

Structure-Function Associations in Healthy and Glaucoma Eyes

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Purpose: To determine whether differences exist in the structure-function associations between healthy and glaucoma eyes.

Methods: Structure-function associations were assessed in three different datasets. First, in the Diagnostic Innovation and Glaucoma Study and African Descent and Glaucoma Evaluation Study, associations between rim area (RA) (Heidelberg Retina Tomography II) and both mean sensitivity (MS) and mean deviation (MD) from conventional automated perimetry (CAP) were assessed in 698 healthy subjects and 1036 glaucoma patients. Associations between retinal nerve fiber layer thickness (RNFLT) from the Spectralis optical coherence tomography (OCT) (Heidelberg Engineering) and MS or MD from CAP were assessed in 198 healthy subjects and 634 glaucoma patients. Second, in the dataset used in Swanson et al (2014), the association between RNFLT from the Stratus OCT (Heidelberg Engineering) and MD from CAP, measures from contrast sensitivity perimetry (CSP-2), and from frequency-doubling perimetry (FDP) in the superior temporal (ST) and inferior temporal (IT) optic disc sectors were assessed in 62 healthy subjects and 51 glaucoma patients. Third, in a dataset obtained from Iowa University, association between RNFLT and relative field sensitivity was assessed in 79 healthy subjects. All associations were assessed with the generalized estimating equation (GEE) procedure, linear mixed effect model (LMM), and the Pearson, Spearman and Kendall correlations. Age was included to adjust for its confounding effect in all GEE and LMM models.

Results: For healthy eyes, no significant structure-function association was found using GEE, Pearson, Spearman and Kendall correlations. With LMM, a significant association was found between RNFLT and both MS and MD. For glaucoma eyes, significant associations were found with all methods.

Conclusion: Significant structure-function associations were identified in glaucoma eyes but not in healthy ones. This suggests that the structure-function associations should be considered separately in healthy and glaucoma eyes because of the different nature of the associations.

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