ID 149

Characterization and Classification of Structural Brain Changes in Generalized Epilepsy using Region based Morphometry

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This study hypothesized that different structural metrics have different potential to classify patients with generalized epilepsy and healthy subjects. Therefore, the present study characterized regional structural brain changes in generalized epilepsy and tested the potential of different metrics in classification of patients and healthy subjects. Patients (45) and healthy subjects (46) were scanned using a 3 Tesla MRI scanner. 3D T1 weighted images were pre-processed, and structural metrics were computed using Computational Anatomical Toolbox (CAT12). Univariate analyses were performed using two sample t-tests and multivariate pattern analyses (MVPA) were conducted using linear support vector machine (SVM). GM volume reductions were detected in cerebellum, frontal, temporal lobes, thalamus, and hippocampal. WM volume reductions reported in cerebellum and CSF volume increments in left lateral ventricle were detected. Reduced regional gyrification was detected in left posterior ramus of the lateral sulcus and reduced sulcal depths were detected in occipital pole, cuneus, and posterior ramus of the lateral sulcus in patients. MVPA revealed different discriminative abilities in classifying patients with generalized epilepsy and healthy subjects (Classification accuracy: 61.1%, 62.2%, 58.8%, 61.1% and 60% for GMV, WMV, CSFV, Cortical gyrification and sulcal depth respectively). However, the above low accuracies may not be potentially useful to distinguish patients and healthy subjects clinically and therefore further studies are encouraged using different classification strategies, large sample sizes and well categorized patients with medication levels for improved results. In conclusion, this study provides an understanding of regional structural brain changes associated with generalized epilepsy and their potentials in classification of patients and healthy subjects.

Keywords: *generalized epilepsy, magnetic resonance imaging, structural brain changes, region based morphometry, univariate statistical analysis, multivariate pattern analysis*