= -.12, CI = -.22 – -.02), *temporal* (temporal pole b =.18, CI = -.35 – -.02; transverse temporal b =.13, CI = -.24 – -.02; superior temporal b =.10, CI = -.18 – -.02), *insula* (b =.14, CI = -.23 – -.05) and *precentral* (b =.14, CI = -.25 – -.04) regions. **Conclusions:** These findings reveal a widespread pattern of cortical thinning in MCR, which encompasses brain regions previously linked to the control and motor aspects of gait, as well as executive functions, language, memory, and social and emotional processes.

P3-387 SURFACE-BASED HIPPOCAMPAL MORPHOMETRY ANALYSIS FOR STUDYING EFFECTS OF APOE-E4 ALLELE LOAD IN COGNITIVELY UNIMPAIRED SUBJECTS

Qunxi Dong[1], Wen Zhang[1], Jianfeng Wu[1], Bolun Li[1], Emily H. Schron[2], Travis McMahon[1], Jie Shi[1], Boris A. Gutman[3], Kewei Chen[4], Leslie C. Baxter[5], Paul M. Thompson[6], Eric M. Reiman[4], Richard J. Caselli[7], Yalin Wang[1], *[1]Arizona State University, Tempe, AZ, USA; [2]Wellesley College, Wellesley, MA, USA; [3]Armour College of Engineering, Illinois Institute of Technology, Chicago, IL, USA; [4]Banner Alzheimer's Institute, Phoenix, AZ, USA; [5]Barrow Neurological Institute, Phoenix, AZ, USA; [6]Imaging Genetics Center, Mark and Mary Stevens Neuroimaging and Informatics Institute, Keck School of Medicine, University of Southern California, Marina del Rey, CA, USA; [7]Mayo Clinic Arizona, Scottsdale, AZ, USA. Contact e-mail: qdong17@asu.edu*

Background: Apolipoprotein E (APOE) e4 is the major genetic risk factor for Alzheimer's disease (AD) and it has been shown to be less efficient in clearing extracellular fibrillary amyloid β (Aβ) plaques, which would accelerate brain deformations from the hippocampus and medial temporal regions to the rest cortical regions (Liu et al., 2013; Cacciaglia et al., 2018). So it is valuable and necessary to reveal and intervene the hippocampal degenerations related to APOE-e4 before the onset of AD. The dose-dependent impact of APOE-e4 on hippocampal volumes has been documented, but its influence on general hippocampal morphology in cognitively unimpaired individuals is still elusive. To decode the exactly deformative hippocampal subregions, this work proposed to apply a novel surface-based hippocampal morphometry framework to study the APOE-e4 dose effects on a cognitively unimpaired cohort. **Methods:** The proposed automated framework includes hippocampal surface segmentation and reconstruction (Patenaude et al., 2011), higher-order hippocampal surface correspondence computation (Leporé et al., 2008; Wang et al., 2010; Wang et al., 2011), and hippocampal surface deformation analysis with multivariate statistics (see Figure 1) (Wang et al., 2010; Yao et al., 2018). This pipeline was conducted on a magnetic resonance imaging (MRI) database of 117 cognitively unimpaired subjects aged between 50 to 85 years (mean=57.4, SD=6.3), including 36 heterozygotes (HT: e3/e4), 37 homozygotes (HM: e4/e4) and 44 non-carriers (NC: e3/e3). Table 1 shows the demographic information of subjects. **Results:** In our experiments, we analyzed hippocampal morphometry differences of the group contrasts of HM vs. NC, HT vs NC, and HM vs. HT. Their corresponding effect sizes were estimated using the cumulative distribution functions (CDF) (Shi et al., 2013; Wang et al., 2013). As shown in Figure 2, our hippocampal morphometry statistics showed greater statistical power by distinguishing cognitively unimpaired subjects with two, one, and no APOE-e4 alleles. **Conclusions:** The work demonstrated that our surface-based morphometry analysis may serve as a useful brain imaging marker to study AD induced brain morphometry changes in preclinical AD stage.

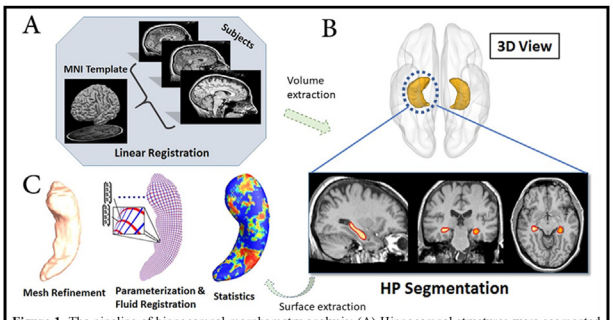
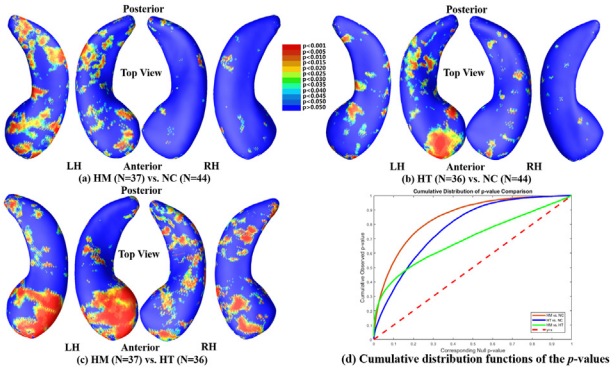


Figure 1. The pipeline of hippocampal morphometry analysis: (A) Hippocampal structures were segmented using FIRST strategy; (B) Triangular meshes were constructed based on the hippocampal segmentation volumes; (C) Each hippocampal surface mesh was parameterized on the refined triangular mesh and then registered to a common template for morphometric features extraction. Eventually, the group differences of hippocampal morphometry were statistically analyzed between different APOE genotype groups.

Table 1. Demographic characteristic statistics between genotype groups.

	NC (e3/e3)	HT (e3/e4)	HM (e4/e4)	Inferential statistics
Sample size	44	36	37	
Age	58.6 (7.2)	57.2 (3.8)	58.4 (6.8)	$F = 0.6$; $p = 0.56$
Education	15.8 (2.3)	15.8 (2.4)	16.1 (2.1)	$F = 0.2$; $p = 0.81$
Male/female	15/29	11/25	9/28	$\chi^2 = 0.9$; $p = 0.63$
MMSE score	29.7 (0.6)	29.9 (0.4)	29.6 (0.7)	$F = 1.7$; $p = 0.19$
AVLT-LTM	8.75 (2.95)	9.86 (2.86)	10.03 (3.07)	$F = 2.3$; $p = 0.1$



P3-388 SEQUENTIAL DEEP LEARNING ALGORITHMS SHOW STRUCTURAL CONNECTIVITY DIFFERENCES BY AMYLOID STATUS

Xingjian Zhen[1], Nicholas M. Vogt[2], Seong Jae Hwang[3], Barbara B. Bendlin[4], Vikas Singh[3], *[1]UW-Madison, Madison, WI, USA; [2]Wisconsin Alzheimer's Disease Research Center, University of Wisconsin School of Medicine and Public Health, Madison, WI, USA; [3]University of Wisconsin-Madison, Madison, WI, USA; [4]University of Wisconsin School of Medicine and Public Health, Madison, WI, USA. Contact e-mail: xzhen3@wisc.edu*

Background: Accumulation of cerebral beta amyloid may be accompanied by neurodegeneration, including loss of myelinated axons in Alzheimer's disease (AD). This abnormality can be observed locally by quantifying the white matter integrity along fiber tracts using diffusion MRI. However, common scalar measures such as fractional anisotropy may not sufficiently capture the fiber

Fiber Name	PiB positive vs. PiB negative.
fmajor_PP	0.665
fminor_PP	0.071
lh.atr_PP	0.582
lh.cab_PP	0.582
lh.ccg_PP	0.582
lh.cst_AS	0.681
lh.ilf_AS	0.582
lh.slfp_PP	0.667
lh.slft_PP	0.071
lh.unc_AS	0.681
rh.atr_PP	0.582
rh.cab_PP	0.582
rh.ccg_PP	0.582
rh.cst_AS	0.681
rh.ilf_AS	0.662
rh.slfp_PP	0.681
rh.slft_PP	0.789
rh.unc_AS	0.581

Table 1: p-values for all fibers from TRACULA in group of PiB positive vs. PiB negative.

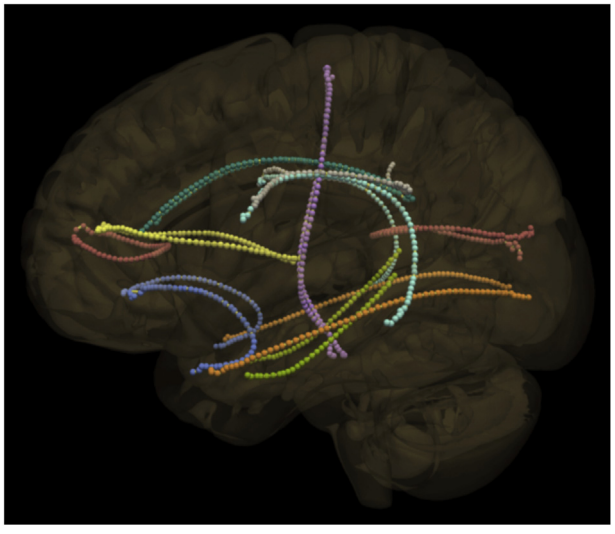


Figure 1: Fibers we used

tract pathology characterizing AD. In this study, we developed and used a deep learning model to capture complex fiber tract alterations associated with amyloid status. **Methods:** The study included imaging data acquired from 196 cognitively unimpaired participants (mean age 61.77±6.27yrs, 66% female, 38% APOE4-positive) from the Wisconsin Registry for Alzheimer's Prevention study who had undergone at least one time point of both single-shell diffusion MRI and [C11]PiB amyloid PET imaging. TRACULA was performed in an independent sample of 75 individuals in order to generate 18 major white matter tracts in MNI-space. The average template-space tracts in 3D coordinates were then non-linearly warped back to each subject's diffusion space, and the diffusion tensor matrix was extracted from each voxel along the tract. For each of the 18 tracts, we partitioned the subjects into PiB+ (N=46) and PiB- (N=280) groups based on their global PiB averages (thresholded at 1.18). Then, for each PiB group, we trained a sequential deep learning model which captures the complex fiber tract patterns of the corresponding participants. Once we obtained two models, we performed permutation testing between the parameters of the two models where statistical significance implies a significant difference between the two models for the same fiber tract (Model 1: PiB+ and Model 2: PiB-). **Results:** The p-values for each of the fiber tracts are shown in Table 1. We found that 2/18 fiber bundles (forceps minor and left superior longitudinal fasciculus) differed significantly by PiB status. **Conclusions:** To identify white matter abnormalities associated with amyloid, we modeled fiber tract patterns using a sequential deep learning model. Two fiber bundles comprising substantial white matter projections in the frontal lobes were significantly associated with PiB status, suggesting amyloid is associated with neurodegeneration even in preclinical AD.

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ELEVATED CEREBRAL ARTERIAL PULSATILITY AND RESISTIVITY ARE ASSOCIATED WITH COGNITIVE IMPAIRMENT: A PHASE-CONTRAST MRI STUDY

Soroush Heidari Pahlavian[1], Hong Zheng[1], Samantha J. Ma[1], Marlena Casey[1], John M. Ringman[1], Helena C. Chui[2], Danny JJ. Wang[1], Lirong Yan[1], [1]*University of Southern California, Los Angeles, CA, USA;* [2]*Keck School of Medicine at University of Southern California, Los Angeles, CA, USA. Contact e-mail: spahlavian@ini.usc.edu*

Background: Emerging evidence suggests cerebrovascular dysfunctions play an important role in the pathogenesis of Alzheimer's disease. Elevated arterial pulsation due to arterial stiffness can cause cerebral microvascular and brain tissue damage, which may contribute to cognitive impairment. The association of arterial pulsatility and cognitive dysfunction has previously been studied using transcranial doppler (TCD) sonography However, the efficient application of TCD depends on the availability of an acoustic windows which is known to be limited in older subjects. The goal of this study was to assess the utility of phase contrast MRI (PC-MRI) in quantifying cerebral arterial pulsatility in the presence of mild cognitive impairment (MCI). **Methods:** volunteers from the Los Angeles Latino Eye Study cohort were included in this study and underwent MRI scans (Table 1). Cognitive assessment was performed using the global clinical dementia rating (CDR) and the Montreal cognitive assessment (MoCA) Test. Flow waveform over a cardiac cycle was measured at the internal carotid artery (ICA) using an ECG-triggered single-slice PC-MRI (Figure 1). Mean blood flow rate (Q_{mean}), pulsatility index (PI=(Q_{max} - Q_{min})/Q_{mean}), and resistivity index (RI=(Q_{max} - Q_{min})/Q_{max}) were calculated, where PI and RI both reflect the resistance in microvasculature fed by the ICA. Furthermore, PI is inversely related to vascular compliance which acts to buffer the systolic pressure during perfusion. Non-parametric statistical analyses (Wilcoxon signed-rank and Spearman's rank correlation) were performed to assess the association of flow parameters with cognitive performance. **Results:** Compared to the subjects with normal cognition (n=25), subjects with MCI (n=16) had significantly higher RI (0.69±0.08 vs 0.76±0.08, p=0.03, Figure 2). Increased PI was observed in MCI (1.22±0.31 vs 1.39±0.35, p=0.08). RI and PI were both significantly increased with the decrease in MoCA score (p=0.02 and 0.05, respectively, Figure 3). No significant correlation was found between Q_{mean} and cognitive performance. **Conclusions:** Our preliminary results suggest that cerebral arterial pulsatility and resistivity assessed by PC-MRI are highly associated with cognitive impairment, which could be useful early biomarkers