ORIGINAL RESEARCH PAPER

Ophthalomology

KEY WORDS: Retinal thickness, optical coherence tomography, retinal nerve fiber layer

A STUDY OF DECREASING RETINAL THICKNESS WITH AGE USING OPTICAL COHERENCE TOMOGRAPHY

Dr Naina Shankar* Final year Postgraduate in MS Ophthalmology, MVJ Medical College and Research Hospital NH 75, Dandupalya, Hoskote Bangalore – 562114 *Corresponding Author

Dr Sujatha V Professor, Dept of Ophthalmology

Dr Vijay Kumar Srivastava Professor & HOD, Dept of Ophthalmology

Dr Pallavi BA Associate Professor, Dept of Ophthalmology

Dr Amudha A Assistant Professor, Dept of Ophthalmology

ABSTRACT

Aim/purpose: To study and correlate the change in retinal thickness with age and to establish a clinical importance between the two factors. **Methods:** A number of 50 healthy subjects between the ages of 18-65 years on outpatient basis were taken and evaluated. Pupils of the subjects were dilated with tropicamide 0.8% and OCT Optic Disc scan was performed on each eye using the Cirrus HD OCT 500. The total retinal thickness and retinal nerve fiber layer (RFNL) thickness were noted. **RESULTS:** Out of the 50 subjects, 48% of them were female and 52% of them male. The mean retinal thickness was 234.78 μm ± 16.07 with a coefficient of variation of 6.8%. The mean RFNL was 84.6 μm ± 20.67 with a coefficient of variation of 24.4%. Linear regression plots are done using x variable as age and y variable as RFNL/Total retinal thickness and using the formula Y = mx + b, it is plotted against a graph for each of the two variables. Unpaired t test used, t = 13.8599. The value P<0.001 and was considered statistically significant. **CONCLUSION:** According to this study, retinal thickness significantly decreases with age. Hence, it is important to perform OCT as a screening process in older individuals to rule out diabetic changes, macular edema, to detect thinning of the retina in myopics as a risk factor for RD and to rule out other pathologies.

INTRODUCTION

Optical Coherence Tomography is a high-resolution technique that permits cross-sectional visualization of the retinal structure in which the time delays of light reflected from different depths within the retina are located by means of low-coherence interferometry.[1]

In normal eyes, the retinal nerve fibre layer (RNFL) is usually best visible in the inferior temporal part of the fundus, followed by the superior temporal region, the nasal superior region and the nasal inferior region.[2] The retinal nerve fibre layer (RNFL) is composed primarily of ganglion cell axons before they coalesce in the optic nerve.

The normal range of RNFL thickness varies between 46 to 106 μm in normal eyes.[3]

In three dimensional optic disc tomography a reference plane is required to calculate optic disc rim or cup values. The position of the reference plane often depends on the retinal thickness at the temporal disc margin. Originally it was assumed that the retinal thickness at the temporal disc margin is independent of age.[4]

The resolution of the OCT image is at about 1–15 μm. It provides details 10 times superior to an ultrasound-B scan.[4]

In this study we calculate the variation with two factors, namely the Retinal Nerve fibre layer thickness (RFNL) and the total retinal thickness which is measured by the Cirrus HD optical coherence tomography (OCT) scanner, software version in healthy patients between the ages of 18 to 65 years.

AIMS AND OBJECTIVES

To study and correlate the change in retinal thickness with age and to establish a clinical importance between the two factors.

Inclusion Criteria

All healthy OPD patients between the ages of 18 to 65 years.

Exclusion Criteria

1. Patients diagnosed to have glaucomatous changes in optic disc
2. Patients diagnosed to have retinopathies of hypertensive or diabetic origin
3. Patients having history of intraocular surgery
4. Patients having refractive error of more than 5D or have undergone refractive surgery
5. Patients diagnosed with cataract
6. Patients having visual acuity less than 6/24
7. Patients having history of any systemic illnesses that affect the retina

MATERIALS AND METHODS

All healthy OPD patients between the ages of 18 to 65 years in the department of Ophthalmology at MVJ Medical College, Bangalore during the period of January 2022 to May 2022. Inclusion and exclusion criteria were followed.

The sample size of the study was taken as 50 patients. Consent for the study was taken in proforma. Pupils of the subjects were dilated with tropicamide 0.8% and OCT Optic disc scan was performed on each eye using the Carl Zeiss Cirrus HD OCT 500. The total retinal thickness and the retinal nerve fiber layer thickness of each patient was noted. Statistical methods used were data collected and entered into MS Excel and charts/tables generated using MS Word. Quantitative variables presented using percentages and qualitative variables presented using mean +/- SD.

Investigations Required

- Autorefractometry
- Best corrected visual acuity
- B scan
- IOP
- Direct/Indirect Ophthalmoscopy
- OCT

RESULTS AND DISCUSSION

The percentage of subjects between the ages 18-31 yrs was

48%, between the ages 31-44 yrs was 28%, 44-57 yrs was 1% and 57-70 yrs was 14% as plotted in Figure 1. Out of the 50 subjects, 48% of them were female and 52% of them male as seen in the histogram in Figure 2.

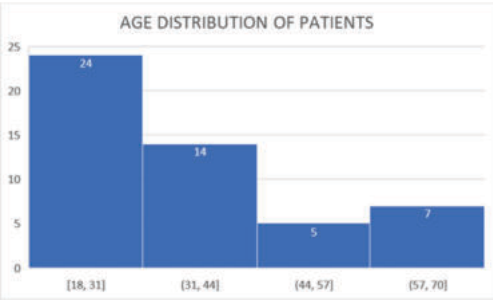

FIG. 1

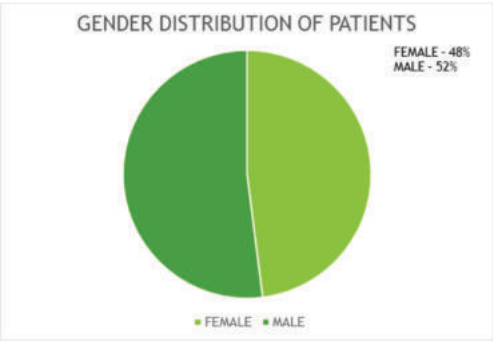

FIG. 2

The mean retinal thickness was 234.78 μm ± 16.07 with a coefficient of variation of 6.8%. The mean RFNL was 84.6 μm ± 20.67 with a coefficient of variation of 24.4%(Figure 3 and 4). Linear regression plots are done using x variable as age and y variable as RFNL/Total retinal thickness and using the formula Y = mx + b, it is plotted against a graph for each of the two variables(Figure 5.1 and 5.2). Unpaired t test used, t = 13.8599. The value P<0.001 and was considered statistically significant. 95% confidence interval of this difference: From -56.36 to -42.24.

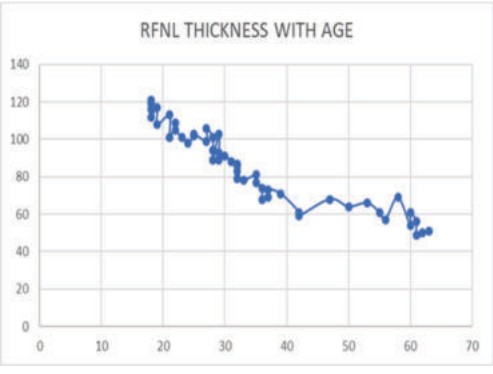

FIG. 3

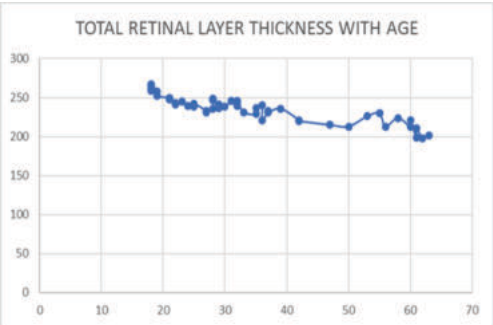

FIG. 4

Linear Regression Plot With Both Variables

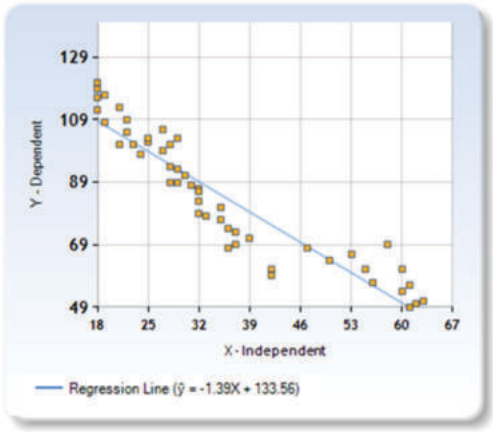

FIG 5.1

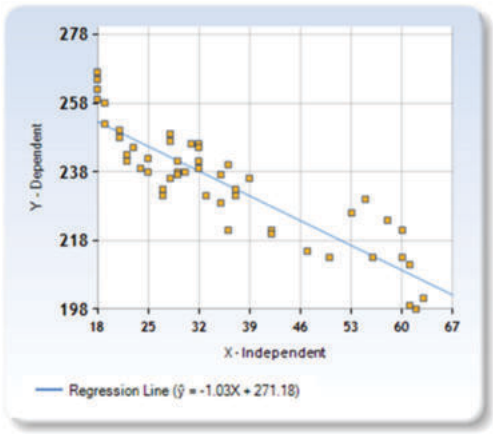

FIG 5.2

Studies by Alamouti and Funk stated that both the total retinal thickness and the nerve fibre layer thickness significantly decrease with age and by Sotaro Ooto stated that inner retinal thickness decreased with increasing age.[4,5]

A cross sectional, observational study done in 2018 by María Nieves-Moreno et al used a total of 297 participants to observe age related changes in retinal layers using OCT. It was found that retinal thickness was reduced by 0.24 μm for every one year of age.[6]

A study done by Lilia Jorge in 2020 also found a decrease in retinal thickness with increasing age, specifically the thickness of the ganglion cell layer.[7] This was attributed to a reduction in the density of photoreceptors, ganglion cells, and pigment epithelial cells with age.[8,9]

CONCLUSION

According to this study, retinal thickness significantly decreases with age.

Hence, it is important to perform OCT as a screening process in older individuals to rule out diabetic changes, macular edema, to detect thinning of the retina in myopics as a risk factor for retinal detachment and to rule out other pathologies.

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