Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies *NLM ID: 101716117*

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Index Copernicus value = 85.10

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Original Research

Assessment of the relationship between RNFL thickness and myopia using Spectral Domain OCT: An observational study

Dr. Prashant Shukla[1], Dr. Mahendra Singh[2]

[1]Assistant Professor, Department of Opthalmology, United Institute of Medical Sciences, Prayagraj, India;
[2]Assistant Professor, Department of Ophthalmology, Noida International Institute of Medical Sciences, Greater Noida, Uttar Pradesh, India

ABSTRACT:
Background: Myopia or near-sightedness, as it is medically termed, is a leading cause of loss of vision throughout the world, and its prevalence is increasing. Imaging modalities such as optical coherence tomography (OCT) can aid in the diagnostic dilemma by measuring retinal nerve fiber layer (RNFL) thickness, which differs significantly between glaucoma patients and controls. Hence; the present study was undertaken for assessing the relationship between RNFL thickness and myopia using Spectral Domain OCT (SD-OCT). **Materials & methods:** A total of 20 myopic eyes were included. Complete demographic and clinical details of all the patients were obtained. All patients were subjected to a comprehensive ocular examination, which included best corrected visual acuity (BCVA), refraction, slit lamp bio-microscopy, goldmann applanation tonometry, axial length (AL), anterior chamber depth (ACD), central corneal thickness (CCT), gonioscopy, dilated fundus examination, and OCT-RNFL. OCT- RNFL was done to measure retinal nerve fibre layer thickness using SD OCT. The average RNFL thickness and four quadrants RNFL thicknesses (superior, nasal, inferior and temporal quadrant) were recorded for analysis. All the results were recorded and analyzed SPSS software. **Results:** Mean RNFL was found to be 99.71 microns while mean RNFL among inferior, superior, nasal and temporal compartment was found to be 121.58 microns, 121.95 microns, 71.56 microns and 74.76 microns respectively. Mean RNFL thickness was significantly higher among patients with severe myopia in comparison to patients with moderate myopia and further from patients with high myopia. **Conclusion:** Myopia did have particular influence on RNFL thickness. Also, degree and severity of myopia affect the RNFL thickness differentially.
Key words: RNFL, Myopia, Spectral domain

Received: 3/09/2020 **Modified:** 24/09/2020 **Accepted:** 25/09/2020

Corresponding author: Dr. Mahendra Singh, Assistant Professor, Department of Ophthalmology, Noida International Institute of Medical Sciences, Greater Noida, Uttar Pradesh, India

This article may be cited as: Shukla P, Singh M. Assessment of the relationship between RNFL thickness and myopia using Spectral Domain OCT: An observational study. J Adv Med Dent Scie Res 2020;8(10):231- 234.

INTRODUCTION

Myopia or near-sightedness, as it is medically termed, is a leading cause of loss of vision throughout the world, and its prevalence is increasing. Although most researchers agree that people's refractive status is in large part genetically determined, a growing body of evidence shows that visual experiences early in life may affect ocular growth and eventual refractive status.[1-3] 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.[4]

The exact pathogenic mechanisms of myopia remain unclear. Recent evidence suggests that myopia is likely to result from the combined and interacting effects of hereditary and environmental factors. 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 fiber 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 undertaken for assessing the relationship between RNFL thickness and myopia using Spectral Domain OCT (SD-OCT).

MATERIALS & METHODS

The present study was conducted assessing the relationship between RNFL thickness and myopia using Spectral Domain OCT (SD-OCT). A total of 20 myopic eyes were included. Complete demographic and clinical details of all the patients were obtained. 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. All patients were subjected to a comprehensive ocular examination, which included best corrected visual acuity (BCVA), refraction, slit lamp bio-microscopy, goldmann applanation tonometry, axial length (AL), anterior chamber depth (ACD), central corneal thickness (CCT), gonioscopy, dilated fundus examination, and OCT-RNFL.

OCT- RNFL was done to measure retinal nerve fibre layer thickness using SD OCT. The average RNFL thickness and four quadrants RNFL thicknesses (superior, nasal, inferior and temporal quadrant) were recorded for analysis. All the results were recorded and analyzed SPSS software.

RESULTS

The present study was conducted for assessing the relationship between RNFL thickness and myopia using Spectral Domain OCT (SD-OCT). A total of 20 patients were analysed. Mean age of the patients was 28.72 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 35 percent, 35 percent and 30 percent of the eyes respectively. Mean RNFL was found to be 99.71 microns while mean RNFL among inferior, superior, nasal and temporal compartment was found to be 121.58 microns, 121.95 microns, 71.56 microns and 74.76 microns respectively. Mean RNFL thickness was significantly higher among patients with severe myopia in comparison to patients with moderate myopia and further from patients with high myopia.

DISCUSSION

Myopia is one of the risk factor of primary open angle glaucoma. Numerous clinic-based studies show an association between myopia and POAG and find rates of open-angle glaucoma two to four times higher for myopes. Although the mechanisms responsible for the link between glaucoma and myopia are poorly understood, it has been postulated that the optic nerve head in myopic eyes may be structurally more susceptible to glaucomatous damage because of the changes in connective tissue structure and arrangement. The increased risk of development of glaucomatous change may be related to the already reduced retinal nerve fiber layer (RNFL) thickness in myopic eyes or the reduced RNFL thickness in myopia may itself represent a risk factor for development of glaucoma.

Table 1: Grades of myopia

Grades of myopia	Number of eyes	Percentage of eyes
High	7	35
Moderate	7	35
Low	6	30
Total	20	100

Table 2: RNFL

RNFL	Mean	SD
RNFL I	121.58	18.32
RNFL S	121.95	17.42
RNFL N	71.56	10.28
RNFL T	74.76	8.64
RNFL average	99.71	11.28

Table 3: Correlation of RNFL with grades of myopia

RNFL	High myopia	Moderate myopia	Severe myopia	p- value
RNFL I	105.8	113.8	128.4	0.000*
RNFL S	108.6	119.4	131.5	0.001*
RNFL N	64.2	68.6	73.8	0.012*
RNFL T	68.6	71.8	79.5	0.037*
RNFL Average	86.2	94.2	115.8	0.000*

*: Significant

These myopic individuals often have enlarged optic discs with more oval configuration and large areas of peripapillary atrophy making diagnosis and management of glaucoma difficult in these cases.[8- 10]

Optical coherence tomography (OCT) has recently made it possible to explore changes in ocular layers as axial myopia progresses and the globe is stretched. These findings consist of dehiscence of retinal layers known as retinoschisis, paravascular inner retinal cysts and lamellar holes, peripapillaryintrachoroidal cavitation (also known as peripapillary detachment in pathologic myopia), tractional internal limiting membrane detachment, macular holes (lamellar and full thickness), posterior retinal detachment and choroidal neovascular membranes.[10- 12] Hence; the present study was undertaken for assessing the relationship between RNFL thickness and myopia using Spectral Domain OCT (SD-OCT).

The present study was conducted for assessing the relationship between RNFL thickness and myopia using Spectral Domain OCT (SD-OCT). A total of 20 patients were analysed. Mean age of the patients was 28.72 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 35 percent, 35 percent and 30 percent of the eyes respectively. Mean RNFL was found to be 99.71 microns while mean RNFL among inferior, superior, nasal and temporal compartment was found to be 121.58 microns, 121.95 microns, 71.56 microns and 74.76 microns respectively. Said-Ahmed KE et al in 2017 assessed the effect of myopia on the peripapillary RNFL thickness by SD-OCT, thus correlating it to glaucoma. Eighty-six eyes of 86 participants were included. Significant correlation was noted between spherical equivalent and axial length with peripapillary RNFL thickness ($P < 0.05$). However, no correlation was noted between age and sex with peripapillary RNFL thickness ($P > 0.05$). High myopia should be considered in the interpretation of OCT data because of thinning of RNFL thickness, and normative database corrected for refractive error and axial length should be incorporated.[10] Fahmy RM evaluated the effect of refractive status and axial length of the eye on retinal nerve fiber layer (RNFL) thickness. A total of 116 eyes of 62 subjects were enrolled. The RNFL thickness decreased with increasing axial length and this was statistically significant in average, superior, inferior, and nasal quadrants, except for temporal quadrant. The RNFL thickness decreased with increasing axial length and this was statistically significant in average, superior, inferior, and nasal quadrants except for temporal quadrant.[13]

In the present study, mean RNFL thickness was significantly higher among patients with severe myopia in comparison to patients with moderate myopia and further from patients with high myopia. Qu D et al determined retinal nerve fiber 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. 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.[11] Tai ELM et al compared the peripapillary retinal nerve fiberlayer (RNFL) thickness measured via optical coherence tomography (OCT) between different groups of myopia severity and controls. The superior, inferior and nasal RNFL was thinner in all myopia groups compared to controls, but after controlling for confounders, only the inferior quadrant RNFL was significantly thinner in the HM group, when compared to the EM group.[12]

CONCLUSION

Myopia did have particular influence on RNFL thickness. Also, degree and severity of myopia affect the RNFL thickness differentially.

REFERENCES

1. Schweitzer KD, Ehmann D, Garcia R. Nerve fibre layer changes in highly myopic eyes by optical coherence tomography. Can J Ophthalmol. 2009;44:13–6.
2. Hayashi W, Shimada N, Hayashi K, Moriyama M, Yoshida T, Tokoro T et al. Retinal vessels and high myopia. Ophthalmology. 2011;118:791.
3. Mitchell P, Hourihan F, Sandbach J, Wang JJ. The relationship between glaucoma and myopia: the Blue Mountains Eye Study. Ophthalmology. 1999;106:2010–5.
4. Kim MJ, Lee EJ, Kim TW. Peripapillary retinal nerve fibre layer thickness profile in subjects with myopia measured using the Stratus optical coherence tomography. Br J Ophthalmol. 2010;94:115–20.
5. Fan DS, Lam DS, Lam RF, Lau JT, Chong KS, Cheung EY et al. Prevalence, incidence and progression of myopia of school children in Hong Kong. Invest Ophthalmol Vis Sci. 2004;45:1071–5.
6. Lam CS, Edwards M, Millodot M, Goh WS. A 2-year longitudinal study of myopia progression and optical component changes among Hong Kong school children. Optom Vis Sci. 1999;76:370–80.
7. Matsumura H, Hirai H. Prevalence of myopia and refractive changes in students from 3 to 17 years of age. Surv Ophthalmol. 1999;44:S109–15.
8. Yoon KC, Mun GH, Kim SD, Kim SH, Kim CY, Park KH et al. Prevalence of eye diseases in South Korea: data from the Korea National Health and Nutrition Examination Survey 2008–2009. Korean J Ophthalmol. 2011;25: 421–33.

9. Vernon SA, Rotchford AP, Negi A, Ryatt S, Tattersal C. Peripapillary retinal nerve fibre layer thickness in highly myopic Caucasians as measured by Stratus optical coherence tomography. Br J Ophthalmol. 2008;92:1076-80.
10. Said-Ahmed KE, A. IbrahemAM, Salama AA. Association of retinal nerve fiber layer thickness and degree of myopia using spectral-domain optical coherence tomography.Menoufia Med J 2017;30:966-70
11. Qu D, Lin Y, Jiang H, Shao Y, Shi Y, Airen S, GregoriG, Wang J. Retinal nerve fiber layer (RNFL) integrity and its relations to retinal microvasculature and microcirculation in myopic eyes.Eye and Vision. 2018; 5:
12. 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
13. Fahmy RM. Effect of Refractive Status and Axial Length on Retinal Nerve Fiber Layer Thickness Using OCT. Int J Ped& Neo Heal. 2017; 1:4, 91-95.