

CASE STUDY

Resolution of Ataxia in a Pediatric Patient Undergoing Subluxation-Based Chiropractic Care: A Case Study

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Abstract

Objective: To report on the response of a pediatric patient with cerebellar ataxia undergoing chiropractic care.

Clinical Features: A seven-year-old female presented for chiropractic care and cerebellar ataxia was noted. A thorough examination was performed and isolated the location of trans-neuronal dysfunction to the right cerebellum.

Interventions and Outcomes: Chiropractic analysis of static and motion palpation were used to examine the spine for subluxations. High velocity-low amplitude chiropractic adjustments were delivered to the area of subluxation in either the cervical, thoracic, lumbar and/or pelvic region as needed. Neuro-rehabilitative exercises were given either at home and/or during the office visit. Within four visits there was marked improvement of gait patterns and resolution of the ataxia.

Conclusion: Understanding and applying foundational neurological principles via a patient specific, individually tailored, chiropractic management plan is essential. Assessing and optimizing asymmetrical neurological indicators should be part of screening and management procedures. In this case, addressing the dysfunction concerning the central integrative state of the cerebellum was necessary for optimum functioning of this seven-year-old female.

Key Words: *Chiropractic, ataxia, cerebellum, trans-neuronal degeneration, chiropractic neurology, pediatrics, vertebral subluxation*

Introduction

Research in the field of neuroscience is rapidly developing and expanding with concepts, that while new to the general chiropractic and medical profession, are not so new to those health professionals studying and examining the nervous system on a daily basis. Some of these concepts include trans-neuronal dysfunction, diaschisis, plasticity, long-term potentiation, and metabolic capacity.¹⁻⁵ These concepts all incorporate neuro-cellular physiology and metabolic

principles.⁶ The concept of integration between neuro-cellular physiology, clinical evaluation and treatment to promote long term potentiation through neuronal activation is the fundamental concept behind functional neurology.^{2,4,7} The purpose of this paper is to report on a case showing the central effects of the spinal adjustment and other appropriate exercises in an effort to correct neurophysiological dysfunction of the human brain.

1. Private Practice-Tucker, GA

The success of treating functional neuronal degeneration in a seven year old female using the chiropractic adjustment will be discussed. It was shown in this case study that specific examination revealed functional degeneration and there was a change in the functional neurological indicators upon treatment using the chiropractic adjustment.^{8,9} The treatment emphasized the activation of NMDA (n-methyl di-aspartate) receptors^{8,10,11} by stimulating joint mechanoreceptors, muscle spindles and golgi tendon organs located in the facet capsule, local musculature, and surrounding fascia.¹¹ The stimulation of these receptors went on to stimulate the ipsilateral cerebellum. The goal of treatment was to develop plasticity and long term potentiation¹ in the right cerebellum via the chiropractic adjustment and simple cerebellar exercises.

Case Report

Patient History

A seven-year-old female presented to the clinic for routine chiropractic care. Patient and guardian denied any complaints and symptomatology associated with the gastrointestinal, genitourinary, cardiopulmonary, and integumentary systems. There was also no reported pathology in the eyes, ears, nose and throat and there were no reported surgeries or hospitalizations. There was a past history of seasonal sinus congestion and intermittent epistaxis that had resolved.

She had the routine vaccinations on schedule and had a past history of antibiotic usage for "colds and infections." Her sleep habits were within normal limits of ten and a half restful hours a night. In general, she has fifteen minutes of recess a day at school, and forty-five minutes of gym class. Nutrition was considered moderately healthy.

She had a normal birth process without complications or trauma. Her family history includes hypertension, in the maternal grandmother, and her mother had gestational anemia. Her paternal grandfather had a history of stroke. There was no significant positive history to indicate this seven year old female had any significant disease processes. She presented as a very active and bright young lady.

Chiropractic Examination

A full physical exam was performed on the patient and revealed the following. All vital signs were within normal limits. Cardiovascular, pulmonary, gastrointestinal, integumentary exams were unremarkable. All global ranges of motion were unremarkable other than segmental restriction to the right in the cervical spine. All orthopedic tests were unremarkable.

Posture analysis was performed visually in the sagittal and coronal planes. Mild postural deviations were noted in the sagittal plane as a left head tilt and a left high shoulder. There was a functional short leg on the right of one-fourth inch. This was consistent in the prone and supine positions.

Using static and motion palpation techniques, there were segmental vertebral restrictions noted at the second cervical vertebrae and sacral segment. The C2 vertebrae had restricted range of motion going to the right along the negative theta Y

plane, according to the Cartesian orthogonal system.⁸ The sacral subluxation had restriction posteriorly.

Sensory exam was intact. Vibration and pinwheel test were negative. Reflexes were also intact, 2/2 in upper and lower extremities according to the Wexler scale. All flexors and extensors were tested in the upper and lower extremities. Muscle testing revealed a 5/5 on the Van Allen scale. Auditory and visual function were within normal limits.

Of note was tearing on cardinal fields of gaze going in all directions. When inspecting the muscle tonicity of the soft palate, there was a mild soft palate depression on the left side; inspection of mouth and throat were otherwise within normal limits. Romberg's test was positive eyes open and closed with the patient falling to her right. As a result, tandem walk and dysmetria were performed. Sway and instability to the right were noted on tandem walk. Even without the details that more sophisticated machinery could provide, the tests performed helped to confirm right cerebellum had a functionally lower central integrative state which is evidence of trans-neuronal dysfunction.

Chiropractic Care

The patient was seen once weekly and experienced improvement after the fourth adjustment. Spinal analysis, Romberg's, tandem walk, and cardinal fields of gaze were performed each visit. Adjustments to the spine along with right cerebellar rehabilitation exercises were given during the time of the office visits. Exercises were also given to be performed at home. These exercises included clapping hand games with her sister that emphasized cross cord reflex stimulation, and right arm rotations to stimulate midline cerebellum functionality.

Spinal analysis consisted of examining the spine in the supine, prone, and seated positions. Analysis was performed of the cervical, thoracic, lumbar, sacral areas of the spine and also the sacroiliac joints of the pelvis. Decreased range of motion along the six degrees of freedom were assessed.⁸ Any restriction or fixation was documented and considered a candidate for adjustment.

Adjustments were given via the Diversified protocol. Supine cervical sets were delivered with the application of functional neurology isolating the location of the delivery to facilitate the correction of the trans-neuronal dysfunction in the right cerebellum. Supine cervical adjustments were only given on the right side.

Biomechanically, the patient presented with right rotation restriction in the mid and upper cervical spine depending on the visit. To ensure the activation of NMDA receptors in the right cerebellum, a spinous push adjustment was delivered to the right side. Proper biomechanics of the cervical facets were taken into consideration, that is, ipsilateral rotation and lateral flexion.⁸ In this case, right rotation with right lateral bending was the direction of the neck and head during the adjustments to correct the biomechanics. With this specificity of stimulating the cervical spine, ipsilateral stimulation of the spinocerebellar tracts was emphasized.

The patient improved within a series of four adjustments. On the fourth sequential visit, Romberg's and tandem walk were negative. A drastic decrease of the tearing was also noted. The patient still had no subjective symptomatology, but the asymmetrical neurological indicators were no longer present.

Discussion

If there is restriction of information to the body secondary to improper biomechanics, it is logical that there would be asymmetrical stimulation to the two sides of the brain. Asymmetrical activation of neurological receptors leads to asymmetrical expression of function. The only correction is the application of asymmetrical modalities of stimulation to the appropriate areas of need. It is important to correct these findings as young in age as possible before the deficiency is allowed to progress. In this case we used the chiropractic adjustment to activate the appropriate mechanoreception to balance the central integrative state of the cerebellum.

The function of the cerebellum is coordination of movement and the maintenance of balance specific to the ipsilateral side of the body.¹² The fundamental function of the cerebellum is to coordinate appropriate timing patterns and rates of stimulation of motor neurons.¹²

A functionally degenerative state would thereby alter the frequency of firing - modifying the timing patterns and rates of firing - creating more aberrant and sporadic firing and producing dysfunction.¹³ This explains why this patient had an inability to control posture in Romberg's test or tandem walk and is evidence of trans-neuronal degeneration, which can only be corrected with proper activation and stimulation to the fibers themselves.

Part of the process of creating plasticity of the cerebellum is to introduce specific stimuli to the pathway recharging the central integrative state for proper firing rates that promote plasticity via immediate early gene responses. In this case study, the chiropractic adjustment was the stimulus to the joint mechanoreceptors and thereby activation of the spinocerebellar tracts.

Creating plasticity by stimulating the spinocerebellar pathways would increase the central integrative state of the cerebellar neurons creating long term potentiation and therefore, would not only improve coordination to the ipsilateral side of the body, but improve function to the entire postsynaptic structures therein. This is the importance of understanding the spinocerebellar tracts and using the information to stimulate the appropriate structures during the adjustment.¹⁴ Achieving long term potentiation is the goal in regards to the reverse pathological state, trans-neuronal degeneration which could result in cell death.⁶

Cerebellar Tracts

If the adjustment stimulates the cerebellum, it would be important to analyze the inputs and outputs to better understand the effects of the adjustment. The cerebellum utilizes 10% of the volume of the brain, but contains over 50% of the neurons.¹⁴ There are integrations to the vestibular system, cortical projections, somatosensory systems and more.

The organization in the cerebellum is precise and intricate. Cerebellar somatotopic maps receive information for proper integration and filtration of information.¹⁴ Motor learning and cognitive functions are another part of the function of the cerebellum.¹⁴

This case study offers a platform for expansion to further study of synaptic integrations in the application of functional neurology. The somatosensory pathways for developing plasticity and long term potentiation are still being researched, though they are becoming more understood and verified since first described by Woolsey and Van der Loos in 1970.⁷ In modern research, analyzing plasticity goes far beyond conscious and unconscious somatosensory pathways. Using stimulation of these somatosensory pathways is beneficial not only to cerebellar infrastructure, but also to all visual systems³ and hippocampal (memory and limbic) neuronal pools.^{4,5}

The unique feature chiropractic has to offer is the stimulation of neurological pathways to facilitate plasticity, that is, reinforcement of cellular genetic expression that causes inherent neurological stability. It starts with a neuronal action potential. Whether by the environment itself, chemical intervention, mechanical stimulation or a variety of toxins, an action potential causes a cascade of responses that in fact alter the infrastructure of the neuron itself. This cascade is referred to as the *cellular immediate early gene response*. The intrinsic cascade of responses facilitates the cyclic AMP pathways producing hypoalgesia¹⁵ and increased cAMP levels correlate with plasticity.³ NMDA receptor activation is necessary to promote plasticity.^{7,10} Therefore, it is suggested that the cellular metabolism of neurons is the level of entry to evaluate and treat neurological imbalances.

Conclusion

Chiropractors for over a century have been claiming to affect the nervous system with the adjustment of the spine. It is in fact understood that all environmental stimuli have an impact on the human nervous system.

Oxygen,¹⁶ nutrients, and stimulation^{1,5,16} are necessary for the survival of a neuron. Stability and resiliency are characteristic of a healthy neuron. This state of health of the neuron is termed plasticity.¹ If plasticity is anabolic, the counterpart of degeneration is catabolic. The stimulation a chiropractic adjustment can give is merely a natural method of bringing anabolic plasticity to a trans-neuronal dysfunctional state.

This model of analyzing the human nervous system was first introduced by Dr. Fred Carrick, founder of the Carrick Institute. He introduced the analysis of the components of the human brain while applying the information functionally by using stimulation modalities to facilitate the correction of brain imbalance. One of the most powerful stimulations was the chiropractic adjustment.^{8,9}

Because of this advancement, over the past twenty-five years chiropractors have been able to functionally analyze the nervous system with objectivity. This application of functional neurology allows for more specificity and efficiency in the application of the chiropractic adjustment. Also, it allows for a new platform of research for the chiropractic profession to

objectify, validate, and clarify the physiological processes behind the adjustment. This case is illustrative of the potential of functional neurology. Further research in this area is encouraged.

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