Support Vector Machine Analysis of VCC Scanning Laser Polarimetry RNFL Thickness Measurements

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Abstract

Purpose: To compare Gaussian support vector machine (G–SVM) analysis of RNFL thickness measurements to standard software generated parameter measurements obtained with variable corneal compensated scanning laser polarimetry (VCC SLP), for differentiating between glaucomatous and non–glaucomatous eyes.

Methods: Using VCC SLP, we imaged one eye from each of 87 glaucoma patients (defined as having repeatable achromatic visual field defects) and 67 healthy subjects of similar age, and expressed RNFL thickness as measurements from 64 sectors in the peripapillary area under the instrument defined measurement ellipse. Using these 64 measurements as G–SVM input, we constructed an ROC curve for classification of eyes using cross–validation and compared this curve to curves generated using the VCC GDx software–generated "Nerve Fiber Indicator" (NFI, an SVM including the 64 parameters included in our data set and 28 more), average RNFL thickness, superior average RNFL thickness, and inferior average RNFL thickness. Sensitivities at 0.96, 0.90, and 0.85 specificity also were compared.

Results: ROC curve areas were similar for G–SVM and NFI. ROC curve areas for G–SVM and NFI were significantly larger than for average RNFL thickness, superior average RNFL thickness, and inferior average RNFL thickness. Sensitivities at all specificities were somewhat higher for G–SVM than for NFI, and were considerably higher than for other parameters.

Conclusions: Support vector machine analysis of VCC GDx parameters improves diagnostic precision compared to standard RNFL thickness parameters. Good discrimination between glaucoma and healthy eyes is possible with a G–SVM trained on a reduced data set.