

척수재활

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Effects of Combined Upper Limb Robotic Therapy in Patients with Cervical Spinal Cord Injury

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Background

Therapy using robotics is more accurate and repetitive than conventional therapy and is expected to be effective in improving neuroplasticity in patients with spinal cord injury (SCI). Studies on the application of upper limb rehabilitation robot to tetraplegic patients with SCI is very lacking, especially on combined upper limb robotic therapy which simultaneously applies not only proximal but also distal upper limb.

Objective

To confirm the effects of combined upper limb robotic therapy (RT) in comparison with conventional occupational therapy (OT) in patients with cervical SCI. And based on these, to suggest treatment guidelines of combined upper limb RT in patients with cervical SCI for optimizing the effects.

Methods

Forty-three individuals with cervical SCI were enrolled and screened for eligibility. Participants were divided randomly into the RT (experimental) group and OT (control) group. The intervention included combined upper limb RT using Armeo power and Amadeo in the RT group or conventional OT in the OT group by experienced therapist in addition of daily inpatient rehabilitation program. The side of upper limb with lower manual muscle test (MMT) scores was chosen as the therapy side. Participants undergone 3 sessions of intervention per week, for 5 weeks, total 15 sessions. Before and after the intervention, we evaluated MMT scores of key muscles and grip strength as primary outcome measures, and Spinal Cord Independence Measurement III (SCIM-III), Graded and redefined assessment of strength, sensibility and prehension (GRASSP) as secondary outcome measures.

Results

After 5 weeks of intervention, both groups demonstrated improvements in strength and function of intervened upper limb measured by MMT, grip strength, SCIM-III and GRASSP compared to before intervention with different training effects. The RT group (n=17)

showed significant increases in MMT scores of elbow flexion/extension, 2-5th metacarpophalangeal extension and SCIM-III subscores of bathing-upper, dressing-upper, grooming which were not observable in the OT group (n=13). There was significant increase in GRASSP_Qualitative Prehension scores which were not significant in the OT group. There were no statistical differences between two groups in almost all measurements except for SCIM-III subscore of bathing-upper.

Conclusion

Combined upper limb RT demonstrated beneficial effects on upper limb motor and function in patients with cervical SCI which were comparable with conventional OT. It showed distinct training effects on proximal upper limb muscles that may lead to positive effects on activities of daily living and on distal fine motor. This Results may be helpful for selection of patients to treat with combined upper limb robotics.