International Journal of Medical Research Professionals
P-ISSN: 2454-6356; E-ISSN: 2454-6364
DOI: 10.21276/ijmrp

Original Research Article.

A Prospective Analysis to Evaluate Peripapillary Retinal Nerve Fibre Layer (RNFL) Thickness Changes in Patients with Myopia at a Tertiary Care Centre

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ABSTRACT

Background: Myopia is characterized by blurring of objects viewed at a distance. Imaging modalities such as optical coherence tomography (OCT) can aid in the diagnostic dilemma by measuring retinal nerve fibre layer (RNFL) thickness, which differs significantly between glaucoma patients and controls. However, myopic patients may have RNFL abnormalities which may complicate this interpretation. Hence; the present study was conducted for studying the peripapillary retinal nerve fibre layer (RNFL) thickness changes in patients with myopia.

Materials & Methods: The study was conducted on 50 patients with 100 myopic eyes. After obtaining an informed consent, a detailed medical history and past history was taken. OCT- RNFL was done to measure retinal nerve fibre layer thickness. All the results were analysed.

Results: Overall, average RNFL thickness was 96.84 microns. Mean RNFL average thickness among patients with high, moderate and low myopia was 89.45 microns, 95.33 microns and 101.37 microns respectively. A significant decline in RNFL average thickness with increasing grades of myopia was seen.

Conclusion: OCT RNFL thickness might be valuable tool for predicting progression of myopia.

Key words: Retinal Nerve Fibre Layer, Myopia.

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Article History:

Received: 15-10-2019, **Revised:** 04-11-2019, **Accepted:** 27-11-2019

Access this article online	
Website: www.ijmrp.com	Quick Response code
DOI: 10.21276/ijmrp.2019.5.6.057	

INTRODUCTION

In India, uncorrected refractive errors are the most common cause of visual impairment and second major cause of avoidable blindness. While the prevalence of myopia has been reported to be very high in East Asia, it is as yet not considered a cause for concern in India.[1-4]

Myopia is characterized by blurring of objects viewed at a distance and is commonly the result of abnormal elongation of the eyeball – which causes the refractive image formed by the cornea and the lens to fall in front of the photoreceptors of the retina. The underlying biological cause of myopia is unknown, and there is no widely accepted means of prevention or cure. The optical error of myopia can be corrected only by using spectacle or contact lenses or corneal surgery. If left untreated, moderate myopia is one of the leading causes of visual impairment worldwide. [4, 5]

The pathophysiology of myopia is multifactorial and is not yet completely understood. There are proofs that multiple genetic variations and environmental and lifestyle factors play an important role in the etiology of this disease. Family linkage analysis, genome-wide association studies, and next-generation sequencing studies as well as a high correlation among monozygotic twins compared to dizygotic twins show that myopia has a genetic component.[6, 7]

The morphological appearance of the optic nerve head in myopia renders the clinical diagnosis and monitoring of glaucoma progression in myopic eyes challenging, especially as these eyes may have concomitant visual field defects mimicking those seen in glaucoma. Imaging modalities such as optical coherence tomography (OCT) can aid in the diagnostic dilemma by measuring retinal nerve fibre layer (RNFL) thickness, which differs significantly between glaucoma patients and controls. However, myopic patients may have RNFL abnormalities which may complicate this interpretation.[5-7] Hence; the present study was conducted for studying the peripapillary retinal nerve fibre layer (RNFL) thickness changes in patients with myopia.

MATERIALS & METHODS

The present study was conducted in the Department of Ophthalmology, Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar, Telangana (India) for studying the peripapillary retinal nerve fibre layer (RNFL) thickness changes in patients with myopia. The study was conducted on 50 patients with 100 myopic eyes. Patients with myopia more than -0.5D and age between 18-40 years of age were included.

Informed consent was taken from all the patients before inclusion in the study. After obtaining an informed consent, a detailed medical history and past history was taken. OCT- RNFL was done to measure retinal nerve fibre layer thickness. All the results were recorded and analysed by SPSS software. One Way ANOVA was used for evaluation of level of significance.

RESULTS

44 percent of the patients belonged to the age group of 26 to 30 years while 24 percent and 18 percent of the patients belonged to the age group ≤ 20 years and of 21 to 25 years respectively. Mean age of the patients was 27.66 years. 70 percent of the patients were females while the remaining were males. According to the grades of myopia, high grade, moderate grade and low grade was present in 30 percent, 42 percent and 28 percent of the eyes respectively.

Overall, average RNFL thickness was 96.84 microns. Mean RNFL average thickness among patients with high, moderate and low myopia was 89.45 microns, 95.33 microns and 101.37 microns respectively. A significant decline in RNFL average thickness with increasing grades of myopia was seen.

Table 1: Age-wise distribution

Age group (years)	Number of patients	Percentage of patients
≤ 20	12	24
21 to 25	9	18
26 to 30	22	44
31 to 35	8	10
More than 35	2	4
Total	50	100
Mean ± SD	27.66 ± 5.87	

Table 2: Grades of myopia

Grades of myopia	Number of eyes	Percentage of eyes
High	30	30
Moderate	42	42
Low	28	28
Total	100	100

Table 3: RNFL average (microns)

RNFL average	Value
Mean	96.84
SD	7.36

Table 4: Correlation of grades of myopia with RNFL average thickness

RNFL	Grades of myopia						p- value
	High		Moderate		Low		
	Mean	SD	Mean	SD	Mean	SD	
RNFL Average	89.45	8.12	95.33	6.84	101.37	6.24	0.00 (Significant)

DISCUSSION

Myopia (near-sightedness) is the most common refractive vision disorder in children. It is characterized by blurring of objects viewed at a distance and is commonly the result of abnormal elongation of the eyeball – which causes the refractive image formed by the cornea and the lens to fall in front of the photoreceptors of the retina.[6- 9] Hence; the present study was conducted for studying the peripapillary retinal nerve fibre layer (RNFL) thickness changes in patients with myopia.

In the present study, 44 percent of the patients belonged to the age group of 26 to 30 years while 24 percent and 18 percent of the patients belonged to the age group ≤ 20 years and of 21 to 25 years respectively. Mean age of the patients was 27.66 years. 70 percent of the patients were females while the remaining were males. According to the grades of myopia, high grade, moderate grade and low grade was present in 30 percent, 42 percent and 28 percent of the eyes respectively. Overall, average RNFL thickness was 96.84 microns. Qu D et al determined retinal nerve fibre layer function and its relations to retinal microvasculature and microcirculation in patients with myopia. Although the average PR/UD of the RNFL in the HM group did not reach a significant level, the birefringence of the inferior quadrant was significantly lower ($P < 0.05$) in the HM group compared to the HC group. Significant thinning of the average RNFL and focal thinning of RFNL in temporal, superior and inferior quadrants in the HM group were found, compared to the HC group ($P < 0.05$). There were no significant differences of retinal blood flow velocities in arterioles and venules among groups ($P > 0.05$). The macular vessel density

in both superficial and deep vascular plexuses was significantly lower in the HM group than in the other two groups ($P < 0.05$) as well as in the MM group than in the HC group ($P < 0.05$). The average phase retardation per unit depth (PR/UD) and PR/UD in the inferior quadrant were not related to refraction, axial length, blood flow velocities and macular vessel densities (r ranged from − 0.09 to 0.19, $P > 0.05$). The impairment of the retinal nerve fiber birefringence in the HM group may be one of the independent features in high myopic eyes, which appeared not to relate to macular microvascular density and blood flow velocity.[9]

In the present study, Mean RNFL average thickness among patients with high, moderate and low myopia was 89.45 microns, 95.33 microns and 101.37 microns respectively. A significant decline in RNFL average thickness with increasing grades of myopia was seen. Tai ELM et al compared the peripapillary retinal nerve fibre layer (RNFL) thickness measured via optical coherence tomography (OCT) between different groups of myopia severity and controls. All subjects underwent a full ophthalmic examination, refraction, visual field analysis and A-scan biometry. Myopic patients were classified as low myopia (LM) [spherical equivalent (SE) from greater than -0.5 D, up to -3.0 D], moderate myopia (MM; SE greater than -3.0 D, up to -6.0 D) and high myopia (HM; SE greater than -6.0 D). The control group consisted of emmetropic (EM) patients (SE from +0.5 D to -0.5 D). A Zeiss Cirrus HD-OCT machine was used to measure the peripapillary RNFL thickness of both eyes of each subject. The mean peripapillary RNFL thickness between groups was compared using both analysis of variance and analysis of covariance. A total of 403 eyes of 403 subjects were included in this study. The mean age was 31.48±10.23y. There were 180 (44.7%) eyes with EM, 124 (30.8%) with LM, 73 (18.1%) with MM and 26 (6.5%) with HM. All groups of myopia severity had a thinner average RNFL than the EM group, but after controlling for gender, age, and axial eye length, only the HM group differed significantly from the EM group.[10] Patel SB et al evaluated the relationship between axial length (AL) and retinal nerve fibre layer (RNFL) profile. Retrospective chart review of 170 eyes of 89 subjects with optical biometry and optical coherence tomography RNFL assessment was conducted. Temporal RNFL thickness showed no association with AL in either glaucomatous or nonglaucomatous eyes. Nasal thinning was most strongly associated with glaucoma in myopic eyes. Both myopic glaucomatous and nonglaucomatous eyes had a mean RNFL thickness of 16–22 µm thinner than mean RNFL thickness of normal AL eyes. An average of 16–22 µm thinning of RNFL compared to nomogram can be tolerated in patients with long AL.[11]

CONCLUSION

OCT RNFL thickness might be valuable tool for predicting progression of myopia. Ophthalmologists should take these structural characteristics into consideration during clinical evaluation of myopia.

REFERENCES

1. Wu JF, Bi HS, Wang SM, Hu YY, Wu H, Sun W et al. Refractive error, visual acuity and causes of vision loss in children in Shandong, China. The Shandong Children Eye Study. PLoS One. 2013;8:e82763
2. Saxena R, Vashist P, Tandon R, Pandey RM, Bhardawaj A, Menon V, et al. Prevalence of myopia and its risk factors in urban school children in Delhi: the North India Myopia Study (NIM study). PloSOne. 2015;10: e0117349
3. Dandona R, Dandona L, Srinivas M, Sahare P, Narsaiah S,Muñoz SR, et al. Refractive error in children in a rural population in India. Invest Ophthalmol Vis Sci. 2002;43:615–622.
4. Murthy GVS, Gupta SK, Ellwein LB, Muñoz SR, Pokharel GP, et al. Refractive error in children in an urban population in New Delhi. Invest Ophthalmol Vis Sci. 2002;43:623–631.
5. Carr BJ, Stell WK. The Science Behind Myopia. 2017 Nov 7. In: Kolb H, Fernandez E, Nelson R, editors. Webvision: The Organization of the Retina and Visual System [Internet]. Salt Lake City (UT): University of Utah Health Sciences Center; 1995-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK470669/
6. Zylbermann R, Landau D, Berson D. The influence of study habits on myopia in Jewish teenagers. J Pediatr Ophthalmol Strabismus 1993;30:319–322.
7. Faghihi H, Hajizadeh F, Riazi-Esfahani M. Optical coherence tomographic findings in highly myopic eyes. J Ophthalmic Vis Res. 2010;5(2):110-121.
8. Ng DS, Cheung CY, Luk FO, et al. Advances of optical coherence tomography in myopia and pathologic myopia. Eye (Lond). 2016;30(7):901-916. doi:10.1038/eye.2016.47
9. Qu D, Lin Y, Jiang H, Shao Y, Shi Y, Airen S, Gregori G, Wang J. Retinal nerve fiber layer (RNFL) integrity and its relations to retinal microvasculature and microcirculation in myopic eyes. Eye and Vision. 2018; 5: https://doi.org/10.1186/s40662-018-0120-3.
10. Tai ELM, Ling JL, Gan EH, Adil H, Wan-Hazabbah WH. Comparison of peripapillary retinal nerve fiber layer thickness between myopia severity groups and controls. Int J Ophthalmol. 2018;11:274-8
11. Patel SB, Reddy N, Lin X, Whitson JT. Optical coherence tomography retinal nerve fiber layer analysis in eyes with long axial lengths. Dovepress. 2018:12: 827—32.

Source of Support: Nil. **Conflict of Interest:** None Declared.

Cite this article as: Amol Chawhan, Sahil Sarpal. A Prospective Analysis to Evaluate Peripapillary Retinal Nerve Fibre Layer (RNFL) Thickness Changes in Patients with Myopia at a Tertiary Care Centre. Int J Med Res Prof. 2019 Nov; 5(6): 246-48.
DOI:10.21276/ijmrp.2019.5.6.057