Abstract 812

PARENCHYMAL CSF FRACTION IS BETTER ASSOCIATED WITH AGE AND DTI-ALPS COMPARED THAN THE PERIVASCULAR SPACE BURDEN

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Aims

The glymphatic system, which is affected by aging and neurodegenerative diseases, plays a critical role in maintaining brain homeostasis. Perivascular spaces (PVS) are a key component of glymphatic clearance and enlarged PVS can be detected on T2W MRI. The previously developed DTI-ALPS index is a measure of diffusivity of CSF along PVS and reflects glymphatic function. (Taoka, 2017) We developed an imaging biomarker, brain parenchymal CSF fraction(CSFF), as an alternate method to assess glymphatic clearance. (L. Zhou, 2022). This study compares CSFF against PVS volume in detecting age-associated changes in glymphatic clearance.

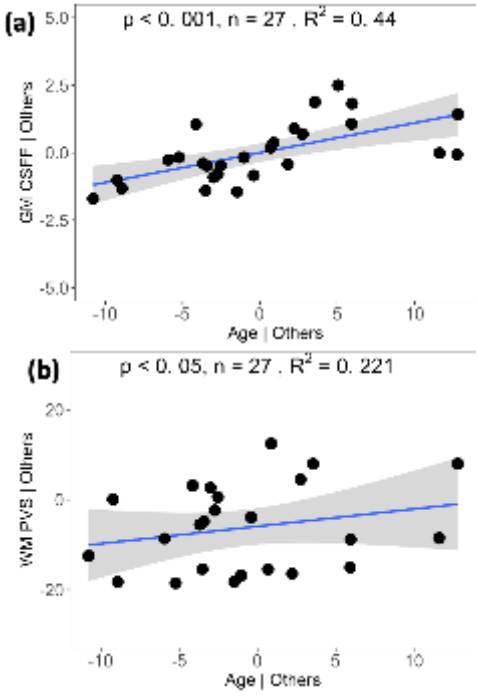
Methods

We acquired T1W (ROI segmentation), T2W (PVS segmentation), multi-echo FAST-T2 (CSFF), SWI (veinous PVS), and DTI (ALPS) data on a 3T MR scanner in twenty-seven cognitively normal subjects (age: mean=68.1, std=6.2.) We associated age with CSFF and PVS load separately with DTI-ALPS and gender as covariates using two multivariate regression models: **CSFF (or PVS)** = **$\beta 0+\beta_1$*Age+β_2*ALPS+β_3*Gender.** These models aim to evaluate the effects of normal aging and DTI-based glymphatic function on CSFF and PVS.

Results

Figure-1 shows that the combination of age and DTI-ALPS can better explain the variation CSFF than PVS (R^2=0.44 vs 0.22). The partial correlation test indicates that the age correlates to CSFF (r=0.61, p<0.001) more than the PVS load (r=0.43, p=0.03) after controlling for the ALPS and gender.

Figure-1: Partial regression plots between CSFF (or PVS) and age by controlling for the ALPS and gender.



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Conclusions

Conventional PVS volume measurement is insensitive to micro-scale PVS in the brain parenchyma, which is invisible on conventional MRI and may reflect glymphatic dysfunction at the early stage. CSFF could be a more sensitive and accurate marker of CSF/glymphatic flow alterations. A multimodal imaging protocol including both DTI and FAST-T2 could provide a non-invasive and comprehensive framework for evaluating glymphatic/CSF flow and clearance in humans.

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