Original Research Paper

Volume - 11 | Issue - 09 | September - 2021 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Ophthalmology

COMPARATIVE STUDY OF RNFL THICKNESS USING SPECTRAL DOMAIN OCT AND VISUAL FIELD ANALYSIS USING HUMPHREY FIELD ANALYSER IN CASES OF POAG

Samra Wahaj Fatima	Senior Resident, Sarojini Devi Eye Hospital/RIO, Hyderabad Telangana
M M M Baig	Associate Professor of Ophthalmology, Government Medical College, Siddipet Telangana
Superna Mahender	Assistant Professor of Ophthalmology, Osmania Medical College, Sarojini Devi Eye Hospital/RIO, Hyderabad Telangana.
M. Geetanjali	Assistant Professor of Ophthalmology, Osmania Medical College, Sarojini Devi Eye Hospital/RIO, Hyderabad Telangana.
Mohammed Ather*	Professor of Ophthalmology, Bhaskar Medical College, Ranga Reddy district, Telangana. *Corresponding Author

ABSTRACT **Purpose:** To compare RNLF structural changes by Spectral Domain- OCT and functional visual field defects by automated perimetry in Primary Open Angle Glaucoma cases

Materials And Methods: A prospective and comparative study was conducted to quantitatively measure the peripapillary retinal nerve fiber layer thickness using SD-OCT and compared it with field changes plotted by Humphrey Field analyser 24-2. The study was conducted at the department of Glaucoma of a tertiary eye care hospital for a period of one year. 60 eyes of 30 patients who diagnosed to have POAG between the age group of 40-65 were included in the study. Patients having substantial media opacity, Retinal pathology and who underwent intra ocular surgeries were excluded from the study. Informed consent obtained from patients who were included in the study. All were examined using Slit lamp, Snellen's chart, Applanation tonometer, Gonioscope, 90 D slit lamp biomicroscope to study Fundus oculi. Fields were plotted using Humphrey field analyser 24-2 , RNFL thickness measured using SD-OCT.

Results: 60 eyes of 30 patients 19 were males 11 were females. 14(23.33%) eyes showed normal visual fields but there was thinning of RNFL was noted in SD-OCT. 41 eyes (68.3%) had visual field defects which corresponded to thinning of RNFL in that quadrant. 5 eyes (8.3%) showed advanced field changes and had corresponding thinning of RNFL in that quadrant.

Discussion: Results of this study shows a significant difference in RNFL thickness among all three grades of glaucoma. It was observed that the average RNFL thickness value in moderate glaucoma (66.34 microns) and all quadrant thickness values were similar to Sihota et al study (RNFL-66.07 microns). The mean RNFL thickness +/- Sd (58 +/-5.52) in advanced glaucoma of present study were closely similar with the findings of Sihota et al study (53.65 +/-14.2).

Conclusion: It is concluded that RNFL thickness changes corresponds to Field changes plotted on Humphrey field analyser in moderate glaucoma. Even in mild cases changes RNFL thickness is noted even though the fields plotted on Humphrey field analyser doesn't show any changes. So RNFL thickness can be taken as Pre perimetric changes as diagnostic criteria for the diagnosis of POAG.

KEYWORDS : POAG, RNFL thickness, SD OCT, Humphrey visual field analyser.

INTRODUCTION:

Glaucoma is among the leading causes of irreversible blindness in the developing world and a major health problem in the developed world[1,2]. World Health Organisation statistics indicate that glaucoma accounts for blindness in 5.1 million persons, or 13.5% of global blindness. Primary open angle glaucoma is explicitly characterized as a "multifactorial optic neuropathy with a characteristic acquired loss of optic nerve fibres", developing in the presence of open anterior chamber angles and manifesting characteristic visual field abnormalities in the absence of other known causes of the disease[3]. Glaucoma is characterized by a gradual loss of retinal ganglion cells and thinning of the Retinal Nerve Fibre Layer (RNFL). Since glaucomatous damage is irreversible, prevention of this injury before it occurs is the essential strategy available to those treating this disease. The early diagnosis of glaucoma and the early detection of glaucomatous progression are twin central challenges facing ophthalmologists[4]. Significant axonal loss may precede the development of visual field defects and identifiable cupping[5]. Subjective assessments of optic nerve head cupping are not sufficiently sensitive to detect small changes, especially notches and other local abnormalities, and in many cases are unable to discriminate between glaucomatous and normal optic nerve heads[6].

Drawings of the optic nerve head and stereoscopic optic nerve head photography depend on the subjective interpretation of the examiner and are thereby subject to variability in interpretation. Current diagnostic techniques such as retinal and optic nerve head analysis instruments and stereo fundus photography lack sensitivity and reproducibility [7]. Optic nerve head analyzers, developed to quantitate cupping, can measure optic nerve head rim area and provide other indices of optic nerve head structure, but cannot reliably differentiate between normal and glaucomatous and are limited in their ability to detect change over time [8]. Improved axial resolution with reduced variability in assessing optic nerve topography is achieved with the confocal scanning laser ophthalmoscope, which produces optical sections of the retina and optic nerve head in a coronal plane. Cross sectional imaging of the fundus with scanning laser ophthalmoscopy is limited by ocular aberrations and the pupil aperture to approximately 300 μm of axial resolution. [9]

Optical Coherence Tomography (OCT) is a non-invasive, noncontact method that allows cross-sectional, in vivo imaging of the intra retinal layers [10]. Anatomic layers within the retina can be imaged and quantitative assessment of RNFL thickness can be performed based on the different reflectivity properties of different layers [11]. OCT data is reported to correlate well with real measurements of RNFL thickness. Studies also have reported a decrease in OCT RNFL thickness in glaucomatous eyes compared with healthy eyes [12]. Structure-based methodologies need to ultimately compare with a gold standard, which is currently, automated perimetry. However, glaucoma patients could suffer a loss (approx. 40%) of retinal ganglion cell axons before an automated perimetry visual field defect is evident[13].

The purpose of this study is to investigate the agreement in glaucomatous damage detection between structural changes by OCT and functional alteration by automated perimetry.

MATERIALS AND METHODS:

A prospective and comparative study was conducted to quantitatively measure the peri papillary retinal nerve fiber layer thickness using SD-optical coherence tomography and compared it with fields plotted on Humphrey automated perimetry in patients with primary open angle glaucoma . Study was undertaken in the Department of Glaucoma of a

tertiary care eye Hospital done over a period of 1 year (May 2018 to April 2019). 60 eyes of 30 patients who were proved to be having POAG were included in the study. 19 were males and 11 were females. Patients having substantial media opacity or any other retinal pathology and who underwent intraocular surgery or had ocular trauma and who doesn't give consent, patients with closed angle and secondary glaucomas were excluded from the study.

Informed consent was obtained from all the patients included in the study. All patients were examined by an experienced Ophthalmologist using, Snellen's chart, Slit lamp, Gonioscope, 90 D slit lamp biomicroscopy . Glaucomatous eyes were designated on the basis of dilated fundus examination. Glaucomatous appearance of the optic disc defined as thinning of the neuroretinal rim, disc haemorrhage, notch, excavation, an RNFL defect or asymmetry of vertical cup disc ratio of greater than 0.2:1 between the two eyes.

Fields was plotted on Humphrey field analyser using 24-2 Programme. All patients were subjected to RNLF thickness measurement using Spectral Domain OCT. RNLF was measured in all four quadrants, Superior, inferior, Nasal and Temporal.

RESULTS:

Study done on 60 eyes of 30 patients who had POAG. 19 were males and 11 were females. 14 eyes were having early glaucomatous changes, 41 eyes had moderate changes and 5 eyes were having severe glaucomatous changes. RNFL thinning was observed in all three categories. In moderate and severe categories there is corresponding glaucomatous field defects plotted on Humphrey field analyser on 24-2 programme. In early glaucoma though there is no field defect but RNFL thinning was seen. The RNFL thinning seen is statistically significant p value of 0.018. Mean deviation of Pattern standard deviation was high in all three categories of glaucoma which is statistically significant with p value of 0.001.

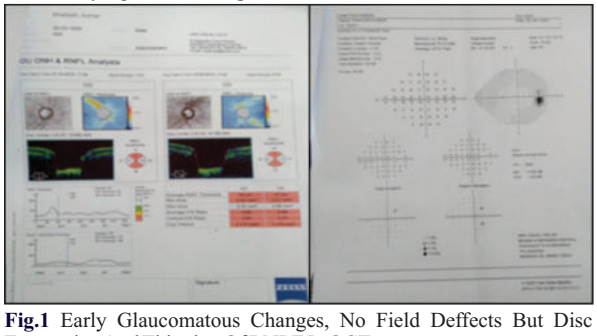

Fig.1 Early Glaucomatous Changes, No Field Deffects But Disc Excavation And Thinning Of RNLF In OCT

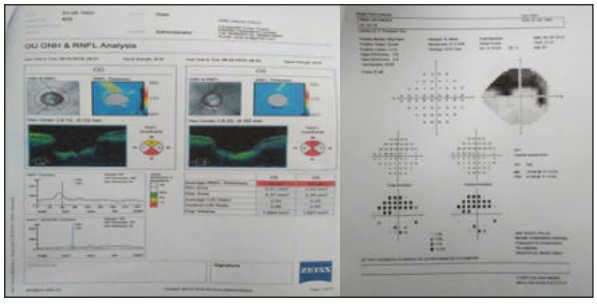

Fig.2 Moderate Changes Disc Excavation And RNLF Thinning On OCT, HVF Field Defect Of Arcuate Scotoma

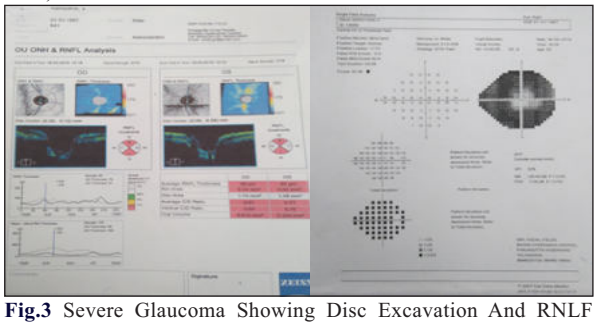

Fig.3 Severe Glaucoma Showing Disc Excavation And RNLF Thinning And HVF Showing Tubular Field Defect

DISCUSSION:

Results of this study shows a significant difference in RNFL thickness parameters among all three grades of glaucoma. It was observed that the average RNFL thickness value in moderate glaucoma (66.34 microns) and all quadrant thickness values were similar to Sihota et al study (RNFL-66.07 microns)[14]. The mean RNFL thickness +/- Sd (58 +/-5.52) in advanced glaucoma of present study were closely similar with the findings of Sihota et al study (53.65 +/-14.2).

There is a moderate structure –function correlation with MD of -7.302 dB with RNFL thickness of 66.34 microns in present study (Leite et al reported similar findings with average MD of >-5 dB)[15].

Leung et al found severe glaucomatous damage with MD of more than -11dB is similar to this study ,which shows MD of -13.45 dB with RNFL thickness of 58 microns in advanced glaucoma[16].

Early glaucomatous damage in present study shows mean RNFL thickness of 68.35 +/- SD 7.099 ,which is almost similar to Sihota et al study (mean RNFL +/- SD of 77.68 +/-15.7 microns).

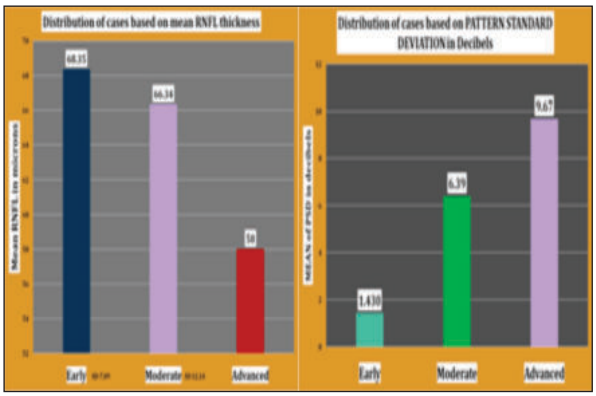

Fig.4 Comparison Of RNLF Thickness In Glaucoma

Fig. 5 Comparison of PSD In Decibels On Field Plotting

CONCLUSION:

OCT serves as an important tool in diagnosing early glaucoma and helps in monitoring the glaucomatous progression. In our study, there is 100% correlation with the structural changes on OCT in form of RNFL thinning and functional changes on visual field testing in corroboration with other studies.

Financial Interest: Nil
Conflict Of Interest: None
Ethics committee approval obtained

REFERENCES:

1. Quigley HA: Number of people with glaucoma worldwide. Br J Ophthalmol 80:389, 1996
2. Thylefors B, Negrel AD: The global impact of glaucoma. Bull world Health Organ 72: 323, 1994
3. American Academy of Ophthalmology: Primary open-angle glaucoma: preferred practice pattern, San Francisco, 1996
4. Schuman SJ et al: Quantification of Nerve Fibre layer thickness in normal and glaucomatous eyes using Optical Coherence Tomography. Arch Ophthalmol 113:586-596, 1995
5. Quigley HA, Addicks EM, Green WR. Optic nerve damage in human glaucoma, III: quantitative correlation of nerve fibre loss and visual field defect in glaucoma, ischemic neuropathy, papilledema, and toxic neuropathy. Arch Opthalmol. 1982; 100:135-146
6. Lichter PR. Variability of expert observers in evaluating the optic disc. Trans Am Ophthalmol Soc. 1976; 74:532
7. Shields MB et al, Reproducibility of topographic measurements with the optic nerve head analyzer. Am J Ophthalmol. 1987; 104:58111.
8. Balazsi GA, et al. Neuroretinal rim area in suspected glaucoma and early chronic open-angle glaucoma. Arch Ophthalmol. 1984; 102:1011-1014
9. Bille JF, Dreher AW, Zinser G., Scanning laser tomography of the living human eye. In Masters BR, ed. Noninvasive Diagnostic Techniques in Ophthalmology. New York, NY: Springer-Verlag NY Inc; 1990; 29:1294
10. Bille JF, Dreher AW, Zinser G., Scanning laser tomography of the living human eye. In Masters BR, ed. Noninvasive Diagnostic Techniques in Ophthalmology. New York, NY: Springer-Verlag NY Inc; 1990; 29:1294
11. Hee MR, Izatt JA, Swanson EA, et al, Optical coherence tomography of the human retina. Arch Ophthalmol. 1995; 113:325-332
12. Zangwill LM, Williams J, Berry CC, et al., A comparison of Optical coherence tomography and retinal nerve fibre layer photography for detection of nerve fibre layer damage in glaucoma. Ophthalmology 1999; 106:570-579
13. Quigley HA, Dunkelberger GR, Green WR. Retinal ganglion cell atrophy correlated with automated perimetry in human eyes with glaucoma. Am J Ophthalmol 1989; 107; 453-464
14. Sihota R, Sony P, Gupta V, Dada T, Singh R. Diagnostic capability of optical coherence tomography in evaluating the degree of glaucomatous retinal nerve fiber damage. Invest Ophthalmol Vis Sci 2006;47:2006-10

15. Leite MT, Zangwill LM, Weinreb RN, Rao HL, Alencar LM, Medeiros FA. Structure-function Relationships Using the Cirrus Spectral Domain Optical Coherence Tomograph and Standard Automated Perimetry. J Glaucoma 2012; 21(1): 49–54
16. Leung CK, Chong KK, Chan WM, Yiu CK, Tso MY, Woo J et al. Comparative study of retinal nerve fiber layer measurement by StratusOCT and GDx VCC, II: structure/function regression analysis in glaucoma. Invest Ophthalmol Vis Sci 2005; 46(10): 3702–3711