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Detection of Gross Brain Volume Changes in Patients with Migraine Using Magnetic Resonance Imaging

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Abstract

Magnetic Resonance Imaging (MRI) based computational neuroanatomy has shown to be an effective approach in detecting grey matter, and white matter changes in the brains of individuals with migraine. However, research on detecting gross volume changes in migraine is rare. Therefore, the objective of this study is to investigate gross volume changes associated with migraine and test the potential utility of gross volume changes in developing a novel neuroimaging biomarker for objective diagnosis of migraine. 45 patients with migraine, and 46 healthy controls were scanned using a 3 Tesla scanner, and 3D, T1- weighted MR images were obtained. First, Tensor-based morphometry was performed using Computational Anatomy Toolbox (CAT 12) to generate voxel-wise Jacobian determinant images and smoothed (HWFM = 8 mm). A group-level univariate analysis was performed, using a two-sample t- test and the results were corrected for multiple comparisons. Second, multivariate pattern analysis (MVPA) was conducted using support vector machine (SVM) to classify the patients with migraine and healthy controls. Reduced gross volume changes in patients were detected in the middle frontal, superior frontal, inferior temporal of right cerebrum, middle temporal, angular, cuneus, calcarine in the left cerebrum and cerebellum. Moreover, the results of the MVPA indicated that gross volume changes can be served as a biomarker to distinguish patients with migraine and healthy individuals (Accuracy = 73.63%). In conclusion, we propose that the gross volume changes detected in migraineurs can be considered when developing neuroimaging tools to facilitate the objective diagnosis of migraine.

Keywords: *Migraine, Gross volume changes, Tensor based morphometry, MRI, Classification*