

Longitudinal Macular Structure-Function Relationships in Glaucoma

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PURPOSE: To investigate the relationship between longitudinal changes in macular thickness measurements from OCT and changes in central visual field (VF) in patients with glaucoma with central or advanced damage at baseline.

DESIGN: Longitudinal cohort study.

PARTICIPANTS: A total of 116 eyes with 3 years of follow-up and 5 macular OCT images and central 10° VF test.

METHODS: OCT superpixels and VF locations were matched correcting for retinal ganglion cell (RGC) displacement. Superpixel thickness and VF total deviation (TD) values, in both logarithmic and linear scales, were averaged within 3 eccentricities (3.4°, 5.6°, and 6.8°) and superior and inferior hemiretinas and hemifields. We estimated pointwise TD rates of change and rates of change at superpixels for full macular thickness (FMT), ganglion cell complex (GCC), ganglion cell inner plexiform layer (GCIPL), and ganglion cell layer (GCL). Correlation of structure-function (SF) rates of change was investigated with parametric tests. We compared the proportion of worsening and positive slopes for superpixels and VF test locations (negative vs. positive rates of change with P MAIN OUTCOME MEASURES: Magnitude of correlation between structural and functional rates of change and proportion of worsening and positive slopes as a function of follow-up time.

RESULTS: The median (interquartile range) follow-up and number of exams were 4.2 (3.7-4.6) years and 8 (7-9), respectively. The highest correlation of change rates was observed at 3.4° and 5.6° eccentricities ($r = 0.24, 0.41, 0.40, \text{ and } 0.40$ for FMT, GCC, GCIPL, and GCL for 3.4° eccentricity and $r = 0.28, 0.32, 0.31, \text{ and } 0.32$ for FMT, GCC, GCIPL, and GCL for 5.6° eccentricity, respectively). Although GCC measures demonstrated the highest overall longitudinal SF correlations, the differences were not statistically significant. Significant structural worsening was more frequently detected than functional deterioration at 3- and 5-year time points (P CONCLUSIONS: Correlations between central structural and functional rates of change were weak to fair in this cohort. Structural changes were detected more frequently than functional changes.

Measurements of both structure and function are required for optimal detection of central progression.

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