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Quantitative Magnetic Resonance Imaging of the Hippocampus in Single Transgenic Mouse Models of Alzheimer's Disease

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In this study, quantitative magnetic resonance imaging (MRI) was used to determine if it could detect atrophy and microstructural changes in the hippocampus, and damage to peripheral white matter (WM) structures in mouse models of Alzheimer's disease (AD). The aim of our study was to determine if T1 relaxation, diffusion tensor imaging (DTI), and quantitative magnetization transfer imaging (qMTI) metrics could reveal changes within the hippocampus and surrounding WM structures in ex vivo transgenic mouse brains with the goal of these changes being used as biomarkers for AD. Mice were either wild type controls (n=6), or had over-expression of the presenilin-1 (PS1) protein (n=6) or the amyloid precursor protein (APP) (n=6), and were imaged at 7.5 months of age using a 7T MRI system. Three coronal slices were selected in each mouse to span the hippocampus. Anatomical details visible in DTI color maps allowed delineation of hippocampal cell layers, which contained more significant differences between groups of mice than did the entire unsegmented hippocampus. This work demonstrates that multiparametric quantitative MRI methods are useful for characterizing changes within the hippocampus and surrounding WM tracts of APP and PS1 mouse models of AD.

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