

## Summary

Deep brain stimulation (DBS) of the globus pallidus internus (GPi) is an effective symptomatic treatment for pharmacoresistant dystonic syndromes. The relationship between grey matter volume and intracortical inhibition of the primary motor cortex (MI) in regard to the effectiveness and the state (ON/OFF) of GPi DBS was analysed in the first study. The grey matter of chronically treated patients showed hypertrophy of the supplementary motor area and cerebellar vermis whereas this difference was more significant in patients with a better clinical outcome. The grey matter of the cerebellar hemispheres of the patients showed positive correlation with the improvement of an intracortical inhibition which was generally less effective in patients regardless of the GPi DBS state. Moreover, we showed the same level of SICI in the good responders as in the healthy controls, while in non-responders was the SICI decreased.

In the second study, by using paired associative stimulation (PAS) we studied the influence of primary somatosensory cortex (SI) on the MI excitability in dystonia in regards to the effectiveness of GPi DBS. SI PAS decreased the MI excitability in the GPi DBS ON state while switching the stimulation off decreased an inhibitory effect of SI on MI excitability. Non-responders showed a persistently increased level of MI excitability regardless of the GPi DBS state. This dysfunction of the sensorimotor interaction between the SI and MI could be the reason of the poor clinical improvement after GPi DBS surgery.

The aim of the third study was to detect GPi DBS-related effects on spinal and cortical inhibitory circuitry in dystonia. The GPi DBS normalised the shortened cortical silent period onset latency, duration and end suggesting the effect at cortical level. Cutaneous silent period and H-reflex did not differ between groups, so the GPi DBS did not affect the spinal inhibitory circuitry.

The influence of GPi DBS on speech in dystonia was analysed in the fourth and sixth study, where the GPi DBS induced the worsening of the hypokinetic dysarthria, but improved the hyperkinetic dysarthria, which is the characteristic sign of the dystonic symptom.

In the sixth study, we did not find any difference in articulation rate between both GPi DBS states, so this parameter should not be used a marker of GPi DBS –induced side effects. In the fifth study, we report our experience with the treatment of patients in status dystonicus, who underwent GPi DBS with a significant reduction of dystonia.

**Keywords:** dystonia, deep brain stimulation, transcranial magnetic stimulation, voxel-based morfometry, spinal reflexes, dysarthria, status dystonicus, articulation rate

