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Resting-state functional connectivity in untreated overt hyperthyroidism (Graves' disease) with mood disorders

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Objectives: Patients with hyperthyroidism have neuropsychiatric problems such as lack of concentration, depression and anxiety. These symptoms are indication of brain dysfunction. However the process of brain dysfunction is unknown. At the same time, the functional magnetic resonance imaging (fMRI) is important technique to assess the brain function. This study is to understand the functions of brain using fMRI in hyperthyroid patients.

Methods: This study included 15 consecutively referred, newly diagnosed and untreated patients with hyperthyroidism. In addition, 20 healthy age and gender matched control subjects were included. Anxiety was assessed by the Zung SAS, and Zung SDS was used to measure the depression. Image preprocessing was carried out using SPM8 and MATLAB. Amplitude of low-frequency fluctuations (ALFF) analyses were performed using REST V1.7 software. For Regions of Interest (ROI)-based fear condition (FC) analysis, a seed reference time course was obtained for each ROI by averaging the time series of all voxels in the ROI.

Results: Results of the two-sample t-test showed significant ALFF differences between patients with hyperthyroidism and healthy controls ($P<0.05$). Areas showing decreased ALFF values in the patients group included the posterior cingulated gyrus and bilateral inferior parietal gyrus; and increased ALFF values in the right thalamus and bilateral cuneus. Furthermore, correlation analysis demonstrated that there was a significant negative correlation between ALFF values of the left inferior parietal gyrus ($P=0.0021$) and the anxiety score in ASA and a significant negative correlation between ALFF values of the left posterior cingulated gyrus ($P=0.0437$). ROI-based FC analysis revealed increased FCs between the left inferior parietal gyrus and left rostral anterior cingulate cortex and bilateral frontal lobe; left posterior cingulated gyrus and bilateral left temporal lobe.

Conclusion: Our study demonstrated that brain dysfunction existed in patients with hyperthyroidism and were associated with neuropsychiatric signs and symptoms.

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