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Original Research Article

Peripapillary retinal nerve fibre layer thickness variation in refractive errors among adults

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ABSTRACT

Context: Refractive errors in the young adults are prone to variation of peripapillary retinal nerve fibre layer (RNFL) thickness.

Aims: To compare the peripapillary RNFL thickness in myopes and hyperopes with emmetropes by optical coherence tomography (OCT).

Settings and Design: A case control cross-sectional study conducted from January-June 2019 among 18-40 years, attending ophthalmology outpatient department of a tertiary care centre.

Materials and Methods: Young adults (18-30 years), with or without refractive errors, underwent anterior and posterior segment examination, intraocular pressure, axial length and subjective refraction and OCT examination for RNFL thickness. SPSS 20.0 software was used and frequency, percentages were calculated for qualitative variables like gender and ethnicity, and were compared by chi square test. One-way analysis of variance (ANOVA) was used to compare the variables among the three groups. P<0.05 was taken as statistically significant.

Results: Of 90 cases, 36(40%) myopes, 24(26.66%) hyperopes and 30(33.33%) emmetropes, with mean RNFL thickness in myopes-90.86 +/- 10.50microns, in hyperopes-116 +/- 3.6mm and emmetropes-120 +/- 4.3mm.Mean RNFL is thinner in myopes than in emmetropes with superior and inferior quadrants thinning with no mean RNFL thickness changes in hyperopes when compared to emmetropes. Mean RNFL thickness is inversely related to axial length in myopes with no variation in hyperopes.

Conclusions: RNFL thickness changes in myopes can be a risk factor for glaucoma, hence OCT of optic nerve head to be included in routine examination.

1. Introduction

The retinal nerve fibre layer (RNFL) is known as a sensitive indicator of early glaucomatous damage.[1,2] Currently, due to its excellent ability to assess peripapillary RNFL thickness, optical coherence tomography (OCT) has been extensively used for the diagnosis and follow-up of glaucoma and other optic neuropathies.[3,4] OCT is currently used in the diagnosis of pre-perimetric glaucoma to quantify the amount of damage to the RNFL. Previous studies using time domain (TD) OCT have shown that RNFL thickness measurements could be influenced by refractive status and the axial length of the eye.[5–8] This study has been done using spectral domain for determining the RNFL thickness changes in refractive errors. OCT is a safe, non-invasive, outpatient department (OPD) method of assessing the RNFL thickness.

It is well known that, refractive errors, especially myopia is an important risk factor for the development of various types of glaucoma. Our study was conducted to compare the peripapillary RNFL thickness in refractive errors (myopia and hyperopia) with that of normal individuals by OCT so as to assess the susceptibility of the RNFL thickness variation in refractive errors as a risk factor for glaucoma.

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2. Materials and Methods

A case control cross-sectional study conducted at the ophthalmology outpatient clinic of a tertiary care centre, among 90 young adults (18-30 years), with or without refractive errors who were grouped accordingly- group 1: 30 emmetropes, group 2: 36 myopes and group 3: 24 hyperopes.

All study subjects underwent anterior and posterior segment examination, intraocular pressure, axial length using A-scan and subjective refraction and RNFL quantitative analysis using spectral domain (SD) OCT.

All patients with congenital and developmental anomalies, with history of glaucoma, keratoconus, anterior segment infections/inflammations, underlying retinal pathology, amblyopia, post refractive surgery patients and media opacities were excluded from the study.

Statistical analysis: was done using SPSS 20.0. Frequency and percentages were calculated for qualitative variables like gender and ethnicity and were compared by chi square test.

All variables were checked with the Kolmogorov-Smirnov test for normal distribution. Mean±SD was calculated for age, SE, axial length and RNFL thickness. Levene's test was used to assess the homogeneity of the variances.

One-way analysis of variance (ANOVA) was used to compare the variables among the three groups. P<0.05 was taken as statistically significant. Pearson correlation coefficients (r) were calculated to evaluate relationships between the RNFL thickness and axial length.

3. Results

Of 90 cases, 36(40%) myopes, 24(26.66%) hyperopes and 30(33.33%) emmetropes, with mean RNFL thickness in myopes-90.86 +/- 10.50microns, in hyperopes-116 +/- 3.6mm and emmetropes-120 +/- 4.3mm.Mean RNFL is thinner in myopes than in emmetropes with superior and inferior quadrants thinning with no mean RNFL thickness changes in hyperopes when compared to emmetropes. Mean RNFL thickness is inversely related to axial length in myopes with no variation in hyperopes.

4. Discussion

Aim of this study was to prognosticate susceptibility to glaucoma by RNFL thickness in refractive errors after comparing with normal subjects.

Our study showed negative correlation between axial length (mean-23.79mm) and peripapillary RNFL thickness, i.e. as the axial length increases, there was thinning of RNFL in most cases. In our study, RNFL thickness in myopes (mean-88.56microns) is reduced, with superior (mean-107.45microns) and inferior (mean-109.56 microns) quadrant thinning when compared with the emmetropes

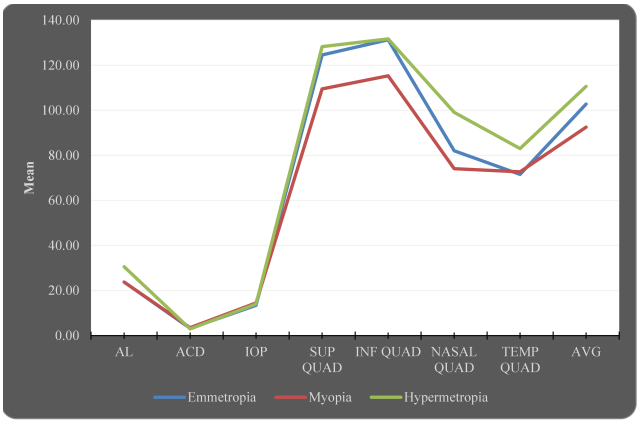

Fig. 1:

(mean-103.97microns).

There was thickening of nasal quadrant (mean-90.25microns) in hyperopes when compared to emmetropes (mean-82.5microns).

Our study showed 33% of subjects (30 myopes) with thinner RNFL in superior and inferior quadrants, similar to the study by Avisha Kausar et al, where 35%(33 myopes) had similar results.[9]

In our study RNFL thinning was more in pathological myopia(33%) when compared to low-moderate myopia(22%) as seen in Betul Ilkay Sezgin Akcay et al study where superior, inferior and nasal quadrant thinning was seen in high myopes(29.5%) as compared to Low-Moderate myopes(71.2%).[10]

On the contrary, in Veysi Öner et al study in 2012 showed RNFL thicker than control group in both myopia and hyperopia($p<0.05$)[11] whereas our study showed thickening of nasal quadrant only in hyperopia (mean-90.25microns) when compared to emmetropes.

However, limitations of our study were a small sample size, purposive sampling and other risk factors for glaucoma not all being evaluated.

5. Conclusion

Peripapillary RNFL is thinner in superior and inferior quadrants in myopes and thicker in the nasal quadrant in hyperopes. OCT is currently being used in the assessment of optic nerve damage in pre-perimetric glaucoma. Apart from its uses in macular disorders, OCT can be an important tool in susceptible/high risk refractive errors in predicting future glaucoma before the optic disc changes are evident. Hence RNFL thickness assessment by OCT should be included in routine assessment in patients with refractive errors as it is beneficial in future follow up.

6. Source of Funding

None.

Table 1: Comparison of average axial length and quadrant wise RNFL Thickness variations among emmetropia, myopia, hypermetropia patients

	Emmetropia	**Myopia**	**Hypermetropia**
Axial length (**mean**)	23.81 mm	23.77 mm	23.13 mm
RNFL thickness:	(Micro metre)	(Micro metre)	(Micro metre)
Average thickness:	103.05	88.558	109.691
Superior Quadrant	124.52	107.7	127.58
Inferior Quadrant	131.21	109.72	130.57
Nasal Quadrant	82.31	69.12	99.25
Temporal Quadrant	72.54	69.135	83.25

Table 2: Showing the average RNFL Thinning in low to moderate myopia to that of pathological myopia

	Total	**RNFL thickness (Average)**	
Low-Moderate myopia: (< -6 dioptre)	20	87.643	Thin
Pathological myopia (> -6 dioptre)	10	85.924	Thinner

7. Conflict of Interest

None.

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