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Lattice degeneration in myopia and its relation with axial length and grades of myopia: A Prospective study

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ABSTRACT:
Aim: Tostudy the prevalence of lattice degeneration in patients with myopia and its relation with axial lengthand grades of myopia.
Methods:305 myopic patients (610eyes) were included in the study. Visual acuityassessment , slit lamp examination, axial length measurement, and indirect ophthalmoscopy with scleral indentation was performed for all the patients with proper consent.
Results: 26 patients (8.52%) were found to have lattice retinal degeneration,out of which 10 (38%) were males and 16 (62%) were females. Highest incidence of lattice degeneration was seen in the age group of 20-40years(n= 15, 57.7%).Frequency of peripheral lattice degeneration increases with the increasing severity of myopia (p<0.001). The highest incidence(42.45%)of lattice degeneration was observed in eyes with axial length between 28.01- 32mm. Increasing axial length was significantly associated with theincrease in prevalenceof lattice degeneration (p<0.001). Bilateral lattice degeneration was found in 61.5 % cases while it was unilateral in 38.5% cases . Atrophic holes within lattice were seen in 3(11.5%) patients. 88.46% of lattice lesions were found in temporal retina, of which 65.38% were seen in infero-temporal retina.
Conclusion: Prevalence of lattice degeneration was higher among patients with high myopia and high axial length. Bilateral lattice degeneration was more common than unilateral lattice degeneration. Though less commonly seen, still lattice degeneration is not uncommon among low myopes. Therefore, while seeing patients with myopia,we should have high index of suspicion for lattice even in patients with low myopia.

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Key Words: Lattice degeneration;myopia;axial length

I. Introduction

Myopia is one of the most common optical aberrations of eye.[1] Many patients have a relatively low degree of myopia, with no deleterious ocular changes known as physiological myopia.[2]Degenerative myopia/progressive myopia indicates a progressive error resulting in high myopia during early adult life which is usually associated with degenerative changes in the eye e.g. chorio retinal degeneration, paving stone degeneration, white without pressure, cystoid degeneration, snail track degeneration and lattice degeneration. It is believed that progressive distention of posterior pole stretches the ocular coats, evidenced by the straightening of the temporal retinal vessels, the appearance of a super traction crescent, thinning of the retina, choroidal crescent formation and chorioretinal atrophy. All these features have been directly related to increased axial length.[3,4,5]Anatomically, the peripheral fundus is defined as the area of fundus anterior to the scleral entrance of the vortex veins to the middle of pars planaciliaris. The peripheral fundus is composed of an equatorial region and an oral region. The equatorial region is a ring shaped area of about 4 disc dioptre (5.83mm) adjacent to the posterior fundus. It extends approximately 2 disc dioptre on either side of the anatomic equator which is located 3mm anterior to the entrance of vortex veins.[4,6]The ora region or extreme fundus periphery is a ring extending on either side of the oraserrata and its average width is about 3.5disc dioptre. At this site we find an intimate attachment of vitreous to the retina and ciliary body in an area known as the vitreous base. Peripheral retina is prone for various degeneration secondary to its anatomical dehiscence like thinness, presence of poorly developed retinal cells and absence of large blood vessels.[7]The typical lattice lesions are sharply defined circumferentially oriented areas of retinal thinning located anterior to the fundus equator.[8]The estimated prevalence of lattice degeneration is 6% to 8% in the general population [6,9] and the incidence is higher in individuals older than 10 years and in myopic eyes[10]. Lattice degeneration is present in approximately 20% of patients with retinal detachment[11,12] and in fellow eyes of phakic retinal detachment[13].Patients with lattice degeneration are predisposed to retinal detachment at any time during their lifetime.[14]The main objective of this study is to assess the prevalence of lattice degeneration in patients with low and high myopia and their correlation with axial length of eye and age of patients. Early detection of peripheral lattice degenerationand prophylactic barrage laser photocoagulation of the degenerationin high risk cases can prevent retinal detachment and serious ocular morbidity.

II. Materials and methods

We included 305(610eyes) myopic patients attending the outpatient department of Ophthalmology, in a tertiary health care centre in Eastern India, between April 2019 and December 2020. Institutional ethical committee clearance was obtained and conduct of the study followed tenets of the Declaration of Helsinki.

Inclusion criteria: All patients between 10 to 50 years of age,with myopia more than 2 dioptres,with less than 0.5 dioptre of astigmatism were included in the study.

Exclusion criteria: 1.Patients with contraindication to pupillary dilatation, for example, angle closureglaucoma.

2. Patients with media opacity which would impair the visualization of fundus for example cataract, corneal opacity and other media opacities.

3. Children below 10 years and adults above 50 years of age.

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4. Patients who had undergone refractive surgeries in the past.
5. Non co-operative patients.
6. Astigmatism >0.5 D.

All patients fulfilling the selection criteria were explained about the purpose of the study and a written consent was obtained from them to participate in the study.

All the patients underwent the following tests for evaluation:

- Best corrected visual acuity assessment with Snellen's chart
- Refraction
- Slit lamp examination of anterior segment
- Axial length measurement using A-scan
- Dilated fundus examination with indirect ophthalmoscopy and scleral indentation

Data was collected and statistical analysis was done using SPSS version 26. Qualitative data were analyzed using proportion and chi-square test. Quantitative data were analyzed using mean and standard deviation.*p* value < 0.05 was considered to be significant.

III. Results

In our study out of 305 patients,127 (41.63%) were males and 178 (58.36%) were females. Peripheral retinal lattice degeneration was seen in 26 patients (8.52%),which was more prevalent among females(n=16, 61.54%) than males(n=10, 38.46%) (Table 1), but there was no significant association of prevalence of lattice degeneration with the gender of the patients (*p*=0.836).Prevalence of lattice degeneration was highest (n=15, 57.7%) among patients between 20-40years of age and the associationwith age was found to be significant (*p*=0.043) (Table 2).

Table 1: Gender wise prevalence of lattice degeneration among myopic patients

Gender	**No of patients (n)**	**(%)**	**Patients with lattice degeneration (n)**	**(%)**	**Patients without lattice degeneration (n)**	**(%)**
Male	127	41.63%	10	38.46%	117	41.94%
Female	178	58.36%	16	61.54%	162	58.06%
Total	305	100%	26	100%	279	100%
***p* Value**			**0.836**			

Table2: Age wise distribution of lattice degeneration among myopic patients

Age group (years)	**Total no of myopic patients**		**Patients with lattice degeneration**		
	Male n(%)	**Female n(%)**	**Male n(%)**	**Female n(%)**	**Total n(%)**
<20	37(12.13%)	54 (17.70%)	3 (0.98%)	5 (1.63%)	8
20-40	89 (29.18%)	115 (38.68%)	7 (2.29%)	8 (2.26%)	15
> 40	1 (0.32%)	9 (2.95%)	0	3 (0.98%)	3
Total	**12(41.63%)**	**178 (58.36%)**	**10 (3.27%)**	**16 (5.24%)**	**26 (8.52%)**

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Out of 305 patients, 228(74.75%) patients had low myopia (myopia < 6D) and 77(24.59%) patients had high myopia (myopia ≥6D). Among 228 low myopes, 6(2.63%) patients, while among 77 high myopes, 20(25.97%) were found to have lattice degeneration. As the degree of myopia increased, the frequency of peripheral lattice degeneration also increased(p<0.001). (Table 3)

Table 3: Frequency of peripheral lattice degeneration in various degrees of myopia

Degree of Myopia	**No. of Eyes**	**No. of Eyes with lattice degeneration**		**No. of Eyes without lattice degeneration**	
		n	**%**	**n**	**%**
Low myopia (myopia < 6D)	228	6	2.63	222	97.36
High myopia(myopia ≥6D)	77	20	25.97	57	74.02
***p*-Value**		**<0.001**			

The highest incidence of lattice degeneration was observed in 12 cases(42.45%) with axial length in between 28.01mm to 32 mm corresponding to a refractive error of -9D to -18D, followed by 9(7.03%) cases having axial length between 26.01mm to 28mm corresponding to a refractive error of -5D to -9 D followed by 5 (3.25%)cases with axial length of 24mm to 26mm, corresponding to a refractive error of -2D to -5D. As the axial length increased, frequency of lattice degeneration also increased significantly (p<0.001). (Table 4)

Table 4: Prevalence of lattice degeneration in different groups of axial length

Axial length	**No of Patients with myopia (n)**	**(%)**	**No of patients with lattice (n)**	**(%)**	**No of patients without lattice(n)**	**(%)**
<26mm	149	48.52%	5	3.35%	144	47.21%
26-28mm	128	41.96%	9	7.03%	119	39.01%
>28mm	28	9.18%	12	42.85%	16	5.24%
Total	305		26		279	
***p* value**			**<0.001**			

Among patients with lattice degeneration, 16(61.5 %) patients had bilateral lattice degeneration and 10 patients(38.5%) had unilateral lattice degeneration. Among patients with unilateral lattice degeneration, right eye was involved in 5 (19.2%) patients and left eye in 5 (19.2%) patients. Most common location of lattice degeneration was temporal retina(n= 23, 88.46%) , out of which in 6 cases (23.07%) it was seen in the superotemporal retina and in 17 cases (65.38%) in the inferotemporal retina(Table 5). Distribution of lattice degeneration among low (LM) and high (HM) myopes in left eye and right eye is shown in figure1.

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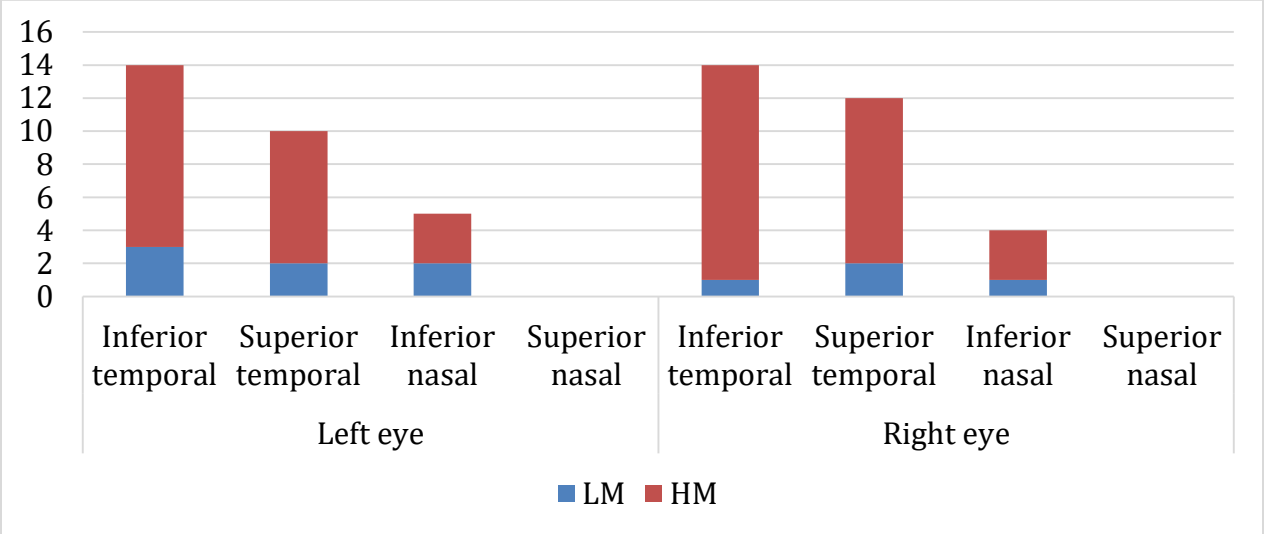
Table5: Quadrant wise distribution of lattice degeneration

No of patients with lattice degeneration(n)	**Temporal retina n (%)**		**Nasal retina n(%)**
26	23(88.46%)		3(11.53%)
	Superotemporal	Inferotemporal	
	6 (23.07%)	17 (65.38%)	

Figure 1: Distribution of lattice degeneration among low (LM) and high (HM) myopes in left eye and right eye



23(88.5%) patients had lattice without hole or break. Atrophic holes within lattice were seen in 3(11.5%) patients, while none of the patient had retinal tear associated with lattice.

IV. Discussion

We studied the prevalence of lattice retinal degeneration in both high and low myopia, and assessedthe axial length and diopteric power of refractive error at which the degenerative changes start, so that we can recommend the threshold of refractive error above which we should go for thorough peripheral retinal screening which will enable us for early detection and treatment of lattice degeneration.

We found the incidence of lattice degeneration to be 8.5% in our study which is comparable to that observed by Rani *et al*(11.33%) [15] and Yura*et al*(10.5%) [16]. The highest frequency of lattice degeneration was observed in the age group of 20 to 40 years (57.7%), which was consistent with that observed by Rani *et al*, Siyal*et al*, Subedi S*et al.*[15,17,19]The frequency of lattice degeneration was more among females(n=16, 62%) than males (n=10, 38%) similar to other studies[15,17,18]. However,Yura*et al*[16] reported males to be affected more than females in their study. But the difference in the prevalence of degeneration among male and female patients was not statistically significant in our study.

In our study bilateral lattice lesions (61.5%) were more common than unilateral lattice lesions(38.5%). Rani *et al*[15]and Celorio*et al*[18], in their studies found unilateral lattice lesions (53% and 54.2% respectively)to be commoner than bilateral lattice lesions. We found that among cases with unilateral lattice degeneration both eyes had equal chances of getting affected

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which was different from the findings of Siyal*et al* and Subedi S*et al*[17,19] , where they have reported right eye to be affected slightly more than the left eye.

Lattice degeneration was significantlymore prevalent in cases of high myopia(76.9%) than low myopia (23.1%)(p<0.001) indicating that as the degree of myopia increased the incidence of peripheral lattice degeneration also increased. Our finding was similar to other studies [15,19],who found higher prevalence of peripheral lattice retinal degenerations in patients with high myopia.

Frequency of lattice lesions was highest(32.5%) among myopes with axial length in between28.01 mm to 32.00 mm (-9D to -20D). Significant association was observed between increasing axial length and increasedincidence of lattice degeneration (p<0.001). Siyal*et al*[17] reported the highest incidence of lattice degeneration in myopes with axial length in between 28.01 mm to 30 mm. In another study, Celorio*et al*[18] reported similar higher prevalence of lattice retinal degeneration in eyes with axial length in between 26.0 to 26.9 mm (-6D to -8 D) and least prevalent in eyes with axial length of 32.00 mm (-24.00 D) or greater. Sanchez and Roldan*et al*[20] found higher frequency of lattice retinal degeneration in eyes having axial length 25-27 mm and 29-30 mm.

We observed atrophic holes associated with lattice degeneration in 3 eyes (11.5%). None of our cases had associated retinal tear. This observation was almost similar to the findings of Siyal*et al*[17], who in their study of 20 cases with lattice retinal degeneration, found atrophic holes in 3(15%) cases. As per a study byManjunath*et al*[21] atrophic holes were the most common type of retinal breaks found in myopic patients.

In 23 cases (88.46%) of lattice degeneration, lesions were located in temporal retina, which is little more than what Subedi*et al*[19] observed in their study(70.49 %). We found lattice lesions in supero-temporal retina in 6 cases (23.07%) and in infero-temporal in 17 cases (65.38%),which was similar to the observation of a Chinese study by Tin Zhang *et al*[22],who found 46% lesions located in the infero-temporal quadrant and33.3% in supero-temporal quadrant. However, Rani *et al*[15] in their study observed lesions to be more common in the supero-temporal quadrant (56%) than in the infero-temporal quadrant(35.2%), similar to observation of Venkatesan*et al*[23].

V. Conclusion

Lattice degenerationis more common among the younger population (20-40years) and among myopes with higher axial length and higher refractive error. Though the incidence of lattice degeneration is commoner in high myopes, still the incidence is not low among low myopes. So keeping in mind the above major findings, and unlike so far routine practice of screening for lattice lesions only in high myopes, we recommend routine screening of all cases of myopia above -2dioptres of refractive error.Our study was a unique study regarding prevalence of lattice degeneration in Eastern India, as so far no literature has been found in this regard from this part of the country.

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