

A New Approach to Assess Intracranial White Matter Abnormalities in Glaucoma Patients Changes of Fractional Anisotropy Detected by 3T Diffusion Tensor Imaging

Engelhorn T, Michelson G, Waerntges S, Hempel S, El-Rafei A, Struffert T, Doerfler A.

Department of Neuroradiology, University of Erlangen-Nuremberg, Schwabachanlage 6, 91054 Erlangen, Germany.

RATIONALE AND OBJECTIVES: The aims of this study was to evaluate, using 3-T diffusion tensor imaging, changes of fractional anisotropy (FA) in the orbital and intracranial part of the optic nerve (ON), the optic chiasm, the lateral geniculate nucleus, and different parts of the optic radiation (OR) in patients with glaucoma compared to controls and to determine whether FA correlates with disease severity.

MATERIALS AND METHODS: Twenty patients with glaucoma and 22 age-matched controls were examined using 3-T diffusion tensor imaging. Regions of interest were positioned on the FA maps, and mean values were calculated for each ON, optic chiasm, lateral geniculate nucleus, and OR. Results were compared to those from controls and correlated with ON atrophy and reduced spatial-temporal contrast sensitivity of the retina.

RESULTS: Compared to controls, FA in patients with glaucoma was significantly lower in the intracranial part of the ON (0.48 ± 0.15 vs 0.66 ± 0.12 , $P = 0.81$). Otherwise, there was no significant difference in FA between patients with glaucoma and controls measured in the orbital part of the ON, optic chiasm, and lateral geniculate nucleus.

CONCLUSIONS: Diffusion tensor imaging at 3 T allows robust FA measurements in the intracranial part of the ON and the OR. FA is significantly reduced in patients with glaucoma compared to controls, with a good correlation with established ophthalmologic examinations.

Acad Radiol. 2012 Jan 24. (Epub ahead of print)

PMID: 22277635 <http://www.ncbi.nlm.nih.gov/pubmed/22277635>