threat to vision. Therefore, there is the need for detailed assessment in all eyes with myopia above 6 dioptres.

Reference

1. Abrams D. Myopia, Duke Elder's practice of Refraction: 10thedition; 53-64.
2. Lam CS, Goldschimidt E, Edwards MH. Prevalence of myopia in local and international schools in Hong Kong. Optom Vis Sci 2004;8:317-322.
3. Schaeffel F. Clinical risk factors for progressive myopia Ophthalmology Aug 2012; 109(8);734-48.
4. Hashemi H, Khabazkhoob M, Miraftab M et al. Axial length to corneal radius of curvature ratio and refractive errors. J ophthalmic vis Res. 2013 Jul; 8 (3): 220-6.
5. Resnikoff S. Global data on visual impairment in year 2002. Bull world health organ 2004;82:844-851.
6. Venkatesan MJ, kumar NS and Vijayalalakshmi C. Clinical analysis of Fundus changes in myopia. Indian Journal of Science and technology 2015; 8(25):1-6.
7. Rens GHMBV, Arkell SM. Refractive errors and axial length among Alaskan Eskimos. Acta Ophthalmologica 1991; 69: 27-32.
8. Gözüm N, Cakir M, Gücukoglu A, Sezen F. Relationship between retinal lesions and axial length, age and sex in high myopia. Eur J Ophthalmol. 1997 ; 7(3): 277-82.

9. Bansal AS, Hubbard GB. Peripheral retinal findings in highly myopic children d”10 years of age. *Retina* 2010 ; 30(4 Suppl): S15–S19.
10. Foster PJ and Jiang Y. Epidemiology of myopia. *Eye* (Lond). 2014; 28(2): 202-208.
11. Curtin BJ. Axial length measurements and fundus changes of the myopic eye. I. The posterior fundus.*Trans Am Ophthalmol Soc* 1970;68:312-34.
12. Lam, Dennis SC, Fan, Dorothy SP.Prevalence and Characteristics of Peripheral Retinal Degeneration in Chinese Adults with High Myopia: A Cross-Sectional Prevalence Survey. *Optometry & Vision Science* 2005; 82(4):235-38.
13. Akbani M, Reddy KRK, Vishwanath K. Association of Posterior Pole Degeneration with Axial Length in the Cases of Myopia- A Cross Sectional Study. *Indian Journal of Public Health Research & Development; New Delhi* 2014; 5(2):64-67)

Legends Tables

Table 1: Age & sex distribution of studied subjects.

	No. of patients	%age
Age(in years)		
≤19	15	15
20-29	48	48
30-39	26	26
40-50	8	8
≥50	3	3
Sex		
Males	44	44
Females	56	56

Table 2: Distribution of eyes according to myopic fundus changes.

S.N.	Myopic fundus changes	No. of eyes(200)	Percentage
1	Crescents	155	77.5
2	Peripapillary atrophy	78	39
3	Chorioretinal atrophy	55	27.5
4	Lacquer cracks	13	6.5
5	Pavingstone degeneration	69	34.5
6	Fuch s spot	36	18
7	Peripheral vitreous degeneration	18	9
8	Lattice degeneration	61	30.5
9	Macular hole	12	6
10	Posterior staphyloma	17	8.5
11	Retinal detachment	14	7

Table 3: Relationship of axial length with various pathological changes in myopia.

Axial length	No. of eyes	C	PPA	CA	LC	PD	FD	PVD	LD	MH	PS	RD
<23.5	12	0	0	0	0	0	0	0	0	0	0	0
23.5-24.4	19	11	4	0	0	2	0	0	3	0	0	0
24.5-25.4	27	18	5	0	0	2	1	0	3	0	0	0
25.5-26.4	33	26	21	0	0	12	0	0	4	1	1	0
26.5-27.4	58	54	26	15	0	27	13	0	21	0	7	4
27.5-28.4	26	22	13	18	0	11	10	0	10	1	3	2
28.5-29.4	7	6	4	4	3	6	4	2	6	1	0	0
29.5-30.4	11	11	2	11	5	5	4	9	8	5	1	5
30.5-31.4	5	5	1	5	4	3	3	5	4	3	3	1
31.5-32.4	1	1	1	1	0	0	0	1	1	0	1	1
≥32.5	1	1	1	1	1	1	1	1	1	1	1	1
Chi square test value		61.72	32.44	107.84	113.75	36.97	46.45	162.58	48.58	80.93	47.15	60.25
p-value		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

C-crescents, PPA-Peripapillary atrophy, CA-Chorioretinal atrophy, LC-Lacquer cracks, PD-Pavingstone degeneration, FS-Fuch s spot, PVD- Peripheral vitreous degeneration,LD- Lattice degeneration, MH-Macular hole, PS-Posterior staphyloma, RD-Retinal detachment,