

## Department of Rehabilitation Medicine

---

Masahiro Abo, *Professor*  
Takeshi Kamikubo, *Assistant Professor*

Kazushige Kobayashi, *Associate Professor*  
Keiji Hashimoto, *Assistant Professor*

### General Summary

The main research projects in our department have focused on perfusion-weighted imaging, diffusion-weighted imaging, brain injury, falls, the easy Z-score imaging system, voxel-based stereotactic extraction estimation, dysphagia, gastrostomy catheters, and stroke rehabilitation.

### Research Activities

**Perfusion-weighted imaging and diffusion-weighted imaging:** Although the perfusion-weighted imaging/diffusion-weighted imaging mismatch model has been proposed to identify patients with acute stroke who would benefit from reperfusion therapy, the optimal definition of a mismatch is uncertain. We evaluated the odds ratio for a favorable clinical response to reperfusion compared with no reperfusion in patients at various mismatch ratio thresholds enrolled in the Diffusion and Perfusion Imaging Evaluation for Understanding Stroke Evolution study. A mismatch ratio of 2.6 provided the highest sensitivity (90%) and specificity (83%) for identifying patients in whom reperfusion was associated with a favorable response. Defining mismatch with a larger weighted imaging/diffusion-weighted imaging ratio may provide greater power for detecting the beneficial effects of reperfusion.

**National Institutes of Health Stroke Scale:** For patients with stroke and a perfusion-weighted imaging /diffusion-weighted imaging mismatch treated with intravenous tissue plasminogen activator at 3 to 6 hours, a substantial change in the baseline National Institutes of Health Stroke Scale (NIHSS) score ( $\geq 10$  points) is a potent discriminator of patients who experience early reperfusion from those who do not. In addition, an NIHSS score of  $\leq 2$  appears to be an excellent endpoint for phase II studies of reperfusion therapies.

**Patients with traumatic brain injury:** To investigate brain activation in the prefrontal cortex during the Wisconsin Card Sorting Test (Keio Version) (KWCST), we examined changes in total hemoglobin volume in 8 patients with traumatic brain injury (TBI) and 20 healthy control subjects using 2-channel near-infrared spectroscopy. We found that mean total hemoglobin volume in the right prefrontal cortex during the KWCST in patients with TBI ( $-0.131 \pm 0.127$ ) was significantly lower than that in control subjects ( $0.016 \pm 0.135$ ;  $2 \times 3$  ANOVA;  $p < 0.05$ ). These results demonstrate that patients with TBI have lower circulation of hemoglobin in the right prefrontal cortex during the KWCST than do control subjects.

**Dysphagia:** The factors affecting the risk of accidents during the replacement of gastrostomy catheters remain unknown and, therefore, have not been thoroughly investigated.

We performed a nationwide questionnaire survey of 415 rehabilitation-training facilities for the replacement of gastrostomy catheters. We received 221 valid responses. Among the catheter-replacement methods submitted, the bumper button replacement method was the most widely chosen, comprising 40% of the valid responses. The measures used to prevent accidental erroneous catheterization included examination of the stomach contents, endoscopic examination of the stomach, and the detection of insufflation sounds, although these measures varied widely among the facilities. Fifty-one of the 221 facilities that responded to the survey reported various mishaps, of which 20 were due to erroneous catheterization. In approximately 40% of the facilities, there was no operative manual for the replacement nor was the patient's consent obtained before the procedure was performed. This investigation clarifies the risks involved in the replacement of gastrostomy catheters. This survey also suggests that the methods for catheter replacement should be re-examined to prevent accidents.

**Preventing Falls:** Falls and fall-related injuries, such as hip fracture, are among the most common medical problems of older persons. Predisposing factor for falls can be divided 2 categories, intrinsic factors and extrinsic factors. Intrinsic factors include motor impairments, sensory disturbances, cognitive dysfunctions, and psychological factors. Extrinsic factors include environmental factors and medication use. Of these factors, a history of falling is a consistently proven predictor of the risk of future falls. Patients with stroke, dementia, or Parkinson disease are usually considered to be at high risk for falls. Many randomized controlled trials have examined the effects of preventive interventions, such as physical exercise and environmental modifications, in elderly persons living at home, in care facilities, or in hospitals. These studies have shown that a multifactorial intervention program can prevent falls. The strategy for fall prevention comprises an exercise program for improving motor function and environmental modifications. For persons living at home, regular physical exercise, consisting of muscle training, balance training, and aerobic exercise, is recommended as "preventive rehabilitation". For persons living in care facilities and for in-patients, the risk of falls should be assessed at the time of admission. The assessment will indicate intervention needed to reduce the risk of falls. The hospital staff should assess ambulation, transferring, toileting, beds, rooms, floor, stairs, bathrooms, footwear, lighting, and medications and modify them if they are inappropriate for preventing falls. In addition, some physical practice is recommended to prevent disuse syndrome. Physical restraints might be needed for some patients with psychological problems, although restraints should not be introduced easily. Hip protectors are effective for preventing hip fracture due to falls but do not prevent falls themselves. Health professionals should pay more attention to falls prevention.

## Publications

**Kakuda W, Abo M.** Intravenous administration of a tissue plasminogen activator beyond 3 hours of the onset of acute ischemic stroke: MRI-based decision making (in Japanese). *Brain Nerve* 2008; **60**: 1173-80.

**Momosaki R, Sugawara H, Sasaki N, Abo M, Kimura C.** Questionnaire survey about gastrostomy catheter replacement in training facilities of the Japanese Association of Rehabilitation Medicine (in Japanese). *Jpn J Rehabil Med* 2008;

45: 291-5.

**Kakuda W, Hamilton S, Thijs VN, Lansberg MG, Kemp S, Skalabrin E, Albers GW.** DEFUSE investigators: optimal outcome measures for detecting clinical benefits of early reperfusion: insights from the DEFUSE Study. *J Stroke Cerebrovasc Dis* 2008; **4**: 235-40.

**Kakuda W, Lansberg MG, Thijs VN, Kemp SM, Bammer R, Wechsler LR, Moseley ME, Marks MP, Albers GW.** DEFUSE investigators: optimal definition for PWI/DWI mismatch in acute ischemic stroke patients. *J Cereb Blood Flow*

*Metab* 2008; **28**: 887-91.

**Hashimoto K, Uruma G, Abo M.** Activation of the prefrontal cortex during the wisconsin card sorting test (Keio Version) as measured by two-channel near-infrared spectroscopy in patients with traumatic brain injury. *Eur Neurol* 2008; **59**: 24-30.

**Kakuda W, Abo M.** Preventing falls: current status of falls and the preparedness action plan (in Japanese). *Tokyo Jikeikai Ikadaigaku Zasshi (Tokyo Jikeikai Med J)* 2008; **123**: 347-71.