A Novel Approach to Dementia: High Resolution $^1$H MRI of the Human Hippocampus at 21.1 T

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Introduction
Demonstrating the first high resolution MR images of human hippocampal brain sections acquired at 21.1 T (900 MHz), this case comparison presents hippocampal sections: a control (1a) versus a specimen with hippocampal sclerosis (1b) (1,2). The 92-year-old female patient showed steady cognitive decline with agitation and intermittent delusion (no seizures) over an 8-year period. Family history was positive for dementia. Despite marked dementia (MMSE 12/30), neurologic examination was negative.

Experimental
Prior to imaging, fixed postmortem human samples were washed in phosphate buffered saline (PBS) and immersed in Fluorinert (3M, Corp). All MR data were acquired using a 21.1-T magnet equipped with a Bruker Avance console and Mini0.75 gradients. Utilizing a 33-mm birdcage coil, high resolution 3D $^1$H Fast Low Angle Shot (FLASH) scans (TE/TR=12/50ms) were acquired over 4.3 hrs at 50-μm resolution.

Results and Discussion
Control images display strong cell layer delineation, with hippocampal regions (CA 1-3) clearly visible. Sclerotic images lack hippocampal definition and display significantly reduced volume and cell layer compression.

Conclusions
This ultra-high field strength provides sensitivity and contrast based on differences in the magnetic susceptibility between tissue types and pathologies that allows for disease determination.

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References