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Inter-eye Asymmetry of Optical Coherence Tomography Angiography Vessel Density in Bilateral Glaucoma, Glaucoma Suspect, and Healthy Eyes

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Abstract

Purpose: To investigate inter-eye retinal vessel density asymmetry in healthy, glaucoma suspect, and mild to moderate glaucoma subjects, and its potential utility for early detection of glaucomatous damage.

Design: Cross-sectional study.

Methods: 153 subjects including 55 healthy, 32 glaucoma suspect, and 66 glaucoma subjects enrolled in the Diagnostic Innovations in Glaucoma Study(DIGS). Vessel density was obtained from optical coherence tomography angiography (OCT-A) macular and optic nerve head scans. Thickness of peripapillary retinal nerve fiber layer (RNFL) and macular ganglion cell complex (mGCC) was measured with spectral-domain optical coherence tomography (SD-OCT) scans. Inter-eye asymmetry was calculated by taking the absolute value of difference in vessel density and thickness between the right and left eyes.

Results: Inter-eye retinal vessel density asymmetry parameters were significantly different among the three groups. Glaucoma suspects had significantly higher peripapillary and macular inter-eye vessel density asymmetries compared to healthy groups in univariate (1.1% vs. 2.0%, P=0.014 and 1.2% vs. 2.5%, P=0.027, respectively) and multivariate analyses (P=0.007 and 0.038, respectively). No significant differences in asymmetry of thickness parameters were found between glaucoma suspect and healthy groups (all P> 0.718). However significant differences in asymmetry of thickness parameters between glaucoma suspects and glaucoma patients (P<0.01) were found for all parameters.

Conclusion: Inter-eye vessel density asymmetry can be quantified by OCT-A measurement. Glaucoma suspects have significantly greater vessel density asymmetry than healthy eyes. Longitudinal studies are needed to better characterize the relationship of vessel density asymmetry with the development and progression of glaucoma.

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