

Neuronal networks in burst suppression EEG patterns in newborns as revealed by source analysis [Poster]

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Angaben zur Veröffentlichung / Publication details:

Reinicke, C., Muthuraman Muthuraman, F. Möller, Kidist Gebremariam Mideksa, Abdul Rauf Anwar, R. Pressler, Günther Deuschl, Michael Siniatchkin, Ulrich Stephani, and Natia Japaridze. 2014. "Neuronal networks in burst suppression EEG patterns in newborns as revealed by source analysis [Poster]." In *20th Annual Meeting of the Organization for Human Brain Mapping (OHBM) 2014, Hamburg, Germany*, PN:2191. F1000Research. <https://f1000research.com/posters/1096336>.

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Neuronal networks in Burst Suppression EEG patterns in Newborns as revealed by source analysis

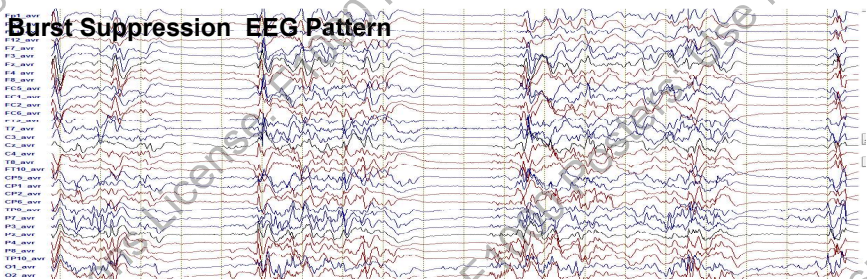
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Introduction: Burst suppression (B-S): an electroencephalogram (EEG) pattern characterized by the quasiperiodic alternant phases of a high voltage activity (burst) and electrical silence (suppression) and is considered as a global state of profound brain inactivation. Burs suppression can occur during different conditions such as Early-Onset Epileptic Encephalopathies, hypothermia, general anaesthesia and coma.

Biophysical mechanisms underlying this broad range of inactivated brain states are poorly understood.

Burst Suppression EEG Pattern



13 Neonates and infants with B-S EEG pattern were included in the study

Age range: 1 day – 13 Month

Diagnoses:

- 1 Early Myoclonic Encephalopathy
- 2 Ohtahara syndrome
- 3 early onset West syndrome
- 4 severe hypoxic ischemic encephalopathy
- 3 Neurometabolic disease

Aim: reveal the neuronal network underlying both burst and suppression phases using a source analysis method and to describe the effective connectivity between the identified sources.

Methods:

- Dynamic imaging of coherent sources (DICS) (Gross et al 2001)
- Renormalized partial directed coherence (RPDC) (Schelter et al 2008)
- DICS was applied separately to the EEG segments with burst and suppression phases
- Power spectrum analyses were performed to identify the predominant frequencies.

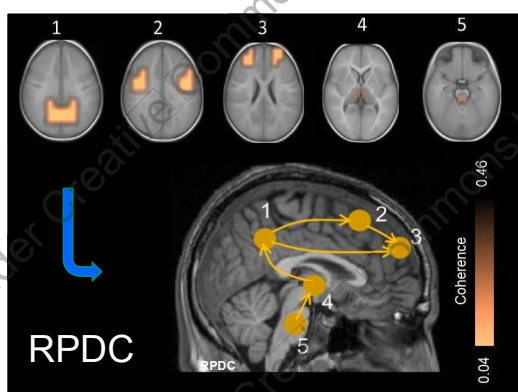
➢ The brain area with the strongest power in the analyzed frequency (1-4 Hz) range was defined as the reference region.

➢ DICS was used to compute the coherence between this reference region and the entire brain.

➢ RPDC was used to describe the informational flow between the described sources.

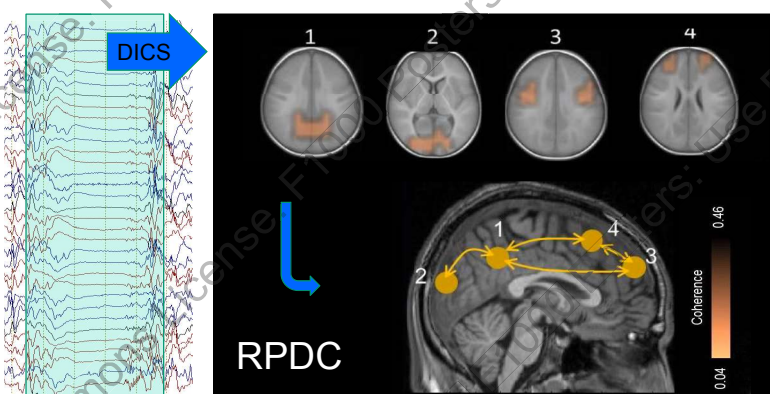
Results

Burst Phases: DICS

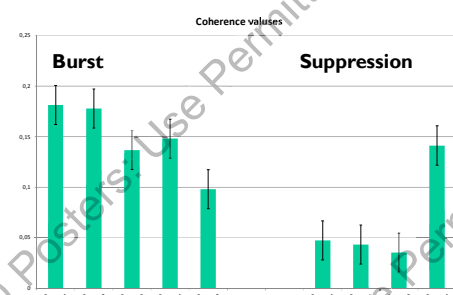


- DICS: Sources in the thalamus and brainstem as well as bilateral sources in the cortical regions mainly frontal and parietal
- RPDC: Ascending informational flow from the brainstem towards the thalamus and from the thalamus to cortical regions

Suppression Phases: DICS



- DICS: Coherent sources throughout the cortical regions
- RPDC: Intercortical connections



■ Graph is showing that Coherence values of burst phases are significantly stronger during the burst phases than during the suppression phases

Conclusion: Delta activity during the burst phases was associated with sources in the thalamus and brainstem as well as bilateral sources in the cortical regions mainly frontal and parietal, whereas suppression phases were associated with coherent sources only in the cortical regions. Results of the RPDC analyses showed an ascending informational flow from the brainstem towards the thalamus and from the thalamus to cortical regions, which was absent during the suppression phases.

Our findings support the notion that “cortical deafferentation” between the cortex and subcortical structures and desynchronizations exists especially in suppression phases of burst suppression EEG.

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