Case Study

An Epidemiological Approach to the Effects of Subluxation-Based Chiropractic Care on a Child with Autism, Acid Reflux, Headache, Seizures, and Vomiting: A Case Study and Review of the Literature

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Introduction

Epidemiologist Albert Benenson defines epidemic as, “The occurrence in a community or region of excess of an illness (or an outbreak) with a frequency clearly in excess of normal expectancy.”1 In light of this definition, it is clear that we are in the midst of a worldwide Autism Spectrum Disorder (ASD) epidemic. On a national level, it has been reported that autism rates have doubled from 1966 to 1997,2 then spiked 26.01% between 1998 to 1999.3

Individual states have documented staggering ASD prevalence that shadows the national numbers. Within the state of California, for example, the number of children entered into the autism registry increased by 210% between 1987 and 1998.2 See below for the occurrences reported by the U.S. Department of Education (USDE) since the early 1990s.

Etiological Considerations

Autism is a condition often characterized by a failure to bond, lack of social interaction, avoidance of eye-to-eye contact, difficulties in language development, and repetitive behaviors known as “stimming” (self-stimulation).3 Milder forms of this condition exist such as Asperger’s Syndrome, PDD (Pervasive Development Disorders) and ADD/ADHD. All these issues are known collectively as Autism Spectrum Disorder(s), or ASD. Children with characteristics of an ASD may have comorbid conditions including: Fragile X syndrome (which causes mental retardation); tuberous sclerosis; epileptic

Abstract

Objective: We present the findings in which a three year girl received results and symptom relief from common neurological autism spectrum manifestations (ASD), acid reflux, vomiting, and seizures as a result of subluxation-based chiropractic care.

Clinical Features: Thirty five month old girl presented into the office with history of bilateral, intermittent headaches, epilepsy, behavioral and developmental delay, acid reflux, sleep disturbances, and vomiting.

Interventions and Outcomes: Subluxation-based specific chiropractic care was administered to the patient which resulted in complete resolution of bilateral head pain, acid reflux, vomiting, and sleeplessness. Significant improvements in ASD manifestations were also noted including calm behavior, increased eye contact, happier demeanor, improved attitude, increased focus and attention and an initiation to sound out words. She continues to progress as is evidenced by a significantly increased vocabulary, continued improvement in attention and focus, and complete lack of epileptic episodes.

Conclusions: The improved outcomes of a child with ASD undergoing chiropractic management to reduce vertebral subluxation is described. We suggest that chiropractic care should be part of the multidisciplinary management of ASD and that further research in this area be conducted.

Keywords: Chiropractic; vertebral subluxation; thermography; motion palpation; pediatric; developmental delay; autism; ASD; seizures; GERD; sleeplessness

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seizures; and Tourette syndrome. About 20 to 30 percent of children with an ASD develop epilepsy by the time they reach adulthood. For many children, symptoms improve with treatment and with age. Children whose language skills regress early in life—before the age of three—appear to have a higher than normal risk of developing epilepsy or seizure-like brain activity. The milder versions are believed to have the same pattern of genetic predisposition coupled with environmental stimuli as autism. It is generally regarded that in most cases the genetic factors “set the stage” for ASD and that environmental stimuli “trigger” the various expression(s) of the disorder. The exact nature of these “triggers” are hotly debated as they can occur in utero, in infancy, or as a toddler. Genetic Factors

Researchers have identified a number of genes associated with the disorder. For instance, several immune abnormalities have been noted in autistic patients. These associations have been extended to the Major Histocompatibility Complex (MHC), a section of DNA remarkable for the number of encoded proteins with immunological functions. One of the strongest MHC associations identified thus far is for the null allele of C4B in the class III region.

Low levels of C4 resulting from the null allele has been suggested to be important in disease pathogenesis especially since C4 has been identified in developing brain neurons. This gene is also suspected to encode a product that is involved in eliminating pathogens such as viruses and bacteria from the body. The DNA region just telomeric to C4 has several genes including tumor necrosis factor which encode proteins with immunological functions and these proteins may act in concert with C4 in disease contribution. Over 25 years ago, Warren et al. documented an increase frequency of the C4B null allele in autism, ADHD, and dyslexia. They also found that two alleles of the DR beta 1 gene had “significantly increased representation” in the autistic subjects from their study. In a follow-up study 10 years later, Odell et al. confirmed this data. Of the subjects with autism studied, 42.4% carried at least one C4B null allele, compared with 14.5% of the control subjects (p = 0.00013), with a relative risk of 4.33. Furthermore, over half of the C4B null alleles in the subjects with autism involved C4A duplications. A marked increase in the ancestral haplotype 44.1 that lacks a C4B gene and has 2 C4A genes was also observed. They concluded that, “the results of this study suggest that the human leukocyte antigen class III C4BQ0 significantly increases the risk for autism.”

Epidemiological Data

The epidemiological data concerning ASD is included below. According to the CDC:

Prevalence

- It is estimated that between 1 in 80 and 1 in 240 with an average of 1 in 110 children in the United States have an ASD.
- ASDs are reported to occur in all racial, ethnic, and socioeconomic groups, yet are on average 4 to 5 times more likely to occur in boys than in girls. However, we need more information on some less studied populations and regions around the world.
- Studies in Asia, Europe, and North America have identified individuals with an ASD with an approximate prevalence of 0.6% to over 1%. A recent study in South Korea reported a prevalence of 2.6%.
- Approximately 13% of children have a developmental disability, ranging from mild disabilities such as speech and language impairments to serious developmental disabilities, such as intellectual disabilities, cerebral palsy, and autism.

Risk Factors and Characteristics

- Studies have shown that among identical twins, if one child has an ASD, then the other will be affected about 60-96% of the time. In non-identical twins, if one child has an ASD, then the other is affected about 0-24% of the time.
- Parents who have a child with an ASD have a 2%–8% chance of having a second child who is also affected.
- It is estimated that about 10% of children with an ASD have an identifiable genetic, neurologic or metabolic disorder, such as fragile X or Down syndrome. As we learn more about genetics, the number of children with an ASD and an identifiable genetic condition will likely increase.
- A report published by CDC in 2009, shows that 30-51% (41% on average) of the children who had an ASD also had an Intellectual Disability (intelligence quotient <=70).
- Studies show that 5% of people with an ASD are affected by fragile X and 10% to 15% of those with fragile X show autistic traits.
- One to four percent of people with ASD also have tuberous sclerosis.
- About 40% of children with an ASD do not talk at all. Another 25%–30% of children with autism have some words at 12 to 18 months of age and then lose them. Others may speak, but not until later in childhood.

Diagnosis

- The median age of earliest ASD diagnosis is between 4.5 and 5.5 years, but for 51–91 percent of children with an ASD, developmental concerns had been recorded before three years of age.
- Studies have shown that about one third of parents of children with an ASD noticed a problem before their child’s first birthday, and 80% saw problems by 24 months.
- Research has shown that a diagnosis of autism at age 2 can be reliable, valid, and stable. But despite evidence that ASDs can often be identified at around 18 months, many children do not receive final diagnoses until they are much older.
Recent studies have estimated that the lifetime cost to care for an individual with an ASD is $3.2 million.

Individuals with an ASD had average medical expenditures that exceeded those without an ASD by $4,110–$6,200 per year. On average, medical expenditures for individuals with an ASD were 4.1–6.2 times greater than for those without an ASD. Differences in median expenditures ranged from $2,240 to $3,360 per year with median expenditures 8.4–9.5 times greater.

Environmental Factors

As stated above, there has been consistent debate in regards to the particular details concerning environmental factors affecting the onset of ASD, albeit there is general agreement that they play a pivotal role. Several etiological causation models have been suggested by McCandless: The Toxic Chemical/Heavy Metal Contamination Model; The Vaccination Model; The Auto-Immune/Allergy Model; The Viral Model; The Gluten/Casein, Enzyme Deficiency and Yeast Overgrowth Model; The Metallothionein Theory. A clear understanding of the possible causes will provide clues as to how to properly diagnosis, treat, and care for those suffering from ASD. Each will be addressed briefly below.

The Toxic Chemical/Heavy Metal Contamination Model. According to the work produced by the Greater Boston Physicians for Social Responsibility in 2000, “In Harm’s Way: Toxic Threats To Child Development,” millions of U.S. children exhibit learning disabilities, reduced IQ, and destructive, aggressive behavior due to toxic chemical exposure. Developmental neurotoxicants are defined as chemicals that are toxic to the developing brain. They include the following: the metals lead, mercury, cadmium, and manganese; nicotine; pesticides such as organophosphates and others that are widely used in homes and schools; dioxin and PCBs that bioaccumulate in the food chain; and solvents, including ethanol and others used in pains, glues, and cleaning solutions.

These chemicals may be directly toxic to cells or interfere with hormones (endocrine disruptors), neurotransmitters, or other growth factors. Some of these chemicals are used extensively in manufacturing and are emitted in the environment upwards to millions of pounds annually. They can be passed to the developing child across the placenta, through breast milk, or in food where they end up in our bones, blood, fat, urine, ovaries, and sperm. Many are so widely dispersed globally that Inuits in the Artic, far from sources of industrial pollution, carry a significant body burden of some of these chemicals. They contend that it is clear that we can no longer ignore the mounting evidence that chemical exposures contribute to the epidemic of developing disabilities.

Of unique interest to chiropractors as health care providers is the role that pesticides play in these numbers. According to the Greater Boston Physicians study, on a weight-adjusted basis, children eat more fruit and vegetables than adult yet, counter-intuitively, this puts children at high risk because twenty million American children five and under consume an average of eight different pesticides every day through food consumption. Moreover, they reported that thirty-seven pesticides registered for use on foods are neurotoxic organophosphate insecticides, chemically related to more toxic nerve warfare agents developed earlier in this country. One such pesticide, chlopyrifos (commonly sold as Dursban), is among the most widely-used insecticides in homes. Dursban decreases DNA synthesis in the developing brain resulting in deficits in cell numbers. National health exposure studies have found that cholorpyrifos residues (as the metabolite TCP) have been detected in up to 82% of adult urine samples and up to 92% in children samples. In addition to food consumption, the Greater Boston Physicians study reported that surveys in Massachusetts and Connecticut have shown that more than 80% of schools routinely spray pesticides. Thus, children are particularly at risk of absorbing toxic pesticides through their skin or ingesting them as they play.

The Vaccination Model: Early (even in-utero or neonatal) injury to the immature immune system of ASD children by toxins or pathogens can start a series of bio-chemical events that culminate into neurocognitive deficits and behavioral challenges. Increasing evidence suggests that a toxic mercury-based preservative long used in vaccinations may have been the “trigger” for a susceptible subset of children, particularly since 1991 when Hepatitis B vaccinations were mandated for every newborn. Many experts believe that the current autism epidemic stemmed from this mandate.

Statistics show a progressive rise in ASD incidence beginning in 1988 when the MMR vaccination was mandated. However, the incredibly steep rise in incidence started in 1991, coinciding with the requirement for newborns to receive the HepB often within hours of birth. According to McCandless, it is clear that early injury by toxins – likely preceded by genetic predisposition and augmented by allergies, illnesses, and repeated antibiotic use – are among the factors that can initiate a cascade of problems starting with a weakened immune system and inflamed intestinal tract.

A weakened immune system makes the body vulnerable to bacterial and viral infections, overuse of antibiotics, intestinal yeast overgrowth, gut inflammation, and impaired nutritional status. “Leaky gut” syndrome enables toxins to spread throughout the body; including the brain. In the complex scenario of vaccination involvement, vaccine-associated mercury, viruses, or other toxins as well as the child’s own overactive immune components (autoimmunity) can attack neurons and thereby interfere with synaptic development and nerve signaling. These factors can combine to create brain malnutrition and the cognitive impairment characteristic of ASD children.

The Auto-Immune/Allergy Model. Many children with ASD also suffer from familial autoimmune or allergic diseases. Comi et al. report, in a survey of 61 autistic patients and 46 healthy controls using questionnaires, that 46% of patients had two or more family members with autoimmune disorders. As the number of family members with autoimmune disorders increased from one to three, the risk of autistic children was greater with an odds ratios going from 1.9 to 5.5, respectively.
In mothers and first-degree relatives of autistic children, there were more autoimmune disorders (16% and 21%) as compared to controls (2% and 4%), with odds ratios of 8.8 and 6.0, respectively.

They conclude that “an increased number of autoimmune disorders suggest that in some families with autism, immune dysfunction could interact with various environmental factors to play a role in autism pathogenesis.” In a follow-up study to his 1993, 1998, and 2002 papers, Singh reports that autoimmunity was demonstrated by the presence of the following: brain autoantibodies; abnormal viral serology; brain and viral antibodies in CSF; a positive correlation between brain autoantibodies and viral serology; elevated levels of pro-inflammatory cytokines and acute-phase reactants; and a positive response to immunotherapy. According to Singh,

“Many autistic children harbored brain myelin basic protein autoantibodies and elevated levels of antibodies to measles virus and measles-mumps-rubella (MMR) vaccine. Measles might be etiologically linked to autism because measles and MMR antibodies (a viral marker) correlated positively to brain autoantibodies (an autoimmune marker)-salient features that characterize autoimmune pathology in autism. Autistic children also showed elevated levels of acute-phase reactants—a marker of systemic inflammation. The scientific evidence is quite credible for our autoimmune hypothesis, leading to the identification of autoimmune autistic disorder (AAD) as a major subset of autism. AAD can be identified by immune tests to determine immune problems before administering immunotherapy. The author has advanced a speculative neuroautoimmune (NAI) model for autism, in which virus-induced autoimmunity is a key player. The latter should be targeted by immunotherapy to help children with autism.”

In another recent study, Dow postulates that MAP, through molecular mimicry to its heat shock protein HSP65, triggers autism by stimulating antibodies that react with myelin basic protein (MBP). As seen above, there is an acknowledged genetic susceptibility to autism via the complement C4. C4 defects are associated with several autoimmune diseases and also confer susceptibility to mycobacterial infections. Mycobacterium avium ss. paratuberculosis (MAP) causes an enteric inflammatory disease in ruminant animals (Johne's disease) and is the putative cause of the very similar Crohn's disease in humans.

Insofar as humans are widely exposed to MAP in food and water, MAP has been also linked to ulcerative colitis, irritable bowel syndrome, sarcoidosis, Blau syndrome, autoimmune (Type 1) diabetes, Hashimoto's thyroiditis and multiple sclerosis. The significance of these anti-MBP antibodies is paramount to our discussion, particularly when we consider the fact that when myelin is destroyed nerve axons cease to function properly. An endless cascade of neurological disorders will ultimately develop.

The Viral Model. The etiological association between ASD and viral infections in ASD is well established by clinical data. For instance, it is commonly accepted that various herpes viruses are related with verbal impairment, seizures, demyelination, and other ASD traits. Baker and Goldberg have found that approximately 30% of their autistic patients respond well to the anti-viral drugs acyclovir and Valtrex (an acyclovir variant). This treatment option was developed by Stan Kurtz, an autism parent who has become a respected colleague of the Autism Research Institute.

According to numerous clinical and parental reports – in the context of diet, special training, and child-specific supplement regimens – the therapeutic use of Valtrex and methylcobalamin (mB12, methyl B12) helps some autistic children in ways other therapies do not. Valtrex is related to acyclovir and has shown efficacy against many but not all strains of some herpes viruses, including HSV1, HSV2, and VZV (chickenpox), with lesser degrees of effectiveness against EBV, HHV6, and possibly CMV. McCandless confirms this relationship in her own practice, observing that “gut pathology must be minimized, nutritional status maximized, and heavy metals must first be removed by physician-supervised chelation” in order to maximize the benefits of pharmaceuticals like acyclovir (or plant alternative anti-virals).

The Gluten/Casein, Enzyme Deficiency and Yeast Overgrowth Model. The enzyme DPP-IV is absent in individuals who cannot properly digest gluten/casein. Friedman and colleagues have pioneered the potential role of DPP IV deficiency in autism. Some have gone so far as to suggest that DPP-IV deficiency may explain some of the abnormalities seen in autism. According to Shaw,

“Peptides from gluten and casein are important because they react with opiate receptors in the brain, thus mimicking the effects of opiate drugs like heroin and morphine. The peptide from wheat is called glutenomorphin (gluten + morphine) and the peptide from milk is called caseomorphin (casein + morphine). Gluteomorphin (also termed gliadinorph) has been verified by mass spectrometry techniques to be present in urine samples of children with autism by Alan Friedman, Ph.D. in work done at Johnson and Johnson....The inability to break down these peptides could indicate a possible genetic deficiency of dipetidyl peptidase IV in children with autism according to Friedman.”

Friedman postulates that DPP-IV is either absent via a genetic mechanism, probably through two recessive genes, or that the enzyme has been inactivated, possibly through autoimmune mechanisms. It has been suggested that people autistic from birth produce no DPP-IV, and those who developed normally and then regressed had their DPP-IV inactivated through an acquired mechanism (such as auto-immunity). One such compound is dermorphin, a mu-opioid agonist that acts as an hallucinogen, which may explain why autistic children commonly appear to be “spaced out.” Another substance is delforphin II. Some researchers theorize that these compounds appear because the enzyme which cleaves certain peptide bonds (DPP IV) is either missing or inactivated. Gluten and casein are two of the proteins from which these opioids can be produced. There may be additional proteins for which this is true as well.

The connection between ASD and gluten/casein has helped catapult the “gluten free”/ “casein free” movement as is
apparent by the vast increase of “GF” and “CF” products on grocery shelves around the country. Becoming an epidemic in its own right, millions of people have and are developing gluten/casein sensitivities. Oftentimes unable to digest gluten/casein, ASD children are included in the statistical prevalence as a standard to the rule and not as the exception, most likely due to the autoimmune nature of ASD as seen above. Thus, it should be no surprise that most ASD children studied suffer from inflamed GI tracts.3

It is important to note that children with impaired immune function coupled with inflamed intestines are particularly vulnerable to fungal invasion, especially the Candida species.3 As Shaw reports, as these yeast species multiple, they excrete toxins that complicate the issue matter considerably; namely, in the form of tartaric acid, a highly toxic substance in which as little as 12g has caused human fatality with death occurring within twelve hours to nine days after ingestion.12

Interestingly, Shaw has found that tartaric acid is also elevated in urine samples of adults with the disorder fibromyalgia, depression, foggy thinking, and chronic fatigue. Furthermore, he notes that values for tartaric acid in urine may be extremely elevated in autism.12 Other common complications of Candida overgrowth include diarrhea, stomachache, gas pains, constipation, headache, fatigue, and depression. According to McCandless, “Behavior problems [caused by Candida] include concentration difficulty, hyperactivity, short attention span, irritability, and aggression.”13

*The Metallothionein Theory.* Walsh et al. claim to have discovered that defective functioning of metallothionein protein (MT) is a distinctive feature of autism.13 This abnormality results in impaired brain development and extreme sensitivity to toxic metals and other environmental substances. This disorder is often unnoticed in infancy and early childhood until aggravated by a serious environmental insult. In a study of 503 autism-spectrum patients, the authors found abnormal levels of copper and zinc in blood (p<0.0001) indicating defective functioning of metallothionein (MT) proteins.13

It is believed that human MT proteins regulate blood levels of these trace minerals, detoxify mercury and other heavy metals, and assist in neuronal development. Subsequently, the expected consequences of defective MT during gestation or early infancy are consistent with several classic symptoms of autism. According to Walsh, “It appears that defective functioning of MT proteins may represent the underlying cause of autism.”13

Russo’s work in assessing both serum concentration of metallothionein (MT) and anti-metallothionein (anti-MT) immunoglobulin G (IgG) in autistic children with gastrointestinal (GI) symptoms tested the hypothesis that there is an association between the presence of MT, anti-MT IgG, and inflammatory GI disease seen in many children with autistic spectrum disorder (ASD).14

The results in his study show promise in supporting this theory. Ten of 41 autistic children with chronic digestive disease had high serum concentration of MT compared to only one of the 33 controls (p < 0.01). Thirteen of the 41 autistic children with chronic digestive disease had anti-MT IgG compared to only four of 33 controls (p < 0.01). Nine of 10 (90%) of autistic children with GI disease with high MT levels had a regressive onset (compared to the expected 25 of 41, or 61%, in this group) (p < 0.05), whereas only nine of 13 of the autistic children with GI disease and anti-MT IgG had a regressive onset (70%) which was not significantly higher than they expected. Russo didn't find any correlation between severity of GI disease and MT concentration or anti-MT IgG. Subsequently, he concluded that the results suggest a relationship between MT, anti-MT IgG and GI disease seen in many ASD individuals.14

**Diagnosis and Treatment (A Historical and Current Perspective)**

**Diagnosis**

It’s imperative to note that many pediatricians and other physicians are not experienced in diagnosing autism or any of the related ASD’s.3 Sad they are trained to believe that the autistic form of ASD is incurable. ASD varies widely in severity and symptoms and may go unrecognized, especially in mildly affected children or when it is masked by more debilitating handicaps.4 Subsequently, the data concerning autism is misleading because many cases are presumably left undiagnosed.

However, the diagnostic criteria for autism agreed upon by most authorities is more consistent. The accepted signs and symptoms are as follows: severe abnormality of reciprocal social relatedness; severe abnormality of communication development (including language); restricted, repetitive behavior and patterns of behavior, interests, activities and imagination; and early onset (before age 3 to 5 years). Many authors would also consider abnormal responses to sensory stimuli as additional criteria.3

To help better understanding differential diagnoses we have included some milestones that, according to the NIH, are indicators of ASD that require evaluation by an expert: 4

**Early Indicators Include:**

- No babbling or pointing by age 1.
- No single words by 16 months or two-word phrases by age 2.
- No response to name.
- Loss of language or social skills.
- Poor eye contact.

**Later Indicators 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.
- Stereotyped, repetitive, or unusual use of language.
- Restricted patterns of interest that are abnormal in intensity or focus.
- Preoccupation with certain objects or subjects.
- Inflexible adherence to specific routines or rituals.
If a child has chronic diarrhea, frequently wakes up at night, self-selects a very restricted diet (generally limited to a few usually non-nutritious foods such as French fries, apple juice, or Pepsi Cola, and corn chips), has suffered ear or other infections, isn’t trying to say words by around 18 months, has a history of bad reactions to vaccinations, does not seem interested in other kids, and does not show the kind of curiosity and relatedness that most other kids do, McCandless advises in finding a physician to screen for ASD as soon as possible. Urgent action is recommended if a child has had a period of normal development and then later regresses.3

It is vital to note that even though many children with ASD have a history of recurrent ear infections in their first year of life, this early pattern may be followed by a period of seemingly strong immunity. Paradoxically, this may be due to a hyper-immune status in response to low-grade chronic infection. Many affected children appear to be “healthy” with seemingly limited related symptomology, though, chronic diarrhea is very common and a sure tip-off that their biochemistry is abnormal.5

Treatment

The current belief that autism is primarily of genetic nature – up to 90% as reported in one account15 – indicates that, until very recently, prevailing treatment protocols rarely advised anything other than sensory integration, visual and auditory training, behavioral modifications, and mood-controlling drugs such as SSRI’s (Prozac, Zoloft, etc.), stimulants (Ritalin, amphetamines, etc.), or behavior-controlling drugs such Risperidone (Risperdal). This is, however, somewhat of an advancement for it has replaced the long-held psychoanalytic belief that autism was caused by “refrigerator mothers” (i.e. “cold,” “heartless” mothers) who were unable to bond with and love their children properly.3

Consequently, the old diagnostic and treatment models for ASD are being augmented by a more biomedical approach. This significant paradigm shift is in part due to the dramatic increase in ASD cases reported across more affluent socioeconomic populations. As more medical professionals are personally affected by the disorder (i.e. having family members recently diagnosed with ASD), there has been a significant focus on better managing the disease. A primary example of this is Psychiatrist Jaquelyn McCandless (Diplomate of the American Board of Psychiatry and Neurology) who, 16 years ago, began her intense study of ASD and completely changed her scope of practice after her granddaughter was diagnosed with autism.

McCandless’ position in her book, “Children with Starving Brains: A Medical Treatment Guide for Autism Spectrum Disorder,” is that ASD is a complex syndrome based on physiological and biochemical disorders that have as a common end-point the cognitive and emotional impairment that we generally associate with autism.3 In other words, aside from rare genetic cases such as an autism derived from Fragile X syndrome, it has become evident that these are physically ill children who can be greatly helped medically, behaviorally, and cognitively by proper diagnosis and treatment of their underlying medical conditions.

This is a vital breakthrough in understanding and one that many practitioners have had a hard time grasping. As stated above, in the past, autism and other conditions in the autism spectrum were considered “psychiatric” or behavior disorders, with only psychiatric or behavioral approaches considered as appropriate treatments. Consequently, since they are physically ill, affected children need biomedical intervention to maximize their healing potential.

Studies have shown that ASD children, compared to controls with neurotypical children, report higher occurrences of the following nutrients:5

<table>
<thead>
<tr>
<th>Nutrient Present</th>
<th>Nutrient Deficiency</th>
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<tbody>
<tr>
<td>Increased serum copper</td>
<td>Magnesium deficiency</td>
</tr>
<tr>
<td>Increased copper/zinc ratios</td>
<td>Iron deficiency</td>
</tr>
<tr>
<td>Increased glutamate</td>
<td>Zinc deficiency</td>
</tr>
<tr>
<td>Decreased Vitamin B6</td>
<td>B12 deficiency</td>
</tr>
<tr>
<td>Decreased plasma sulphate</td>
<td>Calcium deficiency</td>
</tr>
<tr>
<td>Decreased methionine</td>
<td>Fatty acid deficiencies</td>
</tr>
<tr>
<td>Decreased glutamate</td>
<td>Inadequate Vitamins A, D, and E</td>
</tr>
<tr>
<td>Decreased amino acids tyrosine, carnosine, lysine, hydroxylysine</td>
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</tbody>
</table>

In conjunction with the above abnormalities, many experts have noted that several common factors are seen in most ASD patients: namely, impaired immunity, GI inflammation, higher infection rate and subsequent increased use of antibiotics, impaired nutritional status, malabsorption, and decreased ability to metabolize toxins like heavy metals and pathogens.3 The crux of the biomedical treatment model, therefore, is to restore proper brain function by balancing the nutrients above.

This can be done in a variety of ways; namely nutrition, supplements, pharmaceuticals, etc. This approach, though, seems to take longer than other modalities and may not be as complete with older children since biochemical abnormalities and toxic conditions have already become a part of their cellular functioning and are therefore harder to change. The “golden window” of opportunity has been suggested to be between 18 months and 5 years of age, though it is never too late to initiate care. Many older children and adults have experienced dramatic results as well.3

It is imperative to our discussion to note that chiropractic care is not an accepted recommended modality in the management of ASD. We feel that this is a grave mistake. As we will outline below, subluxation-based chiropractic care can not only help facilitate homeostasis due to immunological or neurological pathology, but can be a driving force in resolving associated ASD issues like GERD and autoimmunity.

Case Report

Thirty five month old girl presented into the office with a number of complaints all seemingly related under various presentations of ASD. The patient appeared to be very anxious, but became more comfortable in the office after a few minutes.
Her father commented that during the visit she displayed her best behavior ever at a doctor’s office.

Evidently, she was much more relaxed than usual and the hug that she gave the attending doctor was something quite unusual that she never did with strangers. According to one report by her occupational therapist, it was not uncommon for the patient to cry and scream during her regular doctor visits.

Medical History

In light of the comment made above, “Many pediatricians and other physicians are not experienced in diagnosing autism or any of the related ASD’s” this section offers a detailed description of the patient’s experience with autism through their medical history. Below, you will find various behaviors which will serve as clues and help outline some key commonalities to all children suffering from ASD. This information will enable various health care providers to better understand the multifactoral and the seemingly complicated presentations of autism.

The child was adopted and is biologically her adopted mother’s great niece. Her biological mother’s health history includes a past history of drug abuse, though, according to her adopted father, no drug use is suspected during the pregnancy. Nevertheless, the patient was born prematurely at 28 weeks weighing 2 pounds, 5 ounces.

She was in the NICU for six weeks then came home on oxygen and apnea monitors. After struggling for two years with the child’s seemingly abnormal behavior and receiving multiple “autism” diagnoses from medical doctors, her parents decided to take her in to the Minot Infant Development Program (a division of Minot State University) for a thorough developmental evaluation. This occurred four months prior to presenting to the office for chiropractic care. The Modified Checklist for Autism in Toddlers (M-CHAT) was administered over a course of two weeks on three different days. Five critical items were failed, however, it is noted that she achieved all developmental milestones at typical times, with the exception of talking. For instance, she walked at approximately one year and, according to her mother, she used to say “mama” and babble, but no longer did this at the time of presenting to the office.

Some key points from the M-CHAT results are as follows: 16

Test Selection:
• Functional Vision Screening Checklist
• Early Learning Accomplishment Profile (E-LAP)
• Birth to 3 Comprehensive Test of Developmental Abilities
• Early Reading Checklist
• Receptive-Expressive Emergent Language Test – 3
• Infant/Toddler Sensory Profile

Evaluation Results:
• Chronological Age – 32 months
• Adjusted Age – 32 months
• Expressive Language – 6 months
• Receptive Language – 6 months
• Gross & Fine motor – 24 months
• Cognitive – 8 months
• Social/Emotional – 6 months
• Adaptive/Self-care – 15 months

Summary: The patient was diagnosed with severe deficits in the areas of social/emotional, communication, cognitive, and adaptive/self-help.

Chief Complaint: Headaches

The patient presented to office with the chief complaint of bilateral, intermittent, dull pain of a moderate level in her head. On a visual analog scale (VAS) of 0 to 10, with 0 being no pain and 10 being the worst pain possible, her parents indicated that her pain appeared to be a “4” based off of objective behavior presentations and symptoms. For instance, according to the patient’s father she will frequently rub her head and appear to be in pain, presumably due to the headaches.

Secondary Complaint: Autism and Related Disorders:

As stated above, seven months prior to visiting our office the patient was diagnosed with autism. During a follow-up evaluation with the Minot Infant Development Program three months later, severe deficits in the areas of social/emotional, communication, cognitive, and adaptive/self-help were observed. As you read the report below, note that some of the deficits may seem insignificant or subtle, however, when compared to your typical 2 ½ year old, they have a snow-ball type effect – building on each other – and result in significant developmental delays.

The explanations below are taken directly from her evaluation: 16

Social/Emotional. The patient likes to be around her mother and does not like when she is not there. She consistently goes to her mother when she needs assistance obtaining something. She will protest when someone tries to take something away from her before she is done with it and appears to understand “no” when someone says it to her. The patient doesn’t appear to discriminate strangers from familiar people and doesn’t respond to verbal requests in nursery rhymes or participate in social games (peek-a-boo, so big, etc.). She isn’t interested interacting with other children or taking turns during play. Her eye contact is limited and usually held for only brief periods.

Communication. The patient does not have any verbal words that she uses to communicate with her family. She communicates her wants/needs by pulling family members to the items she desires. If she wants to do something, she will take a family member’s hand and use them as a tool to complete the action. She produces the “m” consonant sound, but does not approximate any functional words using this sound. Vocal productions are primarily vowels with differing tones and volumes. She indicates that she does not want
something by pushing it away or throwing it. Inconsistently responding to her name, she becomes upset when told “no.” However, she does not always stop when told “no.”

**Cognitive.** The patient is able to put the circle pieces into a puzzle. She will look for and find a toy if she accidentally drops it and will pat a mirror when she sees an image of herself. She will bang and shake toys that she is playing with and will briefly flip through the pages of a book and look at the pictures. The patient isn’t yet shaking her head “no” when she doesn’t want something nor imitates sounds that she hears others make or follow simple directions. She doesn’t uncover a toy that she has seen someone cover up.

**Adaptive/Self-help.** When the child wants or needs something she will take her mother’s hand and lead her to what she wants. She will overcome simple obstacles to get what she wants and will finger-feed herself. Her mother reports that she will try to use utensils, but usually gets frustrated. She chews her food and doesn’t gag and will manipulate the stairs by walking up or down holding someone’s hand or the wall. She isn’t completely eating using utensils or drinking from an open cup and doesn’t appear to know when she is wet or dirty, not indicating that she wants to be changed. She isn’t yet dressing herself, but is cooperative when it is time to get dressed.

**Sensory.** The patient has very strong sensory preferences. She likes vestibular input such as swinging and rough play and prefers to watch TV at a very close distance (inches). She climbs on furniture throughout the house and according to her mother has “no fear.” She strongly adheres to routines and becomes upset when they change. Her mother reported that she loves things that move, such as fans, and is fascinated with the color red. She enjoys touching and playing with water. The patient does bite, and her parents feel that sometimes it is just her way of registering sensory information. Her diet was self-restricted, eating only chicken nuggets, macaroni and cheese, Salisbury, grapes, apples, peanut butter and jelly.

**Secondary Complaint: Acid Reflux and Related Issues Vomiting and Sleeplessness**

At birth, the patient was found to have severe acid reflux and was given Reglan to control this. Throwing up an average of 10-15 times per day, the issue progressed and Prevacid was prescribed. The condition was so bad her teeth were starting to erode and by the time she first came into the office she already had one dental surgery due to the severe dental problems. The patient also suffered from constipation oftentimes going days without a bowel movement. Moreover, probably due to these issues, she would frequently wake up during the night, rarely getting a full night of undisturbed sleep.

**Secondary Complaint: Seizures**

Two months prior to visiting office the patient was rushed to the ER because of seizure symptoms. According to her occupational therapist’s report, the attending doctors felt she likely had a seizure, though blood tests were normal and no cause could be determined. Family history indicates seizures are common.

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**Examination, Intervention and Outcomes**

Similar to the onset of various symptoms, ASD reversal or symptom management processes can ebb and flow and occur quite randomly. Certainly nothing is linear about these disorders. Thus, we feel it advantageous to provide a thorough “play by play” explanation to outline the significant details the patient experienced while under subluxation-based chiropractic care. First, note that not every visit is recorded; just those in which significant findings occurred. Secondly, note the rapid response to pain and GI management and the sporadic, gradual response to the neurological issues associated with ASD. Lastly, note the relapse of GI issues during a long two-month stretch in which the patient did not receive chiropractic care and the immediate cessation of symptoms after care was reinitiated.

**Visit 1:** Upon the initial examination, the following conclusions were indicated from a biomechanical evaluation of the cervical and thoracic regions. The presence of tenderness to palpation is evident overlaying the entire upper cervical area. Tenderness to palpation is noted on both sides of the upper thoracic area. The patient also experienced significant tenderness to palpation through the mid-thoracic spine and suboccipital area. Right lateral flexion of the head is observed from postural evaluation. As noted above, the patient presented to the office with a chief complaint of bilateral intermittent dull pain of a moderate level in her head 4 out of 10 on the VAS.

No x-rays were taken and no orthopedic tests were performed. Neurological exam consisted of motor reflexes, all of which were WNL. Thermography revealed autonomic disturbance at the levels of C1, C5, T4, and T8. **FIGURE 1** Severe thermal fluctuations were found at C5 and T8, whereas C1 and T4 displayed moderate thermal fluctuations. Thermography, motion palpation, spinal asymmetry, and muscle tone were used to analyze and diagnosis vertebral subluxations at the level of C2 and T8. A manual adjustment using an activator instrument was performed to decrease misalignments, normalize intersegmental/global mobility, and correct vertebral subluxations at C2 and T8.

Using a Diversified technique, the attending doctor initially utilized the Activator instrument in lieu of traditional hand adjusting because the patient was unable to follow the traditional Activator protocol and she was quite tense, rigid, and uncomfortable with the adjusting procedure as a whole. Thus, preventing side posture or prone adjusting due to muscle guarding. After time, though, she became calmer and more cooperative during her visits as mentioned below. The original care plan of three visits per week was advised, but due to transportation and work conflicts, the patient could only come in approximately once per week.

**Visit 2:** Ten days after her first adjustment, the patient presented with a notable difference in head pain. On the VAS, her parents reported a 1 out of 10 in comparison to 4 from the previous week. Observation of the patient’s posture confirmed a right lateral flexion of the head to the thorax. Analysis and care protocol mirrored that from the first visit.

**Visit 3:** Seventeen days after her first adjustment, patient
presented with a sustained decrease in head pain (1 out of 10). Her mother stated that since her last visit she had 5 bowel movements, almost one per day, which was a significant change. She also stated that the patient’s behavior was much more “mellow” and that she had even been eating slightly better. Chiropractic analysis and care protocol mirrored that from the previous visit.

Visit 4: Twenty-four days after her first adjustment, patient presented with a sustained decrease in head pain (1 out of 10). Her mother, extremely happy with the results thus far, said that the changes her and her husband have seen in their daughter were “incredible.” They reported that she makes eye contact much more frequently and for prolonged periods of time. They also stated that instead of vomiting several times a day due to her acid reflux, she had only vomited a couple times throughout the week. Her bowel movements were becoming more regular and, like the previous week, had 5 bowel movements that past week. Moreover, the patient’s parents reported that she had been much more calm in general and also appeared happier. Analysis and care protocol mirrored that from the first visit.

Visit 5: Thirty-three days after her first adjustment, patient presented with a complete resolution of head pain (reporting 0 out of 10 on the VAS). Her bowel movements slightly increased to 6 out of 7 days. Of significance to note is that acid reflux induced vomiting reduced greatly. In regards to whether the patient had vomited the parents stated: “Almost not at all.” Subsequently, they reduced the medication taken for acid reflux with no adverse effects. Continuing the progress made in the last visit, the child was seemingly happier, continued to make more eye contact, and started to make more verbal sounds according to her mother, yet did not say any actual words. Analysis and care protocol mirrored that from the first visit.

Visit 12: One hundred fifty-two days after her first adjustment, the patient presented into office after continued improvement in attitude, behavior, and demeanor. She came with a positive report from her pre-school teacher stating that her attention and focus had improved significantly. By this time she was almost off all dairy products and taking an Omega 3 supplement on a regular basis. She was quite a bit calmer, displayed more interest in toys/books, and played more quietly. She was still quite non-verbal, not imitating sounds spoken to her. She maintained much more eye contact and didn’t show signs of fearing her surroundings like she did in prior visits. Visual inspection revealed right head tilt and palpation revealed tender musculature s. Analysis and care protocol mirrored that from the first visit.

After 11 visits of consistently adjusting C2 and T8, on visit 12, motion palpation, spinal asymmetry, and muscle tone assessment necessitated a significant change in care. Consequently, to extend intersegmental/segmental joint mobility, correct vertebral subluxations, and alleviate malpositions the following regimen was performed: A manually assisted short lever adjustment was used on C1, C5, T5 and T6 via the Activator; and a specific adjustment was performed on T5 utilizing a double-thaner maneuver. This was the first visit in which a more traditional osseous hand adjustment was performed on the patient. Up until now, her behavior prevented anything, but Diversified adjusting utilizing the Activator instrument. This visit marked significant improvement in her behavior at the office and willingness to cooperate. She was calmer and even eager to receive care, as was indicated by her getting on the adjusting table on her own without any coaxing or prodding by her mother.

Visit 13: Two hundred twelve days after her first adjustment, the patient presented into office with a significant relapse of acid reflux symptoms. After not being able to come into the office for two months due to the inability to schedule transportation, patient was reported as having vomited multiple times and frequently getting up during the night; both of which has not been experienced for several weeks. Interestingly, though still not imitating oral or motor movements, she had become much more verbal during this time; saying spontaneous words in a delayed manner. She appeared to be happy in the office, made good eye contact, and was playing contently with both parents.

She was excited and smiled during the adjustment procedure. She even laughed at the jumping game played during her thoracic adjustment. A discussion occurred with her parents stressing the importance of regular, more frequent visits in order to help manage the acid reflux flare-ups and to see continued improvement with the ASD symptoms. The clinical assessment revealed: tender, deep paraspinal musculature in the upper cervical and upper thoracic areas bilaterally; right lateral flexion of the head in relation to the thorax. Subsequently, a low force specific adjustment was performed on C1, C5, T5 and T6. A specific osseous adjustment was employed on T5.

Visit 14: Two hundred nineteen days after her first adjustment, the patient presented with continued episodes of reflux associated vomiting. According to her father, the occurrence has significantly decreased this past week since her last visit into the office. Palpation revealed areas of spasm, hypomobility and end point tenderness indicative of vertebral subluxation at left C1, T4, and T8. Specific spinal adjustments were performed in these areas to restore proper balance and function.

Visit 16: Two hundred thirty-three days after her first adjustment, patient presented into office reporting that acid reflux flare-ups and related vomiting had decreased to 0 again. Palpation revealed areas of spasm, hypomobility, and end point tenderness indicative of subluxation at left, C1, T2, and T9. Specific spinal adjustments were performed at these areas to improve function of the segments of the spine that were fixated.

Visit 17: Two hundred forty days after her first adjustment, the patient presented with continued absence of acid reflux and related vomiting and significantly more verbal communication. A
second thermography scan was performed to get an update and a comparative study her progress to date. FIGURE 2 Thermography revealed significant decrease in autonomic disturbance, displaying moderate thermal fluctuation at C1, C3, and S1 and minor thermal fluctuations at T3, T7 and L1. Palpation revealed areas of spasm, hypomobility, and end point tenderness indicative of subluxation at right C1, left C5, T5, and T10. Specific spinal adjustments were performed at these areas to improve function of the segments of the spine that were fixated.

Discussion

The term subluxation is discussed below and some explanations are provided as “models” to understand its relationship with the various disorders presented in this paper. The diagnostic criteria used in this study to substantiate subluxation findings were thermography and motion palpation; both of which have support in the literature.

According to Elster, “Paraspinal digital infrared imaging, which measures cutaneous infrared heat emission, is a form of thermography, a neurophysiological diagnostic imaging procedure. Thermography has been established in chiropractic as a practical and sensitive test for spinal nerve root irritation, articular facet syndromes, peripheral nerve injuries, sympathetic pain syndromes, and vertebral subluxation” 17 The accuracy of this technology is supported in the literature. McCoy, et al., in the largest study of thermal scanning reliability conducted, documented excellent intra-examiner and inter-examiner reproducibility in regards to the thermal functions of this infrared scanner.18,19 In this study, “two practicing chiropractors conducted the measures on 100 subjects and found intra class correlation coefficients (ICCs) for agreement and consistency ranging from 0.959 to 0.976. Concordance correlation coefficients (CCC’s) ranged from 0.783 to 0.859 with the confidence intervals indicating robust estimates of these quantities.”19

Similar research and findings have been found in the efficacy of motion palpation in detecting vertebral subluxation. For example, the purpose of a study conducted by Cooperstein et al. was “to determine if allowing motion palpators to rate their confidence in their findings, as well using a continuous data analytic method, would influence the level of concordance.” Having two palpators assess posterior to anterior glide of T3 – T10 in the prone position on 52 asymptomatic volunteers they concluded that, “When each examiner was ‘very confident’ as to the most fixated thoracic segment, the levels they identified were very close. This corresponds to good agreement.”20

Chiropractic’s Role in Resolving Bilateral Head Pain

After the first adjustment, the patient in this case study experienced immediate and dramatic relief from her chief complaint of bilateral head pain. Studies have been published in chiropractic and medical journals substantiating how removing vertebral subluxation(s) produce significant and consistent results in relieving head pain.21-24 Because this fact has become common knowledge, and the reason many people visit chiropractors, we will not be including the well-known physiological cause and effect relationship(s) between the two in this paper. Although, we would like to point out in regards to the Gluten/Casein, Enzyme Deficiency and Yeast Overgrowth Model, common complications of Candida overgrowth include headaches in ASD children. As we see in the next section, the chiropractic adjustment can help manage various autoimmune and GI issues, thus helping reverse Candida overgrowth.

Chiropractic’s Role in Resolving GERD and Related Issues

As stated above, many ASD children, like the patient in this case study, suffer from intractable diarrhea or constipation, abdominal pain, gas/bloating and abnormal stool. The relationship between autism and GI issues has been thoroughly documented in the literature and many mechanisms have been proposed.2,25-28 The proposed neurobehavioral involvement proposed by Ibrahim et al., rather than a primary organic GI etiology, may account for why the patient in this case received such dramatic reduction in GI issues following chiropractic care. Thus, we would like to propose that the patient in this case study experienced GERD as a result of being subluxated.

As Scelfo indicates, “The effects that vertebral subluxation can have on multiple systems are related to the primacy of the nervous system.”29 This primacy appears to be confirmed by the fact that the patient’s symptoms and subsequent vomiting and sleeplessness drastically diminished upon first receiving care. In fact, as long as the patient maintained regular visits, she had no flare-ups. Although, when she did not receive chiropractic care (i.e. when she was unable to make it to the office for 2 months), her symptoms returned. Once regular care resumed again, the acid reflux symptoms, vomiting, and frequent bouts of waking up during the night dramatically decreased. Note that this sequence of events occurred completely independently of any consistent dietary changes, which appears to further confirm our suspicion that her acid reflux was related to vertebral subluxation. As noted above, the patient stopped consuming all dairy products about two months prior to her acid reflux flare-ups.

Assuming that eliminating dairy, a known GI irritant and proven cause of acid reflux in autistic children, would not cause the recurrent bouts of vomiting and sleeplessness, our focus is on the only known changed variable in the child’s life; namely subluxation-based chiropractic adjustments. A similar case has been documented by Elster in which 16 infants with acid reflux and colic all experienced a decrease of acid reflux and sleepless nights.17 Within six weeks of initiating care, all GERD symptoms resolved and did not return for the four months of recorded care that proceeded before the paper was published.

The Neurodystrophic Model of vertebral subluxation can possibly account for this relationship.30 By “subluxation” we are referring to mechanical compression and irritation to spinal joints and nerves creating neurological insult. Subluxation scrambles the neurological feedback loop by causing altered rhythms of neurological flow. As seen above, the patient presented with increased paraspinal muscle tone.

This model of vertebral subluxation posits that the subsequent increased sympathetic stimulation can cause neural dysfunction that will produce a stress-response to various
tissues in the body. Subsequently, specific and nonspecific immune responses can be pathologically modulated; namely, as applicable to our study, allergies and autoimmunity. ASD children frequently present with food intolerance, allergies, inability to digest gluten/casein, and chronic fungal infections which are all sure signs that immunity has been compromised. According to McCandless, “Many DAN! [Defeat Autism Now!] doctors and medical researches believe that a primary factor in [ASD] children’s chronic gastrointestinal disturbances is immune system impairment.” Moreover, these conditions often cause autoimmune responses which manifest as GI inflammation and yeast overgrowth as discussed above.

The interplay of ASD genetic predispositions being expressed by environmental factors is a key component to our discussion. “Because the response to environmental factors is under the regulation of immune response genes,” states Gupta et al., “It is not surprising that a number of immunological abnormalities and an increased association with certain major histocompatibility complex (MHC) genes have been observed in autism…Immunological abnormalities in both the innate and adaptive immune system that are manifest by a paradox of immunodeficiency, inflammation, and autoimmunity have been reported in autism.” The key immune deficiency significant to chiropractic research is decreased interleukin (IL)-2 containing CD4 and CD8 T cells and increased levels of IL6 and proinflammatory cytokines.

In recent by Roy, et al., chiropractic care has been shown to modify mediators of inflammation (IL-6 and CRP). Teodorczyk-Injeyah, et al.confirmed these findings, claiming that spinal manipulative therapy reduces inflammatory cytokines. Teodorczyk-Injeyah et al. also found similar findings concerning IL 2, demonstrating “that cell cultures from subjects, who received a single spinal manipulative treatment in the upper thoracic spine, show increased capacity for the production of the key immunoregulatory cytokine, interleukin-2.” Note that the upper thoracic spine was consistently adjusted as was necessitated via subluxation findings.

Further research is needed to specify the exact mechanism(s) by which a chiropractic adjustment affects these compounds, though this case further substantiates the need to understand this phenomena. We can only assume that IL-2, IL-6, and CRP were properly regulated after the adjustment and not pathologically affected due to the cessation of symptoms.

Many ASD children, like the child in our study, also have difficulty sleeping through the night. The relationship between the two has been studied thoroughly. Recent research has suggested that disordered sleep may be symptomatic of socioemotional and adaptive problems, abnormalities in melatonin, or GERD. A PubMed and Index to Chiropractic Literature review indicated that there is no reported association between chiropractic and melatonin production, though we see various accounts connecting chiropractic to GERD (as seen above) and in helping resolve symptoms related to socioemotional and adaptive problems. We see the connection between GERD and sleeplessness most applicable to our case as, according to our knowledge, no hormone therapy was administered to the patient while under care. Thus, by reversing the pain and discomfort associated with GERD, the child was able to sleep undisturbed throughout the night after receiving chiropractic adjustments.

Chiropractic’s Role in Resolving Classic Autistic Presentations

Several case series and studies have been published highlighting chiropractic’s efficacy in co-managing autism and related disorders. The relationship between the presentation of ASD, as described in the patient in this case study and the possible causation models with chiropractic is becoming more clear as research advances the topic. The association(s) between GI disorders, epilepsy, nutrient deficiency and ASD cannot be stressed enough. Recall from above that studies have shown that ASD children, compared to controls with neurotypical children, report higher occurrences of significant nutritional imbalances. Many physicians have found that almost all ASD children begin improving when their inflamed GI heals, when their immune system is strengthened, and when the toxic load/heavy metals are dramatically reduced. We see the relationship of decreased ASD symptoms seen in response to chiropractic management of GI issues like GERD, improvement of immune response(s), and detoxification due to aiding GI function as a whole. Thus, chiropractic’s apparent effectiveness in reducing ASD symptoms appears to center around managing these root causes related to ASD.

In addition to this, models of vertebral subluxation can also possibly account for a more organic resolution of ASD. In other words, if we see ASD as a primary neurogenic disorder, then freeing the body of subluxation can possibly have a direct effect on the patient regardless of their nutritional status. For example, the Subluxation Degeneration Model describes a progressive process associated with abnormal spinal mechanics. First explored in 1838, this model contends that in the cervical spine, for example, degeneration begins with the intervertebral discs, progressive changes in the vertebrae, and contiguous soft tissues.

In the lumbar spine, pathomechanics and torsional stress have been suggestive causes of degeneration. The neurological consequences of spinal degeneration include, but not limited to: cord compression; nerve root compression; local irritation; vertebral artery compromise; autonomic dysfunction. This dysfunction can possibly be manifested as ASD. We purport the possibility that if chiropractic adjustments can correct vertebral misalignments and degenerative processes, thereby helping to restore the nervous system to optimal performance, we see the plausibility of significant improvement in nervous system functionality. We would, therefore, expect to see positive changes in the neurological behaviors of a patient with ASD. Further research is needed to substantiate this theory.

Chiropractic’s Role in Resolving Seizures

Because the child in this study was a risk candidate in developing a seizure disorder upon presenting to the office and because she had just recently experienced a seizure a few months prior to care, we hypothesize that subluxation-based chiropractic care may have prevented the onset of more
continuous, insidious and pathognomonic epilepsy as is seen in many ASD patients.

Epilepsy is a general term that refers to a tendency to have recurrent seizures. A seizure is a temporary disturbance in brain function in which groups of nerve cells in the brain signal abnormally and excessively. During a seizure, disturbances of nerve cell activity produce symptoms that vary depending on the location and the amount of the brain affected. Seizures can produce changes in awareness or sensation, involuntary movements, or other changes in behavior. Usually, a seizure lasts from a few seconds to a few minutes. Two main classifications of seizures are primary generalized seizures—seizures beginning with widespread involvement of both sides of the brain and partial seizures—seizures beginning with involvement of a smaller, localized area of the brain. With some partial seizures, the disturbance can still spread within seconds or minutes to involve widespread areas of the brain (secondary generalized seizure).

According to the CDC, known causes of seizures are listed below, though nearly two-thirds of cases are idiopathic:

- Oxygen deprivation (e.g., during childbirth).
- Brain infections (e.g., meningitis, encephalitis, cysticercosis, or brain abscess).
- Traumatic brain injury or head injury.
- Stroke (resulting from a block or rupture of a blood vessel in the brain).
- Other neurologic diseases (e.g., Alzheimer disease).
- Brain tumors.
- Certain genetic disorders.

The CDC estimates that about 2.0 million people in the United States have epilepsy and nearly 140,000 Americans develop the condition each year. New cases of epilepsy are most common among children and older adults. The total indirect and direct cost of epilepsy in the United States is estimated to be $15.5 billion.

As stated above, nearly 1/3 of ASD children suffer from epilepsy. It has been reported that the risk of epilepsy in autistic children with severe intellectual and developmental disabilities is 5% at 1 year, 15% at 5 years, and 25% at 10 years. Significantly higher numbers occur when cerebral palsy is included as an additional comorbidity. A key fact to note is that epilepsy persists in the majority of patients into adulthood with remission in only 15%.

Pistolese presented the results of a thorough literature review that out of the 17 papers reviewed, 15 patients out of 15 reported positive outcomes resulting from subluxation-based chiropractic care. Amalu’s concept of reversing cerebral penumbra can possibly explain the apparent effectiveness subluxation-based chiropractic care has in managing seizures within the ASD population.

Within the ischemic cerebrovascular bed, there are two major zones of injury: the core ischemic zone in which necrotic tissue is irreversible; and the borderline ischemic tissue, also known as “ischemic penumbra” (a term generally used to define ischemic, but still viable, reversible cerebral tissue). The penumbral zone is supplied with blood by collateral arteries anastomosing with branches of the occluded vascular tree and it is where pharmacologic interventions are most likely to be effective. According to Agamanolis, “Ischemia, in the penumbra, causes dysfunction due to ionic and metabolic dysfunction but is not severe enough to result in structural damage. Prompt restoration of perfusion in the penumbra by injection of thrombolytic agents may prevent structural damage in this area, thus limiting the neurological deficit.”

According to Amalu, hyperafferancy plays a significant role in neuronal hibernation, whereby hyperafferant activation of the central regulating center for sympathetic function can cause differing levels of cerebral ischemia. He postulates that hyperafferant activation via the superior cervical sympathetic ganglia may also cause higher-center ischemia. In light of Kent’s Dyaffereation Model of vertebral subluxation, we see the significance of Amalu’s theory. The Dyaffereation Model describes those situations in which biomechanical dysfunction result in alteration in normal nociception and/or mechanoreception. This is clearly evident as the intervertebral motion segment is especially endowed by nociceptive and mechanoreceptive structures. As Kent describes, “To use the contemporary jargon of the computer industry, ‘garbage in – garbage out.’” Subsequently, abnormal afferent input to the CNS will lead to a plethora of efferent pathologies.

Assuming the possibility that the pathologically fixated vertebral segments were causing biomechanical dysfunction, it is reasonable to conjecture that normal nociception and/or mechanoreception could have been altered. Consequently, we can further ascertain the afferent-efferent neuronal loop could have been disturbed causing a pathological environment in which seizures and ASD could manifest should the proper environmental stimuli presented itself. Subsequently, we can see the feasibility in how correcting a subluxated vertebral could restore the proper function to the neuronal loop. In other words, by eliminating biomechanical dysfunction, the afferent pathways are free function properly thereby eliminating seizures. Of course, research is needed to substantiate these claims, though we feel that this case study and others published warrant the need to investigate this further.

**Limitations**

The primary limitation to our hypothesis that subluxation-based chiropractic care can help manage ASD and related symptoms is that there have been no systematic studies to specifically isolate chiropractic’s potential involvement. Due to its multi-factor involvement, ASD children are almost always undergoing multiple treatment modalities. A random control cohort study or some equivalent would be most useful in this case as we will never be completely sure what exactly caused the significant decrease to the patient’s symptoms from this study.
Conclusion

According to her mother, the patient from this case study has been “off all of her medications, she’s making improvements with her occupational therapists, speech therapists, even her pre-school teachers are noticing a big difference. I’m getting my little girl back – look, she’s making eye contact with me, and even starting to say a few words! She’ll use her hands to do the motions to the Itsy Bitsy Spider song!” Her mother cannot stress enough the impact that chiropractic care has had on her daughter.

Since ASD has been proven to be a multifactorial disease, we believe that it is only logical to assume a multidisciplinary approach in treating these disorders. Therefore, we feel it advantageous and expedient that chiropractic care be utilized as a first-step approach in the treatment and management of ASD with the other protocols generally used today

We believe that working together, chiropractors, MDs, occupational therapists, and other health care providers will see results by managing the root cause(s) and not just the various symptoms presented by ASD children.

References

Tables & Figures

Figure #1: (Thermal Scan: First Visit)

Figure #2: (Thermal Scan: 17th Visit)