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Combined Use of Retinal Nerve Fiber Layer and Ganglion Cell-Inner Plexiform Layer Event-based Progression Analysis

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Abstract

Purpose: To evaluate patterns of glaucomatous structural progression using the combined retinal nerve fiber layer (RNFL) and ganglion cell-inner plexiform layer (GCIPL) event-based progression analysis feature provided by spectral-domain optical coherence tomography (SD-OCT)'s Guided Progression Analysis (GPA) software.

Design: Retrospective observational case series.

Methods: Seventy-nine (79) patients with open-angle glaucoma (OAG) showing clinically confirmed structural progression within a minimum 3-year follow-up period. For each eye, RNFL and GCIPL GPA data were obtained from serial SD-OCT data from 2012 to 2017. An integrated GPA map thereafter was merged by vascular-landmark-guided superimposition of RNFL and GCIPL GPA event-based progression maps onto the RNFL imagery (resulting in what we call the GPA PanoMap). The GPA PanoMap progression patterns were classified as (1) RNFL-only, (2) GCIPL-only, (3) Concurrent (both RNFL and GCIPL), (4) GCIPL after RNFL, and (5) RNFL after GCIPL. The locations of structural progression were classified, based on an earlier schematic model, as (1) superior vulnerability zone (SVZ), (2) papillomacular bundle (PM), (3) macular vulnerability zone (MVZ), and (4) inferoinferior portion. Structural progression patterns on the GPA PanoMap were evaluated according to the location of progression. Among the eyes with progression in the inferior hemi-retina, structural progression patterns on the GPA PanoMap were evaluated according to the baseline structural damage.

Results: On the GPA PanoMap, when structural progression was located in the SVZ or inferoinferior portion, it was detected only in the RNFL area; when progression was located in the PM or MVZ, various patterns were observed, among which the concurrent pattern was the majority in both areas (43.8% and 45.6% in the PM and MVZ, respectively). Among the eyes with progression in the inferior hemi-retina (n = 66), the location of progression varied but did not differ significantly according to the baseline deviation map (P=0.440). The progression patterns of MVZ were significantly different among the baseline deviation map patterns (P=0.023); however, all of the progression patterns of the inferoinferior portion were RNFL-only.

Conclusion: The various progression patterns were confirmed according to the locations and baseline patterns of glaucomatous structural change on the integrated GPA map (GPA PanoMap). Combined use of RNFL and GCIPL GPA or the GPA PanoMap could be useful for determination of structural progression and understanding of its patterns in patients with glaucoma.