

Predicting visual function from the measurements of retinal nerve fiber layer structure

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PURPOSE: To develop and validate a method of predicting visual function from retinal nerve fiber layer (RNFL) structure in glaucoma.

METHODS: RNFL thickness (RNFLT) measurements from scanning laser polarimetry (SLP) and visual field (VF) sensitivity from standard automated perimetry were made available for 535 eyes from three centers. In a training dataset, structure-function relationships were characterized by using linear regression and a type of neural network: radial basis function customized under a Bayesian framework (BRBF) .

These two models were used in a test dataset to (1) predict sensitivity at individual VF locations from RNFLT measurements and (2) predict the spatial relationship between VF locations and positions at a peripapillary RNFLT measurement annulus. Predicted spatial relationships were compared with a published anatomic structure-function map.

RESULTS: Compared with linear regression, BRBF yielded a nearly twofold improvement (P

CONCLUSIONS: The BRBF generates clinically useful relationships that relate topographical maps of RNFL measurement to VF locations and allows the VF sensitivity to be predicted from structural measurements. This method may allow clinicians to evaluate structural and functional measures in the same domain. It could also be generalized to use other structural measures.

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