

Journal Article Review

Association between intraocular pressure and rates of retinal nerve fiber layer loss measured by optical coherence tomography

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Purpose

Intraocular pressure (IOP) is the only modifiable risk factor in the development of open-angle glaucoma. This study assessed the relationship between IOP and the progression of open-angle glaucoma, as measured by loss of the retinal nerve fiber layer thickness (RNFLT) on SD-OCT.

Methods

The study included 547 eyes of 339 glaucoma patients, 308 eyes of which had a clinical diagnosis of glaucoma, and 239 eyes that were classified as glaucoma suspects. These patients were followed for an average of 3.9 ± 0.9 years. During each visit they were imaged with the SPECTRALIS® SD-OCT, had IOP measurements with the Goldmann applanation tonometer, and underwent standard automated perimetry (SAP). Measurements of RNFLT were compared to IOP and SAP results to assess correlation to glaucoma progression. "Progression" was defined by SAP visual field loss on consecutive visits. Peripapillary RNFL thickness was assessed with a 12° circumpapillary scan.

Discussion

Of the 46 eyes that showed glaucomatous progression on SAP, RNFLT reduction occurred significantly faster than in non-progressing patients (-1.02 vs. -0.61 $\mu\text{m}/\text{year}$, $p < 0.01$). Each 1-mmHg in elevated IOP was associated with 0.20 $\mu\text{m}/\text{year}$ loss of RNFLT in progressing eyes compared with 0.04 $\mu\text{m}/\text{year}$ in non-progressing eyes ($p < 0.01$). While elevated IOP was associated with both progressing and non-progressing eyes, there was significantly more rapid loss of RNFLT in progressing eyes. Since IOP was only measured during a clinic visit and patients were treated at the discretion of their ophthalmologist, the relationship between IOP and loss of RNFLT may have been underestimated. Nevertheless, the correlation of the results is statistically significant.

Conclusions

The results of this study demonstrate a strong correlation between IOP and RNFLT loss in progressing glaucomatous eyes. In order to show a correlation of a considerably variable parameter such as IOP with a structural parameter such as RNFLT, the RNFLT results must be reproducible and accurate. Otherwise, two variable parameters would not offer a clinically meaningful correlation. The active eye tracking and AutoRescan functions of the SPECTRALIS OCT permitted reliable RNFLT measurements over time in order to make a reliable and statistically significant correlation with IOP, a clinically modifiable risk factor of glaucoma.