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NEWS

Migraine-Associated Vascular Changes on Structural 7T-MRI

PURPOSE

Migraine is a complex medical disorder which might be associated with vascular-related changes in the brain, such as white matter hyperintensities (WMH), and in some cases cerebral microbleeds (CMB). The association between migraine and enlarged perivascular spaces (EPVS) has not been thoroughly investigated. Our study utilizes ultra-high field 7T MRI to compare structural microvascular changes in different types of migraine, comparing them for the first time to headache-free healthy controls (HC).

METHODS AND MATERIALS

Participants included 10 chronic migraine (CM), 10 episodic migraine without aura (EMWoA), and 5 age-matched HC. Inclusion criteria were ages 25-60 years and ongoing CM/EMWoA. Exclusion criteria were overt cognitive impairment, brain tumor, prior intracranial surgery, contraindications to MRI, and claustrophobia. Neuroimaging data were collected using 7T MRI scans utilizing T1, T2, FLAIR, and SWI/QSM sequences. We calculated EPVS in centrum semiovale (CSO) and basal ganglia (BG), WMH using the Fazekas scale, and CMB using the microbleed anatomical rating scale. We also collected clinical data such as disease duration and severity, symptoms at time of scan, presence of aura, and side of headache. Regression analysis compared neuroimaging data among CM, EMWoA, and HC.

RESULTS

Preliminary statistical analysis reveals that the number of EPVS in the CSO, but not in the BG, was significantly higher with migraine compared to HC ($p=0.04$). Frequency of WMH and CMB in migraine did not differ significantly from that of HC. However, migraine patients showed a significant correlation between EPVS quantity in CSO and deep WMH severity ($p=0.04$).

CONCLUSIONS

Significant differences in the EPVS in migraine compared to HC might be suggestive of glymphatic disruption within the brain, but whether such changes affect migraine development or result from migraine is unknown. EPVS may influence other vascular-related changes in migraine, suggesting a pathophysiological mechanism or possible use as an early imaging biomarker. Continued study with larger case populations and longitudinal follow-up will better establish the relationship between structural changes and migraine development and type.

CLINICAL RELEVANCE/APPLICATIONS

7T MRI allows us to measure EPVS in migraine more accurately, advancing our knowledge on the effect of vascular/glymphatic changes on various types of migraine for future disease-specific therapy.