



2014

Efficacy of a Carbon Fiber Orthotic Toe-Off Brace in Adults with Cerebral Palsy

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Recommended Citation

Kume-Kick, J., Magel, J. M., DiCandia, E., Hoffman, J., Issing, R., Little, J., . . . Bollinger, L. (2014). Efficacy of a carbon fiber orthotic toe-off brace in adults with cerebral palsy. *Journal of Neurologic Physical Therapy*, 38(1), 71-72.

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CONTROL ID: 1726806

TITLE: EFFICACY OF A CARBON FIBER ORTHOTIC TOE-OFF BRACE IN ADULTS WITH CEREBRAL PALSY

PRESENTATION TYPE: Poster

CURRENT SECTION: Neurology

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SPONSOR NAME: None

Student Category: Not a Student

ABSTRACT_STATUS:

Abstract

ABSTRACT BODY:

Purpose/Hypothesis : This pilot study evaluated the effects of a unique carbon fiber ankle/foot orthosis for individuals diagnosed with foot drop ("Toe-Off" design, Allard USA, Inc). We hypothesized that use of this brace would be useful for adults with cerebral palsy (CP) as evidenced by improved gait characteristics including gait endurance and balance.

Number of Subjects : A convenience sample of 4 patients, between the ages of 29 and 55, with diagnoses of cerebral palsy, was successfully recruited from United Cerebral Palsy (UCP) of Suffolk (Central Islip, NY). All individuals received regular physical therapy at UCP prior to and throughout the study.

Materials/Methods : Patients were assessed wearing their standard plastic orthotics (Pretest) and then fitted for their new carbon fiber bracing. Patients returned for testing at Day 1, Week 4, and Week 8 post-initiation wearing the new brace. At each testing session, patients were evaluated with the Berg Balance test, the GaitRite walkway system for gait analysis, a Six Minute Walk test for endurance, and an orthotic questionnaire incorporating quality of life measures including domains for: a) ease of wearing; b) ease of functional movement, and c) quality of life responses. At week 20, patients were re-evaluated with the Six Minute Walk test and questionnaire. All data was assessed using non-parametric statistical comparisons using SPSS software.

Results : No significant differences between the use of standard plastic and carbon fiber composite bracings were noted in any of the parameters measured which can be partially explained by the small sample size and the greater than normal variability in the dataset. However, overall Berg Balance scores increased for all test intervals following Pretest measures. In addition, patients reported a general increase in satisfaction in the new orthotics whether discussing ease of use, ability to negotiate the environment, or with respect to quality of life.

Conclusions : In this pilot trial assessing the use of a carbon fiber "Toe-off" brace for adults with CP, this bracing appears comparable in efficacy to that of conventional plastic orthotics. However, given the variation in response to testing and the encouraging self-reported satisfaction with the new brace in this patient population, future trials of this paradigm are recommended with an increased sample size.

Clinical Relevance : Technological advances of orthotic bracing has recently lead to the use of carbon fiber composites due to the increased tensile properties of this material compared to those of conventional plastic bracing. Little has been established in the efficacy for using this type of bracing in adults with CP with foot drop. Future studies with larger sample size are necessary in order to increase the strength of statistical analysis given the variability typical of this patient population.

KEYWORDS: gait assessment, CP, balance.