Hippocampal subfield volume in relation to CSF Amyloidß in early Alzheimer's disease in 7T MRI

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INTRODUCTION

Alzheimer's disease (AD) involves neuro-degeneration, amyloid plaques, and neurofibrillary tangles. While CSF/PET biomarkers offer high diagnostic accuracy, they are invasive or expensive[1,2]. Hippocampal atrophy correlates with AD progression. We investigated if high-resolution 7T MRI, by assessing hippocampal subfield volume changes, could offer an alternative AD marker.

RESULTS

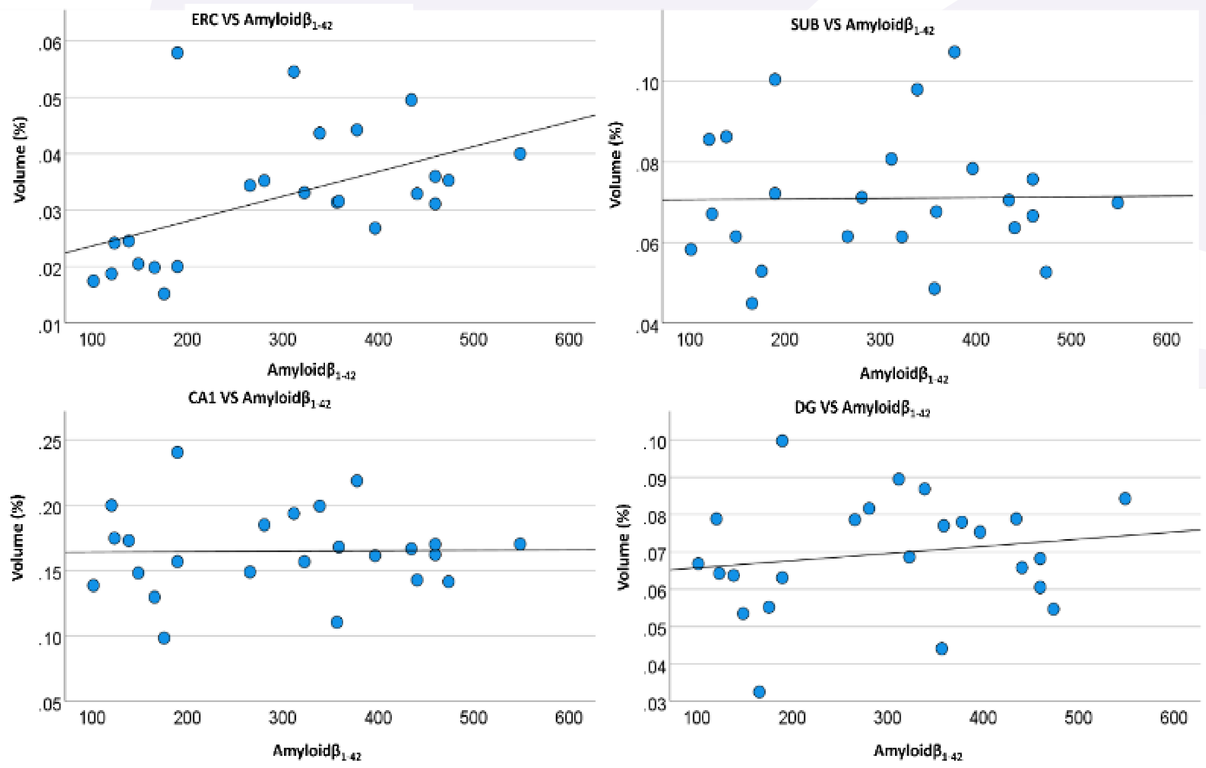


Figure 3: Relationship between the fractional volume of some of the hippocampal subfields for AD participants and the value of CSF amyloid-beta 1-42, with linear trend line included.

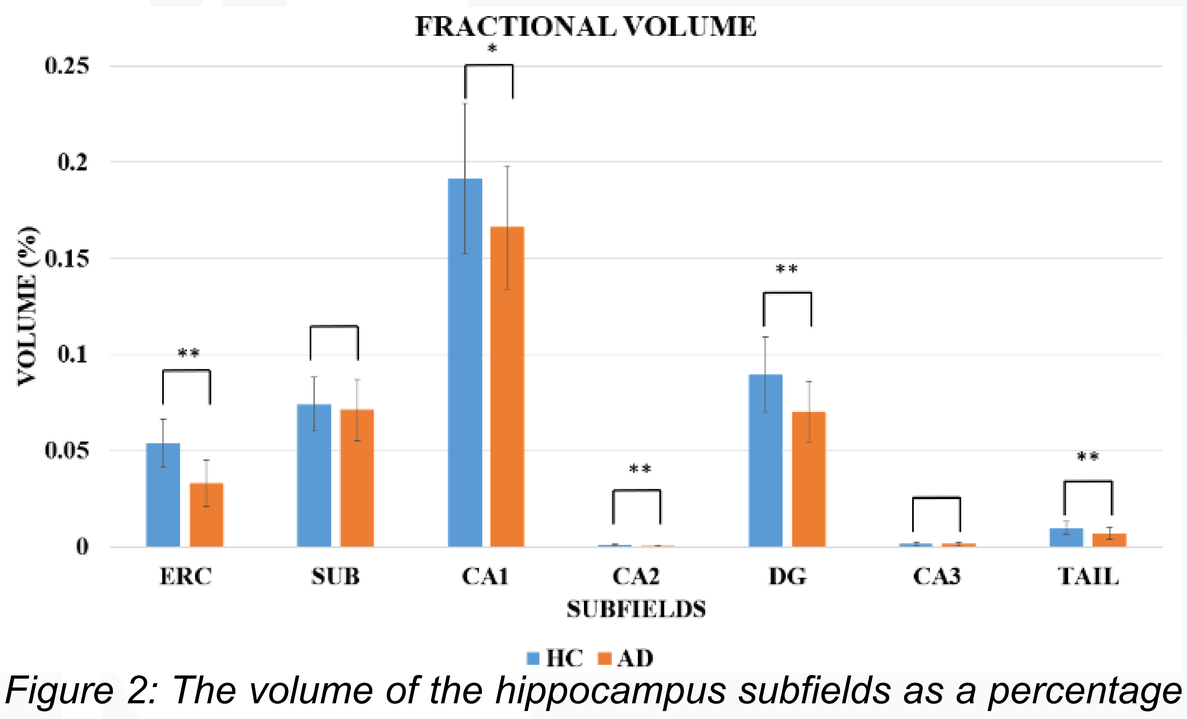


*Figure 2: The volume of the hippocampus subfields as a percentage of whole brain volume averaged over the Alzheimer's disease and healthy control participants. Error bars indicate intersubject standard deviation; * indicates p ≤ 0.05; ** indicates p < 0.01*

CONCLUSION:

The association of the volume of ERC and Amyloidβ$_{1\text{-}42}$ suggests the potential for using high field-high resolution MRI as a biomarker for an early identification of AD, though a larger sample size is needed to verify these results.

METHOD

25 patients and 25 healthy control (HC) participants were recruited. The CSF Amyloidß/tau measurement cut off reported in Hosseini et al[3] was used.

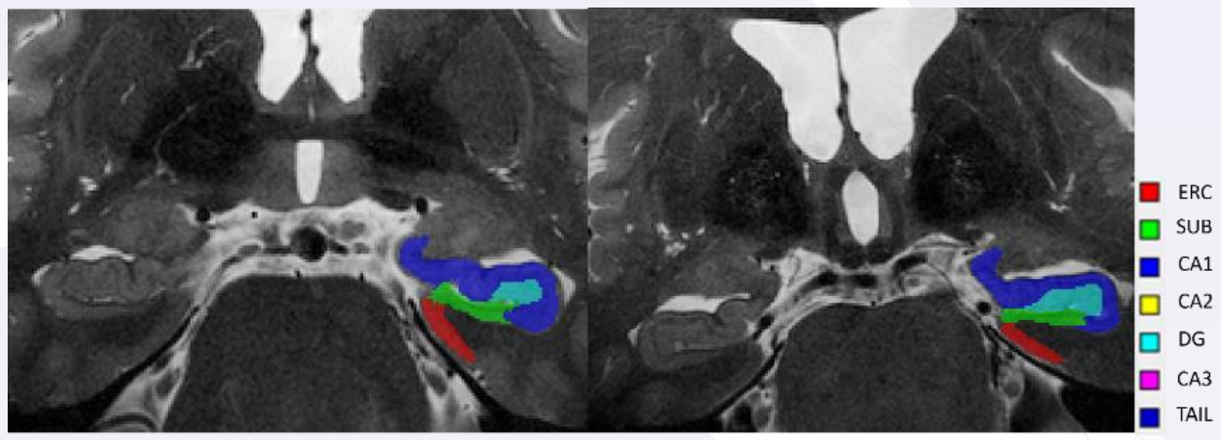


Figure 1: showing the segmentation of the hippocampus obtained overlaid on the T2-weighted image for (A) HC and (B) AD participant in the study. Hippocampus was segmented using ASHS software into CA1, CA2 and CA3, TAIL, DG, SUB and ERC subfields

DISCUSSION

- All hippocampal subfield volumes decreased in AD patients compared to healthy controls, except for the subiculum (SUB) and CA3 regions, where changes weren't statistically significant.
- A decreasing trend in volume was observed across all hippocampal subfields with lower Amyloidβ$_{1\text{-}42}$ levels.
- This association was statistically significant only in the ERC (p=0.002), which also showed the largest volume decrease.
- This finding aligns with evidence suggesting early AD pathology often originates in the ERC, a region critical for memory, navigation, and time perception, before spreading to the hippocampus[4].

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