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Clinical trial of Armeo Spring in training neurological patients with upper limb impairment

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Introduction

Robot-assisted therapy had been introduced recently for post-stroke rehabilitation. It provides task-specific, repetitive and goal-oriented training for patients with impaired upper or lower limb function. Armeo Spring is a gravity-assisted robotic device for the training of the impaired upper extremities. Gradable assistance and interactive training enhance patients' engagement and motivation during stroke rehabilitation.

Objectives

This clinical trial aimed to evaluate the effectiveness of the use of robot-assisted device as an adjunct of physiotherapy interventions, for treating neurological patients with upper limbs impairment.

Methodology

Patients diagnosed with neurological problems resulting in motor impairment of upper limbs were recruited in the trial, from Shatin Hospital, an in-patient rehabilitative hospital. They received robot-assisted training using Armeo Spring for 30 minutes during physiotherapy training sessions. Outcome measures included Fugl-Meyer Upper Limb Motor Score (FMUL), Modified Ashworth Scale (MAS), and hand-grips strength. Subjective acceptance of robotic therapy was examined using 10-point Visual Analog Scale. Complications in upper limb (shoulder pain and shoulder hand syndrome) were noted.

Result

Results Twelve participants (7 male and 5 female) were analyzed. Half of them suffered from ischaemic stroke and the other half suffered from haemorrhagic stroke. Participants on average received 11 sessions of Armeo Spring treatment. Pre- and post- training scores of assessment were analyzed using Wilcoxon Signed Ranks test. Significant improvement was found in FMUL after training, $Z=2.94$, $p=0.003$. There were no significant differences in muscle tones of shoulder, elbow and wrist between pre- and post- treatment scores. Participants with impaired right upper limbs recorded a significant difference after training, $Z=2.03$, $p=.042$, but not in participants with

impaired left upper limb. Participant acceptance of the use of robotic therapy was good, with mean score = 6.8 ± 1.7 . All 12 participants did not present with any shoulder pain or shoulder-hand syndrome after training. Conclusions Armeo Spring, a gravity assisted robotic device may serve as an effective treatment modality for patients with upper limb impairments. Spasticity in upper limb was maintained without complication in training using this device. With good patient's acceptance, robotic device can be used as an alternative treatment to reduce labor demand during upper limbs rehabilitation. Further controlled study is needed to verify the effect of Armeo Spring in upper limb neurological rehabilitation.