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G. Tamas, A. Folhoffer, Muthuraman Muthuraman, J. Raethjen, F. Szalay, A. Takats, I. Szirmai, A. Kamondi

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Post-movement beta synchronization in Wilson's disease

G. Tamas, A. Folhoffer, M. Muthuraman, J. Raethjen, F. Szalay,
A. Takats, I. Szirmai, A. Kamondi (Budapest, Hungary)

Objective: To analyze the post-movement beta synchronization (PMBS) of the electroencephalogram (EEG) in Wilson's disease.

Background: Wilson's disease is an autosomal recessive inherited disorder of copper metabolism. Its most common neurological symptoms (tremor, parkinsonism, dystonia, ataxia, chorea, dysarthria) are mainly related to dysfunction of the basal ganglia-thalamo-cortical and the cerebello-thalamo-cortical pathways. Post-movement beta synchronization is a transient power increase in the beta frequency band, which can be detected above the sensorimotor cortex 1-2 s after the termination of the movement. It is postulated that it reflects active inhibition and information processing. In essential tremor normal PMBS power but increased latency can be measured whereas in Parkinson's disease PMBS latency is normal but its power is decreased.

Methods: Ten patients with neurological manifestation of Wilson's disease and ten controls performed self-paced movement with the dominant hand during EEG acquisition. Five electrodes located in the region of the sensorimotor cortical areas were selected for evaluation (C3, C1, Cz, C2, C4). The power and latency of post-movement beta synchronization were calculated after power spectral analysis with multi taper method.

Results: PMBS power contralateral to the movement was significantly lower in patients with Wilson's disease ($1,94 \pm 0,7\%$) than in controls ($2,5 \pm 0,7\%$; $p=0,01$). In all electrode position the latency of PMBS was significantly longer in the Wilson group ($1,34 \pm 0,45s$) compared to controls ($0,93 \pm 0,44s$; $p=0,005$). The severity and type of neurological symptoms and the location and size of the MRI abnormalities were not correlated with the changes of PMBS. However, alterations of PMBS tended to be more pronounced in patients with more severe neurological symptoms.

Conclusions: PMBS is affected in Wilson's disease with neurological manifestation indicating altered information processing in the sensorimotor cortex. PMBS abnormalities are the combination of changes observed in Parkinson's disease (decrease of power) and essential tremor (elongation of latencies). This may reflect the pathological changes in both the basal ganglia-thalamo-cortical circuit and cerebello-thalamo-cortical loop in Wilson's disease.