Abstract: Objective: There has been reports on the usefulness of diffusion tensor imaging (DTI) about age- or disease-related degradation. DTI is generally evaluated by the region of interest (ROI) methodology. In this study, we applied a statistical way using Statistical Parametric Mapping (SPM) to assess normal aging by DTI and compared results of these two methods.

Methods: Ten young and ten senior normal volunteers were examined. On SPM, tensor images were changed into normalized tensor images. They were compared between the two groups by t-test.

Results: In the senior group, fractional anisotropy (FA) values were higher on the basal ganglia, cingulated gyrus and other cortical gray matter, lower in the corona radiata, internal capsule, centrum semiovale and corpus callosum by using SPM. In the ROI method, the results were almost compatible except in the brain periphery.

Conclusions: Aging changes on water diffusion anisotropy was clearly shown by SPM method which would be useful to evaluate change of water diffusion anisotropy without operator bias even in clinical setting instead of ROI measurement. J. Med. Invest. 52: 186-190, August, 2005

Keywords: magnetic resonance imaging, diffusion tensor image, Statistical Parametric Mapping, normal aging
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FA = $\sqrt{\frac{3}{2}} \frac{\sqrt{(\lambda_1 - \langle D \rangle)^2 + (\lambda_2 - \langle D \rangle)^2 + (\lambda_3 - \langle D \rangle)^2}}{\sqrt{\lambda_1^2 + \lambda_2^2 + \lambda_3^2}}$

$(D) = \frac{\lambda_1^2 + \lambda_2^2 + \lambda_3^2}{3}$

In the context of medical investigation, the fractional anisotropy (FA) is a measure of the degree of anisotropy of water diffusion in biological tissues. The equation given above calculates the FA, where $\lambda_1$, $\lambda_2$, and $\lambda_3$ are the eigenvalues of the diffusion tensor, and $\langle D \rangle$ is the mean diffusivity. This measure is crucial in understanding the directionality and integrity of the diffusion in tissues such as the brain.
Fractional anisotropy with normal aging

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