뇌신경재활

게시일시 및 장소 : 10 월 18 일(금) 13:15-18:00 Room G(3F)

질의응답 일시 및 장소 : 10 월 18 일(금) 15:45-16:30 Room G(3F)

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The Mechanism of Gait Recovery using End-effector type Rehabilitation Robot for Stroke Patients

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Objective

To demonstrate the effect and mechanism of the end-effector type rehabilitation robot (Morning-walk) for stroke patients.

Methods

Stroke patients with functional ambulatory category scale 2 or higher were included in this study. Patients were randomly assigned to one of two groups: 30 minutes of training with Morning walk, a lower limb rehabilitation robot, plus 1 hour of conventional physiotherapy or 30 minutes of training with ergometer plus 1 hour of conventional physiotherapy. All patients received rehabilitation five times per week for three weeks. The primary outcome was the changes of brain activity evaluated by functional Near-Infrared Spectroscopy. (fNIRS) The secondary outcomes were functional ability, assessed using the functional ambulatory category scale, modified Barthel index, Berg balance scale, Motricity index, 10 meter walk test and gait parameters evaluated by motion analysis. All patients were evaluated functional ability before and after 3 weeks of rehabilitation. Also, in the case group, patients were evaluated brain activity using fNIRS at the first and last session of robot assisted gait training.

Results

A total of 13 patients were included in analyses. (Case 7, Control 6) Table 1 represents baseline characteristics of case and control group. There was no significant difference between case group and control group. Table 2 represents the changes of clinical variables before and after 3 weeks of rehabilitation. Although not statistically significant, the results of 10m walk test, motricity index and Rivermead mobility index were more improved in the case group than the control group. Figure 1 represents one example of changes in brain activity evaluated by fNIRS at the first and the last session of rehabilitation. Compared to resting state, the premotor and motor cortical activities of both affected and unaffected side were increased at the end of robot assisted gait training in the first session. The premotor and motor cortical activities of both affected and unaffected side were increased from the early stage of robot assisted gait training in the last session. Generally, the

average degree of brain activity in the last session was higher than brain activity in the first session.

Conclusion

Our results implied that robot assisted gait training with Morning-walk combined with conventional physiotherapy improve walking ability. Furthermore, the premotor and motor cortical activities of stroke patients were increased with robot assisted gait training. These results could provide some explanations for the mechanism of recovery from rehabilitation in the stroke patients. For this work, further study will be necessary.

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Table 1. Baseline characteristics of patients. There was no significant difference between case group and control group.

Clinical variables	Case (n=7)	Control (n=6)	p-value
Age (years)	58.3	67.2	0.53
Sex (Male)	4	1	0.27
Weight (Kg)	62.1	55.3	0.18
Height (cm)	167.1	161.2	0.13
BMI (Kg/cm^2)	22.23	21.29	0.3
Etiology (Infarction)	6	3	0.27
Onset (month)	2.41	3.5	0.1
Initial MBI	68.29	60.33	0.45
Initial BBS	40	30.83	0.23
Initial Motricity index	73.71	69.33	0.63
Initial Gait speed (m/s)	0.85	0.43	0.08

Note : Values are presented as mean

Abbreviations : BMI, Body mass index; MBI, Modified Barthel index; BBS, Berg balance scale

Table 2. The changes of clinical variables before and after 3 weeks of rehabilitation. Although not statistically significant, the results of 10m walk test, motricity index and Rivermead mobility index were more improved in case group than control group.

Clinical variables	Case (n=7)	Control (n=6)	p-value
Improvement of FAC	5	3	0.59
10MW_SSV (sec)	-2.84	-0.09	0.18
10MW_FV (sec)	-2.06	-1.19	0.63
K-MBI	14.29	12.83	0.95
BBS	7.71	6.5	0.73
MI_Lower	9.14	5	0.45
Rivermead Mobility Index (RMI)	3.71	1.33	0.05
Affected side step length (cm)	5.72	5.24	0.93
Stride length (cm)	12.05	11.36	0.79
Step width (cm)	3.63	-1	0.33
Stance phase(%)	3.4	4.42	0.54
Swing phase(%)	-4.46	-4.55	0.54
Single support(%)	2.52	-6.06	0.43
Total double support(%)	1.72	13.58	0.33
Load response(%)	0	0.74	0.66
Preswing (%)	0.3	10.82	0.25
Step time(sec)	-0.08	-0.31	0.05
Gait cycle(sec)	-0.19	-0.53	0.08
Cadence	4.65	25.72	0.08
Gait speed (m/s)	0.15	0.21	0.79
Average speed (m/s)	0.16	0.24	0.79

Note : Values are presented as mean

Abbreviations : FAC, Functional ambulatory category; 10MW_SSV, 10m walk test self selected velocity; 10MW_FV, 10m walk test fastest possible velocity; K-MBI, Korean version modified Barthel index; BBS, Berg balance scale; MI, motricity index

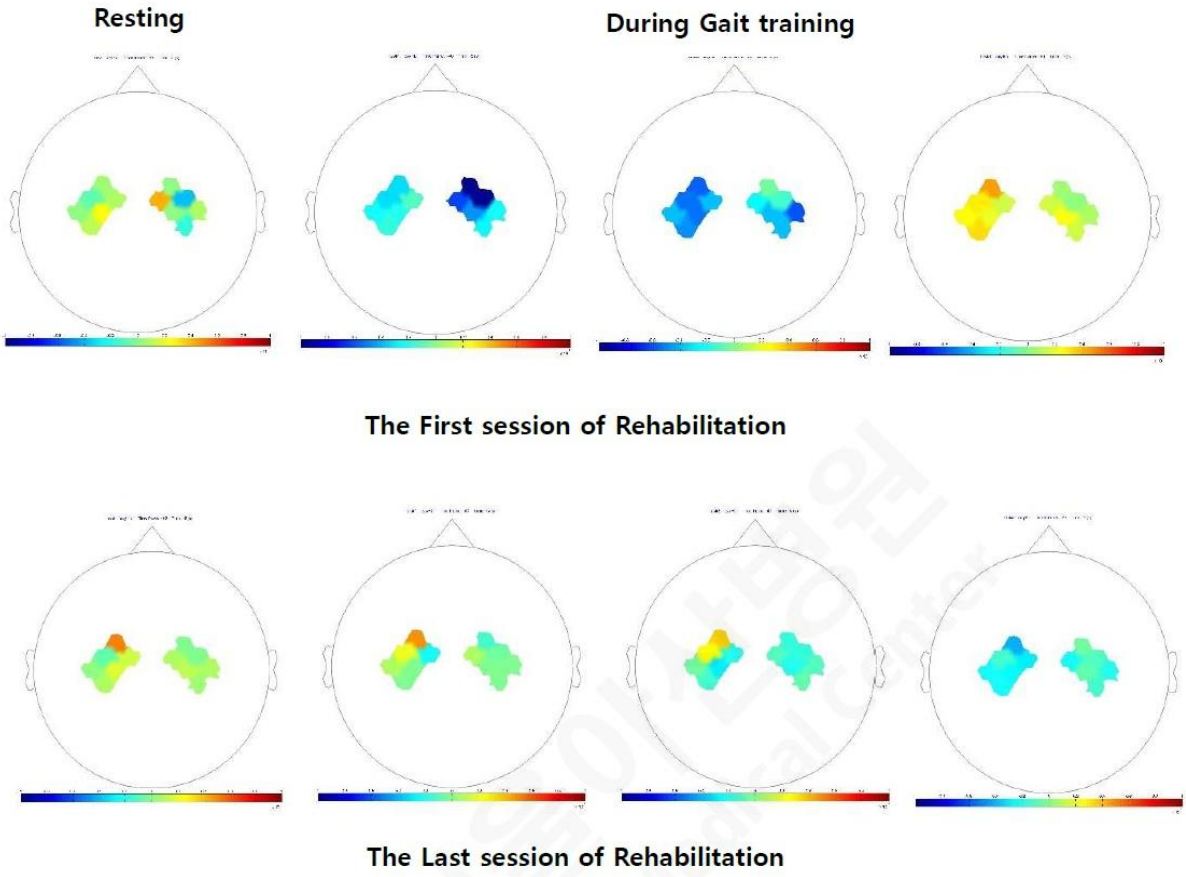

Figure 1. The example of changes in brain activity evaluated by fNIRS at the first and the last session of rehabilitation using end-effector type rehabilitation robot (Morning walk). This patient was diagnosed with Rt. hemiparesis due to Lt. internal capsule infarction. Compared to resting state, the premotor and motor cortical activities of both affected and unaffected side were increased at the end of robot assisted gait training in the first session. The premotor and motor cortical activities of both affected and unaffected side were increased from the early stage of robot assisted gait training in the last session.