Changes in Muscle Spasticity in Patients With Cerebral Palsy After Spinal Manipulation: Case Series

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Abstract

Objective: The purpose of this case series was to report quantitative changes in wrist muscle spasticity in children with cerebral palsy after 1 spinal manipulation (SM) and a 2-week course of treatment.

Methods: Twenty-nine patients, aged 7 to 18 years, with spastic forms of cerebral palsy and without fixed contracture of the wrist, were evaluated before initiation of treatment, after 1 SM, and at the end of a 2-week course of treatment. Along with daily SM, the program included physical therapy, massage, reflexotherapy, extremity joint mobilization, mechanotherapy, and rehabilitation computer games for 3 to 4 hours' duration. Spasticity of the wrist flexor was measured quantitatively using a Neuroflexor device, which calculates the neural component (NC) of muscle tone, representing true spasticity, and excluding nonneural components, caused by altered muscle properties: elasticity and viscosity.

Results: Substantial decrease in spasticity was noted in all patient groups after SM. The average NC values decreased by 1.65 newtons (from 7.6 ± 6.2 to 5.9 ± 6.5) after 1 SM. Another slight decrease of 0.5 newtons was noted after a 2-week course of treatment. In the group of patients with minimal spasticity, the decrease in NC after the first SM was almost twofold—from 3.93 ± 2.9 to 2.01 ± 1.0. In cases of moderate spasticity, NC reduction was noted only after the 2-week course of intensive treatment.

Conclusions: In this sample of patients with cerebral palsy, a decrease in wrist muscle spasticity was noted after SM. Spasticity reduction was potentiated during the 2-week course of treatment. (J Chiropr Med 2016;xx:1-6)

Key Indexing Terms: *Spinal manipulation; Muscle spasticity; Cerebral palsy*

Introduction

The term *cerebral palsy* (CP) refers to a group of permanent disorders of the development of movement and posture, which cause activity limitations and are attributed to nonprogressive disturbances of a developing brain.[1] It is the most common motor disorder among children, affecting approximately 2 children per 1000 births. One in 5 children with CP (20%) has a severe intellectual deficit and is unable to walk.[2]

Muscle spasticity is a clinical syndrome of CP resulting from upper motor neuron lesions, and the reduction of these lesions is an important therapeutic target for optimizing motor performance. The treatment program for a child with spasticity may include different options: exercises, casting, constraint-induced therapy, oral medications, chemodenervation, intrathecal baclofen, selective dorsal rhizotomy, and orthopedic surgery.[3] Because of the limited efficiency of "traditional" treatments, a wide range of complementary and alternative therapies are used for muscle tone management in patients with CP, including spinal manipulation (SM).[4,5]

Spinal manipulation could possibly be used as a separate intervention in CP treatment and as part of an integrated treatment program called the *intensive neurophysiologic rehabilitation system*, which includes different treatment modalities: physical and occupational therapy, extremity joint mobilization, reflexotherapy, body massage, and mechanotherapy. This treatment may be performed in intensive 2-week courses lasting 3 to 4 hours daily.[6]

Descriptive studies of this rehabilitation approach have reported improvements in gross motor functions[7] and a decrease in muscle spasticity in 94% of the cases.[8] However, these studies had methodologic limitations, and spasticity was measured using the Modified Ashworth Scale,[9] whose validity and reliability have been questioned by many authors.[10]

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Paper submitted April 26, 2016; in revised form June 24, 2016; accepted July 31, 2016.

1556-3707

http://dx.doi.org/10.1016/j.jcm.2016.07.003

Table 1. *Demographic Characteristics of the Children*

Variable	Distributions (n = 29)
Age, y	
Mean (SD)	12.7 (2.7)
Min-max	7-18
CP type, n (%)	
Spastic bilateral	23 (79.3)
Spastic unilateral	6 (20.7)
MACS level, n (%)	
Level I	6 (20.7)
Level II	15 (51.7)
Level III	6 (20.7)
Level IV	2 (6.9)
Level V	0
GMFCS level, n (%)	
Level I	7 (24.1)
Level II	13 (44.8)
Level III	8 (27.6)
Level IV	1 (3.4)
Level V	0
Spasticity measured by the Modified Ashworth scale	
Minimal	10 (34)
Mild	10 (34)
Moderate	9 (31)

CP, cerebral palsy; *GMFCS,* Gross Motor Function Classification System; *MACS,* Manual Ability Classification System; *SD,* standard deviation.

A more precise quantitative evaluation of spasticity is possible using the Neuroflexor device, developed by the Swedish company Aggero MedTech AB (Stockholm, Sweden) and validated by a research team from the Karolinska Institute (Solna, Sweden).[11] Recent studies have indicated that Neuroflexor is a reliable measurement tool with high test–retest and interrater reliability,[12] and its sensitivity is good enough to measure changes in spasticity during CP treatment.[13]

The purpose of this case series is to describe the quantitative changes in wrist muscle spasticity in children with CP after 1 SM and after a 2-week course of treatment.

Methods

Patient Selection

Patients were selected for this prospective case series according to the established inclusion criteria and evaluated 3 times. Initial evaluation was followed by SM in 10 to 15 minutes, and the second evaluation was carried out after 15 minutes. The third evaluation was performed at the end of the 2-week course of treatment. All procedures were performed in accordance with the ethical standards of the institutional committee on human experimentation and the Helsinki Declaration of 1975, as revised in 2000; written informed consent was obtained from all patients included in the study. Research work was approved by the Medical Ethics Commission of the International Clinic of Rehabilitation, located in Truskavets, Ukraine.

Fig 1. *The Neuroflexor device for measuring muscle tone components.*

A total of 30 children admitted to the Rehabilitation Clinic took part in the study. Inclusion criteria were as follows: unilateral and bilateral forms of spastic CP, age 7 to 18 years, and Manual Ability Classification Scale levels I–IV. Exclusion criteria were as follows: ataxic or dyskinetic form of CP, fixed contractures of the wrist with less than 50° of passive wrist extension, and inability to understand and comply with instructions. The clinical diagnosis was confirmed by a child neurologist before the subjects were included in the study.

One patient failed to participate in the final evaluation because of somatic disease and was excluded from the study; analysis was carried out in 29 children. The demographic characteristics of the group are presented in Table 1.

Patients were divided into 3 groups according to the spasticity level: minimal spasticity ("1" by the Modified Ashworth scale), 10 children; mild spasticity ("1+" by the Modified Ashworth scale), 10 children; moderate spasticity ("2" by the Modified Ashworth scale), 9 children.

Intervention

Spinal manipulation was performed by an orthopedic medical doctor certified in Manual Therapy. After manual evaluation, high-velocity low-amplitude SM was carried out in all regions of the spine, including thoracic adjustments in the prone position, lumbar manipulation in lateral recumbent position, and cervical manipulation in sitting position.

Spinal manipulation was repeated every day, with a total of 12 manipulations during the 2-week period. The program for children with CP also included daily sessions of physical therapy, massage, reflexotherapy, extremity joint mobilization, mechanotherapy, and rehabilitation computer games with average daily duration of 3 to 4 hours. A detailed description of the treatment is provided in the manual.[6] No side effects were detected by the researcher