Evaluation of Combined Neuromuscular Electrical Stimulation and Dynamic Orthotic Management of Children with Hemiplegic Spastic Cerebral Palsy

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Objective: In a previous study, we showed that neuromuscular electrical stimulation (NMES) combined with dynamic bracing is a safe and effective treatment of upper extremity spasticity in children with cerebral palsy. The objective of this present study was to determine if the combined therapy of NMES and dynamic bracing is more effective than NMES or bracing alone.

Design: A randomized double-blinded clinical study with a follow-up of 6 months.

Setting: Twenty-one patients between 3 and 18 years of age diagnosed with spastic hemiplegia participated in the study. Patients were randomly assigned to one of the following 3 groups: *group one* (n=7) received NMES only; *group two* (n=7) received dynamic bracing only; and *group three* (n=7) received combined therapy of NMES and dynamic bracing. Most patients were referred from hospitals and rehabilitation centers in the states of Kentucky, Ohio, and Indiana. Patients with uncontrolled seizures and/or previous surgery to the involved upper extremity were excluded from the study.

Materials/Methods: NMES therapy was applied transcutaneously to the extensor muscle group of the forearm. The brace consisted of customized elbow and wrist/hand units with adjustable tension and lockout. The therapy consisted of two 30-minute sessions daily and night bracing.

Measurements and Main Results: Evaluative tools included The Melbourne Assessment of Unilateral Upper Limb Function (dexterity), grip and pinch strength, the Zancolli classification, and a questionnaire on activities of daily living. Patients were evaluated at one month before the therapy, at the beginning of the therapy, and at one, three, and six months during the therapy. There was a 95% improvement in strength in *group three* (combined therapy), compared to a 67% in *group two* and a 30% in *group one*. Patients in *group three* showed an improvement of 1.7 grades in the Zancolli classification, contrasted with patients in groups two (0.3) and one (0.8). Patients treated with the combined therapy showed higher scores in The Melbourne Assessment of Unilateral Upper Limb Function, as well as more progress in their ability to perform activities of daily living.

Conclusions: A more noticeable improvement in global hand function was observed in patients treated with the combined therapy of NMES and dynamic bracing than in patients treated with either NMES or dynamic bracing alone. This **non-invasive** therapy could reduce the need for pharmacological injections and surgical procedures. More research is needed to determine the length of the effects of the therapy.

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