

## **Source and network analyses of epileptic activity during wakefulness and sleep**

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**Objective:** Focal epilepsies are no longer considered a dysfunction of circumscribed brain lesions but of widespread neuronal networks. The EEG records neuronal brain activity in real-time, and computer-based algorithms allow to study the underlying sources and their interconnections. Although it is well-known that the sleep-wake cycle can have a crucial impact on the occurrence of seizures, the interaction of epileptic neuronal networks and sleep-wake states has not yet been examined. Therefore, this study aims at comparing EEG brain connectivity during wakefulness and sleep between healthy subjects and patients with sleep- and/or wake-related epileptic seizures.

**Methods:** Individual EEG and structural MRI data will be retrospectively analysed. Interictal EEG will be divided into wakefulness and sleep stages. Based on individual MRI data, the EEG activity will be reconstructed within a distributed source model. Directed functional connectivity will be analysed to generate graph models of the networks, consisting of nodes (sources) and connections between them (information flow). Network properties will be statistically compared between wakefulness and sleep, healthy control subjects and patients with epilepsy, and patients with sleep- and wake-related seizures. Correlations with subsequent intracranial EEG findings or post-operative outcome in relevant subgroups will be performed.

**In search of:** Multicentric data sharing of high density EEG recordings of wakefulness & sleep in patients with epilepsy or healthy controls

**State of IRB approval (needed/pending/approved):** Pending.

**Time frame / current status:** Analyses to be started. Waiting for ethics approval

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