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# Local cerebral hemodynamic response in frontal and parietal cortices during mental rotation of hand pictures in patients with post-stroke hemiparesis: a near-infrared spectroscopy (NIRS) study

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< Introduction>

Occupational therapy for post-stroke hemiparesis has been performed mainly aiming to improve upper limb function. Application of motor imagery training is one of the therapies for paretic upper limb function. A mental rotation task using hand pictures involves presentation of a hand picture at various angles and requires subjects to determine whether the hand is a right or left hand. The task is considered to cause motor imagery. For the practical application of the task, it is necessary to understand the brain activity of patients with post-stroke hemiparesis while they are performing the task.

< Objectives>

In the present study, we used NIRS to investigate the brain activity during mental rotation of hand pictures in patients with post-stroke hemiparesis..

< Methods>

The subjects were 3 patients (2 males and 1 female, Age 46, 68, and 72) with post-stroke hemiparesis. A rotated hand photograph for a task period (8 pictures/cycle) and an arrow picture (point to right or left) for a resting period (8 pictures/cycle) were displayed every 7 s on a LCD monitor. The subjects were required to judge whether the hand was right or left hand, and to judge whether the arrow pointed to right or left. According to the international 10-20 system, the NIRS probes were mounted on head shells and were placed on the scalp overlying premotor, sensorimotor, and parietal association cortices. The changes in the concentrations of oxygenated hemoglobin (Oxy-Hb) and deoxygenated Hb in both the frontal and parietal cortices were recorded during 6 cycles of the 56 s tasks and 56 s resting periods.

< Results>

Significant task-related Oxy-Hb increases were observed in the bilateral premotor, sensorimotor, and parietal association cortices of all the subjects during the task.

< Conclusion>

The finding showed that the mental rotation task using hand pictures induced the cerebral activation in both parietal and frontal cortices, and suggested that motor imagery was caused by the mental rotation task.

< Contribution to the practice>

Widespread activation caused by the mental rotation of hand pictures may contribute to improvement of post-stroke hemiparesis.