The relationship between fractional anisotorpy in cerebral white matter by high-field (3 Tesla) MRI, and regional cerebral blood flow and oxygen metabolism with PET study in ALzheimer disease.

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Abstract

[Purpose] The correlation of fractional anisotropy (FA) of the cerebral white matter using high field MRI(3T) and regional cerebral blood flow (rCBF) and oxygen metabolism (regional cerebral oxygen metabolic rate (r $rCMRO_2$) and regional oxygen extraction fraction (rOEF)) using PET is examined in Alzheimer disease (AD). **[Subjects and Methods]** Subjects were 7 patients with probable Alzheimer disease (AD) (2 males and 5females; 69 ±4 years old, mean ± SD). The diagnosis of AD was made according to the criteria of NlNCDS-ADRDA. MRI scans were performed using a Signa VH/i 3.0 T MR imaging system. A spin echo type echo planar imaging (EPI) sequence with diffusion gradients applied in six directions was used for DT imaging (TR 3000 ms, TE 84 ms. To optimize the measurement of diffusion, only two b factors were used (b1=0, b2=1200 s /mm^2). The scalar in variants of the fractional anisotropy (FA) was derived for every pixel. The ROI (round areas of 25 mm^2) were placed on the subcortical white matter fiber tracts in the middle frontal gyrus, occipital apex, angular gyrus, and the anterior and posterior portions of the corpus callosum and the cingulate bundle in the coronal slices. rCBF, $rCMRO_2$ and rOEF in all cerebral cortex were determined with the steady-state technique using oxygen-15-labeled tracers ($^{15}O_2$, $C^{15}O_2$ and $C^{15}O$) by PET study. **[Results]** There were the significant positive correlation in FA value of the left posterior portions of the cingulate bundle and rCBF of the left frontal cortex ($r=0.79, p<0.05$), and of the left temporal cortex($r=0.70, p=0.08$), and the correlation tendency in FA value of the right posterior portions of the cingulate bundle and rCBF of the right frontal cortex ($r=0.67, p=0.09$). In addition, the significant positive correlation was recognized in FA value of the left posterior portions of the cingulate bundle and $rCMRO_2$ of the left frontal cortex ($r=0.85, p<0.05$), and of the left temporal cortex($r=0.85, p<0.05$), and in FA value of the right posterior portions of the cingulate bundle and $rCMRO_2$ of the right frontal cortex ($r=0.75, p<0.05$), and of the right temporal cortex($r=0.84, p<0.05$). **[Conclusion]** In the Alzheimer disease, there is the correlation for dysfunction of posterior portions of the cingulate bundle and dicrease of rCBF and $rCMRO_2$ in front- temporal cortex.