

Comparing Confocal Scanning Laser Ophthalmoscopy Measurements of the Optic Nerve Head and Peripapillary Retina for Detecting Glaucoma using Machine Learning Classifiers

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Abstract

Purpose: To determine whether assessment of Heidelberg Retina Tomograph measurements along the disc margin or in the peripapillary retina, where measurements are often less variable, can improve differentiation between normal eyes and eyes with early to moderate glaucoma using machine learning classifiers.

Methods: One eye from 95 patients with early to moderate glaucomatous visual field damage and 135 normal subjects over 40 years of age were included. HRT mean height contour was measured in 36 equal sectors both along the disc margin and in the parapapillary region (at a mean contour line radius of 1.7 mm). The sectors were evaluated individually and in combination with other sectors. Linear and Gaussian support vector machine (SVM linear, and SVM Gaussian) learning classifiers were used to interpret HRT sector measurements along the disc margin, and in the parapapillary region to differentiate between eyes with normal and glaucomatous visual fields and to compare the results to global and regional HRT parameter measurements.

Results: The ROC curve for mean height contour of the 36 sectors along the disc margin had a larger area under the ROC curve than mean height contour in the parapapillary region (.97 and .85, respectively). Of the 36 individual sectors along the disc margin, those in the inferior region had the largest area under the ROC curve (.85 to .91). Using SVM techniques, the standard HRT software regional parameters showed the best ability to discriminate between eyes with normal and glaucomatous visual fields, followed by the global parameters, mean height contour measures along the disc margin and mean height contour measures in the parapapillary region; the area under the ROC curve for SVM Gaussian was .98, .94, .93 and .85, respectively.

Conclusions: Global and regional HRT parameters, and mean height contour measurements along the disc margin discriminated better than measurements obtained in the parapapillary region. **Keywords:** imaging/image analysis: clinical • optic disc