CASE STUDY

Improvement in a Child with Autism Following Chiropractic Care to Reduce Vertebral Subluxations: Case Study & Selective Review of the Literature

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Abstract

Objective: To describe and discuss 6 weeks of subluxation-based chiropractic care in a 6-year-old male who was diagnosed with Autism Spectrum Disorder (ASD).

Clinical Features: A 6-year-old male presents with aggressive behavior, hindered social and physical activities, poor eating habits and sleep difficulties. The boy was previously diagnosed with Autism by a neurologist.

Interventions and Outcomes: The patient was assessed for subluxations and adjusted using the Diversified Technique. 15 visits over the course of 6 weeks of subluxation-based chiropractic care were provided. The young patient was assessed using a thermal scan, static surface electromyography, motion and static palpation. Outcomes included decreased time taken to fall asleep, improved sleep quality and sleep time, decrease in aggressive behavior, an increase in alertness, focus and agreement to finish school-related work. Patient was able to discontinue use of medications Risperidone and Tenex.

Conclusions: This case study demonstrates the reduction of ASD symptoms and impairments with the use of subluxation-based chiropractic care.

Keywords: *Autism, chiropractic, autism spectrum disorder, Diversified Technique, subluxation, adjustment, spinal manipulation, aggressive behavior*

Introduction

Autism Spectrum Disorder (ASD) is described as a set of developmental disabilities that can lead to significant social, behavioral and communication restrictions.[1] The term "spectrum" refers to the vast set of symptoms associated with this disorder, including skills and levels of impairment or disability.[2] There is an increase in incidence of autism all over the world, in children of all ages.[3] The official prevalence of autism, reported in 2014 from a study completed in 2010, stated the overall prevalence of ASD was 14.7 per 1,000 (or 1 in 68) children aged 8 years old.[4] This is a significant increase, from a report in 2012 of a study completed in 2008, where the U.S. Federal Centers for Disease Control estimated the incidence of children diagnosed with ASD was 11.3 per 1,000 (or 1 in 88).[5]

Since the CDC report in 2014, a new study has been reported concerning those diagnosed with ASD. The study consisted of a government survey of parents with a child diagnosed with ASD.[6] This survey was significant due to limitations within the previous CDC study estimate, since the study was conducted exclusively on 8-year-old children at certain monitoring sites.[6] The survey indicated that of children ages 3 through 17, 1 in 45 children had been diagnosed with ASD.[6] Of the children in the previous 2014 CDC report, statistics indicated approximately 1 in 42 boys and 1 in 189 girls were identified having ASD.[4]

Costs for having a child with ASD were higher in comparison to a child without ASD. Medical costs alone could have added

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$3,020,[7] and school-based, special education services could have an additional cost averaging $8,610,[7] a year per child. In a recent report in the journal Pediatrics, the cost for mothers of a child with ASD led to working less hours[8] and they earned an average of 28% less than those families without health limitations.[8]

At about 18 months of age, autism can show the first concerns.[9] Of those parents with children having ASD, studies have shown about one-third of them have noticed a problem occurring before the age of one year old.[10] About 80% of the same parents involved in the study saw problems before 24 months.[10] At this time, parents will notice a withdrawal or social disconnection.[11]

It is characterized by persistent deficits in social communication and social interaction across multiple contexts, restricted, repetitive patterns of behavior, interests, or activities, symptoms must be present in the early developmental period (typically recognized in the first two years of life) and, symptoms cause significant impairment in social, occupational, or other important areas of current functioning.[2]

Evaluation for ASD, by an expert, can result in very early indicators such as "no babbling or pointing by the age of one, no single words by age 16 months or two-word phrases by age two, no response to name, poor eye contact, excessive lining up of toys or objects, or no smiling or social responsiveness."[11] Later indications can include "impaired ability to make friends with peers, impaired ability to initiate or sustain a conversation with others, absence or impairment of imaginative and social play, repetitive or unusual use of language."[11]

Diagnosis of ASD is difficult for doctors, due to lacking of a specific medical test, such as a blood test.[12] Today, to diagnose ASD, doctors look at the child's behavior, as well as their developmental pattern to make a diagnosis. They do this using developmental screening and comprehensive diagnostic evaluations.[12] They observe the patient during normal visits around ages 9 to 24 months.[12] They assess development in different areas such as social communication and interaction, behaviors involving unusual patterns such as repetition or restrictions, as well as activities that are not normally developing.[12] Diagnostic evaluation can involve genetic testing, screening for hearing and vision, neurological and other medical testing.[12]

Jennings reported that literature currently lacks identifying a neurochemical, physiological, or anatomical cause for autism.[13] This is the main reason treatment for ASD is so difficult. Possible treatment for symptoms of ASD are behavior or social skills therapy, prescribed medication, or a special diet and vitamin supplements.[14] No effective pharmacological interventions are available to treat the core symptoms of ASD at this time, nor are there any to cure the disorder.[15-16] Some medications are available to help the individual function better in life. Medication may help with high energy levels or the inability to focus.[16] Some medications also help with seizures.[16] With each kid responding differently to each medication, this leads to parents searching for other forms of care. Complementary and alternative medicine (CAM) is one of those other forms.[17] CAM is often labeled "natural", or minus the conventional medical treatments side effects.[17] Chiropractic care has become one type of alternative care pursued to help with the symptoms of ASD.

Chiropractic care focuses on the function of the nervous system. When a vertebrae misaligns, the interosseous articulations of vertebrae, may undergo physiological change, that is, functional and/or structural change which may affect other elements, particularly neural structures and neural function, pathoneurophysiology.[18] This is a vertebra that has misaligned from normal position to end in a fixed abnormal position.[19] The result of this fixed abnormal position is "steady and uninterrupted pressure to bear on vital structures."[19] According to DD Palmer, these "partially dislocated bones will compromise surrounding soft tissue, such as nerves exiting the intervertebral foramina" and "the end result of subluxations would be disease."[19]

Case Report

Patient History

A 6-year-old presented with his mother and father to a chiropractic clinic. He was previously diagnosed with Autism Spectrum Disorder by a neurologist. The parents stated he had developed aggressive behavior and was somewhat hindered in his activities, more socially than physically. The patient was waking often throughout the night, getting up very early in the morning, both leading to not sleeping well through the night.

The young boy had a traumatic birth. Labor was not induced and a C-section delivery took place. The parents stated the doctor assisted in the birth and there was a twisting and/or pulling of the baby. An epidural was used during the birth. The patient developed Erb's palsy as a result of this traumatic event. Pyloric stenosis also developed at a young age for this patient and there was an appropriate surgery to follow for correction of this stenosis at 6 weeks old.

The parents stated he was a picky eater, limiting himself to refined and processed foods like pizza, pasta, mac and cheese, and hot dogs at the time of starting care. He would not eat a typical full meal. He would only graze on foods such as previously mentioned.

The patient had been vaccinated since birth. The young boy was late in reaching his milestones of crawling (1 year) and walking (18 months). Since birth, the patient had multiple ear infections and took antibiotics for each occurrence. He was taking prescription medication when presenting to the office. This medication consisted of Risperidone and Tenex, which he was prescribed to take orally each morning. Each night he was prescribed to take liquid melatonin to sleep. The parents stated they thought the child was exhibiting Asperger's-like symptoms, even though he had never been diagnosed with Asperger's. They also explained he is sensitive to light, sound and crowds, but has never been clinically diagnosed with Sensory Processing Disorder (SPD).

Chiropractic Examination

The doctor performed a chiropractic exam the first day the

parents presented the patient to the office. This was performed to assess for the presence of any vertebral subluxation complex(s) (VSC) and to decide if chiropractic care was right for this patient.

The exam started with static palpation. There was a notable overall very tight and tense palpation to the body. The boy was unable to relax. Range of motion was then assessed as well. The most notable restriction in motion was at the C1 and C2 level. The motion in the right C1 had restriction, as well as the left C2.

The Insight Millennium was used to further perform his chiropractic examination. This Insight use included a rolling thermal scan, a static EMG (sEMG) scan, as well as creating an sEMG scan pattern graph. This was done because thermal asymmetries can be a result of vertebral subluxations.[20]

The rolling thermal scan indicated temperature differentials from the patient's right to left paraspinal musculature, in the mild category, at the levels of T6, T7, L4, L5 and S1. There was an increase in temperature differential seen at the level of C1, on the left, in the moderate category. These findings can be seen in Figure 1.

The patient's sEMG scan indicated mild hypertonicity at C7 on the left, and T1, T6 and T8 on the right. The scan indicated moderate hypertonicity at C5, T8, L5 and S1 on the left, and C5 on the right. The scan indicated severe hypertonicity at C1, C3, T1, T2, T4, T6 and L3 on the left, and C1, C3, C7, T4 and S1 on the right. The other levels in white are within normal limits of muscle activity compared to the normal population standard. These findings can be seen in Figure 2. The sEMG scan pattern graph exhibited an imbalance around the T1 through T3 area on the left more than the right. These findings can be seen in Figure 3.

The chiropractic profession uses thermal evaluation of the paraspinal temperature to measure an effect on the nervous system.[21] The Insight scan measures heat emission, using infrared technology, that comes from the skin surface.[21] Peripheral skin temperature differs from right to left sides with dissimilar sympathetic tone from the nervous system.[21] This is due to changes in the peripheral vasoconstriction from side to side.[21] One difference between thermography patterns and segmental patterns for analysis is the assumption with thermography of the "ability to adapt to a changing environment (homeostasis)."[22] In terms of thermal scans detecting change in the nervous system, one study concludes the consistency observed indicates that the changes seen in properly performed thermal scans are most likely due to actual physiological changes rather than equipment or technical error.[23]

One study of the Insight Subluxation Station reported a "good to excellent reliability of paraspinal thermal scanning."[23] A review of literature was conducted on paraspinal thermography and McCoy concluded that the reliability of scanning was good to excellent.[20] However, now a shift is needing to happen to understanding how to interpret these scans and educate based off their readings.[20]

Electromyography records the muscle activity electrical potential.[24] Surface electromyography uses hand-held electrodes, touching the skin over the areas being recorded, to evaluate the muscle activity.[24] A study completed by Miller and Redmond shows changes in the nervous system was well detected by surface electromyography in patients with Network Spinal Analysis (NSA) care.[25] NSA is another form of chiropractic care. This states the change in the paraspinal musculature can be recorded and then used in chiropractic analysis, even if not for the specific diagnostic application.[25]

Chiropractic Intervention

The patient started chiropractic care for 6 weeks, for a total of 15 visits. He was seen three times a week for 4 of the total 6 weeks, and either one or two times for the remaining 2 weeks of care. Adjustments, along with home exercises of cross crawling and marching, were performed until a reassessment was completed. Recalculation of his care frequency was to be completed upon reassessment. Vertebral subluxations were located with static and motion palpation at each visit, and then the adjustment(s) were applied where VSC(s) were found using the Diversified Technique.

During week one, two specific chiropractic adjustments with the patient in a supine position were administered. The adjustments involved atlas laterality on the right with posteriority, as well as posteriority and rotation of C2. The line of correction (LOC) for the C1 segmental adjustment was posterior to anterior, superior to inferior and right to left, and for C2 on the left, the LOD was posterior to anterior, inferior to superior and left to right. The third adjustment that week was in a prone position for the sacral misalignment, with the aid of a drop on the table. The LOC for this segment was posterior to anterior. During week 2, the patient was adjusted at the level of C1, C4 and sacrum. At C1, the LOD was posterior to anterior, superior to inferior and right to left. The LOD for C4 was posterior to anterior, inferior to superior and left to right. The patient's sacrum was adjusted with a LOC of posterior to anterior. During week 3 through 6, the patient was adjusted at C1 and sacrum. These two segments had the same LOD as the first two weeks.

Diversified Chiropractic Technique

The Diversified Technique is a technique that gave selection for an adjustment segment "based on a static model of joint alignment."[26] Static palpation, postural analysis, x-rays, and sometimes the neurocalometer, were used to decide on subluxation locations. Biomechanical concepts and motion palpation came later in assessing for VSC.[26] A method of more specificity was established with this technique.[26] Some examples of this included a "less long-lever action, and more short-lever action, and the angle of the thrust was more consistent with the planes of the joints, the axis of rotation and the direction of muscle and ligament fibers."[26] The Diversified technique attempts to link the necessary "adjustive spinal manipulative procedure with joint dysfunction" with muscle dysfunction being acknowledged as well.[26] Using the Diversified Technique, a study completed in 2008 suggests a link between cervical adjustments and shifting to a parasympathetic dominance, and a link between thoracic adjustments and shifting to a sympathetic dominance.[27]

Outcomes

Upon returning to the clinic within one week after the first set of adjustments were made, the mother stated the patient fell asleep earlier than normal. He did not take his melatonin to sleep those days and he had been sleeping in later than usual. During his second week, his mother reported that she had not administered either of the two psychiatric medications, Risperidone and Tenex since his first week in the clinic. She also reported a notice in mild improvement of behavior at school. Later in the second week of care, the patient's mother again noted more improvements in behavior at school, including a better focus. Late in the third week, there was an improvement in the eating habits of the patient as reported by the mother. She stated he was eating slightly more at once, as well as eating healthier foods, more often, without complaints. During the fourth week, the mother explained the patient had still been off all medications since before the second week of care. The patient also continued with improvement of behavior and focus in school.

During the fifth week of care, the mother stated that she was "definitely starting to see the changes she was hoping to see and it's been fantastic." The excitement came from all she reported this visit. She stated a few things she had noticed with the patient that has changed recently. The first being how he had a good, positive "attitude adjustment." She noticed his energy level came down, because while doing his homework, he is now very receptive to her trying to teach him more than his average homework assignment. His teacher had also reported an improvement with his behavior and she was very impressed, while all this was taking part without his medication administered. His mother stated she "actually threw his medication in the trash the other day, which is basically the final goodbye." She spoke with the patient's neurologist and this doctor was "very happy with the outcome of everything that has been done with the patient", and usually this neurologist "had the mindset of my way or the highway".

In terms of objective measures, after six weeks of care a rolling thermal scan, sEMG scan and sEMG scan pattern graph were performed with the Insight Millennium technology. These were performed to assess any changes that have taken place in the nervous system. The patient's rolling thermal scan showed decrease paraspinal temperature differences in comparison to his first scan at T6, T7, L4, L5, S1. The second scan only had a moderate reading at the level of C1 on the right. These findings can be seen in Figure 4.

The second sEMG scan showed a change in muscle firing from the first scan. On the second scan, there was mild hypertonicity at C7, L1, L3, L5 on the left, and C1, T8 and T10 on the right. There was moderate hypertonicity at T8 on the left, and C7 and L5 on the right. There was severe hypertonicity at C3, C5, T1, T2, T4, T6 and S1 on the left, and C3, C5, T1, T2, T4, T6 and S1 on the right. There was a reading of hypotonicity on this scan at T12 on the right. The other levels in white were within normal limits of muscle activity compared to the normal population standard. These findings can be seen in Figure 5.

The second sEMG scan pattern graph exhibited an imbalance around the T1 through T3, and C3 areas on the left more than the right. These findings can be seen in Figure 6.

Discussion

Review of Literature

While reviewing the literature for the effectiveness of chiropractic care on improvements of ASD symptoms, many case studies appeared, as well as reviews of literatures More research is needed to aid the progression toward acknowledgment of chiropractic care's role in improvement of symptoms in an ASD patient. Marini and Marini explained chiropractic care of a 6-year-old boy who was diagnosed with autism one-year prior.[28] The patient had "reduced social interaction, altered behavioral patterns, language deficits, and learning difficulties."[28] After the 4th adjustment, the child had not jabbered as much, and he was not rocking his head.[28] By the 6th adjustment, he began spelling out words and by the 7th week, attempts to vocalize his name were being made.[28] After the 8th week visit, another Autism Treatment Evaluation Checklist (ATEC) was completed and improvements were made from the first to the second checklist.[28] After 12 weeks of care, the child was performing better in school.[28]

Noriega et al. explained care of a 6-year-old boy who had a history of chronic nocturnal enuresis and was diagnosed with ASD at two years old. He had a very traumatic birth reported by his mother.[29] He was under NUCCA protocol for his chiropractic care for 20 weeks.[29] After these 11 visits, upon re-evaluation the patient's mother stated he had a 70% improvement in his ASD symptoms.[29] Of these symptoms, performing better in school and showing greater social skills were most notable.[29] Also, he had complete resolution to his bed-wetting since his initial exam.[29]

Singh et al. explained care of a 7-year-old boy diagnosed with ASD at 14 months of age.[15] He also presented with chronic diarrhea and nocturnal enuresis.[15] After six visits in a four-week period, the patient's nocturnal enuresis had decreased, every morning he started having regular bowel movements, and his right eye exotropea had controlled.[15]

Cohn explained care of a 3-year-old boy with delayed communication, cognitive, gross motor skills, fine motor skills, social skills, emotional skills, and self-help skills.[30] There was over 25% delay in social and emotional skills, as well as fine motor, communication and cognition.[30] He lacked the ability to crawl normally.[30] After undergoing care for 2.5 months, there were notable improvements reported, objectively through SEMG and thermography scans, as well as subjectively by the patient's mother and therapists.[30] The boy's communication skills improved throughout this time interval, as well as he started walking, and also improved in his language skills.[30]

Hoffman and Russell explained care of a 3½-year-old who was diagnosed with autism one-year prior.[31] She exhibited reduced social interaction, as well as learning difficulties and language skills.[31] She would only speak with screaming or a tantrum, she was not sociable with others her age and she exhibited constipation as well as sleeping difficulties at several stages of her life.[31] The child was under Torque Release Technique® protocol for two months.[31] After the first month, the mother reported more increased spontaneity, expressions of joy and better posture.[31] She noted a decrease

in nightmare occurrence, expressions of sadness and hyperactivity after just one month of care.[31] At her two-month reassessment scans, the thermal and sEMG readings showed improvement from the first scan.[31]

Scelfo and Chelenyak explained care of a 9-year-old boy who presented to a chiropractic office with chronic ear infections, social interaction difficulties, and communication impairments.[32] He was diagnosed with autism at the age of 3½ years old.[32] The patient was under Diversified Technique and Toggle-Recoil care.[32] During the 14th visit, after two months of care, the mother filled out the ATEC checklist for pre-care and current evaluation of care.[32] Overall improvements were shown to be 16% increase over the four areas.[32] He was improving in his ability to communicate, verbally, physically, and in sociable instances.[32] The child also ceased to use his Risperdal prescription, as well as lower the usage of his Adderall XR medication.[32]

Rosen and Blum explained care of a 6-year-old boy who had Asperger's Syndrome, which caused him to uncontrollably rock, jump and flap with his hands.[33] He also had asthma triggered by exertion, season allergies, colds and bronchial congestion, and severe allergies to mold, dust, and animal dander.[33] He was diagnosed with Asperger's at the age of 3-years old.[33] Application of Sacro-Occipital Technique protocol and cranial evaluation was given.[33] After three weeks under care, there was a noticeable improvement in his Asperger's symptoms.[33] After two months of care, his visit frequency decreased from being seen every 3-5 days, to once every 7-10 days.[33] During the first three years of care, some minor exacerbations took place, but chiropractic care helped mitigate his symptoms, all while not needing his medication.[33]

Cleave et al. performed a case series on a 20-year-old male and a 17-year-old female.[34] The male was diagnosed at 1-2 years old and the female was diagnosed at an unknown age, with autism.[34] The male presented with aggressive behavior that occurred at home, school or in the general public, 2-7 times per week.[34] After his second visit for care, he started eating breakfast more regularly.[34] Between his 4th through 20th visit, there was a noticeable change in his co-operation and a decrease in his behavior of attacking people at home, school or in public.[34] The female presented as non-verbal, self-abusing and suffered with agitated behavior.[34] After her 3rd visit, there was a noticeable decrease in self abuse, as well as she was sleeping through the night.[34] The patient had become more interactive, could sit in the waiting room without an issue, and she actively sought out hugs by the 5th visit.[34]

Bloink reported results from SOT and cranial chiropractic care with a 19-year-old female who was diagnosed with ASD.[35] The patient was unable to speak unless her head was in flexion and eyes looking down before care started.[35] Immediately following care the patient stood up, held her head up and looked straight in the eyes of the doctor and spoke clearly.[35]

McCormick reported results of Diversified Technique care over 24 weeks with a 4-year-old.[36] The boy was diagnosed with autism at the age of 2-years old.[36] He displayed improved responsiveness, eye contact and social behaviors after chiropractic care.[36]

Zielinski reported on a 3-year-old who was diagnosed with autism spectrum disorder.[10] After 13 visits, the parents started seeing improvements with her symptoms of ASD.[10] These included calmer behavior, increased eye contact, happier demeanor, improved attitude, and increased focus.[10] Also, there was complete resolution of bilateral head pain, acid reflux, vomiting, and sleeplessness with chiropractic care.[10]

There is a need for more research to examine the safety and effectiveness of chiropractic care as it relates to autism, as per a systematic review of literature, published in 2011 by Alcantara et al.[37] This review states more trials for chiropractic care need to be performed while waiting for more definitive studies of its effectiveness for this condition.[37] Khorshid et al. stated that the positive benefits seen with care of autistic individuals is unclear whether it is due to the care itself, or the physical touch between the doctor and patient plays a significant role.[3]

Another report on research regarding chiropractic care and autism comes from a review of literature on chiropractic care and neurodevelopmental disorders. Holuszko et al. reviewed 51 articles and the findings reported that "high levels" of research is lacking.[38] To rank the level of research, they used the "University of Oxford's Centre for Evidence Based Medicine's Levels of Evidence" 5 levels of evidence criteria.[38]

Gotlib and Rupert completed a review on chiropractic care and pediatric health conditions in a search containing 1,275 citations.[39] They explain that chiropractors continue to handle pediatric health conditions.[39] However, also stated is that low levels of scientific evidence supports chiropractic care's effect on these pediatric health conditions.[39]

Proposed Mechanism

Regarding an ASD child, "there are many theories regarding the exact identity and mechanism of the environmental insults that trigger the cascade of physical, mental, and emotional dysfunctions which result in the starvation of a child's brain."[40]

With these effects, and other countless options as potential reasoning for a decrease observed in an ASD individual's overall health, we understand the importance of a functioning immune system. However, knowing the immune system can be activated via the sympathetic nervous system,[41] one can truly understand the importance for nerve function throughout the body.

Daniel David Palmer first explained the use of the word subluxation as it pertains to chiropractic.[42] His theory had several versions, all following a similar pattern of:

1. Subluxation, which is a misalignment of one of the vertebrae, causes
2. pressure on the nerves exiting around the vertebrae, causing
3. disease

Therefore,

4. Removal of subluxation (by manually adjusting it to its correct position) causes
5. release of nerve pressure, causing

6. the restoration of health.[42]

D.D.'s theory, related to the vertebral subluxation complex and how the subluxation affects the body, can be understood more with understanding the VSC model's five components:

1. Spinal kinesiopathology
2. Neuropathology
3. Myopathology
4. Histopathology
5. Biochemical changes[43]

The neurodystrophic model proposes that body tissue can be stressed by neural dysfunction.[43] This suggested that the involved nerve could have a direct relation with the immune response. Interference, or derangement of nerve function, is a result of nerve compression and the end result is organ dysfunction or disease.[42] In response to D.D. Palmer's original theory on subluxation and pressure on the nerves, today we can still understand the effect the subluxation has on the body's systems, including the nervous system. As stated in a research agenda, McCoy explained the reasoning of chiropractic principles of vertebral subluxation:

- The body is a self regulating, self maintaining organism;
- The nervous system controls and coordinates all functions of the body;
- The spine and vertebrae house and protect the nervous system;
- Vertebral subluxations can occur and interfere with the function of the nervous system;
- Reducing and/or correcting vertebral subluxations allows the nervous system to function better and allows the fullest expression of life.[44]

This principle reasoned that the vertebral subluxation is hindering in the complete expression of life.[44]

As D.D. Palmer theorized the restoration of health, one can take his theory and apply it directly to the immune system function. Regarding immune system function, "immunological anomalies involving cytokines, immunoglobulins, inflammation, and cellular activation have all been noted in individuals with autism."[45] These anomalies can lead to alterations in the role of the immune system on an individual. The duration, character and intensity of an immune response is all controlled by cytokine secretion.[45] With a skew in cytokine profiles, amongst other components of the immune system, one can observe the effect this takes on the immune system in an ASD patient. An ASD patient's body can present a weakened immune system and due to its vulnerability, this can lead to invading by "bacterial and viral infections, overuse of antibiotics, intestinal yeast overgrowth, gut inflammation, and impaired nutritional status."[45] "Leaky gut syndrome" can occur inside the ASD patient's body, allowing toxic elements to spread throughout the rest of the body.[45] Vaccination toxins can "attack neurons and thereby interfere with synaptic development and nerve signaling."[45] All of these factors can affect the role of immunity of ASD children. It is key to understand the subluxation and the role it plays with our immunity, to further understand ASD's symptoms and possible correlations of chiropractic care and decreased ASD symptomatology.

Limitations

Even with the observed results in this case study, one understands there are still limitations. One limitation to this study is the size. Another limitation is the lack of objective measurements reporting the patient's results. Other than the multiple Insight Millennium scans, there was not another form of objective pre and post representation of the results observed.

Conclusion

The use of subluxation-based chiropractic care in a 6-year-old male resulted in the decreasing severity of symptomatology associated with his diagnosed ASD. Over the course of 6 weeks, this study outlined the chiropractic care provided, the results observed and how this case study can support other research on a possible association between chiropractic care and ASD. This patient's case study may further the research Alcantara et al.[37] awaits. As chiropractic care does not treat any disease, this study can further connect possible vertebral subluxation effects on the nervous system of ASD patients. More research is desired to understand vertebral subluxation and their effects on an ASD patient's nervous system.

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Figures

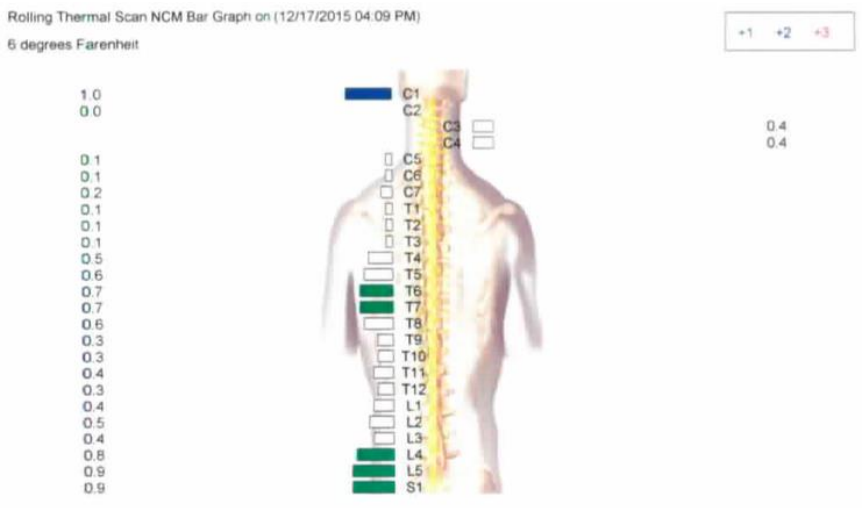

Figure 1: First rolling thermal scan before care started.

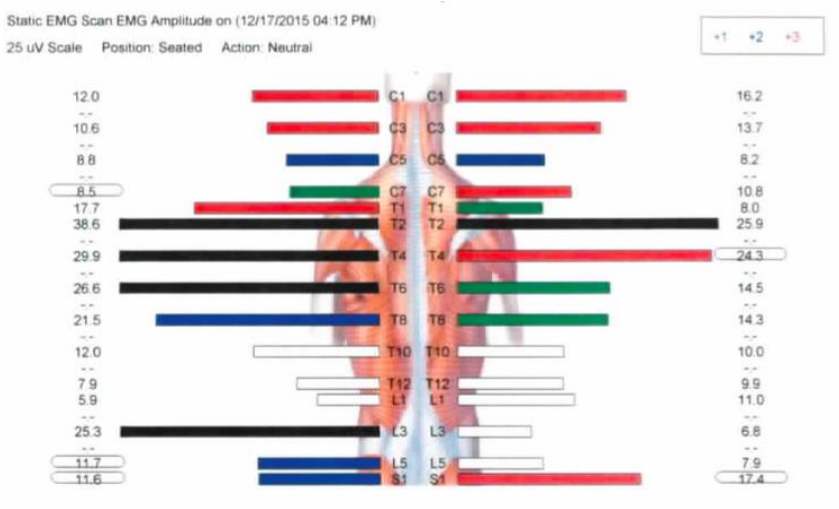

Figure 2: First static EMG scan before care started.

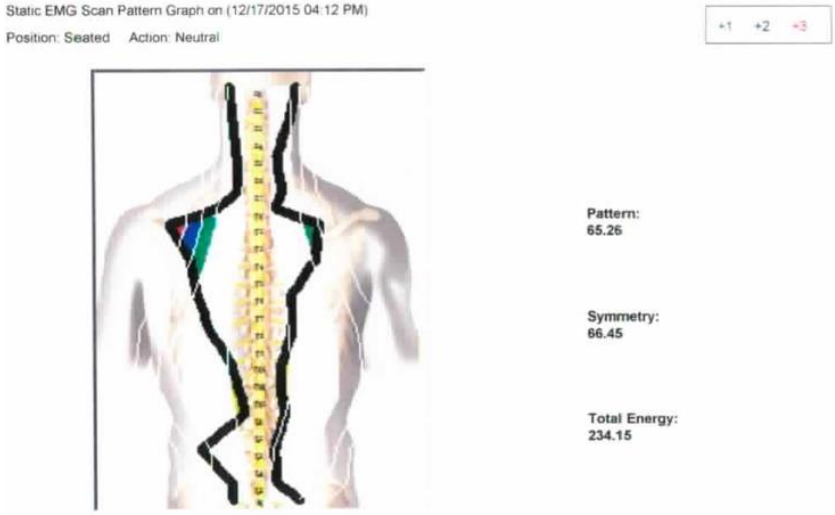

Figure 3: First static EMG pattern graph before care started.

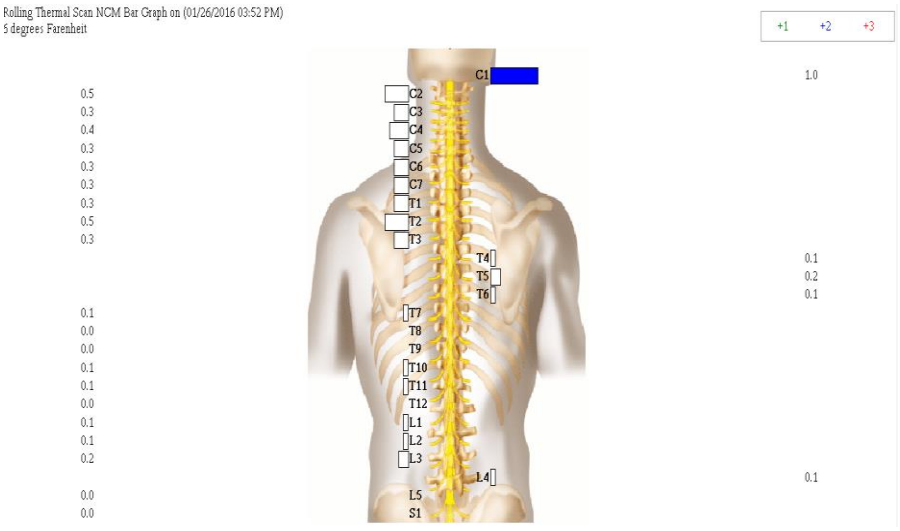

Figure 4: Second rolling thermal scan after 6 weeks of care.

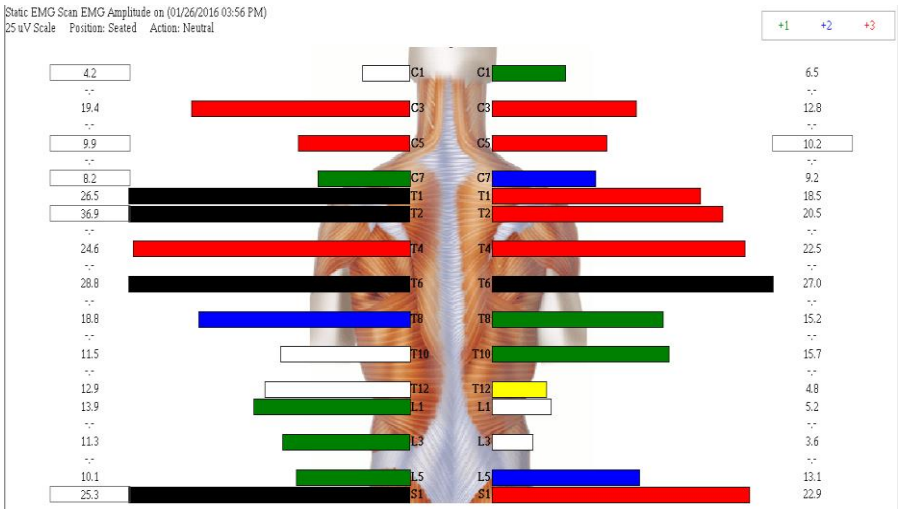

Figure 5: Second static EMG scan after 6 weeks of care

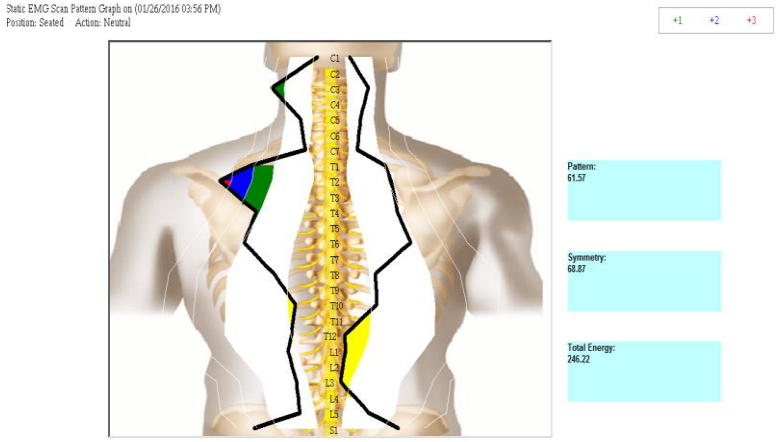

Figure 6: Second static EMG pattern graph after 6 weeks of care