IDENTIFYING SEIZURE ONSET ZONE AND EPILEPTIC NETWORKS WITH THE DYNAMIC IMAGING OF COHERENT SOURCES

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Purpose: In the presurgical evaluation of children with refractory focal epilepsy the main difficulty is to locate the exact point of seizure onset. The aim of this study was to characterize the areas of seizure onset as well as the epileptic network involved in seizure propagation using *Dynamic imaging of coherent sources (DICS)* of ictal EEGs.

Method: DICS is an inverse solution in the frequency domain which describes neuronal networks and coherence of oscillatory brain activity by applying a spatial filter (Gross et al. PNAS 2001; 98:694–699). In 15 children with refractory focal epilepsy, typical seizures were selected from the EEGs recorded during the presurgical evaluation. For every seizure, two data sets of 10 s duration were extracted: one EEG segment contained the seizure onset and the other segment included the middle part of the seizure. For both segments, the frequency range was defined and analyzed with DICS. The brain area with the strongest power in the corresponding frequency range was defined as a reference region and its coherence with the entire brain was computed using DICS. The result of the reference region was compared with the electroclinical localization of seizure onset as well as with the postoperative resection site to determine concordance.

Results: For the beginning of the seizure, a good concordance between results of the DICS localization and postoperative outcome was achieved in all 15 patients. The analysis of seizure propagation revealed an epileptic network which resembled reverberation of epileptic activity between different brain areas.

Conclusion: DICS may be a useful tool to define the seizure onset zone and study epileptic networks.