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Original Article

Correlation of the structural changes in OCT with functional visual field defects among Primary Open angle Glaucoma patients

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ABSTRACT

Glaucoma is characterized by progressive degeneration of retinal ganglion cells and their axons that leads to nerve fiber layer loss, optic disc cupping, and consecutive glaucomatous visual field changes. Study is done in Department of ophthalmology, Fathima Institute of Medical Sciences, Kadapa, AP. A total of 52 eyes of 29 patients were included in the study. Mean age of the patients included in the study is 64.14+/- 11.43 years. Majority were Male patients (68.96%). Female patients were only 31.04%.

Key words: Retinal Nerve Fibre, Primary Open Angle Glaucoma

INTRODUCTION

Glaucoma is a significant global health problem. Glaucoma is second only to cataracts as a cause of blindness worldwide [1]. It is estimated that there will be 79.6 million glaucoma patients by year 2020 and of these, 74% will have Open Angle Glaucoma [2]. Retinal nerve fiber layer (RNFL) loss is considered an early sign of glaucoma [3]. Recent advances in imaging technologies using the optical properties of the RNFL allow objective and quantitative assessment of the RNFL thickness [3-5]. Optical coherence tomography (OCT) is a noninvasive, noncontact technique for imaging the layered structure of the retina [6,7]. It is well known that Perimeters detect Visual field defects only after at least 30% of retinal nerve fibres have undergone damage. Moreover, Automated Perimetry is a subjective test and is dependent on the patients' co-operation. Optical coherence tomography (OCT), based on low-coherence interferometry helps in pre-perimetric diagnosis of glaucoma and is independent of the patient factors.

MATERIAL AND METHODS

This is a cross sectional study done in Department of ophthalmology, Fathima Institute of Medical Sciences, Kadapa, AP. from January 2015 to December 2015.

Aim of the study is to correlate the structural changes in OCT with functional visual field defects.

Source & Procedure: Data was collected on standardized proforma from all the subjects who were willing to participate in the study. Subjects underwent a complete ophthalmic examination including slit lamp examination, IOP measurement using applanation tonometer, 4 mirror gonioscopy, detailed stereoscopic fundus examination, pachymetry, after a detailed history taking.

Automated visual field testing was done in all subjects using Humphrey Field Analyser2 , Carl Zeiss Meditec using the central 24-2 threshold program and also by 10-2 threshold program in patients with central 6 degree visual field loss. Retinal Sensitivity of Superior and Inferior hemifield of a 24-2 print out is calculated and Mean Deviation, Pattern Standard Deviation are noted. Using Spectral Domain OCT Optovue Software version #6,1,0,4, RNFL analysis was done.

Statistical analyses were done with SPSS (Version 16.0; SPSS, Chicago). Pearson's linear regression analysis was used to correlate the retinal sensitivity of both the hemifields on Humphrey's automated perimetry with the average retinal nerve fibre layer thickness in Optical Coherence Tomography of the

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both quadrants respectively. Pearson correlation coefficients with absolute values equal to or greater than 0.5 suggesting a strong association with $p<0.01$ were accepted as statistically significant.

Regression analysis between RNFL and average retinal sensitivity of superior and inferior hemifields was performed, employing linear and curvilinear (quadratic) models with corresponding scatterplots showing best-fit regression curves and regression coefficients.

Inclusion Criteria: Diagnosed cases of Primary Open angle Glaucoma.

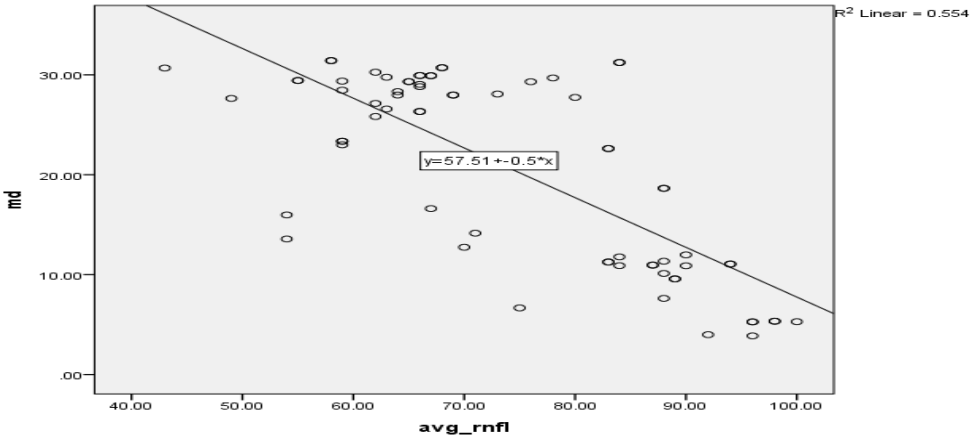
Exclusion Criteria:

1) Angle closure glaucoma
2) Secondary Glaucomas
3) Other diseases affecting visual field. E.g., pituitary lesions, demyelinating diseases, Neurological causes, AIDS.
4) Patients on medications known to affect visual field sensitivity. e.g. Chloroquine.

RESULTS AND DISCUSSION

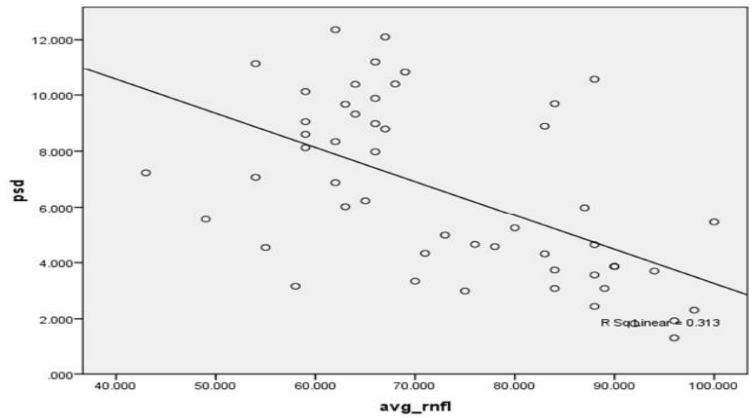
A total of 52 eyes of 29 patients were included in the study. Mean age of the patients included in the study is 64.14+/- 11.43 years. Majority were Male patients (68.96%). Female patients were only 31.04%.

Figure 1: Linear regression analysis of Average Mean Deviation of visual field examination of and Average RNFL thickness of OCT RNFL Analysis examination all 52 eyes



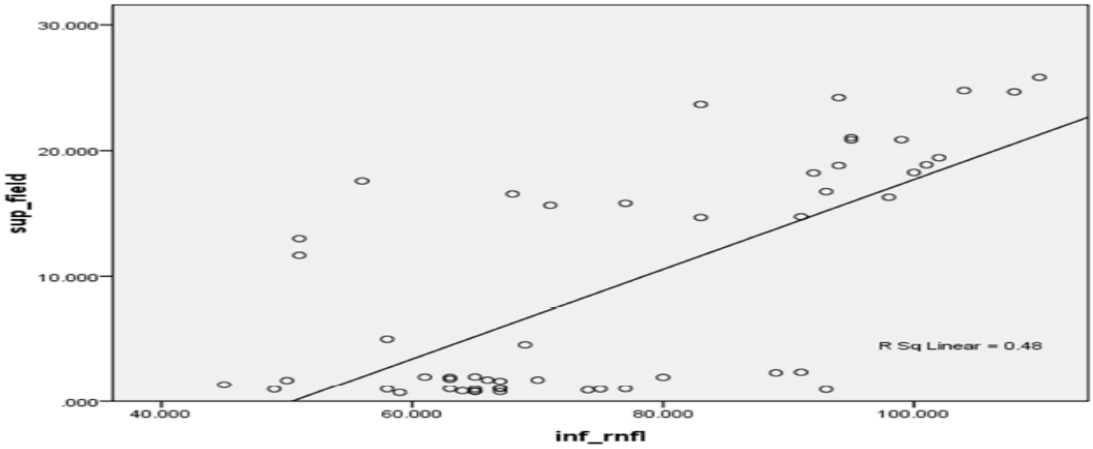
Analysis is made by plotting Mean Deviation of Visual Field Analysis on Y-axis and Average RNFL thickness on X-axis of all 52 eyes. With increase in Mean Deviation there is a decrease in Average RNFL thickness. The correlation coefficient r = -0.725 and it is significant

Figure 2: Linear regression analysis of Pattern Standard Deviation of visual field examination and Average RNFL thickness of OCT RNFL Analysis examination of all 52 eyes



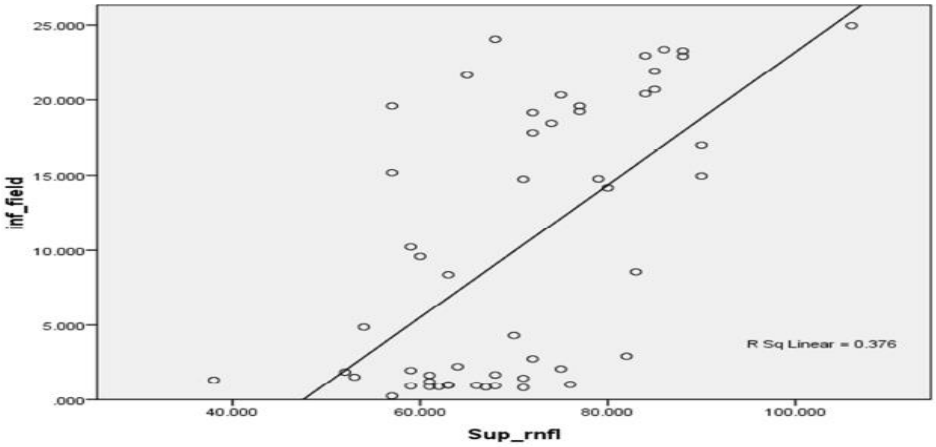
Analysis is made by plotting Pattern Standard Deviation of Visual Field Analysis on Yaxis and Average RNFL thickness on X-axis of all 52 eyes. There is a negative correlation of Mean PSD with Average RNFL Thickness. The correlation coefficient r = -0.5599 and it is significant.

Figure 3: Linear Regression Analysis of Superior hemifield Retinal Sensitivity of visual field examination and Inferior RNFL Thickness of OCT RNFL Analysis examination of all 52eyes



Analysis is made by plotting Average Superior hemifield Retinal Sensitivity on Y-axis and Average Inferior RNFL Thickness on X-axis of all 52 eyes. With decrease in Average Superior hemifield Retinal Sensitivity there is a decrease in Average RNFL thickness. The correlation coefficient r = 0.6931 and it is significant.

Figure 4: Linear Regression Analysis of Inferior hemifield Retinal Sensitivity of visual field Examination and Superior RNFL Thickness of OCT RNFL Analysis examination of all 52 eyes



Analysis is made by plotting Average Inferior hemifield Retinal Sensitivity on Y-axis and Average Superior RNFL Thickness on X-axis of all 52 eyes. With decrease in Average Inferior hemifield Retinal Sensitivity there is a decrease in Average RNFL thickness. The correlation coefficient r = 0.6128 and it is significant

A positive correlation was noted with high statistical significance between average hemifield sensitivity of the visual field analysis and average RNFL thickness of OCT in the present study. Based on the result of this study, there is a direct correlation between the visual field loss in automated perimetry and the RNFL loss in OCT. [8-11] Similar correlation was found in the study conducted by Arun et al. [12] Therefore OCT can be considered for monitoring the progression of glaucoma.

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