

Brain functional connectivity from electroencephalography signals and potential predictive biomarkers of treatment response of major depression

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Background

The treatment efficacy varies across individual patients with major depressive disorder (MDD). It lacks robust EEG markers for an antidepressant-responsive phenotype.

Aims & Objectives

Recently, research has focused on functional connectivity (FC) of brain. We attempted to first test whether FC could differentiate MDD patients from healthy controls (HCs). In addition, we studied the differences of FC between patients before and after treatment (joint effects of antidepressants and therapeutics). Finally, we investigated the differences of FC between responders and non-responders (therapeutic effects).

Methods

This is an observational study enrolling patients with MDD. Patients underwent EEG exams at w0 and w1, while HCs' EEG recordings were acquired only at w0. A resting eye-closing EEG segment was analyzed for functional connectivity (FC). Four parameters were used: (1) nodal strength (NS), (2) global efficiency (GE), (3) clustering coefficient (CC), and (4) betweenness centrality (BC).

Results

There were 28 MDD patients and 33 HCs, with a mean age of 40.7 years, and 71.4% were women. HCs had higher values in delta wave in the indices of NS, GE, BC, and CC than patients. After treatment with antidepressants, patients' FC improved significantly, including GE, mean CC, and mean NS in the delta wave. The FC in the alpha and beta bands of the responders are higher than that of the non-responders. Moreover, responders had significantly higher FC in alpha and beta than non-responders.

Discussion & Conclusion

The FC of the patients at the initial stage was worse than that of HCs. After treatment, the FC improved and was close to the value of HCs. Responders showed better FC in the high-frequency band than non-responders, and this feature exists in both pre-treatment and post-treatment EEG