STRUCTURAL MRI CHANGES DETECTABLE UP TO TEN YEARS BEFORE COGNITIVE IMPAIRMENT DUE TO ALZHEIMER'S DISEASE

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Introduction: Changes in brain structure occurring at different stages of progression of Alzheimer’s Disease (AD) have been mainly described at the point when cognitive symptoms are present. Less is known on whether structural brain changes are detectable earlier, in the asymptomatic phase.

Aims: To identify structural MRI correlates of preclinical AD in healthy elderly.

Methods: In this prospective study, 148 healthy elderly were recruited. At baseline they underwent an MRI scan and neuropsychological examination. Over five to ten years, 32 subjects developed mild cognitive impairment (MCI) and 8 developed AD. We used voxel-based morphometry and shape analysis to study differences between subjects who remained cognitively healthy for 10 years (controls) and subjects who developed MCI and AD (preclinical AD or MCI).

Results: At baseline, preclinical AD or MCI had significantly greater atrophy in medial-temporal lobes, posterior cingulate/precuneus, and orbitofrontal cortex compared to controls. When considering only subjects diagnosed as AD later during the follow-up, they still had greater atrophy in the right medial-temporal lobe compared to controls. Shape analysis showed that the shape of the head of the right hippocampus, measured using a deformable surface model, could already discriminate at baseline between preclinical AD and controls, with high accuracy.

Conclusions: Changes in brain structure occur early in the preclinical phase of AD, are localized to regions typically affected by AD neuropathology, and may be detected up to ten years before diagnosis. In particular, atrophy in the right hippocampus seems to be critical in the earliest preclinical stages of AD.