



Original Article

Effect of mirror therapy and electrical stimulation on upper extremity function in stroke with hemiplegic patient: a pilot study

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Abstract. [Purpose] This study investigated the effects of mirror therapy and neuromuscular electrical stimulation on upper extremity function in stroke patients. [Subjects and Methods] This study recruited 8 stroke patients. All patients were treated with mirror therapy and neuromuscular electrical stimulation five times per week for 4 weeks. Upper limb function evaluation was performed using upper extremity part of fugl meyer assessment. [Results] Before and after intervention, fugl meyer assessment showed significant improvement. [Conclusion] In this study, mirror therapy and neuromuscular electrical stimulation are effective methods for upper extremity function recovery in stroke patients.

Key words: Electrical stimulation, Mirror therapy, Stroke

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INTRODUCTION

Mirror therapy is known as a treatment for improving upper extremity function in stroke patients¹⁾. Previous studies have shown that mirror therapy improves upper extremity function and activation of the motor area of the brain in stroke patients^{1, 2)}. However, mirror therapy does not have an afferent stimulus that actually enters the upper extremity. On the other hand, neuromuscular electrical stimulation (NMES) is effective in decreasing spasticity, muscle re-education, and improving functional movement through electrical stimulation on the paralyzed upper extremity³⁾. In other words, NMES has an afferent stimulus coming into the upper paralyzed side. Therefore, mirror therapy and NMES are complementary treatments. Therefore, this study investigated the effect of mirror therapy and NMES on upper extremity function in stroke patients.

SUBJECTS AND METHODS

This study recruited 8 stroke patients. Selection criteria are as follows. Hemiplegia after stroke, modified Ashworth Scale <2, wrist strength poor grade or better, and no communication problems. The purpose of the study was explained to the participants before enrollment, and informed consent for participation was obtained in accordance with the principles of the Declaration of Helsinki. Mirror therapy was performed based on the previous studies⁴⁾. Both hands were placed on a desk and a mirror placed between them. During the movement of the affected arm, the mirror was observed. Mirror therapy was performed for 20 minutes a day. Immediately after mirror treatment, NMES (Mendel GmbH, Germany) was mediated. NMES was attached to the wrist extension of the arm of the paralyzed arm, and the electric intensity was set to such an extent

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that the wrist could be fully extended. NMES was mediated for 20 minutes a day.

Upper extremity function evaluation was performed using upper extremity part of fughl meyer assessment (FMA). To evaluate the intervention effects, measures before and after the intervention in each patient were compared using the Wilcoxon signed-rank test. Statistical analyses were performed using SPSS version 15.0 (SPSS Inc., Chicago, IL, USA).

RESULTS

Before and after intervention, FMA showed significant improvement from 29.5 ± 12.4 to 36.5 ± 15.5 ($p < 0.05$).

DISCUSSION

This study demonstrates that mirror therapy and NMES are effective interventions to improve upper extremity function in stroke patients. Mirror therapy causes optical illusion through observation of the upper extremity movement reflected in the mirror. At this time, activation of the brain related to the paralyzed upper extremity movement occurs²). Mirror therapy can positively contribute to the plasticity of damaged brain in stroke patients⁵). This activation of the brain also affects the functional recovery of the paralyzed upper extremity. However, mirror therapy does not have an afferent stimulus that stimulates the nerve roots of the upper paralyzed side. NMES, on the other hand, has an afferent stimulus called electrical stimulation in the upper extremity. NMES is known to be effective in decreasing spasticity and increasing functional movement of the paralyzed upper extremity. The results of these previous studies support the results of this study^{6, 7}). Therefore, this study suggests that mirror therapy and NMES are effective methods for restoring upper extremity function in stroke patients. This study has some limitations. Owing to the small number of subjects, the results are difficult to generalize. The effect of intervention could not be compared with that of only mirror therapy or NMES because of the single-group design without a control group.

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