

## **Propagation of Interictal High Frequency Oscillations in Children with Epilepsy**

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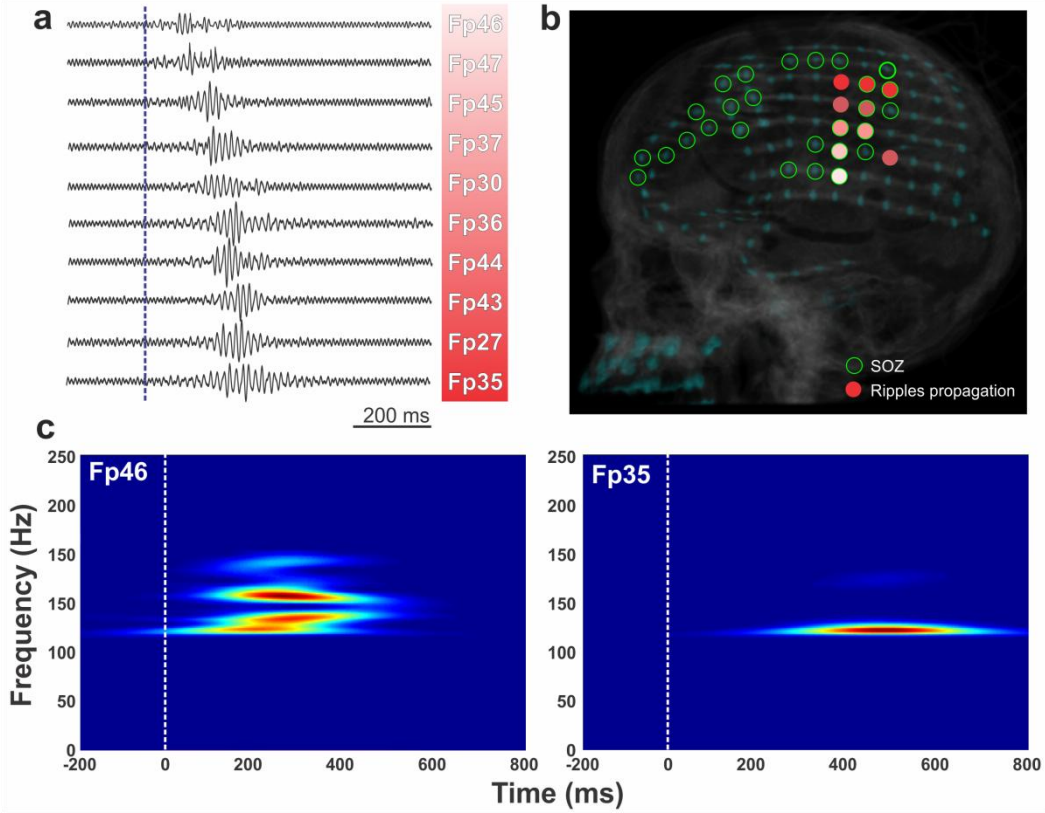
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**Rationale:** Pathological high frequency oscillations (HFOs) have emerged as biomarkers for the identification of the epileptogenic zone (EZ) that may improve presurgical diagnosis and surgical outcome of epileptic patients. Here, we present evidence of spatiotemporal propagation of interictal HFOs in the range of ripples (80-250 Hz) detected with electrocorticography (ECoG) from epileptic children.

**Methods:** ECoG data were obtained from 24 epileptic children with medically resistant partial onset seizures. Segments with interictal activity were identified by the epileptologists, and an automated algorithm was used to extract the HFOs from the envelope of the ECoG signal. Clusters of HFOs across the multichannel ECoG traces were analyzed to investigate their relative time delays and to infer their propagation. The recording site bearing the smallest rank was labeled as the lead generator of HFO discharges. HFOs were correlated with the seizure onset zone (SOZ) as defined by the epileptologists.

**Results:** We identified HFOs bursts in 17 patients with a mean frequency of  $106.84 \pm 11.66$  Hz. Visual inspection of the filtered data indicated a clear propagation pattern across channels in twelve patients (see Figure). The HFO lead generators' area was overlapping with the SOZ in eight patients.

**Discussion:** We report a spatiotemporal propagation pattern of interictal HFOs in the ripple frequency range. Our results indicate that the HFO lead generators may represent a good presurgical biomarker that identifies the EZ during the interictal period. This would limit long term monitoring and significantly improve the presurgical evaluation procedure.



**Figure 1: Propagation of ripples in a 6 years old boy with cortical dysplasia.** (a) Propagation of ripples across different ECoG channels (segment of 1 s). (b) Spatiotemporal mapping of ripples propagation and SOZ. Temporal propagation is indicated as chromatic representation (from white to red). (c) Time-frequency analysis of ripple activity from the first (Fp46) and last (Fp35) channels in the propagation from 0 to 250 Hz.