EFFECTS OF MYOFASCIAL RELEASE AND OTHER ADVANCED MYOFASCIAL THERAPIES ON CHILDREN WITH CEREBRAL PALSY: SIX CASE REPORTS

Sandra L. Whisler, MS, MD,1# David M. Lang, LMTT, TPM,2 Margaret Armstrong, MD,1 Jennifer Vickers, MD,1 Clifford Qualls, PhD,3 and Jay S. Feldman, BA4

INTRODUCTION

Complementary and alternative medicine (CAM) therapy methods are common for the treatment of cerebral palsy (CP).1 This case series is presented in an attempt to describe the use of Myofascial trigger point release to improve comfort, function, and decrease the spasticity (increased muscle tone) in children with CP.

CEREBRAL PALSY

CP can be described as a nonprogressive disorder characterized by motor and postural dysfunction.2 It is the third most common major developmental disability,2 with a prevalence of greater than 2 per thousand live births.4 Children with CP have a 30-year survival rate of nearly 90%.5

It has been estimated that up to 80% of cases of CP may be prenatal in origin.6 The interplay of multiple factors contributes to this disorder.1 Many risk factors are associated with the development of CP, including prematurity, birth asphyxia or hypoxic-ischemic encephalopathy at term, neonatal seizures, neonatal stroke, neonatal encephalopathy, and bleeding disorders.7 Other prenatal etiologies may include intrauterine infections, teratogen exposures, placental complications, multiple births, and maternal conditions such as seizures, mental retardation, or hypothyroidism.1 The motor dysfunction in CP often is associated with other impairments, which include problems with cognition, sensation, communication, perception, seizures, and/or behavior.8 Coexisting morbidities may include visual problems, hearing loss, seizures, bone fragility, cognitive deficits, learning disabilities, and the effects of aging.9

Diagnosis of CP

CP is a clinical diagnosis. There is no specific blood test or imaging study to diagnose it7: neurological and developmental surveillance in conjunction with an awareness of the risk factors are used to make the diagnosis. The average child is not diagnosed until 12 months of age, but some experts believe a definitive diagnosis should be deferred until two years of age.10 Classification of CP includes diplegia (involving both legs), hemiplegia (which involves ipsilateral arm and leg), and quadriplegia (involving all four limbs).11

There is a wide range of severity in motor dysfunction and spasticity seen in this disorder. Approximately 75% of children with CP have spasticity,12 a state of increased muscle tone and heightened deep tendon reflexes.13 This increased muscle tone can cause dislocation of the hips, scoliosis, or curvature of the spine; problems with positioning in a chair or wheelchair; confronted issues; contractures; and pain.14

Management of CP

Therapy for CP is directed at maximizing the quality of life by improving the activities of daily living and reducing the extent of disability.15 CP interventions traditionally involve treatment of coordination and movement impairments and the resulting disabilities, which can include impaired mobility, inability to feed oneself, and difficulties with speech/communication.16

Currently there are no clinically meaningful interventions to repair the damaged brain tissue and improve function.16 Treatment usually requires a multidisciplinary approach, including therapies such as physical therapy, occupational therapy, speech and language therapy, and special education curricula that attempt to reprogram the brain to improve motor skills.17 Other conventional treatment modalities for CP include botulinum injections, a variety of medications, selective surgical procedures, stereotactic encephalotomies, orthopedic interventions, and technological support.15 Management modalities may also include physiotherapy modalities, orthotics, and assistive technology.18

CAM Therapies

CAM therapies, including dietary supplements, herbal extracts, acupuncture, patterning, craniosacral manipulations, spiritual energy, myofascial therapy, and hyperbaric oxygen therapy, are being used by many patients and their caregivers for the treatment of CP. Myofascial therapy, which is a form of manual massage therapy, is the modality we chose to use in this case series. One of the oldest recorded treatment modalities in humans is manual therapy. There are more than 80 documented forms of massage, many of which have been developed in the last 30 years. When the taxonomy classification described by Sherman et al19 is used, myofascial release therapy is classified as a clinical massage technique, meaning that it uses focused manipulation of the muscle or surrounding fascia as well as other bodily systems. This form of massage is used to relieve pain and decrease restricted movement by attempting to release muscle...
spasms, strengthen/stretch specific muscles, and remodel fascial structures.19

Cardiologist Janet Travell coined the phrase “myofascial trigger point” in 1942. Dr Travell together with her co-authors described the effects and treatment of myofascial pain and dysfunction.20 John Barnes, a physical therapist, developed the myofascial release approach as a “whole body hands-on approach for the evaluation and treatment of the human structure to optimize the function of the fascial system.”21

In this study several myofascial release techniques were used in an effort to decrease spasticity in children with CP. Myofascial release includes myofascial trigger point (MTrP) release, myofascial movement facilitation, and craniosacral therapy.22 Myofascial release may also be defined as a system of therapy that combines principles and practices derived from muscle energy techniques, soft tissue techniques, and craniosacral techniques.20

Simons et al20 describe MTrPs as hyperirritable, sensitive spots usually within a tight band of skeletal muscle fascia.26 Other descriptions of MTrPs suggest that they are contracted muscle fibers and neuromuscular lesions that form part of a neurological loop that affect and are affected by the central nervous system.23 MTrPs are the hallmark physical finding in the myofascial pain syndrome.24 Simons et al20 define trigger point release as the application of slowly increasing nonpainful pressure over the trigger point until a barrier of tissue resistance is met. This pressure is then sustained until the tissue barrier releases. Pressure is increased until a new tissue barrier is reached. Craniosacral therapy uses techniques designed to release restrictions in the craniosacral system to improve the function of the central nervous system.25

The theory of myofascial release is based on the principle that physical trauma, inflammation, infection, and structural imbalances may create inappropriate fascial strain.26 Sustained traction or tension on this fascia may cause varying degrees of fascial entrapment of neural structures, thereby causing a myriad of dysfunctions and symptoms.27 If fascial strain persists over time, this strain results in exertion forces that pull the body out of its three-dimensional alignment with the vertical gravitational axis.28

Myofascial release has been used more extensively in adults than in children in the published literature. For example, Barnes et al24 used myofascial release treatments in adults in an attempt to restore pelvic symmetry, and their results indicated that this therapy had the potential to be effective in facilitating a change in pelvic position toward symmetry. Schleip29 described the intimate relationship between fascia and the autonomic nervous system, suggesting that stimulation of mechanoreceptors responsive to manual pressure lowered sympathetic tone resulting in decreased spasticity. One study compared sagittal plane isometric contract-relax and myofascial release leg pull to increase hip flexion range of motion finding that both approaches were significantly more effective than control.20 Other examples of the use of MTrP therapy in adults include the use of MTrP release in conjunction with paradoxical relaxation training, which resulted in significant improvement in pelvic pain, urinary symptoms, libido, ejaculatory pain, and erectile and ejaculatory dysfunction.31 MTrP release has been used to treat interstitial cystitis and urinary urgency-frequency symptoms as well as pelvic floor pain.32 Fryer and Hodgson suggested that manual pressure release techniques may be effective for MTrPs in the upper trapezius.33

**MYOFASCIAL RELEASE FOR CHILDREN WITH CP**

In this case series MTrP release techniques, including pressure and stretching, were performed on six children with CP. These same techniques were taught to the caregivers of the six children. We postulated that myofascial release techniques would decrease spasticity in children with CP. All children and caregivers were recruited from a pediatric practice associated with the University of New Mexico Health Sciences Center (UNM HSC) in Albuquerque, New Mexico. Evaluations using the Modified Ashworth Scale were carried out at a UNM HSC Clinic.34 The therapy sessions were conducted at Myofascial Associates in Albuquerque, New Mexico. Informed consent was obtained from all participants according to protocol as dictated by the office of Human Research and Review Committee at UNM HSC. All study participants were profoundly globally developmentally disabled as defined by a variety of diagnoses, including CP.

**Intervention Protocol**

The myotherapist was a licensed massage therapist with more than 20 years’ experience as a myofascial therapist. His training included massage therapy, training in myotherapy, as well as training in neuromuscular therapy, visceral/neuro therapy, and cranial-sacral therapy. A board-certified pediatric physician with more than 20 years of experience taking care of children with special needs was also present during the treatment session. For six weeks, each child was treated by the myotherapist for a period of 30 minutes during their weekly one-hour appointment. The myotherapist also taught the caregiver the same techniques in the second 30 minutes. The myofascial techniques included stretching and MTrP release. The same myotherapist was used for the entire study, and he conducted standardized MTrP release on all the children, although the order of the different targeted body areas may have been slightly changed from child to child. Because each child had different diagnoses in addition to their baseline diagnosis of CP, he or she may have had to be treated slightly differently. Occasionally, the child’s nurse was available and willing to learn the techniques in addition to the caregiver.

Each child was placed into comfortable position on a massage table. One child was placed on a therapy ball because he was unable to lie prone. The therapist usually began with the child in the prone position. For the first four of the six sessions, the myotherapist proceeded to work up the spine while applying pressure on three points moving away from the center on each side of the spine until the cervical area was reached. From there, the myotherapist worked on points up the neck and under the occipital ridge. After working the points on the scapulae, the child was placed in a supine position. Pressure was applied, and Active Isolated Stretching (AIS) was performed, where appropriate, on the extremities. During the fifth session, the therapist performed a very soft noninvasive fascial release in a clockwise fashion from the ascending colon to the descending colon. The
last or sixth session consisted of the caregiver performing all of the previously learned treatments on the child while supervised by the myotherapist and physician.

The caregiver was taught the same myofascial techniques as used by the myofascial therapist for locating trigger points and releasing those trigger points, emphasizing different segments of the body. This was done by putting consistent pressure on the trigger points for approximately 10 seconds. If there was no release, the caregiver would reapply pressure to the same trigger point. If there was still no release, the next muscle grouping was addressed.

This process was repeated at home daily by the caregiver for six weeks. Each week the caregiver would return their previous week’s completed log. The caregivers were asked to do the myofascial and Active Isolated Stretching (AIS) techniques they learned two to three times per week after the initial six-week sessions. The caregivers reported to us at approximately the 12-week and 24-week follow-up sessions that they had complied with doing treatments two to three times per week for 18 weeks following the initial six-week therapy sessions.

**Measurements**

The Modified Ashworth Scale of spasticity was used to assess spasticity in the children before the study, after six weeks of therapy with the myofascial therapist, approximately 12 weeks after initiation of therapy, and approximately 24 weeks after initiation of therapy. The scale involves manually moving a limb through the ROM to passively stretch specific muscle groups. It is scored on a 0 to 5 scale, with 0 being normal, and 5 being no change noted. Changes for the worse were noted as a four or five. The same caregiver was asked to do this log daily for the initial six weeks of the study.

Combined upper and lower body Modified Ashworth Scale values over weeks are presented for each child. Differences in Modified Ashworth Scale values were assessed over four time periods during the 24 weeks of the study incorporating data according to location which included the whole body (bilateral shoulders, bilateral elbows, bilateral wrists, bilateral hips with flexion and abduction, bilateral knees, and bilateral ankles), upper-extremity (bilateral shoulders, bilateral elbows, bilateral wrists), and lower-extremity measurements (bilateral hips with flexion and abduction, bilateral knees, and bilateral ankles). Combined upper and lower extremity measurements were averaged and are presented in Figure 1.

**RESULTS**

**Myofascial Patient Cases**

**Case 1.** Patient A was an 11-year-old boy whose ethnicity was white. He had been adopted by his current caregivers. Because of a probable history of child abuse, he frequently demonstrated self-stimulatory behaviors and would go into the fetal position if anyone he didn’t know well tried to touch him. Patient’s A’s father was the caregiver who worked with him for the study. The patient’s diagnoses included developmental disabilities, spastic quadriplegia, placement of a ventriculoperitoneal shunt, and a probable history of sexual abuse. Patient A was ambulatory with the aid of a walker. The combined upper- and lower-extremity tone of Patient A increased from week 0 to week 24. Patient A was very tactilely defensive secondary to a history of abuse. When approached for a physical exam by his physician, he would curl up into the fetal position. After participating in the study, he was able to lie supine for a physical examination for at least 10 minutes or more, and his communication abilities also improved. He showed decreased self-protecting positioning/fetal positioning with improvement in tolerance of touch. After entering the study, he was able to lie in the supine position with both hips flat on the table, thus making cleaning and diapering much easier for the caregivers.

**Case 2.** Patient B was a 6-year-old boy whose ethnicity was white. He had been adopted shortly after his second birthday. Patient’s B mother was the caregiver who worked with him in the study. He was living in the same household as Patient A. Patient’s B diagnoses included anoxic encephalopathy secondary to near drowning at age one year, tracheostomy for severe chronic lung disease, spastic quadriplegia, seizures, developmental disabilities, and gastrostomy tube placement. Patient B was nonambulatory. Patient B was not able to be evaluated at week 24 because of hospitalization for pneumonia. Patient B had decreased tone in the combined upper and lower extremities during the time interval of zero to 12 weeks. After entering the study, this child was able to lie in the supine position with both hips flat on the table, thus making cleaning and diapering much easier for the caregivers.
Case 3. Patient C was a 21-year-old woman whose ethnicity was white. Her grandmother was her primary caregiver and the caregiver who participated in the study with her. She had been basically normal at birth but had later started exhibiting progressive developmental disabilities. Subsequently it was discovered that she had an unspecified mitochondrial disorder at 15 years of age. At the time of the study, this patient was exhibiting choreoathetoid movements and was in almost constant motion in her wheelchair. Her diagnoses included unspecified mitochondrial disorder, progressive neurodegenerative disorder, chronic lung disease, seizures, developmental delay, and spastic CP. Patient C was nonambulatory. The combined upper- and lower-extremity tone of Patient C increased during the time interval of week zero as compared with week 24. Patient C experienced the cessation of significant choreoathetoid movements (repetitive involuntary jerking or writhing movements) after entering the study which had been maintained for at least two years after study completion. She also exhibited less teeth grinding behavior after the study.

Case 4. Patient D was a 16-year-old boy whose ethnicity was white. His mother was the caregiver who participated in the study. He had developmental disabilities from birth. This patient had a great fear of falling and would crawl on certain surfaces because of his fear of falling. His diagnoses included developmental delays, anxiety disorder, asthma, and spastic diplegia. Patient D was ambulatory. Patient D was not assessed at week 24 because of medical illness. Patient D had decreased tone in the combined upper and lower extremities during the time interval of zero to 24 weeks.

Case 5. Patient E was a 6-year-old boy who suffered a severe intracranial bleed at one week of age. His ethnicity was white. Patient E’s mother was the caregiver who participated in the study. This patient had very tight hip adductors, which made diapering very difficult. His diagnoses included intracranial bleed, developmental disabilities, seizures, and spastic CP. Patient E was nonambulatory. Patient E was not assessed at week 12 because of medical illness secondary to increased seizure activity. Patient E had decreased tone in the combined upper and lower extremities during the time interval of zero to 24 weeks. After entering the study, this child was able to lie in the supine position with both hips flat on the table, thus making cleaning and diapering much easier for the caregivers. The ability to reach for objects improved in Patient E. His communication skills increased through improved body language.

Case 6. Patient F was a 14-year-old female girl whose ethnicity was white. She suffered an anoxic brain injury at birth. Her mother was the caregiver who participated in the study. This patient had a history of severe constipation and was trying colonic therapy before the study. Her diagnoses included static encephalopathy, developmental disabilities, microcephaly, and spastic CP. Patient F was nonambulatory. Patient F’s combined upper and lower extremity tone was equivocal over weeks 6, 12, and 24; however, she had increased tone at week 24 as compared with week 0. Patient F had started receiving colonic irrigation hydrotherapy two to three weeks before beginning the MTrP release study. After beginning the myofascial therapy in conjunction with colonic, the Patient F was able to have a bowel movement on her own without any external stimulation for the first time in 14 years.
0-Week, 6-Week, 12-Week, and 24-Week Evaluations
Patient B, Patient D, and Patient E had decreased tone in the combined upper and lower extremities during the time interval of zero to 24 weeks. Patient F’s combined upper and lower extremity tone was equivocal over weeks 6, 12, and 24; however, he had increased tone at week 24 as compared with week 0. The combined upper and lower extremity tone of Patient A and Patient C increased during this time interval. It should be noted that Patient B, Patient D, and Patient E had medical illnesses that precluded them from being evaluated at all four time frames (including hospitalization for pneumonia, increased seizure activity, and respiratory syncytial virus infection).

Caregiver Evaluations
Nine parameters were observed in the daily caregiver evaluation form over six weeks of reporting time (Figure 2). These parameters included body symmetry, tone, ROM, teeth grinding, ambulation, self-stimulation, alertness, cooperation, and fatigue. When the five-point Likert Scale to describe changes from baseline is used, zero denotes no change, a positive value denotes improvement, and a negative value denotes worsening in the nine clinical parameters.36 The time periods of weeks 1 and 5 as compared with baseline were analyzed for changes. Week 5 was used instead of week 6 because of the smaller variability in the data (see Discussion). Changes were noted in all parameters at week 1 and week 5 except in teeth grinding and tone at week 1.

Anecdotal Comments from Caregivers
Subjective changes in other clinical and behavioral parameters were also noted by caregivers and recorded. Some of these changes were seen in the clinical and behavioral realms (Table 1). Patient F had started receiving colonic irrigation hydrotherapy two to three weeks before beginning the MTrP release study. After beginning the myofascial therapy in conjunction with colonic, Patient F was able to have a bowel movement on her own without any external stimulation for the first time in 14 years. Patient C experienced the cessation of significant choreoathetoid movements (repetitive involuntary jerking or writhing movements) after entering the study, a response that has been maintained for at least two years after study completion. After entering the study, three children were able to lie in the supine position with both hips flat on the table, thus making cleaning and diapering much easier for the caregivers. Patient A was very tactically defensive secondary to a history of abuse. When approached for a physical examination by his physician, he would curl up into the fetal position. After participating in the study, he was able to lie supine for a physical examination for at least 10 minutes or longer, and his communication abilities also improved. The ability to reach for objects improved in Patient E.

Table 1. Subjective Improvements Reported by Caregivers
- Bowel movements without manual stimulation or laxatives.
- Cessation of choreoathetoid movements which were sustained for 6 months.
- Improved ability to lie with both hips flat on bed in supine position.
- Decrease in self-protecting positioning/fetal positioning with improvement in tolerance of touch.
- Improved ability to reach for objects.
- Communication skills improved through body language.

Figure 2. Parent evaluation: improvement over baseline for physical and behavioral parameters.
DISCUSSION
Few randomized studies have been conducted that analyze the effectiveness of manual therapy in myofascial pain syndromes, and even less research has been published in medical journals concerning this approach in children with CP. This case series attempted to observe and document the effects of MTrP release in children with CP and other comorbidities. Because children with CP have significant motor dysfunction and problems with muscle tone, any modality that can improve motor function and muscle tone may be of benefit. These children will often experience asymmetrical pulling of muscle groups, resulting in clinical problems such as scoliosis, subluxation/dislocation of their hips, and pain.

The goal of treatment in CP is to improve function and delay surgical intervention for fixed deformities. Travell and Simons postulated that nutritional deficiencies, hormonal imbalances, infections, allergies, and low oxygenation of tissues (aggravated by tension, stress, inactivity, and poor respiration) help to maintain and enhance trigger point activity. Children with CP may experience many of the stressors described by Travell and Simons as a direct result of their disease. We postulated that MTrP release could be an effective modality for children with CP because these techniques improve problems associated with fascial strain, modify abnormal muscle tone, improve motor function, and allow the body to return to a more normal three-dimensional alignment, resulting in better motor function and possibly preventing fixed deformities.

In our study we were able to see decreases in muscle tone in half of the children after 24 weeks of MTrP release techniques when we combined our upper and lower extremity Modified Ashworth Scale measurements. These findings were consistent with those of Duncan et al, who found improved motor function in children with moderate to severe CP using osteopathy in the cranial field, myofascial release, or both.

Some of the most dramatic changes noted with MTrP release techniques were observed in the nine behavioral parameters observed by the caregivers during a five-week period. These included changes in body symmetry, tone, ROM, teeth grinding, ambulation, self-stimulation, alertness, and cooperation. The caregivers reported a more symmetrical body position, decreases in body tone, increased range of motion, a decrease in teeth grinding, improved ambulation, decreases in self-stimulatory activity, increased alertness, and improved cooperation with therapies. Although caregiver report can be subjective and unreliable, the positive changes reported in several of our cases warrant further examination using more rigorous evaluation strategies.

In future studies with a larger sample size more accurate measurement techniques may be able to detect statistically significant changes in tone in both the upper and lower extremities. We may be able to incorporate a device such as a "palpometer" described by Bendtsen et al, for measuring the pressure exerted during myofascial release. This could decrease the variation in pressures used during therapy. Surface electromyography could possibly be used to examine muscle activity before and after treatments. Scripting would also be helpful to decrease variation in caregiver assessments. We plan to assess changes in function and quality of life using validated measuring instruments. Although further research is needed, based on this case series, we feel that MTrPs release can be beneficial in decreasing muscle spasticity and in treating certain behavioral problems that occur in children with CP.

REFERENCES


