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Discovering oscillatory EEG interactions after electroconvulsive therapy (ECT) interventions in patients with severe depression

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- Congress Abstract

Background:

Electroconvulsive therapy (ECT) is one of the most effective treatment options for patients with major depression. The mechanisms of action are not fully understood. To further investigate the neurobiological mechanisms of ECT, techniques are needed to noninvasively measure brain function before and following ECT sessions and during the course of ECT series. Electroencephalography (EEG) offers the opportunity to noninvasively investigate changes of brain electric activity before and after ECT.

Methods:

We investigated EEG data of 20 patients with severe depression (ICD 10 diagnoses F31.x, F32.x, F33.x) eligible for ECT and who underwent a series of right unilateral ECT. The mean age of the patients was 51.3 ± 10.7 years. The subjects underwent 13 ± 3.8 ECT sessions. EEG recordings were done 16.8 ± 6.3 days before ECT and 6.2 ± 6 days after completion of the ECT series. Spectrotemporal dynamics were analyzed in sensor and source space (sLORETA) to validate neurophysiologic changes pre to post ECT treatment. Delta (δ), theta (θ), alpha (α), beta (β), gamma (γ) power and sLORETA analyses were calculated from artefact-free EEG epochs.

Results:

Post-pre ECT treatment comparisons revealed significant increased δ and θ power in frontal sensor EEG electrodes (see Fig. 1). The sLORETA analysis indicates the sources of slow-wave current density increases at inferior frontal, superior frontal, insular, and temporal cortices (see Fig. 2). Statistical non-parametric mapping showed increased δ activity (1 – 6.5

Hz) in the middle frontal gyrus (xyz = 35, 35, -10; BA 47) compared to pre-treatment baseline EEG (p

Conclusion:

Main finding of the present study was a change in brain electric activity in the low δ frequency band in frontal brain regions. The frontal cortex is a key anatomical region in depression and alterations of neuronal activity in this region is a common finding in neurophysiological and neuroimaging studies. Changes in low frequency power, directly linked to ECT, might be a neurophysiological correlate of the mechanisms of action of electroconvulsive therapy