

Study of Retinal Nerve Fiber Layer Thickness in Myopic Eye in Rajasthani Population

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Abstract: Purpose: To find out relationship between Average Retinal Nerve Fiber Layer Thickness and Myopia. Methods: A total of 250 myopic eyes were analyzed. Average Retinal Nerve Fiber Layer (RNFL) was measured with OCT (Optical Coherence Tomography) and compared between the two diagnostic groups. Simple Linear Regression analysis was performed to evaluate the relationship between spherical equivalent and Average RNFL thickness. Result: Average RNFL thickness decreases with increase in degree of myopia. Linear regression analysis shows positive correlation between RNFL thickness and degree of myopia (r value = 0.5286, p = 0.0001). Conclusion: RNFL thickness measurements may be a useful parameter to assess and monitor glaucoma damage in myopic patients.

Keywords: RNFL, Myopia, OCT, Glaucoma.

1. Introduction

Myopia is very common refractive errors of the eye. Its prevalence has been increased markedly in recent years specially in Asian countries^{5,6,7,10}. Glaucoma is one of the potentially blinding ocular disease associated with myopia. Assessment of the retinal nerve fiber layer (RNFL) thickness has been an important approach for detecting structural damage in patients with glaucoma. Glaucoma is a group of many conditions characterized by accelerated death of retinal ganglion cells and their retinal nerve fiber layer (RNFL) axons resulting in characteristic visual field defects and corresponding optic nerve head anatomical changes. The optical coherence tomography (OCT) is a noncontact and non-invasive modern imaging device designed to measure the RNFL thickness. OCT can directly measure and quantify RNFL thickness by calculating the area between the internal limiting membrane (ILM) and RNFL border.

Although RNFL thinning is indicative of glaucomatous damage, it is uncertain whether RNFL thickness would vary with the refractive error of the eye. It is therefore important to investigate whether any correlation exists between RNFL measurements and refractive error in myopia, with regard to the observation that the risk of development of glaucoma is increased with an increasing degree of myopia.

2. Material and Methods

A total of 250 healthy myopic eyes were studied in the study. All the patients having myopia ranging from -0.50 D to -23 D visiting in out patient department ASG eye hospital, Jodhpur, Rajasthan. Following individuals were excluded who were previously operated for retinal detachment, person having myopia with retinopathy like diabetic, hypertensive, persons with Optic disc atrophy, Optic disc pallor, Aphakic eye, Cataract and Glaucoma. Each subject underwent a comprehensive ophthalmic evaluation and dilated fundus

examination. Refractions were recorded with an automatic refractometer.

Subjects were divided into two diagnostic groups, according to refractive error; Group A low myopia (spherical equivalent between -0.50 D to -6.00 D) and Group B high myopia (spherical equivalent > -6.00 D) Optical coherence tomography (OCT) is an optical signal acquisition and processing method that captures micrometre-resolution, three-dimensional images from within optical scattering media (e.g., biological tissue). In our study Fourier domain (Optovue, RTVue, version 6.3.2.73) type of Optical Coherence Tomography machine was used to calculate RNFL thickness.

Statistical analyses were performed with commercially available software (SPSS ver. 16.0). Linear regression method was used to determine the correlation between RNFL thickness and spherical equivalent, and expressed as the Pearson coefficient of correlation.

3. Results

A total of 250 cases have been studied. Out of which 164 are that of Low myopia (Group A) and 86 are that of High myopic (Group B) . (Table: 1).

Thickness of Average Retinal Nerve Fiber Layer is decreased with increase of myopic refraction. Thickness of Average Retinal Nerve Fiber Layer in Group A is 104.51 μ m and in Group B is 93.11 μ m. (Table: 2). The myopic refraction is correlated significantly with average RNFL thickness (r = 0.528, P = 0.00001) (Table: 3).

Table 1: Showing the distribution of cases according to their spherical equivalent refraction.

Group	Range	No. of Cases
Group A	Low Myopia (-0.50 D to -6 D)	164
Group B	High myopia (>-6 D)	86

Table 2: Showing RNFL thickness by Optical coherence tomography (OCT) in different groups

Parameter	Group A		Group B	
	Mean	SD	Mean	SD
Avg. RNFL μm	104.5	10.3	93.11	7.2

Table 3: Correlation between Myopia and Average RNFL thickness by Karl Pearson's correlation coefficient method

Parameter	r-	t-	p-	Sig
Avg.	0.5	9.8	0.00	S

4. Discussion and Conclusion

OCT utilising the fast retinal nerve fibre layer peripapillary scan programme has been found to provide highly reproducible measurements of retinal thickness at a diameter of 3.4 mm centred on the centre of the optic disc.¹

In contrast to our study, a Singaporean population of myopic eyes studied with OCT, Hoh et al(2006)³ found that there was no significant correlation between level of myopia (range 0 to -14 dioptres) and mean RNFL thickness using a 4.5 mm scan diameter.

Christopher Kai-Shun Leung et al (2006)² found that the RNFL measurements were significantly lower in the high myopia group compared with those of the low-to moderate myopia group. The average RNFL thickness in highly myopic eyes was $100.69 \pm 10.36 \mu\text{m}$, which was significantly thinner than that in low-to-moderately myopic eyes ($107.49 \pm 12.74 \mu\text{m}$; $P= 0.003$). Sung-Won Choi et al (2006)⁹ found that as the level of myopia increased the thickness of the peripapillary RNFL decreased. Shin Hee Kang et al (2010)⁸ found that high myopia group had significantly lower peak RNLF thicknesses in both superior and inferior areas than the low to moderate myopia group. The average RNFL thickness decreased with SE(Spherical Equivalent) and an increase in the axial length. J Lee et al (2011)⁴ found that the mean RNFL thickness was thinner in the high myopia group ($87.8 \mu\text{m}$) than those of emmetropia and moderate myopia groups (98.3 and $97.5 \mu\text{m}$, for emmetropia and moderate myopia groups, respectively) (multiple comparison, all, $p<0.05$). Zhao JJ et al (2013)¹¹ found that as the degree of myopia increases, the RNFL thickness measured by 3D -OCT including the average and superior, nasal, inferior sectors decreases. Average RNFL thickness (μm) in Low myopia, Moderate myopia, High myopia, Extreme high myopia are respectively $123.22 \pm 8.11 \mu\text{m}$, $117.76 \pm 9.09 \mu\text{m}$, $115.41 \pm 7.49 \mu\text{m}$, $114.42 \pm 11.12 \mu\text{m}$.

In the present study we found that avg. RNFL thickness decreases with degree of myopia. This study result is supported by many researchers. Some researchers also found that there is no significant correlation between degree of myopia and RNFL thickness.

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