

Conference

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Title

Use of Oscillating Motors in the Design and Fabrication of an Upper Extremity Spasticity Control Orthosis

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Objectives

This interventional case study assessed the feasibility of fabricating a custom-designed passive range of motion oscillating hand orthosis and its effect on post-stroke spasticity in a 67-year-old woman. An interdisciplinary team included the attending PM&R physician, occupational therapist, rehabilitation engineer, and medical and engineering students. Participant acceptance of the device, compliance with use, tolerability, and the device's effectiveness in managing tone and improving function were assessed.

Design

The participant's affected arm was scanned to produce a custom fit 3-D printed orthosis including an oscillating motor. She received her usual regimen of botulinum toxin injections before beginning. An 8-week protocol was employed using two hand positions (fingers free and fingers extended). The orthosis passively ranged the wrist through full flexion and extension in each position, tested in an alternating sequence, with a one-week intervention period followed by a one-week washout period (e.g., week 1: fingers free, week 2: washout, week 3: fingers extended, week 4: washout. A second set of the same interventions was repeated in weeks 5 through 8 as the participant neared the nadir of the effect of the toxin. Baseline and post intervention assessments of grip, box-and-blocks, passive range of motion, and Modified Ashworth Scale scores were performed. Throughout the study, the participant completed a home diary and a motor activity log.

Results

Grip strength and box-and-blocks results progressively improved. They did not correlate with either having the fingers free or extended, or with reduction in efficacy of botulinum toxin anticipated over the study period. Journal entries noted subjective improvement in function during intervention versus washout weeks.

Conclusions

The results support the practicality and tolerability of a custom oscillating orthosis in post-stroke rehabilitation. While outcomes were not dependent on hand position or botulinum toxin timing, the observed improvements highlight the need for broader clinical investigation.