Diffuse retinal nerve fiber layer defects identification and quantification in thickness maps
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Purpose: To report retinal nerve fiber layer (RNFL) defect identification and quantification in RNFL thickness maps according to the structural RNFL loss, and to evaluate diffuse RNFL defects.

Methods: A total of 170 patients with glaucoma and 186 normal subjects were consecutively enrolled. We defined RNFL defects in a RNFL thickness map based on the degree of RNFL loss. The reference level for RNFL defect determination was set as a 20% to 70% degree of RNFL loss with a 1% interval. To identify RNFL defects, each individual RNFL thickness map was compared to the normative database map using MATLAB software (The MathWorks, Inc., Natick, MA) and the region below the reference level was detected. The area, volume, location, and angular width of each RNFL defect were measured. Diffuse RNFL defects were defined as having an angular width > 30°.

Results: The optimal reference level for glaucomatous RNFL defects identification was 42% loss of RNFL. RNFL defects were identified in all (100%) of the 170 glaucoma patients and false positive RNFL defects were detected in 16 (8.16%) cases among the 186 normal subjects. The proportion of diffuse RNFL defects was 64.1%, and the proportion of mild glaucoma within diffuse RNFL defect group was 47.7%. The volume of diffuse RNFL defects was significantly associated with the severity of glaucomatous damage (p = 0.009). Diffuse RNFL defects were located closer to the center of the optic disc than localized RNFL defects (p < 0.001).

Conclusions: RNFL thickness map analysis is an effective method for analyzing RNFL defects. It can identify RNFL defects with clear borders, regardless of whether they are visible or invisible in red-free photography and whether they are localized or diffuse. Quantitative measurements (area, volume, location, and width) were useful to understanding diffuse RNFL defects.