

Dynamic Splinting for Excessive Plantarflexion in Stroke Patients: a Randomized, Controlled Study of Gait Analysis

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Abstract

Cerebral Vascular Accident (CVA) or stroke is the third leading cause of death and the top leading cause of long-term disability in the United States. This condition affects over 700,000 new patients per year and 5,839,000 Americans have a history of stroke. CVA often shows the complication of hemiparesis and excessive neuromuscular tone in plantarflexion, impairing functional ambulation.

Botulinium Toxin-A injections have proven efficacy in tone management and varied therapeutic protocols have benefited CVA patients' gait patterns. Dynamic splinting, which employs low-torque stretching for prolonged durations has been shown effective in reducing contracture and in benefitting patient's gait patterns, but testing has not been accomplished to investigate the benefit this modality may have for stroke patients' ambulation.

The **purpose** of this study is to examine efficacy of BTX (tone management) and dynamic splinting (contracture reduction) for improving gait patterns in CVA patients diagnosed with excessive plantarflexion. This experiment will recruit **72 patients** who have suffered a stroke one year prior to this experiment. This experiment will measure kinematic and kinetic patterns in the lower extremities while ambulating.

Random categorization will enroll patients into one of the three groups: Control patients will receive a standardized physical therapy program (2/wk) with BTX injection; Experimental Group I will receive standardized physical therapy with Ankle Dorsiflexion Dynasplint (ADFD); Experimental Group II will receive standardized physical therapy, BTX injections, and ADFD.

The **duration** of this study will be 12 weeks, and after enrolling each patient will have their gait pattern analyzed to measure excessive plantar flexion in ambulation, symmetry in foot cadence, rotation while ambulating, and foot-aloft times. Gait testing will be performed again at completion of this study. Then treatments of PT, BTX, and ADFD will be immediately initiated. All patients will have a one year follow up measuring maximal AROM and duration treated with ADFD.

Statistical analysis will be calculated to determine if a significant change in ankle plantar flexion while ambulating was evident, and this will be the dependent variable. Independent variables will be include categories (control vs. experimental I vs. experimental II) and duration since CVA occurred. The analysis will be calculated with a repeated measures analysis of variance. A secondary analysis will be performed on the data from the one year follow ups. The purpose of this study is to examine the change in excessive plantar flexion while ambulating, following treatment with the BTX and ADFD.