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The dynamic structure-function model: A new approach to monitor glaucoma progression

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While the presence and rate of glaucoma progression influences treatment decisions, the methods currently available to detect and monitor progression are imprecise and do not allow clinicians to make accurate assessments of the status of their patients. We have developed a dynamic structure-function (DSF) model to detect glaucoma progression, with the long-term goal of improving the detection and monitoring of glaucoma progression using structural and functional data jointly. This DSF model has two descriptors: Centroids and velocity vectors. The centroids represent the current stage of the disease, while the velocity vectors represent the trend of change of the centroids over time. The velocity vectors are in 2-dimensional space and show the direction (vector orientation) and rate (vector length) of change. We have also developed an individualized inferential component for our DSF model that is based on permutation analysis and that allows the model to tease out true progression from variability for each eye. Longitudinal data from patients with ocular hypertension or primary open-angle glaucoma enrolled in the diagnostic innovations in glaucoma study or in the African descent and glaucoma evaluation study were used to assess the prediction accuracy of the model. We used mean sensitivity as a functional measure and rim area as a structural measure. In this paper, we present the details of our DSF model, compare its prediction accuracy to that of ordinary least square linear regression, and assess its agreement with other measures of glaucoma progression.

Biography

Lyne Racette is an Assistant Professor of Ophthalmology at the Eugene and Marilyn Glick Eye Institute at Indiana University's School of Medicine (Indianapolis, IN), and an Adjunct Professor at Indiana University's School of Optometry (Bloomington, IN). After receiving her PhD from Carleton University (Ottawa, Canada), she joined the University of California at San Diego (San Diego, CA) where she completed a Postdoctoral Fellowship at the Hamilton Glaucoma Center.

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