

# Structural and functional abnormalities of retinal ganglion cells measured in vivo at the onset of optic nerve head surface change in experimental glaucoma

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**PURPOSE:** To compare peripapillary retinal nerve fiber layer thickness (RNFLT) , RNFL retardance, and retinal function at the onset of optic nerve head (ONH) surface topography change in experimental glaucoma (EG) .

**METHODS:** Thirty-three rhesus macaques had three or more weekly baseline measurements in both eyes of ONH surface topography, peripapillary RNFLT, RNFL retardance, and multifocal electroretinography (mfERG) . Laser photocoagulation was then applied to the trabecular meshwork of one eye to induce chronic elevation of IOP and weekly recordings continued alternating between ONH surface topography and RNFLT during one week and RNFL retardance and mfERG the next week. Data were pooled for the group at the onset of ONH surface topography change in each EG eye, which was defined as the first date when either the mean position of the disc (MPD) fell below the 95% confidence limit of each eye's individual baseline range and/or when the topographic change analysis (TCA) map was subjectively judged as having demonstrated change, whichever came first. Analysis of variance with post hoc tests corrected for multiple comparisons were used to assess parameter changes.

**RESULTS:** At onset of ONH surface topography change, there was no significant difference for RNFLT versus baseline or fellow control eyes. RNFL retardance and mfERG were significantly reduced in the recordings just prior (median of 9 days) to ONH onset (P < 0.05).  
**CONCLUSIONS:** These results support the hypothesis that during the course of glaucomatous neurodegeneration, axonal cytoskeletal and retinal ganglion cell functional abnormalities exist before thinning of peripapillary RNFL axon bundles begins.

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