Postictal EEG

Post-ictal EEG alterations have been identified in studies of intracranial recordings, but the clinical significance of post-ictal EEG activity is undetermined. The purpose of this study was to examine the relationship between peri-ictal EEG activity, surgical outcome, and extent of seizure propagation in a sample of pediatric epilepsy patients.

METHODS: Intracranial EEG recordings were obtained from 19 patients (mean age = 11.4 years, range = 3-20 years) with 57 seizures used for analysis (mean = 3.0 seizures per patient). For each seizure, 3-min segments were extracted from adjacent pre-ictal and post-ictal epochs. To compare physiology of the epileptic network between epochs, we calculated the relative delta power (Δ) using discrete Fourier transformation and constructed functional networks based on broadband connectivity (conn). We investigated differences between the pre-ictal (Δpre, connpre) and post-ictal (Δpost, connpost) segments in focal-network (i.e., confined to seizure onset zone) versus distributed-network (i.e., diffuse ictal propagation) seizures.

RESULTS: Distributed-network (DN) seizures exhibited increased post-ictal delta power and global EEG connectivity compared to focal-network (FN) seizures. Following DN seizures, patients with seizure-free outcomes exhibited a 14.7% mean increase in delta power and an 8.3% mean increase in global connectivity compared to pre-ictal baseline, which was dramatically less than values observed among seizure-persistent patients (29.6% and 47.1%, respectively).

SIGNIFICANCE: Post-ictal differences between DN and FN seizures correlate with post-operative seizure persistence. We hypothesize that post-ictal deactivation of subcortical nuclei recruited during seizure propagation may account for this result while lending insights into mechanisms of post-operative seizure recurrence [1)].

1)
Tomlinson SB, Khambhati AN, Bermudez C, Kamens RM, Heuer GG, Porter BE, Marsh ED. Alterations of network synchrony after epileptic seizures: An analysis of post-ictal intracranial recordings in pediatric epilepsy patients. Epilepsy Res. 2018 Apr 5;143:41-49. doi: 10.1016/j.eplepsyres.2018.04.003. [Epub ahead of print] PubMed PMID: 29655171.