NEURONAL NETWORKS IN EPILEPTIC ENCEPHALOPATHIES WITH CSWC

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Aim: Continues spikes and waves during slow sleep (CSWS) is an age related epileptic encephalopathy characterized by occurrence of diffuse, continues spike and wave discharges during NREM sleep, seizures and psychomotor impairment. The aim of our study was to investigate the neuronal networks underling background oscillations of CSWC using the source analysis method Dynamic Imaging of Coherent Sources (DICS) and renormalized partial directed coherence (RPDC).

Methods: In order to investigate underlying network and effective connectivity within the detected network, a DICS analyses and renormalized partial directed coherence (RPDC) methods were applied. The baseline sleep EEG recordings and follow up sleep EEG recordings from 12 Patients with CSWS were used for the analyses.

Results and Conclusions: The results revealed that independent of aetiology and severely of the disease CSWS EEG pattern is associated with the complex network of coherent sources in medial prefrontal cortex, somatosensory association cortex/posterior cingulate cortex, medial prefrontal cortex, middle temporal gyrus/parahippocampal gyrus/insular cortex, Thalamus and cerebellum. The described network underlying CSWS was found on both group and individual levels and was no longer observed in follow up EEGs of the patients with normalized sleep EEGs, suggesting the specificity of the network for the CSWS pattern. Further on, for the first time, using RPDC analyses we investigated the hierarchy within the described network, which showed that Thalamus, together with mesial temporal and parietal regions may be seen as a central hub of the underlying network. The involvement of this thalamocortical network, which was no longer observed in normalized EEGs, and a further propagation towards the frontal region may interfere with restructuring of cognitive networks in the sensitive phase of development.