CASE STUDY

Improved Health Outcomes & Quality of Life in a 10-Year-Old Child with Autism Spectrum Disorder Following Chiropractic Care to Reduce Vertebral Subluxation: A Case Study & Selective Review of the Literature

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Abstract

Objective: To report on the positive health outcomes in a child with Autism following chiropractic care to reduce vertebral subluxations.

Clinical Features: A 10-year-old female child diagnosed with Autism Spectrum Disorder (ASD), who originally presented with complaints of neck pain, low back pain, head banging, insomnia and uncontrolled behaviors was examined and found to have vertebral subluxations.

Intervention and Outcomes: Chiropractic adjustments were given at each visit using the Torque Release Technique® (TRT) protocol. The patient received 12 adjustments in the areas of dural attachment, occiput, C1, C2, sacrum, and coccyx over an eight-week period. The patient would present to the clinic in a protective position, taut and rigid. After adjustment the child was more relaxed. Her outburst ceased and had a calmer demeanor. Her sleep improved.

Conclusions: This case study shows improved health outcomes, behavior and quality of life, subjectively and objectively, following chiropractic care in a child with ASD. Previous chiropractic care has shown similar responses. More research is needed on chiropractic and the management of children with Autism.

Key Words: *Autism Spectrum Disorder, chiropractic, pediatric, Torque Release Technique, Integrator™, Vertebral Subluxation, adjustment, quality of life*

Introduction

Epidemiology- Incidence, Prevalence, and History

Autism Spectrum Disorder (ASD) is a multisystem neurodevelopmental condition that occurs in a period during the first 36 months of life that manifests as abnormalities in communication deficits, social skills, along with repetitive stereotyped behaviors.[1] The etiology of ASD is ambiguous, and the hypothesis of causation varies from genetic abnormalities, toxic agent exposure, obstetric complications, and infectious agents.[2,3]

Due to the reported dramatic increase in the prevalence of ASD in developed countries, genetic susceptibility factors are thought to likely lead to the disorder. This dramatic increase in ASD has resulted in intensified scientific focus on environmental exposures. Environmental exposures that have immunotoxic insults, prenatal and perinatal, are now heavily suspected as contributors to this increase. Thimerosal, a common preservative in some pediatric vaccines, consists of Mercury (Hg). Hg is both a neurological and an immune toxin. According to the Journal of Developmental

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Disabilities, there are no direct human studies on the risks of Hg exposure from thimerosal containing vaccines. Risks were only found in animals.[4]

However, in August 2014, William W. Thompson Ph.D. a senior scientist with the Centers for Disease Control released a statement about falsification of data regarding ASD and the MMR vaccine containing thimerosal. African American males who received an MMR vaccine before the age of 36 months were at increased risk for ASD.[5]

Over the past couple of decades, many countries have reported higher rates of ASD. In the United States, ASD is one of the most common childhood disabilities. ASD was found to involve one in 68 children aged eight years. Data from the ASD and Developmental Disabilities Network stated 78% increase in the years 2002 to 2008.[6] The CDC reported a 29% growth in pervasiveness from 2008 to 2010 in children aged eight years. ASD is found in one out of every 42 boys and one in every 189 girls.[7]

Economic Cost to Society

The economic burden that will be related to ASD will be considerable due to the multiple aspects that are affected. This includes, but is not limited to, educational, medical, occupational and social hardships. The total costs per year for children with ASD in the US were estimated to exceed $17,000 per child.[8] Children and adolescents with ASD had an average medical expense that exceeds those without by about $4,110-$6,200 per year.[9] In 2005, the Medicare costs for ASD were $10,709 per child, which is six times higher than children without ASD.[10]

The total estimated cost of ASD in the US for 2015 was $268 billion. The cost number was calculated and forecasted by using a cost of illness method estimated by annual prevalence of the disease.[11] The number of children diagnosed with ASD might exceed this estimate with the implication of ICD-10 and better tracking of statistics.

The exact cost for a child with ASD to receive chiropractic care for a year would vary based on the care plan and location. When more research has been completed with chiropractic care and ASD, more concrete evidence-based care plans and cost could be available. The goal of chiropractic treatment of ASD patients would be to increase functionality which would decrease overall economic burden.

Case Report

This case report was on an established patient who originally presented with a chief complaint of neck and low back pain. Following chiropractic care, the parent noticed improved behavior and fewer outbursts.

History

The patient is a 10-year-old Caucasian female student who presented with neck and low back pain. The patient had been diagnosed with ASD, pervasive development disorder (PDD) and explosive outburst disorder (EOD).

The patient stated that her neck pain was currently a 6/10, worst 7/10, and sharp on the right near the cervicothoracic junction. The patient could not state a specific mechanism of injury but indicated that studying while looking down at her book made it worse. Chiropractic adjustments did help previously. The patient denied radiation. It did not affect the patient's activities of daily living but did state that when she would play it would bother her.

The low back pain was currently a 5/10 with the worst being 8/10. The patient pointed to her right Sacroiliac joint when asked for the site of pain. The patient denied radiation. A previous medical professional diagnosed the patient with scoliosis. Chiropractic care did help previously for the low back as well. The pain has been there for about four years; she states that running and sitting for too long makes the pain worse. It did not affect activities of daily living.

Pregnancy History

The mother states she maintained a healthy diet during the pregnancy. She consumed no caffeine and gained 26 pounds. She had proteinuria, blood in the urine (from kidney stones during pregnancy), two kidney infections, anemia (diagnosed previously), frequent urination, swollen ankles and low blood pressure. She also stated that she was not emotional during the pregnancy.

The mother of the patient had a total of six pregnancies with four births and two miscarriages. The mother was on medication during the pregnancy. Two of the three medications that the patient was on, for most of the pregnancy, were Lovenox and Heparin. The mother had two deep vein thrombi (DVT), and the medications were used for prevention. The last five weeks the mother was also prescribed Demerol for pain and was bed ridden for the remainder of the pregnancy.

The patient was born at 32 weeks, delivered via cesarean section, weighed 3 pounds 14 ounces and was 18 inches long. The Apgar score was 6 at birth. The patient was in the neonatal intensive care unit (NICU) for one week until the Apgar score was a 10.

The child met all developmental milestones until 18 months. Immunizations were administered at 18 months, after which developmental milestones were not met. The child was unable to throw a ball, climb or descend stairs, use a spoon, feed herself, identify body parts, sit self in a chair, speak 4-20 words, turn pages of a book, or build a tower of five blocks. She was delayed in hitting the 30 and 36-month milestones. The 3-4, 4-5, 5-6 year milestones were also delayed. The mother of the patient began chiropractic care for the child around six years of age. The patient met the 6-7, 7-8, 8-9 and 9-10 year milestones.

The patient never had influenza, chicken pox, whooping cough, pneumonia, measles, rheumatic fever, fifth's disease, asthma or rubella. The child gets sick about one time a year. The patient has repeated trauma from hitting herself or beating her head against the wall due to the PDD and EOD.

Immunization History

The child was first immunized in 2007. She received several vaccines at the same time, Hib, MMR, DTap, and IPV. Within 24 hours the patient ran a fever and was given an Advil to abatement. She started to act lethargic, stopped interacting with the mother and started to gasp for air. The mother called 911 and the patient stopped breathing. The mother did CPR until the ambulance came. The patient had a violent seizure for about 42 minutes. The hospital administered a medication that stopped the episode. She was released four days later.

In 2009, the child was in daycare on a regular basis when both the mother and caregivers began to observe behavioral abnormalities. She started to rock back and forth, flapped her hands, made no eye contact, and would not interact with the other children. She also began to beat her head against a wall. The patient would be restrained by the adults to prevent her from hurting herself or the other children. Shortly after this behavior started, the mother took the child to a chiropractor that practiced Torque Release Technique (TRT).

The mother noticed after the first adjustment that the child was only restrained once a week rather than 20-30 times. She continued chiropractic care for a while and saw that the child was hurting herself less, calming down, stopped flapping her hands, improved communication, had less repetitive behavior, interacted with other children and improved eye contact. Currently, if not adjusted regularly, the child gets frustrated, is less receptive to authority, gets angry quickly and begins to hit herself and others.

Physical exam

The initial chiropractic exam revealed an abnormal posture pattern with the patient deviating her body towards the left. Her right scapula was more pronounced and elevated. The patient had a positive Cervical Syndrome. Palpation was performed with the patient struggling throughout the process, which prevented any objective findings. Thermal scanning using the Tytron was used to determine autonomic nervous system abnormalities. The skin has a complex network blood vessels and nerves controlled by the autonomic nervous system. A study done at Johns Hopkins Medical Institute showed that changes by 1° Celsius are significant.[12]

The Tytron report presents four quantifiable indicators of autonomic nervous system function, severe, moderate, mild and normal. Severe readings indicate an asymmetrical difference of 0.8 to 2.0 Celsius (C). Moderate readings are between 0.5 and 0.8 C° and mild 0.3 and 0.5 C°. Normal readings are between 0.0 to 0.3 C°.[13] The cervical segments, C1-3 on the right, along with segments T9 –sacrum on the right had severe readings. The left side had a normal reading from occiput to the sacrum.

Outcome assessment tools (OATs) were given for more objective findings. The parent filled out questions, answered by the patient, from the neck Quadruple Visual Analog Scale (QVAS), low back QVAS and Short Form Survey (SF-36).

QVAS is a prevalent form used for pain measurement in many specialties varying from chiropractic to psychiatry. The QVAS asks the patient to answer four questions that are scaled from 0 being no pain through 10 being the worst possible pain. Question 1 asks the patient to describe the current pain. Question 2 asks for typical or average pain. Question 3 and 4 asks for a ranking of the pain at its worst and best respectively. Scores greater than 50 indicate a high intensity of pain. A score less than 50 would demonstrate a low intensity of pain.[14]

The SF-36 is a 36-question survey which profiles crossover in the patient's physical and psychological health. The survey uses eight scales in which both the physical and psychological components can reflect treatment outcomes. The physical scales include role physical, bodily pain, and physical functioning measured in the physical component summary (PCS). The psychological scales include mental health, role emotional, and social functioning measured in the mental component summary (MCS). General health, vitality, and social functioning combine and scored in both components. The maximum SF-36 score would be 100 and the minimum 0. The average or a normal score is 50.[15] This patient initially scored an 86 on the neck QVAS, 83 on low back QVAS and PCS 41 MCS 22.

Diagnosis

The conclusion of the case history, instrumentation, chiropractic examination and physical exam diagnosed the patient with myalgia and abnormal posture. Those diagnoses were accompanied along with vertebral subluxation of the cervical, thoracic, lumbar and sacral regions. Progression in the patient's care would be measured by TRT 15 indicators of subluxation, thermography (Tytron), pain scale, SF-36, neck and low back QVAS.

Intervention

The patient was prescribed a three times a week care plan which would end with a re-examination 45 days later. Adjustments were given at each visit while using the TRT protocol. The patient received 12 adjustments in the areas of dural attachment, occiput, C1, C2, sacrum and coccyx over an eight-week period.

Outcome

The Tytron readings two months later showed no severe readings. The patient had a moderate reading at C1, mild at C2-3 and in the mid thoracic area on the right. She had a normal reading on the right lumbars along with the whole left side from occiput to sacrum. The OAT score for neck QVAS improved from an 86 to a 53. The patients low back QVAS score went from 83 to a 0. The SF-36 score was PCS 54, MCS 44.

The patient would present to the clinic in a protective position, taut and rigid. After adjustment, within 15-20 minutes, the child was more relaxed. Her outburst ceased and had a calmer demeanor.

The more times she was adjusted in a week, the longer she stayed calm. When the patient went a week without adjustment, she had several outbursts and had to be restrained several times to stop her from bashing her head or body. She

would describe the outburst incidents as if volcanoes in her head exploded.

The night's after her adjustment she slept easier and longer and on the days she was without adjustments, the patient would struggle with sleep.

Chiropractic technique

TRT is a technique that is based on a non-linear, vitalistic and tonal model. It focuses on finding the primary subluxation using a neurologically based reflex to assess the abnormal tension in the Cranio-Spinal-Meningeal Functional Unit (CSMFU). The CSMFU is the continuous connection of the multi-level meningeal entwinement of the brain, spinal cord, bones of the cranium, vertebral column, and pelvis. This abnormal CSMFU tension causes pressure, which interferes with the fundamental protein structures.[16]

TRT uses an FDA 510k registered instrument called The Integrator™. It is the only technique that uses the chiropractic Toggle technique's adjustment recoil in an instrument. The technique uses a device on the patient to create increased intra-examiner reproducibility. Spinal cord tension has been shown in the recent literature to be described as a source of autonomic dysfunction. TRT is one of the few techniques that apply a tonal model clinically for an alleviation of spinal cord tension.[17]

TRT uses 15 indicators of subluxation; palpation, functional leg length inequality, abductor/adductor tendency, foot flare, foot supination/pronation, heel tension, abnormal breathing patterns, inappropriate sustained patterns of paraspinal contractions, congestive tissue tone, postural faults, cervical syndrome test, wrong-un-test, bilateral cervical syndrome test, Derefield test and abnormal heat from radiation.[16]

Discussion

ASD and chiropractic is a relatively new researched topic. The efficacy of chiropractic care and ASD is still in progress. A randomized control study was done by Khorshid et al. in 2005 and compared upper cervical adjustments to full spine adjustments in patients with ASD. The patients improved four-fold when the patients shifted from full spine adjustments to Upper Cervical Atlas Orthogonal adjustments.[18]

Diversified adjustments have been shown to improve a patient with ASD. These studies were either case reports or case studies. The regions adjusted that showed the most improvement were in the cervical or sacrum. Adjustments were given in the cranium, cervical, thoracic and sacral regions. Full spine adjustments typically involve multiple segments in the same visit, which does not isolate the exact location of the vertebral subluxation. The adjustments also vary per full spine practitioner in regards to speed, depth, accuracy and vigor.[19-22]

A Torque Release Technique case study has shown improvement in pediatric patients with ASD. The case had both subjective and objective measures to show improvement of the patient. TRT can be reproducible due to the implementation of an instrument that delivers the same adjustment each visit.[23]

A chiropractic case, reported in England, involved a 10-year old boy with violent outbursts in 2014, showed that adjustments reduced incidences. The chiropractic care administered to the patient involved toggle-recoil, Thompson drop technique, and diversified adjustments. The patient's mother completed a Medical Outcome Profiled questionnaire (MYMOP). The questionnaire subjectively measures symptom severity, well-being and ability to perform an activity. The questionnaire is scored from 0-6 with 0 being as good as it can be and 6 as bad as it could be. The initial MYMOP score was a 6/6 and was reduced to 1.6/6 by the ninth visit.[24]

About 70% of the children diagnosed with ASD receive pharmacologic treatment and most suffer adverse side effects.[25] There is limited evidence for any beneficial outcomes since ASD causation is not clearly defined and that medications treat behavioral symptoms not autism. Evidence-based treatments for early autism is also difficult to solidify due to lack of long-term randomized control trials with cross-site replication studies.[26] This in conjunction that one hundred and twenty-five different classes of prescribed drugs have been used to treat ASD. The most prescribed classes were antidepressants, stimulants, psychoactive drugs, anticonvulsants, hypotensive agents, sedatives and benzodiazepines.[25]

The complementary and alternative medicines (CAM) management for ASD varies from Homeopathy, Aromatherapy, Acupuncture, Naturopathy, Diets, Chiropractic, Massage, horseback riding to spiritual healing. Most of the CAM modalities have shown improvement in children diagnosed with ASD. 75% of the parents reported that it helps their child.[27]

Proposed mechanism of subluxation correction

The vertebral subluxation is a tonal dysfunction of the nervous system through direct or indirect transmission via the spinal cord.[28] The subluxation is based on the theory DD Palmer proposed in 1914 that normal human tone variations of tension, structure, temperature, elasticity and renitency are a deviation from health, which leads to disease.[29] Coincidently, the same year in the Journal of Biological Chemistry reported a similar article about the effect of pressure on protein denaturation.[30]

> "Proteins are the most versatile macromolecules in living systems and serve crucial functions in essentially all biological processes. They function as catalysts, they transport and store other molecules such as oxygen, they provide mechanical support and immune protection, they generate movement, they transmit nerve impulses, and they control growth and differentiation."[31]

Proteins are converted by changes in pressure from minuscule conformational effects to supramolecular structures. Nucleic acids have a low sensitivity with the lipid membrane having extreme sensitivity to pressure. Misfolded proteins and

amyloid diseases have been studied with pressure being a cause of the dysfunction.[30]

The meninges make up the connective tissue of the central nervous system (CNS) widely penetrating every aspect. The meninges project through all structures of the CNS. The projection is from the stroma of the choroid plexus to formation of the perivascular space in the spinal cord and brain. "The meninges modulate most of the physiological and pathological events of the CNS throughout life."[32] The meninges are a continuous mat of extracellular matrix molecules. The matrix is but not limited to collagens, laminin, fibronectin and proteoglycans that are both a part of the structures of the brain and spinal cord. These meningeal tissues are a source of neurotrophic factors such as insulin-like growth factors and cytokines.[32]

Collagen, laminin, and fibronectin are unusual because of their innate roles in growth and repair.[33] This innate ability for growth and repair might explain why chiropractic adjustments to the spinal cord and the dura-meningeal system have unique outcomes and occurrences.

Increased cytokines were present in cerebrospinal fluid (CSF) of post-mortem brain tissue of individuals with ASD.[34] Increased cytokines could be due to the increase in pressure on the meninges releasing abnormal measurements of cytokines in the CSF. The myodural bridges at the craniocervical junction are dense connections that extend into the cervical dura sac. These connections significantly control the CSF dynamics. The majority of the CSF is stored in the vertebral canal and restriction of fluid movements has been shown clinically to cause symptoms in patients such as headaches and other neurological findings.[35]

CSF along with its neurotrophic component changes should be studied to show physiological responses of the vertebral subluxation complex. The release of these trophic factors in conjunction with the pressure changing the fundamental biochemical building block of the body, proteins, should be the physiological response studied for the vertebral subluxation complex. The mechanical spinal cord and CNS meningeal system tension should be the principal mechanism of study when trying to explain chiropractic care.

Limitations

There were many limitations to the study. The most notable was that the parent did not adhere to the care plan. The patient was adjusted twice a week the first week and then was only seen once the following two weeks. The patient was feeling better, and the parent waited about a month before returning when the child deteriorated to the pre-treatment state. Other limitations involved are the fact that this is a single case study.

Future studies need to include the ASD Treatment Evaluation Checklist (ATEC) developed by the ASD Research Institute of San Diego, California. The parent or a caregiver of the children participating would complete the ATEC. The ATEC is a one-page questionnaire that has four parts: Speech/Language Communication, Sociability, Sensory/ Cognitive Awareness, and Health/Physical/Behavior.[18]

Conclusion

This case study shows improved behavior, subjectively and objectively, following TRT chiropractic care that focuses on removing pressure off the CSMFU in a child with ASD. Previous chiropractic care has shown similar responses. However, limitations of this study need to be considered.

Chiropractic needs more research with patients with ASD since positive outcomes from adjustments have shown to improve behavior. Improved behavior in children could potentially limit the economic burden. The goal of treatment with patients would be to advance the quality of life potentially. This goal is particularly the case since the number of ASD patients has grown exponentially in the past few decades. Since causality is still in question, early and frequent conservative CAM treatment should be available due to the high percentage of favorable behavioral outcomes with patients with ASD.

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