

## Department of Rehabilitation Medicine

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### General Summary

The main research topics of our department are as follows: 1) repetitive transcranial magnetic stimulation (rTMS) for stroke, 2) botulinum toxin type A (BoNT-A) for stroke, 3) development scales for children, 4) evaluation of dysphagia, 5) prevention of hospitalization-associated disability, and 6) traumatic brain injury (TBI).

### Research Activities

#### *rTMS for stroke*

1. Functional cortical reorganization after low-frequency rTMS plus intensive occupational therapy for upper limb hemiparesis: evaluation by functional magnetic resonance imaging in patients after stroke

The results indicated that our proposed treatment can induce functional cortical reorganization, leading to motor functional recovery of the affected upper limb. In particular, neural activation in the lesional hemisphere appears to play an important role in such recovery in patients with hemiparesis after stroke.

2. Bihemispheric rTMS combined with intensive occupational therapy for upper limb hemiparesis after stroke: a preliminary study

The combination of bihemispheric rTMS at both 1 and 10 Hz and intensive occupational therapy was both safe and feasible and improved the motor function of the hemiparetic upper limb in patients after stroke.

3. High-frequency rTMS using a double-cone coil for gait disturbance

High-frequency rTMS of bilateral leg motor areas using a double-cone coil can potentially improve walking function in patients with hemiparesis after stroke.

4. High-frequency rTMS applied over bilateral leg motor areas combined with mobility training for gait disturbance after stroke: a preliminary study

The protocol featuring high-frequency rTMS with a double-cone coil and mobility training is safe and feasible and can improve walking function after stroke.

5. Bilateral rTMS combined with intensive swallowing rehabilitation for chronic stroke dysphagia: a case series study

A 6-day protocol of bilateral rTMS combined with intensive swallowing rehabilitation improved laryngeal elevation delay time in all patients. Our proposed protocol of rTMS plus swallowing rehabilitation exercise seems to be safe and feasible for chronic dysphagia after stroke.

*BoNT-A for stroke*

1. Long-term effects of injection of BoNT-A combined with home-based functional training for patients with spastic upper limb hemiparesis after stroke

The combination of BoNT-A injection and home-based functional training reduced spasticity and improved the motor function of the proximal upper limb and the fingers.

2. Clinical efficacy of a double-injection protocol of BoNT-A for upper limb hemiparesis after stroke

A more significant improvement was found in muscle spasticity and in upper limb motor function after 2 injections of BoNT-A. Our findings suggest that repeated injections of BoNT-A followed by a comprehensive rehabilitative program would be an effective treatment for limb spasticity after stroke.

*Development scales for children*

1. Validity of the Family-Rated Kinder Infant Development Scale for Children

This study provides evidence for the validity of the family-rated Kinder Infant Development Scale for assessing the developmental age of children in early childhood.

*Evaluation of dysphagia*

1. Applicability of the 2-step thickened water test in patients with poststroke dysphagia: a novel assessment tool for paste food aspiration

The 2-step thickened water test might be a useful tool for assessing the risk of paste food aspiration in patients with dysphagia after stroke.

*Prevention of hospitalization-associated disability*

1. Systematic introduction of a system to prevent hospitalization-associated disability: preliminary trial to improve the quality of medical care for hospital patients

Our proposed system to prevent hospitalization-associated disability was safely introduced in our hospital and appears to facilitate the early rehabilitation of hospitalized patients.

*TBI*

1. Vocational rehabilitation for clients with cognitive and behavioral disorders associated with TBI

Despite a high prevalence of cognitive and behavioral disorders after moderate-to-severe TBI, long-term functional improvement is likely to occur in clients with TBI. Greater gains in both physical and cognitive functions are made through a multidisciplinary, wide-ranging, comprehensive approach to rehabilitation.

**Publications**

**Yamada N, Kakuda W, Senoo A, Kondo T, Mitani S, Shimizu M, Abo M.** Functional cortical reorganization after low-frequency repetitive transcranial magnetic stimulation plus intensive occupational therapy for upper limb hemiparesis:

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cranial magnetic stimulation combined with intensive occupational therapy for upper limb hemiparesis after stroke: a preliminary study. *Int J Rehabil Res.* 2013; **36**: 323-9.

**Sasaki N, Mizutani S, Kakuda W, Abo M.** Comparison of the effects of high- and low-frequency repetitive transcranial magnetic stimulation on upper limb hemiparesis in the early phase of stroke. *J Stroke Cerebrovasc Dis.* 2013; **22**: 413-8.

**Kakuda W, Abo M, Nakayama Y, Kiyama A, Yoshida H.** High-frequency rTMS using a double cone coil for gait disturbance. *Acta Neurol Scand.* 2013; **128**: 100-6.

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**Momosaki R, Abo M, Kakuda W.** Bilateral repetitive transcranial magnetic stimulation combined with intensive swallowing rehabilitation for chronic stroke dysphagia: a case series study. *Case Rep Neurol.* 2014; **6**: 60-7.

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**Hashimoto K, Sakamoto N, Takekoh M, Ikeda N, Kato K, Honda M, Tamai S, Miyamura K,**

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**Watanabe S.** Vocational rehabilitation for clients with cognitive and behavioral disorders associated with traumatic brain injury. *Work.* 2013; **45**: 273-7.

**Takekawa T, Hara T, Kakuda W, Kobayashi K, Sase Y, Abo M.** Clinical efficacy of a double injection protocol of botulinum toxin type A for upper limb hemiparesis after stroke (in Japanese). *Japanese Journal of Rehabilitation Medicine.* 2014; **51**: 38-46.

**Kakuda W, Furuta N, Shibata T, Inomata E, Nakayama Y, Nakamura C, Yoshida H, Mochio K, Watanabe S, Abo M.** Systematic introduction of a system to prevent hospitalization-associated disability: preliminary trial to improve the quality of medical care for hospital patients (in Japanese). *Tokyo Jikeikai Ika Daigaku Zasshi.* 2014; **129**: 59-70.

## Reviews and Books

**Abo M.** Repetitive transcranial magnetic stimulation and rehabilitation (in Japanese). *Rinsho Shinkeigaku.* 2013; **53**: 1264-6.