Title: Different correlates of loss of responsiveness during complex partial versus secondary generalized seizures

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Abstract: 2.3

Loss of responsiveness (LOR) during complex partial seizures (CPS) is associated with sleep-like rhythms in the cortex. However, the mechanisms of LOR during generalized tonic-clonic seizures (GTC) remain largely unknown. Here we contrasted spectral features of intracranial cortical activity during 18 CPS and 15 GTC (both leading to LOR) and during 13 simple partial seizures (SPS, without LOR), from 15 patients. We used a three-way ANOVA to examine changes from baseline in high-gamma and delta power and beta/delta ratio in three brain areas (seizure onset zone [SOZ, mostly temporal], parietal and frontal) during two ictal periods.

SPS did not exhibit significant spectral changes in the first half of the ictal period, but we found increased delta power in parietal and frontal lobes during the second half. CPS displayed high-gamma increase within the SOZ during the first ictal period, while increased delta power and decreased beta/delta ratio were observed across the whole brain during the second half. During GTC, significant high-gamma increase was observed across the whole brain and in both the first and second ictal period, with an emphasis in the second half of the seizure, which was accompanied by an increase in delta power; beta/delta ratio remained elevated throughout the ictal period across the whole brain.

While CPS combined increased high-gamma activity restricted to the SOZ and sleep-like activity across cortical regions, GTC were characterized by diffuse increase of high-gamma, delta and beta/delta ratio across brain regions, and building up throughout the seizure. SPS only showed minimal increase in sleep-like activity. These results suggest that different mechanisms may account for LOR during GTC versus CPS, with a more widespread ictal involvement of the cerebral cortex in GTC.