

## Combined Use of FMRI and Voxel-Based Morphometry in Assessment of Memory Impairment in Alzheimer's Disease Patients

**Authors :** A. V. Sokolov, S. V. Vorobyev, A. Yu. Efimtcev, V. Yu. Lobzin, I. A. Lupanov, O. A. Cherdakov, V. A. Fokin

**Abstract :** Alzheimer's disease (AD) is the most common form of dementia. Different brain regions are involved to the pathological process of AD. The purpose of this study was to evaluate brain activation by visual memory task in patients with Alzheimer's disease and determine correlation between memory impairment and atrophy of memory specific brain regions of frontal and medial temporal lobes. To investigate the organization of memory and localize cortical areas activated by visual memory task we used functional magnetic resonance imaging and to evaluate brain atrophy of patients with Alzheimer's disease we used voxel-based morphometry. FMRI was performed on 1.5 T MR-scanner Siemens Magnetom Symphony with BOLD (Blood Oxygenation Level Dependent) technique, based on distinctions of magnetic properties of hemoglobin. For test stimuli we used series of 12 not related images for "Baseline" and 12 images with 6 presented before for "Active". Stimuli were presented 3 times with reduction of repeated images to 4 and 2. Patients with Alzheimer's disease showed less activation in hippocampal formation (HF) region and parahippocampal gyrus then healthy persons of control group ( $p < 0.05$ ). The study also showed reduced activation in posterior cingulate cortex ( $p < 0.001$ ). Voxel-based morphometry showed significant atrophy of grey matter in Alzheimer's disease patients, especially of both temporal lobes (fusiform and parahippocampal gyri); frontal lobes (posterior cingulate and superior frontal gyri). The study showed correlation between memory impairment and atrophy of memory specific brain regions of frontal and medial temporal lobes. Thus, reduced activation in hippocampal formation and parahippocampal gyri, in posterior cingulate gyrus in patients with Alzheimer's disease correlates to significant atrophy of these regions, detected by voxel-based morphometry, and to deterioration of specific cognitive functions.

**Keywords :** Alzheimer's disease, functional MRI, voxel-based morphometry

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