Altered Network Organization in Mild Alzheimer's Disease Compared to Mild Cognitive Impairment Using Resting-State EEG

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Abstract : Brain functional networks based on resting-state EEG data were compared between patients with mild Alzheimer's disease (mAD) and matched patients with amnestic subtype of mild cognitive impairment (aMCI). We integrated the time–frequency cross mutual information (TFCMI) method to estimate the EEG functional connectivity between cortical regions and the network analysis based on graph theory to further investigate the alterations of functional networks in mAD compared with aMCI group. We aimed at investigating the changes of network integrity, local clustering, information processing efficiency, and fault tolerance in mAD brain networks for different frequency bands based on several topological properties, including degree, strength, clustering coefficient, shortest path length, and efficiency. Results showed that the disruptions of network integrity and reductions of network efficiency in mAD characterized by lower degree, decreased clustering coefficient, higher shortest path length, and reduced global and local efficiencies in the delta, theta, beta2, and gamma bands were evident. The significant changes in network organization can be used in assisting discrimination of mAD from aMCI in clinical.

Keywords : EEG, functional connectivity, graph theory, TFCMI
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