

Department of Rehabilitation Medicine

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General Summary

The main research topics of our department are: 1) effects of repetitive transcranial magnetic stimulation (rTMS) on brain injury, 2) treatment for stroke, and 3) analysis based on database.

Research Activities

Effects of rTMS

1. We studied the relationship between sleep during low-frequency rTMS session and motor function improvement in upper limb in post-stroke patients. The bispectral index (BIS) monitor was used to investigate the relationship. The patients were sorted into awake and asleep groups based on the BIS change during rTMS sessions. Action Research Arm Test was significantly improved in asleep group compared to awake group, while Fugl-Meyer assessment was not. Sleep during low-frequency rTMS may be associated with motor improvement in upper limb hemiparesis.
2. At early stage for the upper limb paresis, healthy brain hemisphere is not yet overactive and high frequency rTMS to the damaged side is effective. For lower limbs, it is better to apply during chronic phase. Frontal lobe rTMS for apathy may also be beneficial.
3. We have been applying rTMS for aphasia since 2009 along with the therapy. Preconditioning, interhemispheric inhibition, and usage of fMRI are explained as the basis of our treatment.

Treatment for stroke

1. Motor function and spasticity
 - 1) The effects of repetitive botulinum toxin A therapy (BoNT-A) and intensive rehabilitation (IR) on lower limb spasticity in post-stroke patients were retrospectively studied. The treatment improved lower limb spasticity in post-stroke patients, and those who show the forward gait pattern prior to therapy tended to be freed from the braces after therapy.
 - 2) We retrospectively investigated the relationship between BoNT-A combined with multidisciplinary rehabilitation and muscle echo intensity in post-stroke patients with spasticity. We observed significant improvements in the modified Ashworth scale scores after the treatment, especially in those with lower echo intensity.
2. Higher brain dysfunction

- 1) We discussed five current issues on higher brain dysfunction: lack of social understanding, incomplete rehabilitation system, difficulty in differentiating social and psychological issues, diagnostic challenge, and needs for social support for return-to-work.
- 2) The approach to return-to-drive for post-stroke patients was discussed based on multi-pronged analysis.
- 3) The questionnaire was performed to patients' family, regarding the disease, home environment, and social support.

Analysis based on database

1. Impact of orthotic therapy for improving motor ability in activities of daily living in individuals with spinal cord injury was discussed as a retrospective cohort study. Leg orthoses may improve activities of daily living in individuals with spinal cord injury after the acute phase.

Publications

Hara T, Abo M, Hara H¹, Kobayashi K, Shimamoto Y¹, Shibata Y¹, Sasaki N, Yamada N, Niimi M (Kikyogahara Hosp). Effects of botulinum toxin A therapy and multidisciplinary rehabilitation on lower limb spasticity classified by spastic muscle echointensity in post-stroke patients. *Int J Neurosci.* 2018; **128**: 412-20.

Hara T, Abo M, Hara H¹, Sasaki N, Yamada N, Niimi M, Shimamoto Y¹ (Kikyogahara Hosp). The Effect of Repeated Botulinum Toxin A Therapy

Combined with Intensive Rehabilitation on Lower Limb Spasticity in Post-Stroke Patients. *Toxins (Basel).* 2018; **10**: pii: E349. doi: 10.3390/toxins10090349.

Niimi M, Sasaki N, Kimura C¹, Hara T, Yamada N, Abo M (Kimura Hosp). Sleep during low-frequency repetitive transcranial magnetic stimulation is associated with functional improvement in upper limb hemiparesis after stroke. *Acta Neurol Belg.* 2019; **119**: 233-8.