Section: Ophthalmology

Original Research Article

EVALUATION AND COMPARISON OF AXIAL LENGTH AND MACULAR THICKNESS IN ADULT MYOPIC PATIENTS IN DIFFERENT GRADES OF MYOPIA

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Abstract

Background: To determine axial length and macular thickness in myopic eyes in adult patients with different grades of myopia and to compare it with emmetropic patients axial length and macular thickness. **Materials and Methods:** This was a observational comparative case control study conducted in OPD patients with 122 sample size fulfilling inclusion and exclusion criteria. **Result:** Myopia affects more female(36subjects) than males(24subjects). Myopia involve right eye slightly more than left eye. High grade myopia contributes(18.85%) more than any other grades of myopia. Axial length is more in high grade myopia(26.85609) than moderate and mild respectively. Overall macular thickness of mild myopic eye(292.04) is more than moderate(277.23) and high myopic eye(273.1).**Conclusion:** Females are more likely to get affected from myopia rather than the males. However, Right eyes were being affected more among our patients. High grade of myopia contributes more in myopic patients in adult population. Mild grade of myopia show thick macular thickness and thin foveal thickness in comparison with moderate and high grade of myopia. Longest axial length in high grade of myopia in comparison with moderate and mild grade.

INTRODUCTION

Myopia also named as near-sightedness is common type of refractive error that occurs throughout the world which mainly happens when the parallel rays of light coming from infinity gets focused in front of retina when accommodation is at rest.[1]

Approximately 27% of the population or 1.45 billion people globally has been affected from myopia which is one of the most leading cause of distance refractive error.[2] In familial forms of early-onset high myopia, there is strong evidence that genetic variation plays a significant impact.[3] Myopia increases with increasing years of education.[5]

Macula is oval in shape, consisting of central part of the retina and is somewhere around 5 mm in diameter.That is why, the researchers have suggested that the thickness of the macula decreases in the four quadrants of the inner as well as in outer circles along with progression of myopia.[5]

Axial length is the distance from the corneal surface to the retinal pigmented epithelium or to the bruch's membrane. On an average the mean value of axial length among adults is 22 to 25 mm. It matches with the length of the adult eye at the age of 13 years.[6]

OCT is also considered to be a non-invasive and non-contact technique to carry out the in vivo imaging of the human retina. A cross-section image of the object, or a two-dimensional image in space, can be created via OCT in real time.[7] With the help of it, the exact presence of the pathological features can be visualized through the segmented maps in the retina and it is also used for understanding the predictive factors for the prognosis as well as follow up.[8] Macular diseases such as macular edema, macular holes, and detachments of the neurosensory retina and pigment epithelium can be diagnosed and monitored.[9]

On the other hand, ultrasonography has also turned out to be one of the most useful kinds of diagnostic tools for ophthalmologists.When high frequency sound waves hit an interface, they cause echoes, and the structures that are acoustically distinct are revealed.[10]

- A SCAN results in non-dimensional images where the echoes get plotted like spikes.

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- B SCAN results in images that are bidimensional in nature.

The purpose of this study was to determine axial length and macular thickness in myopic eyes in adult patients with different grades of myopia.

MATERIALS AND METHODS

This was an observational comparative case control study conducted in OPD patients with 122 sample size.

Inclusion Criteria

- Case group-All Myopic patients of either gender between age group 20-40yrs.
- Patients who are willing to take part in study and sign the Informed consent form.

Exclusion Criteria

- Patients having other ocular pathology causing visual problem
- Patients with history of past intra ocular or refractive surgery.
- Un co-operative patients.
- Any other ocular disease or ocular trauma.
- Any history of corneal dystrophy or corneal opacity.
- Patients with some other co morbidities which can hinder OCT examination.

Case Group:- All Myopic patients enrolled in our study was subdivided into 3 different groups according to refractive status.

All patients presented in OPD after taking detailed ocular and systemic history are divided in case group depending upon their refractive error. General ocular examination was done and followed by axial length estimation by A-Scan and macular thickness determination by Zeiss OCT machine.

RESULTS

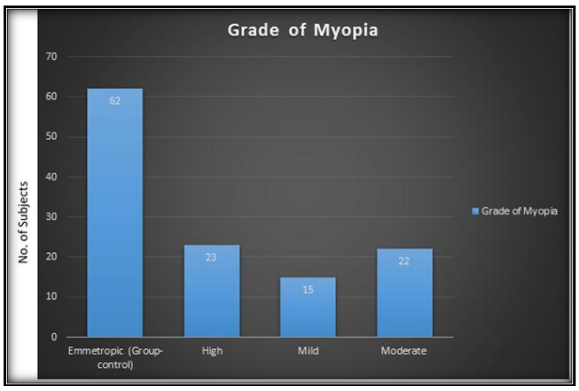

Figure 1: Represent the frequency distribution of the subjects according to Grade of Myopia.

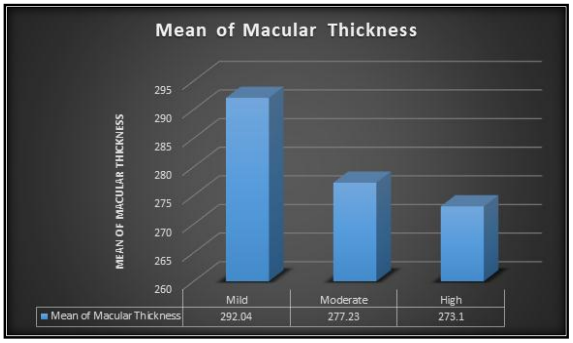

Figure 2: Association between Grade of Myopia and Sex

Table 1: Represent the frequency distribution of the Subjects according to Grade of Myopia.

Grade of Myopia	No of Subjects	Percentage
Emmetropic	62	50.82
High	23	18.85
Mild	15	12.30
Moderate	22	18.03

[Table 1 and Figure 1] shows the frequency distribution of Grade of Myopia.

Table 2: Association between Grade of Myopia and Sex.

Grade of Myopia	Sex		P-Value
	Female	Male	
Emmetropic	36(50%)	26(52%)	0.674
High	13(18.05%)	10(20%)	
Mild	11(15.2%)	4(8%)	
Moderate	12(16.6%)	10(20%)	

[Table 2 And Figure 2] shows the Association between Grade of Myopia and Sex.

Table 3: Association between Grade of Myopia and Eye.

Grade of Myopia	Eye		P-Value
	LE	RE	
Emmetropic	31(50.8%)	31(50.8%)	0.991
High	11(18.03%)	12(19.6%)	
Mild	8(13.11%)	7(11.4%)	
Moderate	11(18.03%)	11(18.03%)	

[Table 3] shows the Association between Grade of Myopia and Eye.

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Table 4: Comparison of mean among Mild, Moderate, High with variability in case group.

Group-Cases		Mean	Std. Deviation	P-Value
Age	Mild	31.53	8.692	0.31
	Moderate	27.55	6.822	
	High	31.65	8.166	
K1	Mild	42.85	1.17	0.001*
	Moderate	43.7	0.999	
	High	44.77	0.678	
K2	Mild	43.74	1.154	0.001
	Moderate	44.44	0.848	
	High	45.93	0.435	
Axial length	Mild	23.77267	0.822578	0.001
	Moderate	25.05773	1.423714	
	High	26.85609	1.596618	

[Table 4] shows the comparison of mean among Mild, Moderate, High with variability in case group.

Table 5: Comparison of mean among Mild, Moderate, High with variability according to macular thickness in case group.

Macular Thickness		Group-Cases		
		Mean	Std. Deviation	P-Value
Inner superior	Mild	293.93	2.631	0.001
	Moderate	283.77	4.023	
	High	265.87	6.669	
Inner temporal	Mild	278.2	4.769	0.001
	Moderate	263.41	5.324	
	High	247.61	4.707	
Inner inferior	Mild	291.13	2.722	0.001
	Moderate	280.0	4.117	
	High	256.0	9.991	
Inner nasal	Mild	290.87	2.167	0.001
	Moderate	274.64	6.411	
	High	253.09	6.03	
Outer superior	Mild	301.07	2.282	0.001
	Moderate	295.55	3.218	
	High	280.09	4.981	
Outer temporal	Mild	280.73	3.615	0.001
	Moderate	263.82	6.246	
	High	238.48	8.289	
Outer inferior	Mild	297.0	6.302	0.001
	Moderate	270.95	6.986	
	High	246.48	7.153	
Outer nasal	Mild	304.20	4.144	0.001
	Moderate	288.14	6.819	
	High	268.17	5.042	
Foveal thickness	Mild	183.73	6.11	0.001
	Moderate	201.76	4.03	
	High	220.32	5.21	

[Table 5] shows the comparison of mean among Mild, Moderate, High with variability according to macular thickness in case group.

Table 6: Comparison of mean between group case categories with variability according to overall average of macular thickness.

OverallMacular Thickness	CaseMean ±SD	P-Value
Mild	292.04±3.13	0.001
Moderate	277.23±5.28	
High	273.20±15.14	

[Table 6 and Figure 2] shows the comparison of mean between group case categories with variability according to overall average of macular thickness.

DISCUSSION

In our study mean age in mild myopic group found to be 31.53±8.692, mean age in moderate myopic group was 27.55±6.822 and high myopic group was 31.65±8.166.

While representing that frequency distribution as per gender we observed that the majority of the subjects were female which accounts for 59% and only 41% of the subjects were males. While checking frequency of distribution of the eye; right eye found to be more affected than left.While comparing

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association between grades of myopia and gender shows association not significant. Even in the research study of Zereid&Osuagwu, it was identified that the females were more affected than the males and the ratio of female - male was 60-40.[11]

Following that the frequency distribution of the cases as per the Visual Acuity in Case group was observed in which the majority of the cases was noticed to be under 3/60 whereas the lowest frequency of 0.8% was being observed in the 6/9 and 6/18 Visual Acuity. Similarly the frequency distribution according to the Best corrected visual acuity was also noticed to be the highest in the category of 6/6 which was having a value of 74.6% person and the lowest once were again 0.8% to be noticed in 3/60, 5/60 and 6/24.

As per the grade of the myopia, majority of the cases were notice to be high grade of myopia that included 18.85% of the cases then came the moderate grade including 18.03% and lastly the mild grade had 12.30% of the cases.

The mean age came up to be 28.66yr where the minimum age was considered to be 20yr and the maximum age was considered to be 40yr having a standard deviation of 6.826. Similar to this research study the researchers Matri et al., had observed the mean of their cases to be 30.14 which is a value that is quite near to ours value.[12]

The representation of the control group as per k1 has shown that the mean value±SD 44.27±1.337mm. Similarly as per the k2, the mean value±SD 44.59±1.302mm.The representation of the Case group as per k1 has shown that mean±SD of mild myopic group was 42.85±1.17mm; moderate myopic group was 43.7±0.999mm and in high myopic group was 44.77±0.678mm. Similarly as per the k2, the mean±SD mild myopic group was 43.74±1.154mm;moderate myopic group was 44.44±0.848mm and for high myopic group was 45.93±0.435mm.

Following this we represented the mean value of macular thickness in the control group as per the inner superior that came up to be 327.65 ±24.842 and outer superior was identified to be 297.74±8.388. The mean value of the subjects as per the inner nasal that came up to be 328.73 ±21.185 and outer nasal came up with the mean value of 311.71±9.203.

Additionally the mean value of inner inferior was noted to be 321.29±23.138, and the mean value of outer inferior was 283.11±5.951. On the other hand the mean value of inner temporal came up to be 315.39±20.267and outer temporal was noted to be 278.5±5.551. The mean value of foveal thickness came upto be 192.8±6.4. the average macular thickness of the subjects of mild myopic;moderate myopic and high myopic group was 292.04±3.13; 277.23±5.28 and 273.20±15.14 respectively.

Mean value of macular thickness in the Case group as per the inner superior that came up to be 279±12.5 and outer superior was identified to be 291±9.7. The mean value of inner nasal and outer nasal that came up to be 270.4±16.1; 284.5±15.4 respectively.

Additionally the mean value of inner inferior was noted to be 273.6±16.1, and the mean value of outer inferior was 268.1±21.1. The mean value of inner temporal came up to be 261±13.1 and the mean outer temporal was noted to be 258±18.3. The mean value of foveal thickness came upto be 204.5±15.3. The overall macular thickness of cases of Case group was 307±32.09.

The Chi-square test was being used to find out Association between the grade of myopia to that with the sex of the subjects and the association was found to be statistically not significant since the P value came up with a value of 0.674 which was greater than 0.05. Similar to our results, the researchers Harb et al., had also found no such statistically significant connection with the type of myopia in their study to that with the sex of the patients as the value in their study was 0.723.[13]

Our study had also calculated to find out the association between the grade of myopia to that with the eye when it was noticed that statistically it was insignificant since the P value was 0.991 which was again greater than 0.05. On the other hand the researchers had noticed that there was some sort of statistical connection between the types of myopia to that with the eyes and they somehow had the results that there is association with myopia to that with the right eye of the patients as the statistical difference for their cases was 0.417. But majority of the studies in this field have noticed that there is no such Association between any particular eyes to that with the myopia and one such study was formulated by the researchers Dubis et al., where the p value was 0.873 which was again more than 0.05.[14]

In our study it has been observed that the foveal thickness was noticed to be highly correlated to the high grade of myopia along with moderate grade of myopia and also with mild grade of myopia with mean foveal thickness 220.32;201.76 and 183.73 respectively and the P value was 0.001 i.e less than 0.05. Even the thickness of the fovea was noticed to be much more in the high myopia cases while being compared to the moderate myopia cases and mild myopia cases. This shows that there is a significant rise in the thickness of the fovea with that of the progression of myopia. Significant intergroup difference in terms of macular thickness was present over there as the values of high degree of myopia were higher than the moderate values but were very higher than that of the mild degree of myopia. A The mean values of Axial length in regards to Myopia was 23.77±0.82 for Mild grade of myopia, 25.05±1.42 for Moderate grade of myopia and 26.85±1.59 High grade of myopia.

Researchers like Wakitani et al., had previously discuss the fact that since the increase in the actual length leads to the mechanical stretching so it leads to traction of the vitreous across the eyes affected with myopia which develops the oval thickening and

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rises the grade of myopia which can turn up to be one of the earliest signs of vitreoretinal traction.[15] Our results for similar to that with the results of Xie et al., who came up with the fact that minimum as well as average foveal thickness was less in mild myopia but it was more in the high and moderate myopia groups as the P value was less than 0.05.[16] Lim et al., Had observe that in their study there was not much significant variation between the average thickness of the macular retina to that with the different degrees of myopia which suggest that the intergroup difference of the thickness of inner as well as outer macula might not differ always to the different degrees of myopia.[15]

CONCLUSION

Finally, from the results we can come to the conclusion that the mean age of mild myopic was 31.53±8, mean age of moderate myopic group was 27.55±6.822 and mean age of high myopic group was 31.65±8.166. Additionally, the females are more likely to get affected from myopia rather than the males. However, in this study we concluded that Right eyes were being affected more among our patients.High grade myopia contributes more to myopia in adults.Macular thickness is highest in mild grade myopic eye whereas foveal thickness is more in high grade of myopia in comparison with other grades.Axial length is highest in high myopic patients.

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