

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) driving after stroke, 3) development of scales for children, 4) imaging in mild traumatic brain injury (TBI), and 5) cognitive rehabilitation.

Research Activities

rTMS for stroke

1. Effectiveness of low-frequency rTMS and intensive speech therapy in patients with aphasia after stroke: A pilot study based on evaluation with functional magnetic resonance imaging in relation to the type of aphasia

Patients with left-hemispheric stroke and aphasia were studied. Each patient received 10 treatment sessions consisting of low-frequency (LF) rTMS and intensive speech therapy. The area for stimulation was selected with functional magnetic resonance imaging. The LF-rTMS was applied to the inferior frontal gyrus for patients with nonfluent aphasiae and to the superior temporal gyrus for patients with fluent aphasiae. After treatment, patients with nonfluent aphasiae showed significant improvements in auditory comprehension, reading comprehension, and repetition. Patients with fluent aphasia showed a significant improvement in spontaneous speech only.

2. Effect of LF-rTMS on motor neuron excitability after stroke

Patients with spastic upper-limb hemiparesis after stroke were studied. The LF-rTMS was applied to the motor cortex of the nonlesional hemisphere. The amplitude ratio of mean F-wave to M-response (F-mean/M ratio) was measured before and after LF-rTMS and was analyzed for both limbs. The application of LF-rTMS significantly decreased the F-mean/M ratio in the affected upper limb but not in the unaffected limb.

3. Change in regional cerebral blood flow after LF-rTMS combined with intensive occupational therapy for upper-limb hemiplegia after stroke: A study with single photon emission computed tomography

Patients with upper-limb hemiplegia after stroke were studied with single photon emission computed tomography before and 4 weeks after treatment with LF-rTMS and intensive occupational therapy. Before and after treatment, the function of the hemiplegic upper-limb function showed significant improvement. The specific areas with significantly increased regional cerebral blood flow (rCBF) were the insula (BA 13), precentral gyrus (BA 44), and cerebellum in the affected hemisphere, and the lingual gyrus and cer-

ebellum in the nonaffected hemisphere. On the other hand, rCBF was significantly decreased in the middle frontal gyrus (BA 6), precentral gyrus (BA 4), and postcentral gyrus (BA 3) in the nonaffected hemisphere. These results suggest that the combination of LF-rTMS and intensive occupational therapy has an effect on rCBF and has contributed to the improvement of upper-limb hemiplegia after stroke.

Driving after stroke

1. Resumption of driving after stroke

In a questionnaire survey of 525 patients discharged after stroke, 118 patients responded that they drove before having a stroke, and 42 (35.6%) had resumed driving. At the time of discharge, nearly 70% wanted to start driving again. Supporting the resumption of driving after stroke is an important mission for rehabilitation specialists.

Development of scales for children

1. Evaluation of the Ability for Basic Movement Scale for Children Type T in disabled children

Children with disabilities who were able to walk participated in this study. Subjects were administered the Ability for Basic Movement Scale for Children Type T (ABMS-CT) by 2 physicians, and the results of the Functional Independence Measure for Children (WeeFIM) were recorded. Spearman's rank correlation coefficient analysis showed that both the individual scores for each item and the total scores of the ABMS-CT correlated significantly with the total scores of the WeeFIM. The items of the ABMS-CT had appropriate internal consistency and reliability.

Imaging in mild TBI

1. A new method for evaluating of mild TBI with neuropsychological impairment using statistical imaging analysis for Tc-ethyl cysteinate dimer single-photon emission computed tomography

Using 2 analytic software packages, the easy Z-score imaging system and voxel-based stereotactic extraction estimation, we identified specific lesions with low regional uptake of Tc-99m ethyl cysteinate dimer possibly associated with neuropsychological impairment (NPI) after mild TBI. This trend was most marked in the left anterior cingulate gyrus in patients with mild TBI and NPI and in patients with diffuse axonal injury. The optimal "extent" cutoff value, as a criterion for single-photon emission computed tomography abnormality, might help the diagnosis of NPI after mild TBI.

Cognitive rehabilitation

1. Evidence based cognitive rehabilitation

To establish best practice recommendations, it is necessary to assess the evidence regarding cognitive rehabilitation. This study sought to integrate a growing number of treatment guidelines recommending the delivery of evidence-based cognitive rehabilitation. 1) The guidelines suggest several interventions that may be used to treat patients with aphasia. 2) There is strong evidence that compensatory strategy training is effective in improving memory outcomes after brain injury and, therefore, improving quality

of life. 3) Direct attention training may be recommended for patients who unable to concentrate, and time pressure management significantly reduces task errors. 4) Survivors of TBI with deficits of executive functioning should receive metacognitive treatment or goal management training. 5) Patients with apraxia should be trained in compensatory strategies, e.g., verbalization and following a written/pictorial action sequence. 6) Longitudinal studies suggest that planned behavioral modification programs are effective for preventing these undesired behaviors from becoming established. 7) For patients with brain injury who want to return to work, supported employment is effective.

Publications

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