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Brain Structural Covariance Networks of Patients with Migraine: A Source-based Morphometry Study

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Abstract

Migraine is associated with grey matter changes in the human brain, but the interrelationships between voxels and naturally grouped patterns of structural variations need to be identified to understand how migraine affects the brain at the network level. Three dimensional, T1 weighted images of 45 migraine patients and 46 healthy controls who underwent brain MR scanning in a 3 Tesla scanner were selected. The data were analyzed using Computational Anatomy Toolbox-CAT12. Group independent component analysis (Group ICA) was performed on grey matter volumes using GIFT toolbox. Two sample t-tests were performed using component loadings of each component to find out the significant independent components (ICs). Nine maximally independent components (ICs) were resulted using group ICA and labeled according to the Resting State Network (RSN) atlas. Among them 6 ICs were found to be significant (p<0.05) based on two-sample t-tests representing the attention, sensorimotor, frontal, and visual networks. Further, mask based multivariate pattern analyses (MVPA) were performed to distinguish patients with migraine and healthy controls. MVPA revealed that component 4 (sensorimotor, classification accuracy=61.53%), component 5 (sensorimotor, classification accuracy=73.62%), component 7 (sensorimotor, classification accuracy=69.23%) and component 8 (visual, classification accuracy=68.13%) show different potentials to correctly classify patients with migraine and healthy subjects (p<0.05, number of permutations, n=1000). Source Based Morphometry can detect the structural covariance networks of brains with migraine, which exhibit significant differences when compared with healthy controls. Further, the above structural network changes can be used to develop an effective biomarker for objective diagnosis of migraine.

Keywords: *Migraine, Source based morphometry, Grey matter, Independent component analysis, Structural covariance networks*