

P3-412:

Background The perivascular space (PVS) functions as part of a brain clearance system that drains interstitial fluid and solutes including AB and tau from brain parenchyma and is associated with the development of AD. Recent developed imaging tools of cerebral parenchymal CSF fraction (CSFF)¹ and diffusion tensor imaging along perivascular spaces index (DTI-ALPS)² provide an insight of the perivascular CSF flow and early PVS pathology in the cerebral cortex and cerebral white matter, respectively. We applied CSFF and DTI-ALPS in an elderly cognitive normal cohort to investigate their value in brain aging.

Methods

A total of 27 cognitive normal subjects in this study are within age 57 and 79 years (mean=68.1, std=6.2). We conducted MR FAST-T2 scan for CSFF^{1,3}, T1W and T2W for PVS burden⁴, and DTI for DTI ALPS index². CSFF was fitted using three compartment model with 6 TEs = 0, 7.5, 17.5, 67.5, 147307.5 ms. PVS burden was calculated by using imaging processing based PVS segmentation on enhance PVS image (T2W/T1W). DTI ALPS was calculated by

 $ALPS = \frac{mean(D_{x,proj}, D_{x,assoc})}{mean(D_{y,proj}, D_{z,assoc})}$

where Dx, Dy and Dz are the diffusivity along x-, y- and z-axis, and the projection, association regions. Multi-variate linear model Age~1+DTI_ALPS+CSFF was compared with Age~1+DTI_ALPS+PVS_burden.

Parenchymal CSF Fraction and DTI-ALPS in Brain Aging

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Discussion The preliminary results showed that CSFF and DTI-ALPS can better predict brain aging. Figure 3 shows larger variation of PVS at certain age level than that of CSFF in Figure 2, this can be seen by comparing the R² of the two models. The conventional PVS burden only measures the MRI visible PVS in brain WM while CSFF can assess MRI invisible micro- scale PVS along small arteriole and capillary in the cerebral cortex, which is closely related to glymphatic system and reflect the PVS function alert at early stage⁵. Therefore, CSFF could be a marker of CSF flow stasis in PVS. Since PVS plays a key role in the CSF clearance function, CSFF and DTI-ALPS could be a potential marker for detecting early stage of dysfunction of glymphatic clearance. In our other poster, we build model between CSFF and DTI-ALPS, which shows that the combination of these two measures could potentially be used to distinguish normal and MCI subjects.

Conclusion We compared two multivariates models that predicting normal aging using PVS load and parenchymal CSF fraction. Our results show that CSFF outperforms PVS load for predicting aging in normal subjects.

Reference **1.** Liangdong Zhou, BioRvix:2021. **2**. Toshiaki Taoka, Jpn.J.Radiol. 2022 **3.** Thanh D Nguyen, Magn Reson Med, 2016 4. Farshid Sepehrband, Scientific Reports, 2019 **5.** Andreas Charidimou, Sleep, 2015

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