Reduced hemispheric asymmetry of brain anatomical networks in attention deficit hyperactivity disorder.

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Abstract

Despite many studies reporting a variety of alterations in brain networks in patients with attention deficit hyperactivity disorder (ADHD), alterations in hemispheric anatomical networks are still unclear. In this study, we investigated topology alterations in hemispheric white matter in patients with ADHD and the relationship between these alterations and clinical features of the illness. Weighted hemispheric brain anatomical networks were first constructed for each of 40 right-handed patients with ADHD and 53 matched normal controls. Then, graph theoretical approaches were utilized to compute hemispheric topological properties. The small-world property was preserved in the hemispheric network. Furthermore, a significant group-by-hemisphere interaction was revealed in global efficiency, local efficiency and characteristic path length, attributed to the significantly reduced hemispheric asymmetry of global and local integration in patients with ADHD compared with normal controls. Specifically, reduced asymmetric regional efficiency was found in three regions. Finally, we found that the abnormal asymmetry of hemispheric brain anatomical network topology and regional efficiency were both associated with clinical features (the Adult ADHD Self-Report Scale and Wechsler Adult Intelligence Scale) in patients. Our findings provide new insights into the lateralized nature of hemispheric dysconnectivity and highlight the potential for using brain network measures of hemispheric asymmetry as neural biomarkers for ADHD and its clinical features.