Abstract

**Background:** The main aim of rehabilitation is to ameliorate motor function and use the damaged limbs in the activities of daily living. Several factors are needed in the self-recovery of the patients, and the most important one is to reduce spasm. Some mechanical repetitive movements can affect and change the excitability of motor neurons.

**Objective:** To observe the effect of repetitive training on ameliorating spasm of upper limbs of hemiplegic patients.

**Design:** A self-controlled observation before and after training.

**Setting:** Department of Rehabilitation, Xuanwu Hospital of Capital Medical University.

**Participants:** Seven hemiplegic patients induced by brain injury were selected from the Department of Rehabilitation, Xuanwu Hospital, Capital Medical University from March to June in 2005. Inclusive criteria: 1) Agreed and able to participate in the 30-minute training of hand function; 2) Without disturbance of understanding. The patients with aphasia or apraxia, manifestation of shoulder pain, and severe neurological or mental defects. For the 7 patients, the Rivermead motor assessment (RMA) scores ranged 0-10 points, the Rivermead mobility index (RMI) ranged 1-3, and modified Ashworth scale (MAS) was grade 2-4. Their horizontal extension of shoulder joint was 0°-10°; and the elbow joint could extend for 15°-135°.

**Methods:** The viva2 serial MOTOmed exerciser (Reck Company, Germany) was used. There were three phases of A-B-A. 1) The phase A lasted for 1 week. The patient sat on a chair facing to the MOTOmed screen, and did the circumduction of upper limbs forwardly, 30 minutes a day and 5 days a week. 2) The phase B lasted for 3 weeks. The training consisted of forward circumduction of upper limbs for 15 minutes, followed by backward ones for 15 minutes and 5-minute rest. 3) The training in the phase A was performed again for 2 weeks. The extensions of upper limbs were recorded at phase A, the extension and flexion of elbow joints were recorded at phase B, and the extensions were recorded at the second A phase. All the patients were evaluated by the same therapeutist. 1) RMA was used to evaluate the motor function completely, including the motor control of both upper and lower limbs, but only the data of upper limbs were recommended to be used. The flexibility and concordance of upper limbs were described by detecting the ability of hand to move objects with 15 items, 2 grades for each item; 0 for could not complete and 1 for could complete. 2) RMI was used to measure the flexion and extension of elbow joint and shoulder joint, the scores ranged from 0 (no movement and no obvious muscle contraction) to 5 (close to normal movement). 3) MAS was used to evaluate the muscle tension in clinic. Grade 1 for without abnormal increase of muscle tension, and grade 5 for muscle rigidity, and it was unable for passive movement. 4) Ranges of motion of elbow joint and shoulder joint were measured using protractor.

Effect of repetitive training on ameliorating spasm of upper limbs in hemiplegic patients

**Research Results**

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Main outcome measures: 1) The strength of each limb to persist for 40 s recorded by two hand pedals; 2) Changes of muscle tensions detected by the two hand pedals; 3) Changes of muscle contraction at the flexion and extension of ipsilateral limb recorded by EMG; 4) Minimal moment of ipsilateral end foot; 5) RMA; 6) RMI; 7) MAS; 8) Ranges of motion of elbow joints and shoulder joints.

Results: The functions were evaluated at 6 weeks after training. 1) The strength of each limb to persist for 40 s was recorded, and the strength of the ipsilateral limb changed obviously from 20%-40% to 50%-70%. 2) The muscle tensions detected by the two hand pedals changed from 2.2-4.0 Nm to 0.2-1.0 Nm. 3) EMG displayed that along with the enhancement of fast movements, the strength curve increased (the EMG for the extension of elbow joints were obvious), which were shown in Figure 1. 4) The minimal moment of ipsilateral end foot was 5.0 Nm. 5) The RMA scores ranged 15-30 points. 6) The RMI ranged 4-5. 7) MAS were grades 0-2. 8) For shoulder joints, the ranges of motion were 90°-180° for external extension, 90° for anteflexion, 90° for internal rotation and 50°-75° for external rotation; For elbow joints, the extension of active movements was close to 0°.

Conclusion: After repetitive movements, the strength of upper limb increased the range of motion enlarged, and spasm reduced.

The active/passive therapy intervention has been performed with the motor-assisted movement therapy device MOTOMed viva2 (Reck-Technik, Betzenweiler, Germany).

If you are interested in the complete study please contact us at info@motomed.com.