Onset and Progression of Peripapillary Retinal Nerve Fiber Layer (RNFL) Retardance Changes Occur Earlier than RNFL Thickness Changes in Experimental Glaucoma

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PURPOSE: Longitudinal measurements of peripapillary RNFL thickness and retardance were compared in terms of time to reach onset of damage and time to reach a specific progression endpoint.

METHODS: 41 rhesus macaques with unilateral experimental glaucoma (EG) each had three or more weekly baseline measurements in both eyes of peripapillary RNFL thickness (RNFLT) and retardance. Laser photocoagulation was then applied to the trabecular meshwork of one eye to induce chronic elevation of IOP and weekly imaging continued. Pairwise differences between baseline observations were sampled by bootstrapping to determine the 95% confidence limits of each measurement's repeatability. The first two sequential measurements below the lower confidence limit defined the endpoint for each parameter. Segmented linear and exponential decay functions were fit to each RNFL-vs-time series to determine the time to damage onset.

RESULTS: 29 (71%) of the EG eyes reached endpoint by RNFL retardance and 25 (61%) reached endpoint by RNFLT. In total, 33 (80%) reached endpoint by at least one of the RNFL parameters and 21 (51%) reached endpoint by both RNFL parameters. Of the 33 EG eyes reaching any endpoint, a larger proportion reached endpoint first by retardance (N=26, 79%) than did by RNFLT (N=7, 21%; p=0.002) . Survival analysis indicated a shorter time to reach endpoint by retardance than by RNFLT (pCONCLUSIONS: The onset of progressive loss of RNFL retardance occurs earlier than the onset of RNFL thinning. Endpoints of progressive loss from baseline also occurred more frequently.