

HFOs recorded with Magnetoencephalography

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It is known from studies with intracranial electroencephalography (EEG) that high frequency oscillations (HFOs) are markers of epileptogenicity in patients with focal epilepsy. Magnetoencephalography (MEG) allows studying magnetic changes of extended cortical areas with high spatial resolution. The main obstacle in the non-invasive detection of HFOs is their low signal-to-noise-ratio (SNR). However, simulations have shown, that it is possible to record HFOs in scalp EEG and MEG. HFOs in scalp EEG recordings of epilepsy patients were shown to be spatially related to seizure onset zone. Also in MEG there is first evidence that HFOs are recordable in spatial agreement with the epileptogenic area. Several approaches, e.g. virtual electrodes, can help improving the SNR of HFOs in MEG signal. New inverse methods such as the wavelet Maximum Entropy on the Mean (MEM) method allow reconstructing the generators of single and multiple HFOs. Thus, they enable to study the spatial distribution of HFOs recorded with MEG in source space. These findings motivate further studies that evaluate epilepsy related HFOs in non-invasive MEG recordings.

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