

Functional MRI signal changes in primary visual cortex corresponding to the central normal visual field of patients with primary open-angle glaucoma

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PURPOSE: To investigate, by functional magnetic resonance imaging (fMRI) , the impact of glaucomatous neuropathy of primary open-angle glaucoma (POAG) on neuronal activity in the primary visual cortex, which corresponds to the central normal visual field.

METHODS: Six POAG patients with asymmetric visual field damage and spared central vision were enrolled in the study. All patients underwent detailed ophthalmic examinations, including visual acuity, intraocular pressure, refraction, gonioscopy, and fundus examination. Scanning laser polarimetry with variable corneal compensation, confocal scanning laser ophthalmoscopy, posterior segment optical coherence tomography (OCT) , and SITA-standard 30-2 and 10-2 visual field perimetry were also performed on each patient. Block-design fMRI was then performed. The stimulus was a hemifield checkerboard contrast, reversing at 8 Hz and viewed by the examined eye monocularly during fMRI scanning, with the fellow eye occluded.

RESULTS: The blood oxygen level-dependent (BOLD) fMRI signal change in the primary visual cortex corresponding to central visual input from the more severely affected eye was less than that of the fellow eye. Such a difference in fMRI response did not correlate with interocular differences in measurements of scanning laser polarimetry, OCT, and scanning laser ophthalmoscopy, but showed a negative correlation with interocular pattern SD (PSD) difference of visual field analysis.

CONCLUSIONS: Glaucomatous neuropathy from POAG may lead to decreased cortical activity in the primary visual cortex, which corresponds to the central normal visual field. The resultant cortical depression is not related to interocular differences in results of polarimetry, OCT, and ophthalmoscopy, but is negatively correlated with PSD of visual field analysis.

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