Movement-related beta and gamma synchronization of the supplementary and primary motor cortex measured in epilepsy patients during longterm video EEG monitoring with subdural electrodes [Abstract]

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Angaben zur Veröffentlichung / Publication details:

Tamás, G., Muthuraman Muthuraman, D. Fabó, L. Entz, J. Raethjen, P. Radics, G. Rásonyi, P. Halász, and L. Eröss. 2011. "Movement-related beta and gamma synchronization of the supplementary and primary motor cortex measured in epilepsy patients during longterm video EEG monitoring with subdural electrodes [Abstract]." *European Journal of Neurology* 18 (Supplement 2): 496. https://doi.org/10.1111/j.1468-1331.2011.03552.x.

MOVEMENT-RELATED BETA AND GAMMA SYNCHRONIZATION OF THE SUPPLEMENTARY AND PRIMARY MOTOR CORTEX MEASURED IN EPILEPSY PATIENTS DURING LONG-TERM VIDEO EEG MONITORING WITH SUBDURAL ELECTRODES

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Introduction: Exploration of sensorimotor integration processes during movement regulation is crucial to understand the pathophysiology of movement disorders and the effect of neuromodulation therapy. In Parkinson's disease, dysfunction of supplementary motor cortex (SMA) has a primary role in evoking typical symptoms. In this study we detected post-movement beta (PMBS) and gamma synchronization of the SMA and primary motor cortex with electrocorticography (ECoG) in patients with epilepsy. PMBS is an electrophysiological indicator of sensorimotor integration, its parameters alter differently in several movement disorders.

Methods: ECoG in 3 patients with epilepsy was recorded during invasive preoperative long-term video EEG monitoring through subdural strip and grid electrodes placed on the SMA and lobulus paracentralis and the representation field of the hand area in the primary motor cortex. Patients were requested in the interictal period to repeat short flexions of each thumb thirty times voluntarily; the trials were averaged with respect to the offset of the brisk movements. Time-frequency analysis of power was performed with multitaper method.

Results: Post-movement synchronization could be detected mainly in the gamma frequency band above SMA and in the beta band above primary motor cortex. Latencies of post-movement synchronization varied in the SMA and primary motor cortex.

Conclusions: Activity of the SMA in the two hemispheres cannot be detected with electroencephalography or magnetoencephalography. In our study we showed the first time that post-movement synchronization appears mainly in the gamma band in the SMA. Evaluation of the latencies supports the hypothesis that post-movement synchronization indicates a motor network activity.