Brain activity assessments by Functional Near-Infrared Spectroscopy between the Motivate exercise and passive ROM exercise to the day-care stroke patients in our rehabilitation hospital

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Abstract
The role of the medical faculty has been classified to main three types, an acute hospital, a sub acute ward in hospital, and a chronic hospital or nursing home since 2000 in Japan. The concepts of these classifications are reduction of medical expenses. The shorter the better in acute phase, the concentrated rehabilitation in sub acute phase only, and then in chronic phase the man power including nursing care and rehabilitation staffs declines rapidly. To keep the rehabilitation program in longer period we have recommended the Motivative exercise since two decades. This exercise can continue by themselves with small staffs. We tried to verify the usefulness of this exercise by Functional Near Infrared Spectroscopy (f-NIRS) compared with the passive manual ROM exercise by physical therapists. And we have got the advantageous results that this exercise activates brain function better than passive ROM exercise by f-NIRS.

Purpose
We have already reported the effectiveness of this Motivative exercise by fMRI. (2012). But by the fMRI the condition was limited to ankle movements only. So we also verify the further study by fNIRS to explain this exercise effective to brain activity during combined knee and ankle exercise.

Method
We practiced these protocols from March to August; 2010 in Okayama rehabilitation hospital. The subjects were 13stroke patients who entree in our day rehabilitation services. Their age 54 to 83 (ave.68). All were passed over 1year since stroke onset. We selected their functional evaluation by Care Scale, BRS and ROM to both lower extremities, BI and MMSE (HDSR: mental test).

The FIORE-3000 by Shimazu Corporation was used for fNIRS extermination. FIORE-3000 can perform the oxygen hemoglobin change of the brain surface.

After these practices we calculated the DATA by Bonferroni’s Method, analysis soft device attached to Fiore 3000.

Result
Comparing these two exercises, we verify the brain activated more in the Motivative exercise to affected lower limb. We analyzed ox hemoglobin (OxyHb) three times summation by t statistics’ soft in fNIRS. But rough their functional changes or differences between March and August couldn’t be gotten.

Consideration
This study is one of the six trials allover Japan, using national research funds. We are sure the Motivative exercise effective to old stroke patients. This exercise’s tool; PATA-KORO is very convenient and portable. And by fNIRS, we can certify these tiny tools have the big power to activate the affected brain. After 15years large numbers of the Japanese baby boomers will grow older.

We hope they will keep their independent life by themselves as long as possible by Motivative exercises.

Reference
1) Yoshiko Morita, Editorial supervision, the collection of biophilia rehabilitation society research section meeting Medical Research Institute drafts, 2013.3.1, Yokohama
2) Yoshiko Morita¹ and Shigeo Takizawa, Brain Activity During Motivative Exercise Versus Passive ROM Exercise by fMRI, BIOPHILIA, 2.1, pp35-40