A comparison of high frequency oscillations in high-density scalp and invasive EEG recordings using selected computer-aided detection methods - preliminary results.

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Rationale:
Although high frequency oscillations (HFOs) detected in invasive EEG recordings have been considered a promising biomarker for delineating epileptogenic brain tissue in the last decade, there are only few studies on occurrence and detectability of non-artificial/spontaneous HFOs in the scalp EEG. However, the detection of HFOs in scalp EEG recordings might provide a complementary tool, specifically for the planning of invasive EEG recordings. In the current analysis we compared HFOs detected in invasive and high-density scalp EEG recordings using selected computer-based detection methods.

Methods:
In six patients with intracerebral Stereo-EEG (9 to 15 arrays per patient, 9 channels per array) and HD-Scalp EEG (256 channels) during routine presurgical evaluation, HFOs were detected in segments of 30 minutes using different semi-automatic detection algorithms implemented in MEEGIPS, a software developed by the Department of Neurology, PMU Salzburg. Following each detection run, detected HFOs were visually reviewed in order to assess whether they were artificial or non-artificial. We then compared temporal frequency and spatial distribution of intracranial HFOs versus scalp HFOs.

Results:
In comparison to intracranial EEG recordings the scalp EEG recordings contained high proportions of artificial HFOs deriving e.g. from muscle or filtering artifacts. The number of detected non-artificial HFOs however was very low and their proportion was heavily depending on the applied detection method. In some recordings we did not find any non-artificial HFOs at all.

Discussion:
We suggest to systematically evaluate further computer-aided detection methods with respect to their suitability for high-density scalp EEG HFO detection and to adopt them to the peculiarities of scalp HFOs in order to improve detection reliability.

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