Original Research Article

Correlation between axial length and posterior pole changes in myopic eyes

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Abstract

Purpose: To measure axial length, evaluate fundus changes and correlate these posterior pole changes with axial length in myopic patients. **Methods:** Prospective observational study done on 200 eyes of 100 patients of myopia more than -3D. Patients of all age group and sexes are included. All the patients under went detailed ocular examination which includes visual acuity (VA), refraction, slit lamp bio microscopy, fundus examination using direct and indirect ophthalmoscopy and axial length measurement using A-scan. Details obtained were analyzed by descriptive statistical analysis. **Results:** Hundred patients were studied with mean age of 41.88+14.96 years. The mean axial length was 29.11mm. The study showed the patients with myopia have fundus changes like lacquer cracks (112/200; 56%), lattice degeneration (106/200; 53%), posterior staphyloma (79/200; 39.5%), optic nerve crescent (77/200; 38.5%), choroidal neovascularization (50/200; 25%), retinal holes (23/200; 11.5%), foster fuch's spots (7/200; 3.5%) while no eye found to have tilted optic disc, retinal detachment and posterior vitreous detachment. Study also showed that most of these changes were seen unilaterally except optic nerve changes and posterior staphyloma which were bilateral. **Conclusion:** Posterior pole and peripheral retinal degenerative lesions were found in considerable proportions of patients with high myopia. As some of these lesions can predispose to visual impairment, high myopic patients should be educated on symptoms of various eye conditions and seek care immediately if symptoms arises.

Key Word: Axial length, Fundus, Myopia, Posterior pole

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INTRODUCTION

Myopia occurs when an object's image is formed anterior to retinal surface due to an excessive steep corneal curvature, an abnormally spherical lens, an increase in lenticular index of refraction as in nuclear sclerosis or more commonly as a result of increased axial length. Duke-Elder defined pathological myopia as myopia accompanied by degenerative posterior segment changes.[1,2] The spherical equivalents of an eye with high myopia(HM) are > -6D or an axial length >25.5mm, where as eyes with pathological myopia (PM) are >8D, or axial length >32.5mm.[3] The loss of best corrected visual acuity (BCVA) in addition to the decrease of uncorrected visual acuity due to its specific complications is a major feature of PM. Various demographic characteristics have been shown to be associated with myopia. Female gender, young age, early onset of myopia, positive family history are all found to be associated with the progressive myopia. Increased income and educational level have been associated with high level of myopia, likely due to their correlation with increased level of near work.[4] A large retrospective study by Grossniklaus and Green describes various abnormal posterior pole findings in PM like tigroid fundus, tilted optic nerve, peripapillary detachment, chorioretinal atrophy, posterior vitreous detachment (PVD), retinal detachment, foster fuch's spots, lacquer cracks, lattice degeneration, scleral thinning, choroidal neovascularisation (CNV).[5] The

development of such vision-threatening complications is caused by eye deformity, characterized by a formation of posterior staphyloma.

MATERIAL AND METHOD

Hundred patients of all age groups and both the sexes with myopia ≥-3D, who presented to a tertiary care center in north India over a period of 2 years (November 2015 to November 2017) were included. Patients with media opacity which prevent posterior segment evaluation or any previous posterior segment pathology or any systemic pathology were excluded. After collecting demographic data of the patients, a detailed history regarding age of onset of myopia, duration of use of glasses, presenting symptoms, any other known ocular or systemic pathology were documented. Detailed ocular examination which includes visual acuity (VA), BCVA by retinoscopy and subjective refraction, slit lamp examination, keratometry, fundus examination using direct and indirect ophthalmoscopy were documented. Fundus photo were taken when ever needed. All patient's axial length was measured using A-scan. Data obtained from the study was analyzed by descriptive statistical analysis.

RESULT

The study was conducted on 200 eyes (100 patients) with myopia ≥-3D. Out of 100 patients 42 (42%) were female and 58 (58%) were male (mean age 41.88±14.96, range 17-65years). 98/100 (98%) presented with chief complaint of blurring of vision and 50/100 (50%) presented with headache. The study showed significant association between VA and axial length (P<0.05).(table1.a,b.)

Table 1.a

Unaided VA RE	Axial length				Total
	22-25	25-28	28-31	31-34	
6/60	0	0	0	3	3
6/36	0	17	12	19	48
6/24	0	0	3	0	3
6/18	1	3	2	0	6
6/12	2	8	8	0	18
6/9	0	8	1	13	22
Total	3	36	26	35	100

Table 1.b

Unaided VA LE	Axial length				Total
	22-25	25-28	28-31	31-34	
6/60	0	0	0	3	3
6/36	0	17	12	19	51
6/24	1	0	3	0	4
6/18	0	3	2	0	5
6/12	2	8	8	0	18
6/9	0	8	1	13	22
Total	3	36	26	35	100

102/200 patients had lacquer cracks. 14/100 patients had unilateral (P<0.05) and 49/100 patients had bilateral lacquer cracks (P = 0.057). (Table2)

Table 2

Lacquer cracks	Axial length (mm)				Total	P- value
	22-25	25-28	28-31	31-34		
Right eye	1 1.70%	22 36.70%	15 25%	22 36.70%	60 100.00%	0.781
Left eye	1 1.90%	22 42.30%	18 34.60%	11 21.20%	52 100.00%	0.014
Unilateral	0 0.00%	0 0.00%	3 21.40%	11 78.60%	14 100.00%	0.002
Bilateral	1 2.00%	22 44.90%	15 30.60%	11 22.40%	49 100.00%	0.057

56/200 eyes had lattice degeneration in right eye (RE) and 50/200 in left eye (LE). 100 eyes had no lattice degeneration. 27/100 patients had unilateral (P=0.00) while 44/100 patients had bilateral (p=0.081) lattice degeneration.(Table 3)

Table 3

Lattice degeneration	Axial length (mm)				Total	P- value
	22-25	25-28	28-31	31-34		
Right eye	2 3.6%	17 30.40%	15 26.80%	22 39.30%	56 100.00%	0.58
Left eye	2 4.00%	19 38.00%	18 36.00%	11 22.00%	50 100.00%	0.028
Unilateral	3 15.80%	2 10.50%	3 15.80%	19 57.90%	27 100.00%	0
Bilateral	1 2.30%	17 38.60%	15 34.10%	11 25.00%	44 100.00%	0.211

4/200eyes had foster fuch's spot in RE and 3/200 eyes had in LE, while 193/200 eyes had no foster fuch's spot. 3/100 patients had unilateral (P=0.00) while 2/100 patients had in bilateral eyes (P=0.285). (table 4)

Table 4

Foster fuch's spot	Axial length (mm)				Total	P-value
	22-25	25-28	28-31	31-34		
Right eye	1 25.00%	0 0.00%	0 0.00%	3 75.00%	4 100.00%	0.011
Left eye	1 33.30%	0 0.00%	0 0.00%	2 66.70%	3 100.00%	0.006
Unilateral	2 66.70%	0 0.00%	0 0.00%	1 33.30%	3 100.00%	0
Bilateral	0 0.00%	0 0.00%	0 0.00%	2 100.00%	2 100.00%	0.285

Out of 200 eyes 23 had retinal holes.11/100 patients had unilateral (P=0.025) while 6/100 patients had bilateral (P=0.733). (table 5)

Table 5

Retinal hole	Axial length (mm)				Total	P-value
	22-25	25-28	28-31	31-34		
Right eye	0 0.00%	6 50.00%	5 41.70%	1 8.30%	12 100.00%	0.157
Left eye	0 0.00%	8 72.70%	2 18.20%	1 9.10%	11 100.00%	0.054
Unilateral	0 0.00%	8 72.70%	3 27.30%	0 0.00%	11 100.00%	0.025
Bilateral	0 0.00%	3 50.00%	2 33.30%	1 16.70%	6 100.00%	0.733

40/200 eyes had posterior staphyloma in RE and 39/200 eyes in LE. 19/100 patients had unilateral (P=0.542) while 30/100 patients had bilateral (P=0.03) posterior staphyloma. (Table6)

Table 6

Posterior staphyloma	Axial length (mm)				Total	P-value
	22-25	25-28	28-31	31-34		
Right eye	8 20.00%	17 42.50%	13 32.50%	2 5.00%	40 100.00%	0.071
Left eye	6 15.40%	18 46.20%	14 35.90%	1 2.60%	39 100.00%	0.01
Unilateral	6 31.60%	5 26.30%	7 36.80%	1 5.30%	19 100.00%	0.542
Bilateral	4 13.30%	15 50.00%	10 33.30%	1 3.30%	30 100.00%	0.03

25/200 eyes had choroidal neovascularization in RE and 25/200 eyes in LE. 150/200 eyes showed no choroidal neovascularization. 28/100 patients had unilateral (P=0.022) while 11/100 patients had bilateral (P=0.38) involvement. (Table 7)

Table 7

Choroidal neovascularization	Axial length (mm)				Total	P-value
	22-25	25-28	28-31	31-34		
Right eye	0 0.00%	13 52.00%	4 16.00%	8 32.00%	25 100.00%	0.192
Left eye	1 4.00%	11 44.00%	5 20.00%	8 32.00%	25 100.00%	0.741
Unilateral	1 3.60%	16 57.10%	7 25.00%	4 14.30%	28 100.00%	0.022
Bilateral	0 0.00%	4 36.40%	1 9.10%	6 54.50%	11 100.00%	0.38

No eye was found to have retinal detachment, posterior vitreous detachment, tilted optic disc.

DISCUSSION

Out of 100 cases, 58 were male and 42 were female. Our study showed that there is slightly male dominance whereas in other studies the prevalence of myopia is more in women.□6,7,8□ The most common fundus finding in our study was lacquer cracks (56%) whereas in other studies done by Chen et al incidence of it was only 29.1%.[9] Our study found that posterior staphyloma increased in prevalence with respect to increasing age, increasing myopia and increasing axial length whereas in a Japanese cohort with myopia > -8D or axial length >26.5mm, staphyloma was identified in 90% of subjects and 96.7% in those 50yeard of age or older.□10□ Optic nerve crescent was found in 77/200 eyes (28.5%). Study done by Curtain B at el the incidence of crescent formation demonstrate a steady rise from 0% in eyes of 20-21.4mm diameter to 100% in in all eyes with >28.5mm diameter[11] The association of increased axial length with larger temporal crescent as well as both simple and combined forms of annular crescents agrees with a number of previous studies.[12,13] Our study found choroidal neovascularization (CNV) was present in 50/200 eyes (25%). Chang et al found that only 3 subjects had definite CNV with macular hemorrhage. In addition, early CNV could have been missed from our study by examining fundus photographs without the aid of fluorescein angiography.[14] Significant association with axial length was observed for all the lesions except retinal detachment, retinal holes, retinal tears and pigmentary degeneration. In very long eyes, both the retina and vitreous are involved by the stretching of ocular structures. The dynamic interaction between vitreous and retina is responsible for frequent posterior vitreous detachments observed in long eyes, as well as for some peripheral retinal degeneration (pigmentary, white with or without pressure and retinal tears).[15]

CONCLUSION

Posterior pole and peripheral retinal degenerative lesions were found in a considerable proportion of subjects with high myopia. As some of these retinal lesions might predispose to visual impairment, highly myopic individuals should be educated on the symptoms of various eye conditions and seek care immediately if symptoms arises.

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