



Research Week 2020

Linking Traumatic Brain Injury, and Post-Traumatic Headache: a Potential Role for Glymphatic Pathway Dysfunction

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Abstract

Headaches are frequently reported by patients with traumatic brain injury (TBI). The relationship between TBI and headaches is poorly understood. Disruption of the glymphatic pathway, a brain-wide network of perivascular spaces, could explain this link. The glymphatic pathway allows the exchange of fluid, solutes, and wastes between the cerebrospinal fluid and the brain interstitium. MRI-visible enlarged perivascular spaces (ePVS) may be putative surrogates of glymphatic function. The purpose of this study is to: a) characterize the ePVS burden in a cohort of healthy adolescents; b) determine if ePVS burden is increased in individuals with post-concussive symptoms.

Methods

Characterize ePVS burden. One hundred and eighteen 12-21 year old subjects received T1- and T2-weighted 3T MRI. ePVS were identified in white matter on T2-weighted imaging and their characteristics were calculated using a local heterogeneity approach.

Evaluation of ePVS burden in subjects with post-concussive headaches. Twenty subjects with post-concussive headaches received a 7T MRI (T1, T2, FLAIR, GRE). ePVS burden was estimated as above, and compared to 20 healthy individuals (preliminary data).

Results

Total ePVS number ranged from 16 to 287. ePVS were found more often in frontal and parietal WM lobes ($p < .01$). Males had a significantly higher number of ePVS than females (mean [SD]; 98.4[50.5] males vs. 70.7[36.1] females, $p < 0.01$). Age and pubertal status were not significantly associated with ePVS burden when controlling for gender.

Preliminary results in one subject scanned under this protocol show that there is an asymmetry in the ePVS burden, which correlated with the injury location, and surrounds an area of microhemorrhage.

Conclusion

In our cohort, males have a higher ePVS burden than females, regardless of age and pubertal status. We provide the first evidence, although preliminary, of regional changes on ePVS burden in a subject with post-traumatic headaches, seen with high resolution MRI.