VOLUME - 11, ISSUE - 12, DECEMBER - 2022 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Ophthalmology

AN OBSERVATIONAL STUDY TO CORRELATE THE MACULAR THICKNESS IN PATIENTS WITH HIGH MYOPIA USING OCULAR COHERENCE TOMOGRAPHY IN A TERTIARY CARE CENTRE

Dr. Pradeep A V Professor and Head of Department, Mandya Institute of Medical Sciences, Mandya, Karnataka Department of Ophthalmology

Dr. Parvathi Anil* Junior Resident, Department of Ophthalmology, Mandya Institute of Medical Sciences, Mandya, Karnataka *Corresponding Author

ABSTRACT Myopia is the commonest refractive error encountered in the OPD among young adults. High myopia is defined as the refractive error more than or equal to -6.0D Spherical equivalent or Axial length more than or equal to 26.5mm. This study aims to observe the correlation of the macular thickness in patients with high myopia using Ocular Coherence Tomography. This observational study was conducted for a period of 6 months on 55 subjects. The foveal, parafoveal and perifoveal thickness were assessed using fast macular thickness scanning protocol. Full foveal thickness was not correlated with spherical equivalent (p value >0.05) but the parafoveal and perifoveal thicknesses had significant positive correlations with SE (p value>0.05). Serial follow up of high myopic patients with OCT helps in assessing the rate of alteration in macular thickness which helps in helps in understanding the macular thickness status while evaluating other macular pathologies.

KEYWORDS : High Myopia, Foveal thickness, Parafoveal thickness, Perifoveal thickness, Ocular Coherence Tomography

INTRODUCTION

Myopia is the commonest refractive error encountered in the OPD among young adults.[1] High Myopia is defined as the refractive error more than or equal to -6.0D Spherical equivalent orAxial length more than or equal to 26.5mm[2]. According to histological studies, the retina becomes atrophic and degenerates in myopic eyes, particularly at the posterior pole, and these changes are associated with a high frequency of macular abnormalities.[3] In high myopia patients, scleral ectasias are relatively frequent and involve the posterior pole of the eye, leading to poor visual prognosis in adult life.[4] Therefore, monitoring the macular thickness in high myopes are important.

Optical coherence tomography (OCT), first described in 1991, is a noncontact, non-invasive imaging technique that can reveal layers of the retina by looking at the interference patterns of reflected laser light.[5] With the advent of the modern imaging technologies like OCT, the measurement of the retinal thickness has been made possible in vivo and a relationship between high myopia and retinal thickness has been made.[6] This makes OCT a good prognosticating tool in assessing the macular changes in pathological myopes.

Serial follow up of high myopic patients with OCT helps in assessing the rate of alteration in macular thickness which helps the Ophthalmologist to decide on the appropriate timely intervention. It also helps in understanding the macular thickness status while evaluating other macular pathologies and glaucoma and thereby helping in better diagnosis and treatment[7]

METHODOLOGY

After obtaining clearance from the Institutional ethics committee,a hospital based observational study was conducted on patients attending outpatient department of Ophthalmology, Mandya Institute of Medical Sciences, Mandya from May 2022 to Oct 2022. 55 subjects were recruited after fulfilling the inclusion criteria of ≥-6.0 D Spherical Equivalent (SE) A well-informed consent was obtained from all patients before examination.The criteria for exclusion from the study were Presence of systemic diseases and other ophthalmic disease like glaucoma, uveitis, media opacities and retinal diseases.

Demographic data such as age, gender and relevant systemic and ophthalmic history was obtained. Thorough Ocular examination was conducted including refraction, Intra Ocular Pressure recording using Goldman's Applanation Tonometer, Anterior segment and Posterior segment evaluation using Indirect Ophthalmoscope with 20 D lens to find out the evident retinal changes in high myopia. The study was initiated after obtaining the clearance from institutional ethics committee.

Spectral Domain-Ocular Coherence Tomography was used to image the retina. The fast macular thickness scanning protocol was used. The calculation of macular thickness was based on the 6 mm retinal thickness map analysis printout. The map is composed of nine sectorial thickness measurements in three concentric circles with diameters of 1, 3, and 6 mm. The central 1 mm circular region represented the fovea. The area bounded by the outer (6 mm) and middle (3 mm) circles formed the outer ring (perifovea) and the area bounded by middle (3 mm) and inner circles (1 mm) formed the inner ring (parafovea). The perifovea and parafovea are further divided into four quadratic zones: Temporal, superior, nasal, and inferior zones.

Statistical Analysis

All data collected were entered in Microsoft Excel sheet and were statistically analyzed. Data was analyzed using Statistical Package for the Social Sciences (SPSS) trial version. The macular thickness was described in terms of central foveal, peri foveal and para foveal thickness in terms of age, gender and Spherical equivalence refraction of the study subjects and was expressed as mean with standard deviation (mean ± SD). Pearson's correlation coefficients were used to evaluate the relationship of SE with macular thickness. A value of $p \leq 0.05$ is considered statistically significant.

RESULTS:

A total of 55 subjects were recruited for the study. The age group of people varied from 12 to 52 years. The mean age of participants was 28.01 ± 9.87SD. 28 were ≤ 18 years, 20 subjects were between 19 and 30 years and remaining 7 subjects were above 35 years. Out of the 55 participants, 34 were females and 21 were males which was 61.8% and 38.2% respectively. There were 15 participants with refractive error between -6D to -8D, 14 with refractive error between -8D to -10, 19 were between -10D and -15D and 7 were above -15D.The refractive errors of high myopes ranged from -6 to -18D. The

central Foveal thickness in the study subjects were 243.36±14.372 μm. Central foveal thickness was not correlated with the Spherical Equivalent (p > 0.05). The parafoveal and perifoveal thickness of the study subjects were 296.21 ± 18.63μm and 264.57 ± 15.43μm, respectively. The parafoveal and perifoveal thickness showed significant positive correlation with the Spherical Equivalent (r = 0.352 P< 0.001 and r=0.472 P< 0.001, respectively).

Table 1. Characteristics Of Subjects Under Various Attributes

Parameters	High Myopia	P-value
Age (years)	28.01±9.87	0.246
Gender	21 M, 34 F	0.065
Spherical Equivalent (D)	-11.82 ±1.32	< 0.001

D- Dioptre, M- Male, F- Female

Table 2. Relationship Between Central Foveal, Parafoveal And Perifoveal Thickness With Spherical Equivalent And Age In Mean ± Sd.

Parameter	High Myopia	P-value
Foveal Thickness (μm)	243.36 ± 14.372	0.642
Parafoveal Thickness (μm)	296.21 ± 18.63	< 0.001
Perifoveal Thickness (μm)	264.57 ± 15.43	< 0.001

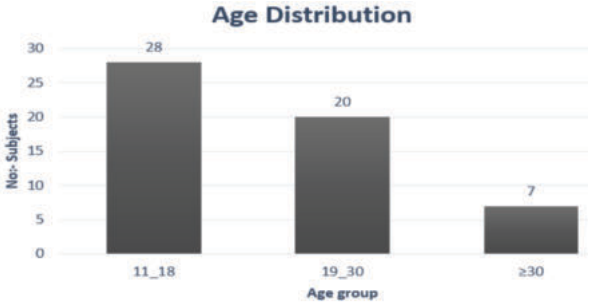

Figure 1. Age Distribution

P value =0.642

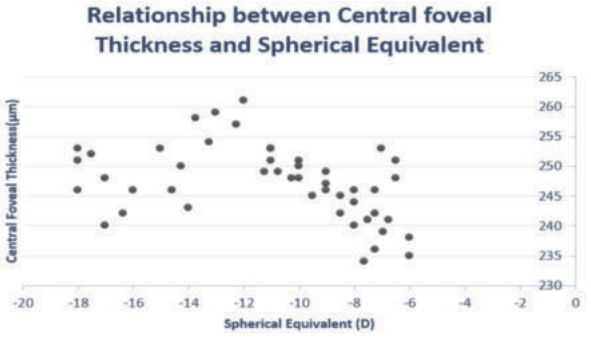

Figure 2. Relationship Between Central Foveal Thickness And Sphercal Equivalent

p value = 0.642

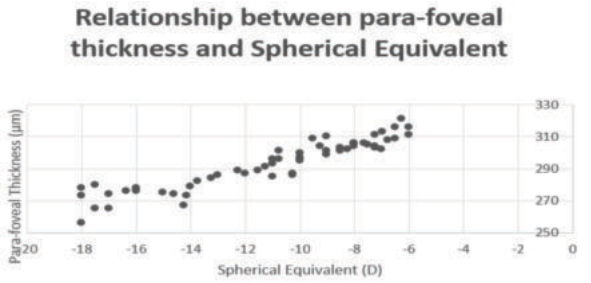

Figure 3. Relationship Between Parafoveal Thickness And Spherical Equivalent

p- value = < 0.001

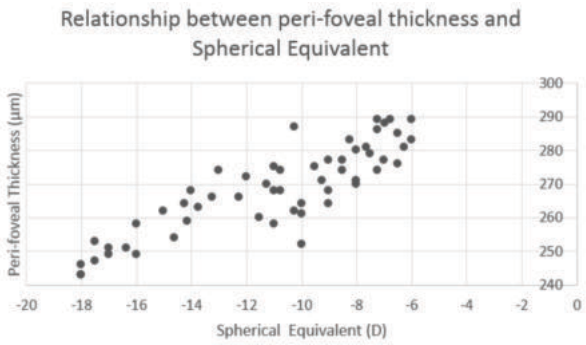

Figure 4. Relationship Between Perifoveal Thickness And Spherical Equivalent

p- value = < 0.001

DISCUSSION

The study was performed to observe the correlation of the macular thickness in patients with high myopia using Ocular Coherence Tomography. The results of our study show that there is no correlation of the central foveal thickness with the spherical equivalence (p value =0.642) but there is a significant negative correlation between parafoveal and perifoveal thickness with spherical equivalence (p value = <0.001).

High myopia, also called pathologic myopia is generally defined as near-sightedness of -6.00 diopters or greater or an axial length >26.5mm. [2] With the advent of newer imaging modalities, like SD-OCT assessment of macular thickness became possible. OCT uses infrared light with lower coherence interference measurement and can be measure tissues with good resolution.[4]

In a study conducted by Chaudhary A. et al and Pang Y. et al showed a significant negative correlation in the parafoveal and perifoveal thickness in high myopic eyes whereas the central foveal thickness was positively correlated with the spherical equivalence (p value <0.001).[1,8]

In a study conducted by Zhao Z et al showed there was there is a significant negative correlation between parafoveal and perifoveal thickness with spherical equivalence but no correlation between the central foveal thickness and the spherical equivalence (p value < 0.001) which was consistent with our study.[3,7] This findings are due to the fact that peripheral retina lacks large blood vessels and optic fibres which in turn makes them more susceptible to the stretch stimuli and the decrease in peripheral thickness compensates for the stretching ovetr entire retina to preserve the central retinal thickness. [1]

On the contrary, in a study conducted by Zhao M et al in young Chinese myopic patients showed that the central foveal thickness had a significant negative correlation with spherical equivalent and the parafoveal and perifoveal regions had a positive correlation with the spherical equivalents.[4]

CONCLUSION

Our study showed statistically significant negative correlation of the parafoveal and perifoveal thickness with the spherical equivalence and no correlation between the central foveal thickness and the spherical equivalence. This study warrants the fact that refractive error can affect the macular thickness significantly which can interfere with the evaluation of other macular diseases such as diabetic macular edema. This study also suggests for a longitudinal follow up to address early the complications due to retinal thinning such as

Rhegmatogenous Retinal Detachment and Vitreomacular traction.

Conflict Of Interest

None declared

REFERENCES

1. Choudhary A, Venkatesh RH, Jayashree M P, Surendrappa HD, Divya R, Darshini L M. Effect of high myopia on macular thickness: An optical coherence tomography study in a tertiary care hospital, Karnataka, India. J Clin Ophthalmol Res [serial online] 2021 [cited 2021 Dec 7];9:14-7. Available from: https://www.jcor.in/text.asp?2021/9/1/14/313479
2. American Association of Paediatric Ophthalmology and Strabismus [Internet]. Available from: https://aapos.org/glossary/progressive-high-myopia
3. Zhao, Z., Zhou X., Jiang C. *et al.* Effects of myopia on different areas and layers of the macula: a fourier-domain optical coherence tomography study of a chinese cohort. *BMC Ophthalmol* 15, 90 (2015). https://doi.org/10. 1186/s 12886-015-0080-5
4. Zhao MH, Wu Q, Hu P, Jia LL. Macular Thickness in Myopia: An OCT Study of Young Chinese Patients. Curr Eye Res. 2016 Oct;41(10):1373-1378. doi: 10.3109/02713683.2015.1119854. Epub 2016 Feb 10. PMID: 26863054.
5. Ahmad A. American Academy of Ophthalmology [Internet]. Eyewiki: Spectral Domain Optical Coherence Tomography in Glaucoma- American Academy of Ophthalmologists [updated 2022 Jul 10; cited on 23rd Sept 2022]. Availablefrom: https://eyewiki.aao. org/Spectral_Domain_Optical_Coherence_Tomography
6. Faghihi H, Hajizadeh F, Riazi-Esfahani M. Optical coherence tomographic findings in highly myopic eyes. *J Ophthalmic Vis Res*. 2010;5(2):110-121
7. Tarek A, Amrl E, Ossama T, Mariam R. A comparative study of OCT findings in low and high myopia. J. Egy Ophth Society. 2020 Jan; 113(1):22
8. Pang Y, Goodfellow GW, Allison C, Block S, Frantz KA. A prospective study of macular thickness in amblyopic children with unilateral high myopia. Invest Ophthalmol Vis Sci. 2011 Apr 14;52(5):2444-9. doi: 10.1167/iovs.10-5550. PMID: 21071748.