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Ageing and The Retinal Nerve Fiber Layer Thickness (RNFLT) in a Population Based Study – The Central India Eye and Medical Study (CIEMS)

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The retinal nerve fiber layer is of paramount importance in the assessment of glaucomatous eyes and may indicate early glaucomatous damage.[1,2] Age related loss of retinal nerve fibers has been demonstrated in cadaveric histologic sections[3,4] With the development of newer imaging devices that have shown a correlation with histological findings, studies have been performed by Schuman[5], Funk[6] and Parikh[7] demonstrating a loss of retinal thickness with age. However some histological studies did not show a significant relationship between aging and retinal nerve fiber loss.[8,9] Since imaging instruments are used in the detection and follow up of glaucoma patients, it may be

important to establish the importance and influence of aging on the retinal nerve fiber layer. It was the purpose of this study to assess the effect of ageing on the retinal nerve fiber layer thickness as measured by the Confocal scanning laser ophthalmoscope in a population based study, the Central India Eye and Medical Study.

Materials and Methods

The Central India Eye and Medical Study is a population based, cross sectional cohort study being conducted at the Suraj Eye Institute, in Nagpur, Central India. Total number of subjects examined in the were 2423 out of a total of 3093 eligible subjects. Data on CSLO was available for 1712 randomised eyes of 1712 subjects, after excluding aphakes, pseudophakes and those with IOP greater than 21 mm. Hg. All subjects underwent a complete eye examination including, refraction, slit lamp biomicroscopy, applanation tonometry, biometry, pachymetry, gonioscopy, FDT, confocal scanning laser ophthalmoscopy, pupillary dilatation. Fundus evaluation and photography. In addition medical tests were done including a complete blood count, blood sugar, glycosylated haemoglobin, and kidney function tests. For confocal scanning laser ophthalmoscopy, the HRT II (software v.3.0) was used. The reference plane height was calculated 50 um posterior to the mean height contour along a small temporal section of the contour line. Parameters were measured using this reference plane. Cup area, cup-disc area ratio, cup volume below the reference plane, RNFL thickness and cross sectional area, and rim area were included in the analysis. The contour line was drawn keeping in view the colour optic disc photograph on the same computer screen. Data were fed into a SPSS (Version 10) program and analysed.

Results

Of the 1712 subjects there were 771 (45%) males and 941 (55%) females. The mean age was 46.52±12.75 yrs. The spherical equivalent was –0.164±1.42 D, the mean intraocular pressure was 13.75±2.8mm.Hg. and the mean retinal nerve fiber layer thickness global was 0.251±0.071mm. There was a significant negative correlation of age with global retinal nerve fiber layer thickness (RNFLT) ($p<0.001$; $r=-0.31$), and for all the six optic optic disc quadrants for which values were obtained from the CSLO. Table 3. RNFLT nasal ($p<0.001$; $r=-0.295$), nasal inferior ($P<0.001$; -0.286), nasal superior ($P<0.001$; $r= 0.001$; $r= -0.253$), temporal ($P<0.001$; $r=-0.172$), temporal inferior ($p<0.001$; $r=-0.272$), temporal superior ($P<0.001$;$r= -0.225$)

Table-1: General Characteristics

	Mean ± SD
Age(Yrs)	46.52±12.75
Spherical Equivalent (D)	-0.164±1.42
Intra Occular Pressure (Mm of Hg)	13.75±2.8

Table-2: Mean Retinal Nerve Fiber Layer Thickness Global and Segments

Quadrants	Mean Retinal Nerve Fibre Layer Thickness Mean ±Sd
Global (mm)	0.25±0.071
Temporal (mm)	0.084±0.028
Temporal Superior (mm)	0.28±0.096
Temporal Inferior (mm)	0.27±0.093
Nasal (mm)	0.29±0.10
Nasal Superior (mm)	0.35±0.10
Nasal Inferior (mm)	0.36±0.11

Table-3: Correlations and Pearsons Coefficient values with Age

Parameters	P r
Mean RNFL Global (Mm)	<0.001, -0.31
RNFL Nasal (Mm)	<0.001,-0.295
RNFL Nasal Inferior (Mm)	<0.001,-0.286
RNFL Nasal Superor (Mm)	<0.001,-0.253
RNFL Teporal (Mm)	<0.001,-0.172
RNFL Temporal Inferior (Mm)	<0.001,-0.272
RNFL Temporal Superior (Mm)	<0.001,-0.225

Note: *Disc segments according to Heidelberg Retina Tomograph.*

Discussion

Age related loss of retinal nerve fiber layer was seen in the Central India Eye and Medical Study using the Confocal Scanning laser ophthalmoscope. Various histological studies have shown axonal loss per year ranging from 500 to 7000 axons per year.[3,4,10,11] Loss was noted for all age groups starting from 30 years

onwards. Our results showed that when analysed separately, the age group of 30-50 years and 50 years onwards both showed significant loss of retinal nerve fiber layer thickness with age. It is apparent that glaucomatous loss will be superimposed on the age related loss. There may also be systemic factors that may be associated with age related loss. Through cohort studies it may be possible to quantify loss of retinal nerve fiber layer thickness and correlate with the axonal loss on histopathology. Further studies may help to segregate loss from ageing and glaucoma. This may enable better assessment of effectivity of glaucoma and neuroprotection therapy in subjects of glaucoma.

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