Abnormal spontaneous brain activity in drug-naïve, first episode depression: A resting-state fMRI study

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Purpose

Existing study on the functional connectivity in the resting state of bipolar depression patients report disrupted connections between the prefrontal cortex and limbic related structures (1). It is unclear, in patients with first episode depression, how are local properties in specific regions. Using amplitude of low-frequency fluctuations (ALFF) approach (2), we are to test the hypothesis of the abnormal neural activities in the prefrontal−limbic networks in drug-naïve, first episode depression.

Methods

Twenty-three patients experiencing first episode depression (mean age = 31.2 ±8.2, seven males and sixteen females) according to the diagnostic criterion of DSM-IV, and twenty age and sex matched normal controls (mean age = 29.3 ± 5.2, eight males and twelve females) were recruited. Twenty-two axial slices covering whole brain were acquired using a 3.0T MR scanner (Philips Achieva 3.0T X-series, Netherlands) with an 8 channel phase array head coil (TR/TE 2000/45 ms, flip angle 90°, matrix 64 × 64, FOV 24cm, thickness/gap 5/1mm, total 200 volumes). Data processing was performed using (DPARS) (data processing assistant for oresting-state fMRI) software. Data preprocessing included slice timing, head-motion correction and spatial normalization. Further analyses included band-pass filtering (0.01 - 0.08 Hz), linear-trend removing, power spectrum calculation, mean square root (0.01 – 0.08 Hz), spatial smoothing (FWHM = 4mm), and standardization by dividing global mean ALFF. Two sample t-test was used to compare the ALFF differences between the two groups.

Results

Compared to controls, a significant increased ALFF in right medial frontal gyrus and superior frontal gyrus were found in patients with first episode depression; Meanwhile patients showed a significant decreased ALFF in right cerebellum anterior lobe and posterior lobe, right cerebellar tonsil, right occipital lobe as well as right parahippocampa gyrus compared with controls.

Discussion and Conclusion

In this study, abnormal ALFF in different brain regions demonstrate that spontaneous neural activity in the resting state is changed in patients with drug-naïve first episode depression. A significant increased ALFF in medial frontal gyrus and superior frontal gyrus could correlate with the cognitive and emotional dysfunction in first episode depression (3). A significant decreased ALFF in parahippocampal gyrus and cerebellum maybe involved in the mood regulation in first episode depression patients (4). In conclusion, the abnormal neuronal activity in resting state should be considered in explaining findings in behavior deficits and support a model of dysfunction in the prefrontal−limbic networks in first episode depression. The simplicity and noninvasiveness of this method make it as a potential tool to monitor the progression of depression.

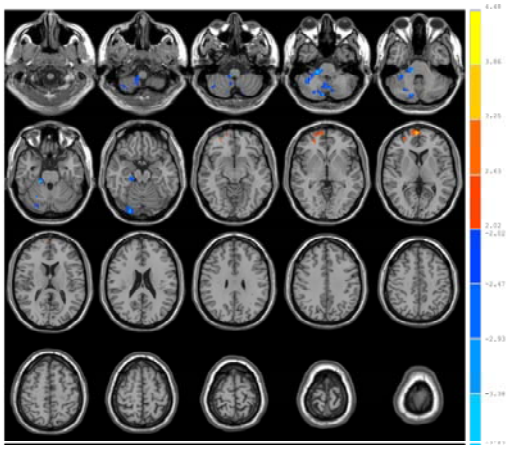

Fig.1 ALFF differences between first episode depression patient and control groups. Blue indicates that patients had decreased ALFF compared with the controls and the yellow indicates the opposite. T score bars are shown on the right. Left in the figure indicates the right side of the brain.

References

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