

CASE STUDY

Improvements in a 4-year-old with Autism Spectrum Disorder Following Chiropractic Care to Reduce Vertebral Subluxation

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Abstract

Objective: This case study describes the effects of subluxation-based chiropractic care on a 4-year-old boy diagnosed with autism spectrum disorder (ASD) experiencing significant language delays.

Clinical Features: A 4-year-old boy diagnosed with ASD was brought into a chiropractic clinic by his parents for chiropractic care. The parents' main concern was his delay in language development. The patient was non-verbal and had diminished ability to sense pain.

Interventions and Outcomes: Subluxation-based chiropractic care was initiated for 15 visits over a period of 8 weeks. The patient was assessed using static palpation, motion palpation, and postural analysis, and adjustments were performed using Diversified Technique. The parents reported significant improvements in language development over the course of care. The Autism Treatment Evaluation Checklist (ATEC) was used to assess effectiveness of chiropractic care on four areas of impairments: Speech/language/communication improved 34.8%, Sociability improved by 50%, sensory/cognitive awareness improved by 50%, health/physical/behavior improved by 31.4%, and the patient had an improvement in their overall score by 40.6% over 8 weeks.

Conclusions: This case study serves to strengthen the relationship between the reduction of vertebral subluxation and improvement in function of patients with ASD.

Key Words: *Autism, autism spectrum disorder, chiropractic, subluxation, pediatric, ATEC, Diversified Technique, adjustment*

Introduction

Autism Spectrum Disorder (ASD) is an early developmental disorder characterized by deficits in social communication and interaction, with restrictive, repetitive behaviors, causing significant impairment in social, occupational, or other areas of function, that are not better explained by intellectual disability.¹ In 2014, the Centers for Disease Control (CDC) reported that 1 in 68 children are classified as having ASD,² up from 1 in 110 in 2006.³ ASD affects more than 400,000 children in the United States and is the third most common developmental disorder in children.⁴ Estimated costs of care for individuals with ASD range from \$17,000 to more than

\$100,000 per year per child.^{4,5} In 2011, ASD put a burden on the United States economy of \$11.5 billion.⁵

ASD classically presents with deficits in three areas: social interaction, social communication and imaginative thinking.⁶ Those affected have issues with sensorimotor integration, motor planning, and motor output.⁷⁻⁸ One third to one half of children experience deficits in communication.⁹⁻¹⁰

The exact cause of autism is still unknown. However, most scientists agree that a variety of factors play a contributing

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role in its pathogenesis.^{2,8,10-12} Eapen, et al found a strong genetic component to ASD, as demonstrated by a 10% concordance in ASD in dizygotic twins versus 70-90% in monozygotic twins.¹³ However, this still leaves much room for contribution of environmental factors, such as toxic exposures, prenatal, and perinatal stresses.^{11-12,14}

There is currently no cure for autism and current medical treatments focus on abatement of co-morbid symptoms using antidepressants, antipsychotics, and anti-seizure medications commonly used to combat attention deficit hyperactivity disorder, obsessive compulsive disorder and depression.^{6,12,15-16} Over 50% of parents of children diagnosed with ASD have reported using at least one form of complementary and alternative medicine (CAM) therapy, with over seventy-five percent of those reporting some improvement.¹⁷ The most commonly used practitioner-based CAM therapy for children in the United States is chiropractic.¹⁸

Gray's anatomy states that the nervous system controls and coordinates every function in the entire body.¹⁹ A basic tenet of chiropractic care is that when there are disturbances in the nervous system, specifically by vertebral subluxation, the body's ability to function is hindered.²⁰ Regardless of the health condition, when a chiropractic adjustment is delivered with the intent of removing vertebral subluxation, the nervous system is able to operate more effectively.²⁰ With this neurological interference removed, the body will be better able to adapt to its environment, leading to a higher quality of life.

The following case study describes a 4-year-old boy diagnosed with ASD who presented for a trial of subluxation-based chiropractic care.

Case Report

History

A 4-year-old boy diagnosed with autism spectrum disorder presented to a chiropractic clinic by his mother and father. They explained that he had a "delay of language." He was able to cry out and make guttural sounds, but was unable to formulate words or communicate. They explained that he could hear commands, but his only reaction would be temper tantrums. He frequently injured himself in ways that they would expect to elicit pain, although he did not react as such. For example, they reported that he one time dropped a rock on his foot, resulting in his foot swelling for about two weeks, although he showed no signs of pain or apprehension.

This was the mother's third pregnancy and second birth; her first pregnancy resulted in a miscarriage. The mother denied use of any medications prior to or during birth, although she had hypertension in the latter part of her pregnancy. Her labor was induced and lasted three hours. The delivery was vaginal, with use of an epidural for pain relief.

The parents stated that the patient had experienced the flu, frequent colds, ear infections and allergies since birth. He was sick about four times per month, with each episode lasting 2-3 days, and was prescribed antibiotics each time. He also suffered from rashes, sore throats, eczema, coughing, vomiting, a "runny nose," and dry skin on a regular basis. He

frequently visited his medical doctor, hearing specialist and eye doctor. He had poor vision but refused to wear glasses: he would constantly take them off his face and throw them. The parents stated that he slept for 10 hours per night and took one nap per day. The parents explained that the child was prone to repetitive behaviors such as constantly rolling a ball in his hands. He also still wore a diaper and the parents stated he was unable to be "potty-trained."

Examination

The physical examination was catered to the cooperation level of the patient. The initial chiropractic examination revealed that the patient had a slight left head tilt and a left rotated pelvis during gait. He would not make eye contact during the examination. Upon lying both prone and supine, the patient had a functional left short leg of approximately ½-inch. The patient appeared to have a diminished response to sound on the left side of his body when compared to the right. Lung auscultation revealed crackles on inspiration. When the patient turned his head to the right, his eyes appeared to lag up and to the left. His cranial circumference was measured as 18" and was asymmetrical: the right side measured 9.5" and the left measured 8.5." Through the use of static palpation for edema and muscular hyperactivity,²¹ motion palpation for motion restriction of vertebrae,²² and postural analysis for asymmetries related to the structure and function of the neuromusculoskeletal system,²³ a pattern of vertebral subluxation was determined as a right laterality and posteriority of atlas and internal rotation of the right ilium.

Intervention

Chiropractic care was initiated for 15 visits over a period of 8 weeks. Each visit, the patient was assessed using static palpation, motion palpation, and postural analysis, and vertebral subluxations were adjusted accordingly utilizing Diversified Technique. Adjustments were made at atlas for right laterality and posteriority using a posterior to anterior, right to left, and superior to inferior line of drive in the supine position for all visits except 2 and 8. During visits 3, 5, 7, 12, and 13, Webster's coronal suture adjustments were used to address the asymmetrical circumference of the cranium by taking a thumb contact on either side of the coronal suture on the side of larger cranial hemispheric circumference and using a "scissor" impulse at 4 different locations along the suture. Posteriority and inferiority of thoracic vertebra were addressed using a Diversified bilateral transverse process contact on visit 2 at T3, visits 6, 8, 9, and 10 at T4, and visit 14 at T7. Internal rotation of the right ilium was corrected on visit 1, and posteriority of the right aspect of sacrum was corrected on visit 15, using Diversified side posture adjustments with a posterior to anterior and medial to lateral line of drive at the right PSIS, and a posterior to anterior line of drive just right of the S2 tubercle, respectively.

Outcomes

After the delivery of the first adjustment, the patient made eye contact with the practitioner for the first time. On the 3rd visit, his parents stated that he seemed to be understanding direction better, but overall had been acting more aggressively. At the 4th visit, the parents stated that the patient was attempting to

verbalize more, although he had not yet been able to formulate words. During the 6th visit, the parents stated that the patient had asked to “eat” that morning, and began calling his Aunt “Auntie” when she was present. He also began asking to go in the “car” when he went outside, and had been having significantly less temper tantrums. During visit 7, the father related that the patient had asked for a “hug” for the first time. He began learning to avoid hitting objects when using his tricycle prior to the 8th visit. The mother related on the 11th visit that her son had started calling her “momma” three days prior. On visit 13, the patient hugged the practitioner for the first time. By the end of care, the patient’s head tilt was barely visible, and the pelvic rotation was no longer apparent.

On the 15th visit, the mother completed two Autism Treatment Evaluation Checklists (ATEC). She was asked to fill one out with respect to her son’s status before care and one for his current condition. The ATEC was created by the Autism Research Institute and was designed to evaluate the effectiveness of treatment protocols for ASD.²⁴ It consists of four sections, assessing the patient’s speech/language/communication, sociability, sensory/cognitive awareness, and health/physical/behavior.²⁴ The higher the scores in each of the four subsets and the total score, the higher the severity of impairment. The patient improved in all sections of the ATEC: speech/language/communication score decreased from a 23/28 to 15/28 for a 34.8% improvement, sociability score decreased from a 28/40 to 14/40 for a 50% improvement, sensory/cognitive awareness score decreased from a 20/36 to 10/36 for a 50% improvement, and health/physical/behavior score decreased from a 35/75 to 24/75 for a 31.4% improvement. The total score from the patient decreased from a 106/180 to 63/180 for a 40.6% total improvement, indicating a change from severe to moderate severity. (Figure 1)

Discussion

A 4-year-old boy diagnosed with autism spectrum disorder saw significant improvements in almost all areas of concern after 8 weeks of chiropractic care, as evidenced by both subjective reports from the parents and more objective scoring from the ATEC. Previous studies using the ATEC have shown that non-intervention control groups show no significant improvements in ATEC scores in any aspect over the period of one year.²⁵ Therefore, the improvements in this patient are compelling, considering the level of change over a short period of 8 weeks.

In a 2011 review of literature, Alcantara, et al stated that the literature base regarding chiropractic care and autism is lacking.¹⁴ This case study helps to strengthen the relationship between the reduction of vertebral subluxation and improvement in function in patients with ASD.

Proposed Mechanisms

While there is no known cause for ASD, research shows a significant role of the nervous system in the pathophysiology of the condition. Geschwind and Levitt state that symptoms of autism arise from a disconnection of the frontal lobe from other areas of the brain during development.²⁶ Critchley, et al found significant differences between autistic and control patients in activities of early visual cortex, early auditory

cortex, cerebellum, lateral temporal lobe, and mesolimbic areas such as the insula, amygdalohippocampal junction, and putamen during facial expressions when viewed using functional MRI.²⁷ Other studies have found involvement in the limbic system and an overall imbalance between activities of the sympathetic and parasympathetic nervous systems and their mediation over the hypothalamic-pituitary-adrenal (HPA) axis.^{10,27} The HPA axis is a major controller of immune function in the body, so any altered function can result in immune suppression or hyperactivity, leading to immune dysfunction commonly associated with ASD.²⁸⁻²⁹ In this case study, the presence of eczema, ear infections, allergies and other symptoms may have resulted from this immune imbalance.

Regardless of the pathogenesis of the disorder, each symptom relates, either directly or indirectly, to aberrant sensorimotor integration and subsequent output.⁸ The relationship between chiropractic care and the positive improvements in patients with ASD may lie in the influence of vertebral subluxation over the structures of the central nervous system that seem to be aberrantly functioning and disconnected from one another.

Vertebral subluxation is a mechanical distortion of the spinal column causing nervous system interference and dysfunction.³⁰ This mechanical distortion can come in the form of a misalignment which can affect the muscle spindle and golgi tendon organs of surrounding muscles and tendons, as well as the facet joints and intervertebral discs, each of which are riddled with nociceptors and mechanoreceptors.³⁰ Specifically, Pacinian corpuscles are found near blood vessels in these areas, Ruffini corpuscles are seen in supraspinous and interspinous ligaments, nerve endings are found in the ligamentum flavum, supraspinal ligament, and lumbodorsal fascia, the annulus of the intervertebral disc is not only innervated by the sinuvertebral nerve, but also has Pacinian corpuscles and Golgi tendon organs in its posterolateral region, and type I, II, and III ligament mechanoreceptors and non-encapsulated nerve fibers are located in the facet joints of the cervical spine.³⁰⁻³¹ Mechanical strain in these tissues not only leads to a chronic inflammatory response, but also to an altered transmission of both proprioceptive and nociceptive information to the central nervous system, a process known as sensory dysafferentation.^{30,32} This information is transmitted to the ipsilateral cerebellum, contralateral thalamus, and contralateral cerebral cortex via the spinocerebellar, medial lemniscal, and spinothalamic tracts.^{31,33} After being mapped at the cortex, this information can have a profound effect on the function of the amygdala, which receives stimulation from all areas of the cortex.³¹ The amygdala, along with the hypothalamus and dorsal horns of the spinal cord, comprise a major part of the limbic system, and mediate feelings, emotions, and a state of well-being via complex interactions of neuropeptides and biochemical mediators known as the “Brain Reward Cascade.”³⁴⁻³⁵ This altered limbic function may have a profound effect on autistic children who already have altered reward processing, as confirmed by functional MRI.³⁶⁻³⁷

This cascade of effects from sensory dysafferentation leads to a change in the central integrative state of the neurons responsible for responding to environmental stimuli, specifically, the cerebrum and cerebellum.³² These effects of dysafferentation from subluxation may contribute to the

previously mentioned disconnection from the frontal lobe during development,²⁶ differences in activities of other areas of the brain found by Critchley, et al²⁷ and altered limbic and autonomic function.¹⁰ A chiropractic adjustment specific to removing subluxation resets the joint and mechanoreceptor activity, changes the central integrative state of the central nervous system, and results in a more appropriate adaptation and response to the environment.⁸

Chiropractic Literature

While literature within chiropractic has not yet determined the level of efficacy in the resolution of ASD, many studies have had similar improvements in symptoms. A study by Khorsid, et al demonstrated improvements in 12 of 14 children with autism using full spine technique and upper cervical care as demonstrated by ATEC scores.³⁸ The children under upper cervical care had a 32% improvement in scoring, while those under full spine care showed a 19% improvement in scoring. However, the article does not state whether or not there was statistical significance in any of these findings.³⁸

Improvement in ATEC scores has also been seen with a 6-year-old boy following chiropractic care over 16 weeks utilizing Diversified and Thompson Drop techniques alongside trigger point therapy.³⁹ Also noted were improvements in learning abilities, social interactions, language skills and behavioral patterns.³⁹

McCormick discussed a 4-year-old boy who was diagnosed with autism at the age of two years.⁴⁰ The boy had previously undergone speech therapy and dietary changes which only helped to improve his gastrointestinal symptoms. Following chiropractic care over a period of 6 months, he saw improvements in social behaviors and his ATEC scores.⁴⁰

Singh, et al described the care of a 7-year-old patient with autism suffering from nocturnal enuresis.¹² After 4 weeks, his nocturnal enuresis had reduced from six nights a week to two nights a week. After two months, he began to use the toilet by himself for the first time. His parents noted many other positive changes in his behavior, such as a significant reduction in the number of his temper tantrums.¹²

Hoffman and Russell described the care of a 3-year-old female who had been diagnosed with autism a year previously.⁸ After 10 weeks of chiropractic care utilizing Torque Release Technique®, the patient saw improvements in socialization and language capabilities.⁸

Lumb 2014 discussed the care of two children with ASD with delays in speech and language.¹⁰ They saw an average of six times greater rate of development in expressive and receptive language during one year of Network Spinal Analysis care when compared to other long term studies of autistic children.^{10,41-42}

Zielinski and Borkhuis described the care of a thirty-five month old girl with autism complaining of headaches, epilepsy, acid reflux, vomiting and sleep disturbances.¹¹ With subluxation-based chiropractic care, she saw resolution of her headaches, acid reflux, vomiting and sleep disturbances. She also saw improvements in other symptoms of ASD, such as

calmer behavior, increased eye contact, increased focus and attention, and an overall more positive demeanor.¹¹

Cleave, et al described the care of a 20-year-old male with autism and 17-year-old female with autism over periods of five and four months, respectively.⁴³ Each was seen once per week. The male patient experienced a decrease in aggressive behavior, and the female patient experienced an increase in her socialization and decrease in her self-abusive behavior.⁴³

Bloink described the care of a 19-year-old female diagnosed with ASD with a language delay.⁴⁴ Her care consisted of category two Sacro-Occipital Technique for sacroiliac dysfunction and cranial therapy, including intraoral temporal and sphenomaxillary procedures, for craniomandibular dysfunction. Prior to care, the patient would only speak with her head in flexion and her eyes looking downward. Immediately following one treatment, the patient began to speak while making eye contact, which lasted for seven days.⁴⁴

Scelfo and Chelenyak describe the care of a 9-year-old boy with autism experiencing chronic ear infections and deficits in social interaction and communication.⁴⁵ The patient had a 16% overall improvement in her ATEC scores after two months of chiropractic care and digestive enzyme supplementation as prescribed by a nutritionist. The patient also improved in her social skills and language development. The parents also noted that they had reduced his usage of medication.⁴⁵

Autism Treatment Evaluation Checklist (ATEC)

The Autism Treatment Evaluation Checklist was developed by the Autism Research Institute in San Diego, CA in order to more effectively monitor the effects of various treatment protocols on ASD. The ATEC has been confirmed reliable using a split-half reliability test resulting in an uncorrected r of .942 for the total score, .920 for speech, .836 for sociability, .875 for sensory/cognitive awareness, and .815 for health/physical/behavior.²⁴ The practitioner in this study used the ATEC because it has high reliability, was specifically designed to monitor treatment outcomes for children with ASD, is not copyrighted, and has free scoring available online.

Limitations

The major limitation in this study is that it is a case study. There was no comparable control group to systematically isolate the effectiveness of chiropractic care. The administration of the ATEC on the final visit for both pre and post values could limit the objectiveness of the survey. Administering the ATEC before and after a set amount of care and utilizing a larger sample size, including a control group, would lead to a more valid study.

Conclusion

This case study shows improvement in symptoms of ASD in a 4-year-old boy after 8 weeks of subluxation-based chiropractic care as evidenced by a 40.6% improvement in total impairment rating by the ATEC. With a growing body of case studies on chiropractic and ASD, this study serves to strengthen the relationship between reduction of vertebral

subluxation and improvements in function in patients with ASD. The positive results of this and other case reports calls for larger studies on the efficacy of subluxation-based chiropractic care on ASD. Because chiropractic care is used to correct disturbances in the nervous system caused by vertebral subluxation, its implementation can lead to an abatement of a variety of symptoms, although it is not used specifically as a treatment for any disease, illness, or injury. The improvements in function in children with autism over a broad spectrum of areas may demonstrate a close connection between autism spectrum disorder, the central nervous system, and the role of the chiropractic adjustment.

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Figure 1 – A comparison in ATEC scores in 4 subsets and total scores pre and post 8 weeks of subluxation-based chiropractic care

