

INNER RETINAL STRUCTURE-FUNCTION RELATIONSHIP WITHIN THE CENTRAL 20 DEGREES IN RETINITIS PIGMENTOSA

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Purpose: Retinitis pigmentosa (RP) is a progressive outer retinal degeneration associated with loss of vision. Outer retinal (OR) thickness is a predictive of visual field (VF) sensitivity however its ease of discrimination and dynamic range reduces with disease progression. Inner retinal structures such as the ganglion cell complex (GCC) may provide a wider dynamic range as it is often less affected until later disease stages. We aimed to establish the relationship of retinal thickness: outer versus inner and visual function.

Materials and methods: This study included seven RP subjects with disease progression within the central 20 degrees with visible ellipsoid zones, and seven age-matched normals. GCC (the anterior border of the inner plexiform layer to retinal nerve fiber layer) and outer retina (from the basement membrane to the external limiting membrane (ELM), or to the inner border of the RPE in the absence of the ELM) thicknesses was determined from the Spectralis OCT 8x8 macular cube grid (61 B-scans over 30x25°). Visual function was determined using the Humphrey Field Analyzer (10-2 test grid) using standard protocols (Goldmann size III and 200 ms stimulus duration). Sensitivities were plotted as a function of retinal thickness values, as well as calculated ganglion cell count (GC_{Count}) per stimulus area, at corresponding retinotopic locations.

Results: Linear regression showed significant correlations between OR thickness and sensitivity in normal (slope = 5.56 ± 0.82 , $R^2 = 0.16$, $p < 0.01$) and RP (slope = 5.42 ± 0.24 , $R^2 = 0.69$, $p < 0.01$) subjects with no significant difference in slope value ($p = 0.94$). There were significant correlations between GCC thickness and sensitivity in normal (slope = 1.01 ± 0.12 , $R^2 = 0.22$, $p < 0.01$) and RP (slope = 4.21 ± 0.39 , $R^2 = 0.31$, $p < 0.01$) (Fig 1). GCC regression slopes in normal versus RP differed significantly suggesting the inner retinal structure-function relationship changes in RP. Comparison of GCC and OR correlations in RP showed a slight, but significant difference between the slope values. A similar difference in slope value between normal and RP patients was found when using GC_{Count} .

Conclusions: GCC thickness and GC_{Count} are alternative measurements to OR thickness predictive of visual function in RP. Although its structure-function relationship is similar to OR thickness in RP patients with visible ellipsoid zones, it has potential as an alternative structural measurement in advanced disease. Further studies could examine the structure-function relationship along the disease spectrum to determine optimal structural and functional techniques for measuring progression.