Oral Communication

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Transcutaneous Spinal Stimulation Combined With A Long Opponent-Pronation Orthosis (FAST-HAND) for Upper Extremity Motor Function in Patients With Chronic Stroke: A Randomized, Controlled Trial

Topic: Neurostimulation (rTMS, tDCS, etc.)

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BACKGROUND

Motor impairment of the upper extremity (UE) after stroke is a substantial burden on individuals. Recovery of function in the hemiparetic UE is still challenging. To address this, we developed a novel rehabilitation treatment, transcutaneous spinal stimulation combined with a long opponent-pronation orthosis. This treatment is called functional assistive stimulation for the hand (FAST-HAND). We conducted a randomized, controlled trial. This trial aimed to assess the effect of FAST-HAND in patients with chronic stroke.

METHODS

This was a single-blind, randomized, controlled trial with a four-week follow-up. All participants received task-oriented UE rehabilitation for 40 minutes per session, twice a week, for a total of eight sessions. In the FAST-HAND group, participants received rehabilitation sessions trained with transcutaneous spinal stimulation combined with a long opponent-pronation orthosis. In the Control group, the participants received rehabilitation sessions without these devices. The Fugl-Meyer Assessment upper extremity motor score (FMA-total), the modified Ashworth scale, the Motor Activity Log-14 amount of use, the Box and Block Test, the H-reflex, and reciprocal inhibition were assessed before, after, and 4 weeks after intervention.

RESULTS

Fifteen participants were randomly allocated to the FAST-HAND (n = 7) and Control (n = 8) groups. Two-way ANCOVA showed a significant main effect of time in FMA-total ($p = 0.012$, $\eta 2 = 0.309$). The post hoc paired t-test showed that FMA-total (mean [95% Confidence Interval]) was significantly changed after (42.4 [29.5 to 55.4]) compared to before (39.0 [25.1 to 52.9]) ($p = 0.014$). FMA-A and FMA-C showed the significant main effect of time on two-way ANCOVA (FMA-A: $p = 0.036$, $\eta 2 = 0.261$ and FMA-C: $P < 0.001$, $\eta 2 = 0.521$). The post hoc paired t-test showed that FMA-A in the FAST-HAND group was significantly changed at post (23.0 [15.3 to 30.7]) compared with before (21.6 [13.7 to 29.5]) ($p = 0.025$).

CONCLUSION

This novel rehabilitation treatment, FAST-HAND, transcutaneous spinal stimulation combined with a long opponent-pronation orthosis, improved UE motor function immediately after the intervention. This treatment could be beneficial for UE rehabilitation in chronic stroke patients.

Statement of Disclosures

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Toshiyuki Fujiwara is the named lead inventor of a patent on the transcutaneous spinal stimulation device used in this trial.

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