

Correlation between regional blood flow and oxygen metabolism by PET and inversion recovery image in the cerebral cortex using 3 tesla MRI in patients with Alzheimer disease

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Abstract

Alzheimer disease (AD) is characterized by degeneration and atrophy of the cerebral cortex. Some recent studies for early AD using positron emission tomography (PET) and single photon emission computed tomography (SPECT) suggested that the earliest changes appear in the posterior cingulate cortex rather than in the hippocampus. One possible explanation for the difference in results between morphological and functional studies is that a reduction in regional cerebral blood flow and glucose metabolism might reflect synaptic density and activity of axons projecting from other brain regions, rather than the activity of neurons in the region observed. To investigate the relation between the activity of neurons and regional cerebral blood flow and oxygen metabolism in patients with probable AD, we used inversion recovery (IR) MR image. IR imaging was performed using a 3.0 Tesla magnetic resonance scanner in 18 probable AD patients and 10 age-matched elderly healthy volunteers. IR ratio (IR signal intensity ratio between each cerebral gray matter and cerebellar gray matter) was decreased significantly in hippocampus, cingulate gyrus and temporal gyrus in AD patients compared with controls. IR ratio was significantly correlated with rCBF and rCMRO₂ in temporal lobe in AD patients but not in hippocampus. In AD patients there was no significant correlation between IR ratio and rCBF nor rCMRO₂ in cingulated gyrus. These findings suggested that the decreased cerebral blood flow in posterior cingulate gyrus was mainly involved in diaschisis mechanism rather than cell loss.