

## Correlation of Macula Ganglion Cell Complex Thickness and Central 10-2 Visual Field Changes of Patients with Primary Open Angle Glaucoma: A Multicenter Study in Lagos, Nigeria

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**Introduction:** The macula region bears the highest density of retinal ganglion cells (RGC).<sup>1</sup> Macula damage is seen early in glaucoma using the ganglion cell complex (mGCC or mGCL++) of the Optical Coherence Tomography (OCT).<sup>2</sup> Standard Automated Perimetry (SAP) is an integral tool in glaucoma diagnosis and management in our local clinics. On SAP, this macula region falls within 10 degrees from fixation. This area is better tested using the 10-2 visual field (VF) tests than the 24-2 VF test because the former tests 68 points while the latter tests only 4 points within this 10 degrees.<sup>3</sup> Early structural macula defects detected by OCT may correspond to functional defects detected using the 10-2 test. The aim of

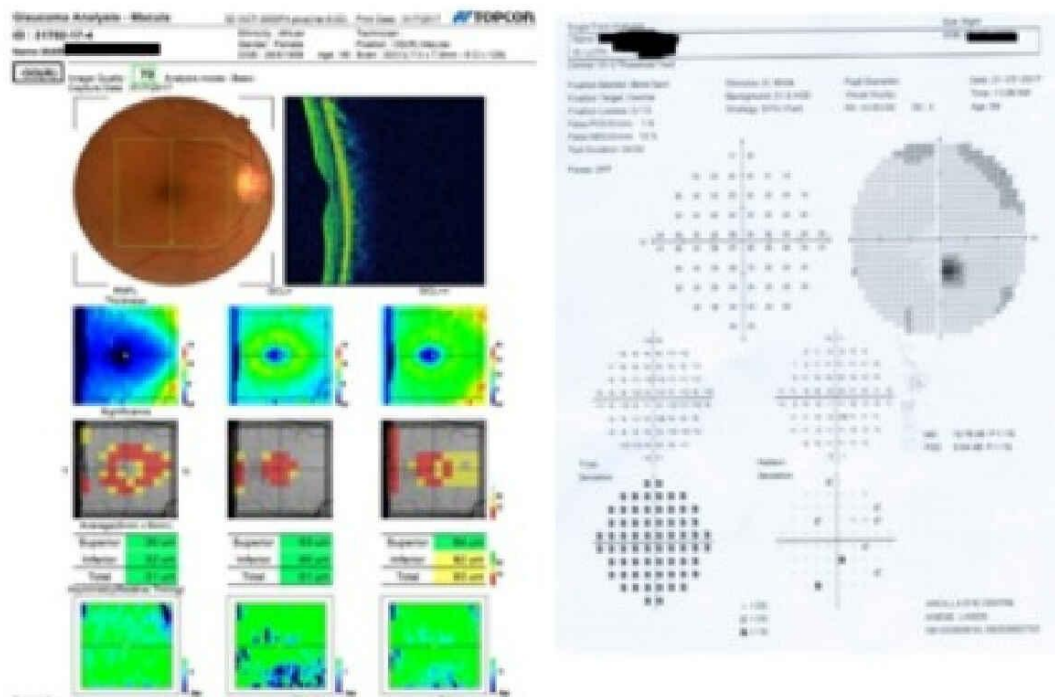
this study is to investigate the correlation of structure to function in glaucoma evaluation, if any, in order to improve timely glaucoma diagnostic ability among African descents.

**Methods:** This was a cross sectional study carried out in public tertiary and private ophthalmic centers in Lagos State. Three hundred and seventeen consenting adults who met the inclusion criteria were recruited. Detailed ophthalmic evaluation was performed by the same ophthalmic doctor. Optical coherence tomography was carried out with the Topcon 3D OCT-2000 (TRC-NW200, Topcon, Inc., Tokyo, Japan), while the Humphrey Visual Field Analyzer II (VFA) (Carl Zeiss Meditec, Inc., Jena, Germany) was used for visual field analysis. Each test was performed by the same trained operator to reduce inter observer error. Print outs were reviewed by the same glaucoma specialist.

For quantitative analysis, the SAP Mean Sensitivity (MS) was recorded in its raw nonlinear decibel (dB) format.<sup>4</sup> Visual sensitivity loss was calculated using the decibel scale values at each test location on the pattern deviation numerical plot. The sum of the values from all test points within the visual field sectors corresponding to the anatomic sectors of the macula was obtained and correlated with the corresponding macula area mGCC thickness value.<sup>4,5</sup>

Data entry, cleaning and analysis was done using the statistical package for the social sciences, IBM SPSS software version 21.0 (IBM Corporation, USA).

**Results:** Readings from 504 eyes were analyzed. There was significant correlation between mGCC of the inferior macula area and corresponding superior hemifield VF defects ( $r = 0.117$ ,  $P < 0.01$ ), and also the total mGCC and corresponding global



**Figure 1:** Optical Coherence Tomography scan and 10-2 visual field print out of right eye of the same patient showing reduced mGCC thickness of inferior macula area and corresponding superior partial arcuate visual field defect.

VF defect ( $r = 0.118$ ,  $P < 0.01$ ). Using linear regression, all macula areas had significant association with their corresponding VF: superior mGCC with inferior hemifield ( $R^2 = 0.018$ ,  $P < 0.05$ ); inferior mGCC with the superior hemifield ( $R^2 = 0.014$ ,  $P < 0.01$ ) and total mGCC with the global VF loss ( $R^2 = 0.014$ ,  $P < 0.01$ ).

**Discussion:** On OCT, the inferior macula area, also called the macula vulnerability zone of Hood, an area most susceptible to glaucomatous damage<sup>6</sup> had considerable correlation with its corresponding superior area on VF. Factors such as increasing age and severity of glaucoma also had significant correlation with reducing mGCC thickness in this study.

**Conclusion:** There is considerable correlation between OCT mGCC thickness and SAP central 10-2 VF changes. Correlating the mGCC and the 10-2 VF test in POAG patients can help in diagnosis of glaucoma.

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