

# CASE STUDY

## Improved Allergen-Specific IgE Levels in an 8-year-old Female Following Chiropractic Care to Reduce Vertebral Subluxation: A Case Study & Selective Review of the Literature

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### Abstract

**Objective:** To present the outcomes following chiropractic care of a pediatric patient with food allergies and other neuromusculoskeletal complaints.

**Clinical Features:** An 8-year-old female presented for chiropractic care with left hip pain of six months duration, and left internal foot rotation since age five. History and previous medical documentation revealed peanut, pecan, and walnut allergies with abnormal specific IgE levels of 0.65, 0.26, and 0.65 kU/L respectively.

**Intervention and Outcome:** Chiropractic care included the use of Torque Release Technique® for the analysis of vertebral subluxation, and the use of the Integrator™ instrument for specific chiropractic adjustments. After thirty-eight weeks of regular chiropractic care, patient follow-up with allergist revealed improved specific peanut, pecan, and walnut IgE levels of 0.16, 0.20, and 0.43 kU/L respectively. Additionally, hip pain was eliminated, and internal foot rotation was improved.

**Conclusion:** Objective food allergy improvements were documented following chiropractic care. Further research to explore the benefits of chiropractic care in relations to allergies is recommended.

**Key Words:** Allergies, chiropractic, vertebral subluxation, adjustment, Torque Release Technique (TRT), children

### Introduction

As a growing concern to both individual and public health, food allergies are estimated to affect as many as 15 million Americans, and over 5.9 million U.S. children.<sup>1,2</sup> The CDC reported in 2013 that 5.1% of children in the United States have food allergies, with other estimates as high as 8%.<sup>2,3</sup> Of even more concern, may be the dramatic increase in prevalence of food allergies. In the decade from 1997 to 2007, there was an 18% increase in prevalence among children, making allergic reactions to food the most common cause of anaphylaxis in the community health setting.<sup>4,5</sup> From 1997 to 2011, the reported increase in prevalence was as high as 50%.<sup>3</sup>

While individuals of all races and ethnicities are affected by food allergy, Hispanic children had lower reported rates than

non-Hispanic white or non-Hispanic black children and there is an increased risk of food allergy among Asian and black children compared to white children.<sup>3,6</sup> Numerous additional risk factors have been proposed, including sex, genetics, atopy, vitamin D insufficiency, reduced omega-3-polyunsaturated fatty acids, obesity, increased hygiene, and the timing of exposure to foods.

In a clinical review by Sicherer et al, vitamin D levels less than 15ng/mL, latitudes farther from the equator, prolonged allergen avoidance, male sex in children, female sex in adults, and comorbidity of asthma were all linked to increased food allergy, while food allergy decreased with increasing birth order.<sup>6</sup> In another review of potential risk factors,

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STAT6, IL10, and IL13 genetic polymorphisms are recognized in association with food allergy, as are single nucleotide polymorphisms in the CD14 gene region, and gene-environment interactions whereby breastfeeding increased the risk of food sensitization in children carrying the GG genotype, but decreased the risk in those carrying the GT/TT genotype.<sup>7</sup> This review also highlights the mild to highly increased risk of food allergy following cesarean section found in recent data, yet notes other data determining that mode of delivery has no relationship to food allergy.

A reduction in omega-3-polyunsaturated fatty acids, with an increased consumption of omega-6-polyunsaturated fatty acids has been supported by some reports as a proponent for the increased prevalence of food allergies, but a systematic review concluded that supplementation with omega oils would be unlikely to prevent sensitization or allergic disease.<sup>8</sup> Although previously, maternal dietary restrictions during pregnancy and lactation, as well as delayed ingestion of common food allergens by the child were recommended, these avoidance recommendations have now been withdrawn due to lack of evidence.<sup>9</sup> The inflammatory state induced by obesity has also been theorized to lead to increased risk of food allergy.<sup>7</sup>

The prevalence of food allergy also appears to increase with higher income levels. Among children whose family income was less than 100% of poverty level, between 100-200% of the poverty level, and above 200% of the poverty level, food allergy prevalence was 4.4%, 5.0%, and 5.4% respectively.<sup>3</sup> Research suggests that peanut allergies in particular may have a strong genetic component. There is a seven fold increase in peanut allergy risk if a child has a parent or sibling with the allergy, and a 64% likelihood of the allergy if his or her twin sibling has the peanut allergy.<sup>7</sup> Conditions such as atopic dermatitis and eosinophilic gastrointestinal diseases may be triggered by or associated with food allergies.<sup>1</sup> Asthma, skin allergy, and respiratory allergy also appear to be highly related to food allergy. In 2007, the CDC reported that 29% of children with food allergy also had reported asthma, 27% also had reported eczema or skin allergy, and over 30% also had reported respiratory allergy, making children with food allergy two to four times more likely to have these other related conditions when compared to children without food allergies.<sup>4</sup>

There are certain food allergies that are more common than others. There is such a strong prevalence of certain allergies compared to others, that in fact, eight types of food account for over 90% of allergic reactions to food; these eight include milk, eggs, peanuts, tree nuts, fish, shellfish, soy and wheat.<sup>1,4</sup> Estimates for overall prevalence of peanut allergy are near 2%, while prevalence of peanut allergy in the U.S. is estimated at 0.6% of the population, with one 2011 U.S. survey suggesting a 25.2% peanut allergy prevalence in children.<sup>2,6,10</sup> The same survey reports that of the 38,480 children surveyed, 38.7% had a history of severe reaction, and 30.4% had multiple food allergies. In particular, 25-40% of those with peanut allergies also had an allergy to tree nuts.<sup>11</sup>

There is some natural resolution of food allergies seen, but such resolution varies by specific food. Milk, egg, soy and wheat are food allergies that children often eventually tolerate, whereas tree nut and peanut allergy are much less frequently overcome, as are fish and shellfish allergies that tend to be

lifelong once developed.<sup>1,6,10,11</sup>

The CDC reports that more than 300,000 ambulatory care visits per year among children in the U.S. are a result of food allergies.<sup>1</sup> A 2011 study determined that the cause of approximately 200,000 emergency department visits per year is food allergy, meaning that every three minutes a food allergy sends someone to the emergency department, and that every six minutes the reaction is anaphylactic.<sup>12</sup> In the years 2004-2006, 9,537 hospital discharges per year occurred with a food allergy-related diagnosis among children, which has significantly increased since 1998-2000.<sup>4</sup>

With the extensive hospital visits and additional medical costs associated with the care and management of food allergy, the economic impact is large. The total direct medical cost due to food allergy is estimated at \$4.3 billion (\$724 per child) per year.<sup>13</sup> In addition, the annual out-of-pocket cost to caregivers of children with food allergy is estimated at \$5.5 billion (\$931 per child). The same report estimates associated annual lost labor productivity costs totaling \$773 million (\$130 per child). Overall economic cost from medical, out-of-pocket, lost labor, and lost opportunity costs due to food allergy total \$24.8 billion annually (\$4,184 per child).<sup>1,13</sup>

The effects of food allergy are far reaching. Due to the effects upon individual children, families, educational systems, health institutions and the economy, the aim of this case study is to add to the limited evidence base of chiropractic care for allergy, in hopes of providing a future alternative or concurrent form of care for the condition.

## Case Report

### *Patient History*

An 8-year-old female patient presented with complaints of left hip pain, left internal foot rotation, and allergies. The mother stated that the child had experienced a combination of dull and stabbing left hip pain, with occasional radiation down the left leg for a duration of five months, as well as left internal foot rotation during gait since the age of five, and peanut, pecan, walnut, and hay fever allergies for at least the past six years.

The patient experienced the hip pain whenever walking or hiking at length, and rated the severity of pain as 5/10 on a scale of 0 to 10, with 10 being the worst pain. The pain prevented her from family activities. Resting and minimal doses of Ibuprofen were the only relieving factors. The mother noted that the child had suffered from frequent stumbling while walking or running throughout childhood, which led to many knee abrasions. She stated that the "turning in" of the foot that they had noticed early on, had not improved over time. Prior to our examination, the patient had seen a pediatric orthopedist, who had ruled out serious hip pathology and recommended stretching and NSAID's for the hip pain.

Reported allergies included anaphylactic peanut, pecan, and walnut allergies for which the child carried an EpiPen®, as well as seasonal allergies described as hay fever, for which she utilized lemon, lavender, and peppermint essential oil diffusion in the spring and fall. The earliest date of allergies reported was six years prior to the initial exam, when the child

was three years of age. The results from the most recent visit to the patient's allergist, 2.5 months prior to seeking chiropractic care showed peanut specific IgE levels of 0.65 kU/L, pecan specific IgE levels of 0.26 kU/L, and walnut specific IgE levels of 0.65 kU/L, all of which are reported in Table 1.

The child had a history of past eczema, and tonsillectomy with adenoid removal at the age of seven. She was birthed head-down, via a normal vaginal delivery with no complications of labor. Due to latching difficulties, the patient was breastfed for one month, and then began a soy-based formula. Her immunizations were "up to date", and she had experienced no adverse vaccination reactions. The child had a history of antibiotic use approximately one to two times per year. No major traumas, broken bones, or motor vehicle accidents were reported, and all sensory, motor, and behavioral milestones were reported as being within normal limits.

#### *Chiropractic Exam*

Palpation results yielded mildly taut right-sided musculature at C3, edema at upper sacrum, and motion restriction at both C3 and Sacrum. Postural analysis revealed high right shoulder of 0.25 inches and high left ilium, of 0.5 inches. Gait appeared as normal heel to toe gait, but with moderate left internal foot rotation. Prone static leg length was 0.5 inches short on the left. All orthopedic and neurologic examination findings were negative. The patient was diagnosed with hip myalgia, sacral subluxation, cervical subluxation, and postural abnormalities.

#### *Chiropractic Analysis*

Torque Release Technique® (TRT) protocol was utilized to analyze the patient for vertebral subluxation. Any necessary adjustments, as indicated by TRT analysis, were performed utilizing the Integrator™, a hand held adjusting instrument.

The subluxation-based TRT model, originally developed by Dr. Jay Holder, consists of non-linear, non-mechanistic, neurological testing and adjusting, based on tone.<sup>14-18</sup> The Integrator™ and TRT model were originally developed for the purpose of a large human population randomized clinical trial on the effects of subluxation-based chiropractic on human potential, state of well-being and quality of life.<sup>19,20</sup> In this tonal model of subluxation, Holder considers the brain, spinal cord, multiple layers of meningeal sheath, bones of the cranium, vertebral column, and pelvis as one integrated unit, termed the Cranio-Spinal Meningeal Functional Unit (CSMFU).<sup>14,15</sup> To determine the presence, location and listing of subluxation, the technique utilizes non-linear testing priorities, and observation and/or testing of the following 15 indicators of subluxation:

1. Palpation (scanning, tissue, intersegmental, and motion)
2. Functional leg length inequality (Functional Leg Length Reflex /FLLR)
3. Abductor tendency/adductor resistance
4. Foot flare
5. Foot pronation/supination
6. Heel tension
7. Abnormal breathing patterns

8. Inappropriate sustained patterns of paraspinal contractions/EMG
9. Congestive tissue tone
10. Postural faults (sitting, standing, prone)
11. Cervical syndrome test
12. Wrong-un test
13. Bilateral cervical syndrome test
14. Derifield test
15. Abnormal heat/energy radiation/thermography.<sup>14,15</sup>

TRT differentiates between the primary, secondary and tertiary subluxations, whereby the primary subluxation is the origin of any of the additional subluxations which may be present at one particular time in an individual.<sup>14,15,18</sup> In TRT, only primary subluxations are adjusted.<sup>14,15</sup> Emphasis is placed on cord tension subluxations, which are due to distortion of the meninges, versus cord pressure subluxations which are due to pressure upon the contents of the spinal canal, as originally described by R.W. Stephensen.<sup>14,21</sup> Distortion of the meninges is thought to apply abnormal tension patterns, or abnormal tone to the neural tissue itself, and tone of the nervous system is thought to be responsible for the normal adaptive response of the overall functional unit.<sup>17,22,23</sup> Tone, described by D.D. Palmer as the normal degree of nerve tension, is the premise upon which chiropractic was originally founded.<sup>24</sup> Palmer wrote that "life is an expression of tone...the cause of disease is any variation of tone".<sup>24</sup>

In this tonal, non-mechanical model of subluxation, points of dural attachment to bone are considered to be highly involved in any alteration of tone within the nervous system.<sup>22</sup> These points of dural attachment are mainly occiput, C2 (or C3), C5, S2, S3, S4, and the end-points of the CSMFU, the coccyx and sphenoid, which can be highly involved in overall cord tension.<sup>14,15,22,23,25</sup> Considering the extensive nature of the intricate meningeal connections to the spinal cord, it is difficult to consider biomechanical aspects of the spinal cord in isolation from tension in and transmitted from other sections of the cord.<sup>23,25</sup> TRT focuses its priorities for subluxation correction at these levels of dural attachment, although any other segment can be appropriate for an adjustment as well, if determined through the model's analysis.<sup>17,18</sup>

The Integrator™ was granted an FDA 510K (U.S. Patent no. 5,632,765), with its indication for use being the correction of vertebral subluxation.<sup>15,20,26,27</sup> The adjusting device was designed for consistency and reproducibility in the delivery of the chiropractic adjustment, featuring an automatic trip sensor mechanism which assures the instrument will fire when an exact, pre-determined pressure is reached when placed against the skin.<sup>20</sup> The Integrator™ adjusting instrument fires at a frequency of 64Hz; it is designed to administer torque for a more specific line of drive, and 0.25 inches of recoil (at 1/10,000<sup>th</sup> of a second) for a more dynamic thrust, as in the traditional toggle recoil adjustment.<sup>15,16,20</sup> The Integrator™ is used with one of three possible tips (30, 60 or 90 durometer) applied to the end, which are designed to replicate the shape and size of the human pisiform.<sup>15</sup> The Integrator™ is currently considered to be the profession's only toggle-recoil adjusting device, the only adjusting device that incorporates torque, and because it is the only device that fires independent of the chiropractor's force, is the only intra-patient/professional

reproducible adjusting device.<sup>15</sup>

For TRT analysis, the patient is prone with the bow of the shoelaces resting on the end seam of the table, with a two-inch wedge at the feet to position the knees into very slight flexion. Prior to the analysis of each primary subluxation, the neurological display must be cleared by means of flexing the prone patient's knees ("pumping the legs") to approximately 45 degrees two times.<sup>15</sup> The Functional Leg Length Reflex (FLLR) is then performed by quickly forcing the patient's feet into bilateral dorsiflexion which engages the achilles tendon reflex, releasing immediately, then engaging dorsiflexion again for about 0.5 seconds. The reflex is observed on the second dorsiflexion to determine the side of functional short leg.<sup>15</sup> Once the side of short leg is determined, pressure tests (a very light directional touch with the distal tip of the phalanx) are performed according to the non-linear testing time sequence adjusting priorities, as listed in Figure 1. The FLLR is re-performed after each individual pressure test and pressure test with torque in order to determine the primary subluxation. The legs will appear perfectly even, when, and only when the primary subluxation is pressure tested in the correct line of correction with the correct torque; improvement in functional leg length is considered insufficient unless it is perfect balancing of the functional leg length.<sup>15,17,18</sup> Once primary subluxations are located and the correct torque is determined, the adjustment is made by placing the pre-cocked Integrator™ at the correct segment in the proper line of drive with enough pressure for the instrument to fire. According to TRT protocol, a maximum of three primary subluxations are adjusted per visit, and if the primary subluxation is a posterior inferior occiput or a coccyx subluxation, following their adjustment, no more are to be made at that time.<sup>14,15</sup>

#### *Intervention - Chiropractic Care*

Care was recommended at a frequency of one visit per week. The patient began care, and on each visit the patient was evaluated for subluxation with the TRT protocol. All necessary adjustments were made with the Integrator™.

Subluxations found by TRT analysis were at the levels of occiput, C1, C5, trochanter and sacrum most often, but were also at C2, C7, L3, L5, ilium, and coccyx/sphenoid over the course of care. The patient had a total of 35 visits and adjustments over the course of 38 weeks. Reassessments were made at the 6<sup>th</sup>, 9<sup>th</sup>, 23<sup>rd</sup>, and 30<sup>th</sup> visits.

#### *Outcomes*

The patient's hip pain with extended activity such as walking and hiking was reduced from a severity of 5/10 to 2/10 following the fourth adjustment, and within 12 weeks of care, her hip pain had been fully eliminated. Initial postural findings of high right shoulder (0.25 inches) and high left ilium (0.5 inches) were both improved to level measurements at the second reassessment. Static prone leg length difference was reduced from 0.5 to 0.25 inches short on the left at the third reassessment, and left internal foot rotation during gait had been reduced from moderate to mild. A regular yearly follow-up assessment with the patient's allergist occurred at the 38<sup>th</sup> week of care, which revealed improvements in the patient's peanut and tree nut allergies. The patient's peanut, pecan, and

walnut specific IgE levels were reduced to 0.16, 0.20, and 0.43 kU/L respectively, as shown in Table 1.

#### **Discussion**

The immunopathogenesis of food allergy is constantly under investigation, as a complex interplay of environmental influence and genetics appears to underlie the manifestations of the various allergic disorders.<sup>6</sup> The role of antigen-presenting cells, T cells and T<sub>H</sub>1/T<sub>H</sub>2 bias, humoral immune response, homing receptors, signaling pathways, dietary factors, inflammatory states, microbiota, and effector cell function have all been considered and reviewed in the pathogenesis of the disorder.<sup>6,28-32</sup> Despite the complex pathophysiology, food allergy can be said to encompass a large spectrum of abnormal immunologic responses to food antigens; mainly IgE-mediated reactions (although cell-mediated and mixed reactions also play a role), which induce a variety of symptoms ranging from pruritus, urticaria, rhinitis, atopic dermatitis, nausea, abdominal pain, bronchospasm, cardiovascular and respiratory distress in varying degrees of severity.<sup>28,31,33</sup>

Commonly, food allergies share the pathophysiology of food antigen sensitization and T<sub>H</sub>2 skewing of the immune system.<sup>33</sup> The epitope, or amino acid sequence, present in dietary antigens elicits the manifestations of food allergy in an individual with a loss of, or failure to induce tolerance.<sup>28,33</sup> An increased understanding of the factors that alter the immune decision of the antigen-presenting cell at the first exposure to a food allergen will provide better explanation of what influences allergen specific T cells to become T<sub>H</sub>2 cells, and allergen specific B cells to become IgE producing plasma cells.<sup>31</sup> Despite knowledge of the standard anaphylactic response in humans, whereby histamine is released from basophils and mast cells after IgE-mediated activation, accurate identification of the major effector cell of the anaphylactic reactions to food proteins requires further study.<sup>31</sup>

In the allopathic model, the most rudimentary and common approach in management of food allergy is the complete avoidance of the symptom causing foods, combined with emergency preparedness.<sup>6,31,33-35</sup> Although in recent years, researchers have gained insight into additional methods besides strict avoidance, many of which are reaching clinical trials and may represent the potential for a significant shift from the current clinical approach.<sup>6</sup> One major shift in regards to food allergy prevention may be in regards to the suggestion that contrary to previous recommendations, prolonged avoidance of solids and specific allergens may not be protective.<sup>6</sup>

Traditional emergency management plans, often including epinephrine anaphylaxis treatments and antihistamine are common, yet even the variation of possible medical treatments in this area carry with them complex determinations of the most beneficial drugs, taking the potential of equivalent effectiveness, the variety of auto-injectors, and also the avoidance of sedation into consideration.<sup>6,36,37</sup> The antihistamines diphenhydramine and cetirizine have shown similar efficacy in the treatment of food allergic reactions, yet differences in onset and duration of action, frequency of CNS

effects, and sedative effects must be considered, as sedation in particular can complicate the further assessment of the patient being treated for an acute allergic reaction.<sup>36</sup> Auvi-Q, a unique epinephrine auto injector was shown to be significantly preferred by users and their caregivers over the traditional EpiPen®, due to device size, shape, ease of use, ease of carrying, method of instruction and ease in following instructions.<sup>37</sup>

Therapies under investigation for future use in the treatment of specific food allergies such as egg and milk include numerous variations of immunotherapy, including oral, sublingual, intralymphatic, and epicutaneous therapies with whole allergens, modified proteins, and extensively heated forms of allergens.<sup>6,35,38</sup> Immunotherapy, the gradual increase of exposure to allergens with the goal of temporary desensitization and permanent tolerance has shown promise, but some forms of immunotherapy, subcutaneous in particular, have also resulted in unacceptable rates of severe adverse reactions.<sup>33</sup> The use of modified recombinant vaccines in combination with immunotherapy in order to decrease such adverse effects is also being investigated.<sup>33,35</sup>

Immunotherapy utilizing peptides, proteins, and plasmid DNA has been investigated in various animal trials with mixed results, raising concern about the technique being used for human subjects.<sup>33,35</sup> A study comparing the use of oral immunotherapy (OIT) and sublingual immunotherapy (SLIT) indicated increased efficacy but also increased systemic reactions with OIT, making SLIT more desirable, as reactions were typically more mild and isolated.<sup>38</sup> However, some authors do recommend the practice of OIT under strict medical supervision.<sup>39</sup> In addition, therapy approaches for non-allergen specific treatment include monoclonal antibodies, probiotics, and Chinese medicine, although more studies are required to evaluate the safety and efficacy of such approaches.<sup>6,31,33-35</sup>

The use of omalizumab, a monoclonal antibody (mAb) to IgE, initially used in the treatment of moderate to severe asthma, showed a reduction in IgE-mediated food allergy symptoms of all 22 asthma patients in a study by Rafi et al.<sup>40</sup> In a smaller report of two individuals with severe allergy, a great improvement in cutaneous, respiratory, and digestive symptoms related to food allergy were observed following treatment with omalizumab.<sup>41</sup> This mAb has gained importance in terms of a possible therapeutic role for food allergy, yet further study is required, and side effects including injection site reactions, viral and upper respiratory infections, sinusitis, headache, slight increase in malignant neoplasms and even anaphylaxis must be considered.<sup>40</sup>

The contribution of probiotic treatment to restoration of intestinal barrier function and allergy symptoms has been investigated, and reinforcement of normal intestinal flora may benefit the intestinal barrier aiding in a reduction of hypersensitivity reactions.<sup>34,42-44</sup> Probiotic bacteria such as *Lactobacillus* GG, *Lactobacillus acidophilus*, and *Bifidobacterium lactis*, may therefore play a role in the treatment of food allergy by means of downregulating hypersensitivity reactions and intestinal inflammation in allergy patients.<sup>34,42-46</sup> Probiotic supplementation has been associated with decreased allergen-induced production of IL-5

and IL-10, with higher levels of CXCL10 and CCL17, suggesting a greater capacity for immune regulation.<sup>6,47</sup>

The vast majority of complementary and alternative management for food allergy involves traditional Chinese medicine. The food allergy herbal formula FAHF-2 is a nine herb formula created upon traditional Chinese medicine. Protective effects of the herbs shown to be effective in preventing anaphylaxis in a murine model of peanut allergy lasted up to 6 months, and were also shown to modulate the allergic response in multiple food allergies besides peanut.<sup>33,48-51</sup> FAHF-2 is thought to have multiple immunomodulatory effects, including effects on T and B lymphocytes, mast cells and basophils, with studies showing decreased IgE levels, T<sub>H</sub>2 cytokine, IL-5, and IL-13 production, but an increase in IFN-gamma, reflecting that it is not simply a general immunosuppressive, but is selectively suppressive and inhibitive of the T<sub>H</sub>2 specific response.<sup>33,35,48,49</sup> FAHF-2 has thus far undergone acute and extended Phase I FDA study which showed that FAHF-2 is safe and well-tolerated by subjects with food allergy, and that it appeared to have multiple targets on the immunopathological mechanisms of food allergy.<sup>52</sup>

Previous investigation into the mechanism by which helminth parasites modulate host allergic inflammatory responses requires further research.<sup>53,54</sup> Inverse associations between allergen skin test reactivity and infection with various helminths has been demonstrated.<sup>53</sup> A parasitic helminth, *Trichuris suis*, is also undergoing research on peanut and tree nut allergy patients, grounded upon the observation of greatly diminished anaphylactic symptoms and decreased peanut specific IgE in a murine model study.<sup>35</sup>

The chiropractic literature specific to allergy (and not atopic asthma) is limited, and that related particularly to food allergy is even more limited. A case study by Alcantara provides an example of the limited amount of literature on the chiropractic care of allergy. The case consisted of a 7-year-old male suffering from chronic colds, allergies, and asthma since the age of five months, however these reported allergies were primarily in response to molds and mildew.<sup>55</sup> The child had been on Alavert for his allergies, and following Activator Technique chiropractic care for two weeks at a frequency of three times per week, the child was reportedly no longer dependent on his prescription medication for allergies.

Another case study reports of a patient with allergic dermatitis, who, following a lack of sufficient improvement with prescribed steroid ointments turned to chiropractic care.<sup>56</sup> The 14-month-old female showed initial exacerbation, then resolution of her symptoms after 28 treatments with the Toftness System chiropractic technique. The authors theorize that the treatments had affected the autonomic nervous system, which in turn corrected an immune system imbalance, improving the patient's condition.<sup>56</sup> It should be noted however, that the allergenic cause of the dermatitis in this case was not known; an egg white reaction was revealed in blood tests, but was not confirmed, as the child had only been breastfed.

An additional case study notes allergy improvements following chiropractic care, but again, these allergies refer to

respiratory allergies which were not food specific. In this case, an 11-year-old girl presented to a chiropractic practice with asthma, chronic allergies, sinus problems, dry skin, and leg cramps.<sup>57</sup> She had been taking Flonase, a corticosteroid, and Claritin, an antihistamine, to relieve allergy symptoms due to smoke and other air borne triggers prior to receiving chiropractic care. The child was adjusted using the handheld Impulse instrument initially, then was transitioned to manual adjusting, traction, and use of a Denneroll under Chiropractic Biophysics technique for another 19 visits, following which, her allergies to smoke had resolved.

Basso reports of a 16-year-old female who presented with Juvenile idiopathic arthritis, and suffered from seasonal allergies and asthma.<sup>58</sup> The patient was evaluated according to Activator Methods protocol and adjusted as necessary with the Activator instrument for six weeks, at an initial frequency of three times per week. Following the initial chiropractic care plan, the individual reported that she no longer had to take allergy or asthma medications.

In a multi-faceted comparative study of 57 allergy patients (12 of which had food and drug allergies) who also had Crohn's Disease, the authors found vertebral subluxation to be a common and characteristic finding in allergy and Crohn's disease patients.<sup>59</sup> The authors concluded that there is a high possibility that allergies and Crohn's disease closely relate to the innervation of organs involved in immune function which are affected by changes in the vertebrae caused by vertebral subluxation.<sup>59</sup> The possibility of vertebral subluxation as a cause of chronic nerve compression having a significant effect on the immune function of the allergy patients is considered.

There is an intimate connection between the functioning of the immune and nervous systems. The immune system has even been described as a continuation of the nervous system, with immune cells functioning as the effector cells of the nervous system as it alerts and guides the immune system, mediated by numerous factors such as neurotransmitters and cytokines.<sup>60-63</sup> This close association of the two systems has long been acknowledged in chiropractic as an underlying feature of the mechanisms of the functioning human body, yet initially lacked research behind the relationship.<sup>64</sup>

The thymus, spleen, and lymph nodes are inundated with nerve to gland connections that bring immune response via the autonomic nervous system.<sup>65,66</sup> The immune system can receive information from the nervous system via neuropeptides, which conversely also send information from the immune system to the nervous system.<sup>65,66</sup> In recent years various researchers have discovered the existence of adrenal receptors which receive sympathetic nerve stimuli on the cell membranes of various leukocytes central to the immune system, shedding more light on the fact that the immune system is controlled by the autonomic nervous system.<sup>67,68</sup> Brown suggests that with the increased understanding of these intricate system connections, chiropractors may play a pivotal role in psychoneuroimmunology research, perhaps gaining progress on our explanation of how chiropractic works by substituting the idea of the release of neurotransmitter messenger molecules for that of releasing 'innate intelligence'.<sup>66</sup>

Autonomic nervous dysfunction may contribute to an abnormal increase in sympathetic activity. This sympathetic activity may be responsible for immune changes due to the rich innervation of lymphoid tissues by sympathetic fibers.<sup>69,70</sup> Studies on the responsiveness of the autonomic nervous system in patients with asthma and other allergic diseases showed multiple imbalances in components of the autonomic nervous system in these allergic subjects.<sup>71</sup> Subjects with allergic disorders had beta-adrenergic hyporeactivity, and cholinergic hypersensitivity abnormalities that appeared closely related to the atopic state, as beta-adrenergic agonists normally inhibit the secretory process of mast-cell derived mediators, and cholinergic agonists normally enhance mast cell degranulation.<sup>71</sup>

In a review of basic science literature relevant to spinal subluxation and adjusting, Cramer provides a clear summarization of the modulator and receptor mechanisms by which the nervous and immune systems communicate, and from the evidence, postulates that spinal influences may have a clinically significant impact on immune function.<sup>68</sup> However, Cramer calls for additional research on the subject, as evidence prior to her review proved conflicting.<sup>68</sup> Ressel suggests that childhood allergies are a possible result of the neuro-immune effects of the pelvic distortion subluxation complex.<sup>72</sup> Additionally, Martin proposes a direct relationship between chiropractic and the functioning of the immune system, centered on the theory that immune function is affected by intact performance of the nervous system.<sup>73</sup> He infers that the correction of vertebral misalignment via the chiropractic adjustment can enhance the immune system directly, by acting on nervous system areas regulating immunological components, or indirectly, through normalization of other bodily systems.

Somatoautonomic reflex effects following spinal manipulative therapy may include immune system modulation.<sup>62,74</sup> Although such alterations must be further explored, there is experimental evidence of spinal manipulative therapy impacting systemic sequelae including functional changes in how peripheral blood lymphocytes respond to immunoregulatory mediators, including a "priming" effect on the effector cells.<sup>62</sup> Additional immune responses following spinal manipulation include changes in absolute number of T and B lymphocytes, NK cell numbers, enhanced neutrophil and monocyte respiratory burst in response to particulate challenge, changes in IgA, IgG, and IgM antibody levels, and CD4 T Helper cell counts in HIV positive patients.<sup>63,75-80</sup> In an extensive review of the literature surrounding physiologic changes and associated health benefits of chiropractic adjustments, Hannon documents statistically significant improvements in immune function established in evidence gathered from varying methodologies, suggesting subluxation correction is associated with long-term overall health benefits, including improved immune function.<sup>81</sup>

As a growing body of evidence shows that the nervous system is capable of modulating the immune system, the chiropractic adjustment is thought to possibly be connected to positive influences on the immune system because of its effect on the nervous system.<sup>77,82,83</sup> Elimination of nervous system disturbance via subluxation-based chiropractic care as a means of promoting normalization of sympathetic activity to reduce

immune dysfunction and improve allergy is an attractive concept, yet one which requires much additional study. The evidence for chiropractic adjustment as a means of improving immune function and allergy rests on positive findings in reviews of the interconnection between chiropractic, neuroimmunomodulation, and musculoskeletal function, as well as current models of vertebral subluxation and the somatosympathetic reflex hypothesis.<sup>77,82,84,85</sup>

The neurodystrophic model of vertebral subluxation states that “neural dysfunction is stressful to body tissues and that lowered tissue resistance can modulate specific and nonspecific immune responses”.<sup>85</sup> The norepinephrine in lymphoid organs is playing a large role in this modulation.<sup>65,69,82,85</sup> According to this model, maintenance of a healthy immune system is dependent upon the very maintenance of a healthy nervous system, providing the link for spinal adjustment and the alteration of immune system activity.<sup>85</sup>

In reflection of the reciprocal nature of communication between the immune and nervous systems, the dysafferentation model of subluxation must also be considered. The integrity of neural receptors and afferent pathways, if compromised by vertebral subluxation may qualitatively and quantitatively compromise the efferent response, in this case, the neural control of the proper immune response.<sup>85</sup> Biomechanical dysfunction and the associated aberration of afferent input to the central nervous system caused by vertebral subluxation may lead to dysfunction in efferent communication of the nervous system.<sup>85</sup> With the sympathetic nervous system being an important modulator of the immune system, altered efferent communication is posited to lead to altered immune function via the extensive neuro-immune connection of modulator and receptor mechanisms.<sup>68,82</sup>

According to Korr’s somatosympathetic reflex hypothesis, proper sympathetic nervous system function is dependent on continuous, accurate sensory input to the central nervous system from the musculoskeletal system; when some type of musculoskeletal dysfunction occurs, the sensory input to the central nervous system is altered, contributing to sustained sympathetic hyperactivity.<sup>84,86</sup> This sustained sympathetic hyperactivity occurs due to facilitation of the efferent lateral horn cells responsible for sympathetic outflow, which is a neurobiologic result of spinal lesion.<sup>86</sup> Korr states that the sympathetic nervous system “significantly influences the response, including resistance of tissues, to antigenic, infectious, irritative, toxic, and even carcinogenic agents”, and that manipulative therapy functions to quiet sympathetic hyperactivity when it reestablishes the necessary coherent patterns of afferent input.<sup>84</sup>

It is by means of restoring the proper afferent input to the nervous system through the adjustment of vertebral subluxation that we propose to have reduced the possible sympathetic overload that may have contributed to the allergies seen previous to chiropractic care in this case. Chiropractic adjustment of vertebral subluxation may have manifest a shift away from sympathetic and toward parasympathetic tone, especially considering the location of adjustment of primary subluxation, in this case having been

completely absent from the thoracolumbar region of sympathetic outflow and instead directed above and below to the areas associated with parasympathetic response.<sup>58,87</sup> The tonal technique used in this study shares the common objective with other clinical models of subluxation of correcting spinal nerve interference caused by vertebral subluxation.<sup>87</sup> Specifically, subluxation-based chiropractic adjustment for the normalization of the tone and tension within the nervous system, consistent with the principles of the Torque Release model, is the mechanism we contend to be involved with an improved allergy outcome after restoration of aberrant sensory input and neural dysfunction related to vertebral subluxation.

#### *Limitations*

Due to the nature of the case report itself, we acknowledge the lack of generalizability due to limitations including small sample size, lack of control group, and the possibility of a self-limiting or natural course of the allergic condition. Although these limitations apply, the case report can serve as a contribution to the evidence base on chiropractic care for allergy, informing higher-level research designs and the understanding of clinical experiences.

#### **Conclusion**

This case report describes the subluxation-based chiropractic care of an 8-year-old female and the concomitant objective improvements in peanut, pecan, and walnut allergies. Although there is some existing evidence supporting the positive effects of chiropractic care for improved immune system function, the evidence base is limited, especially pertaining to food allergy. We support further research in this area of patient care, examining the evidence for chiropractic care as a potentially beneficial treatment for allergies.

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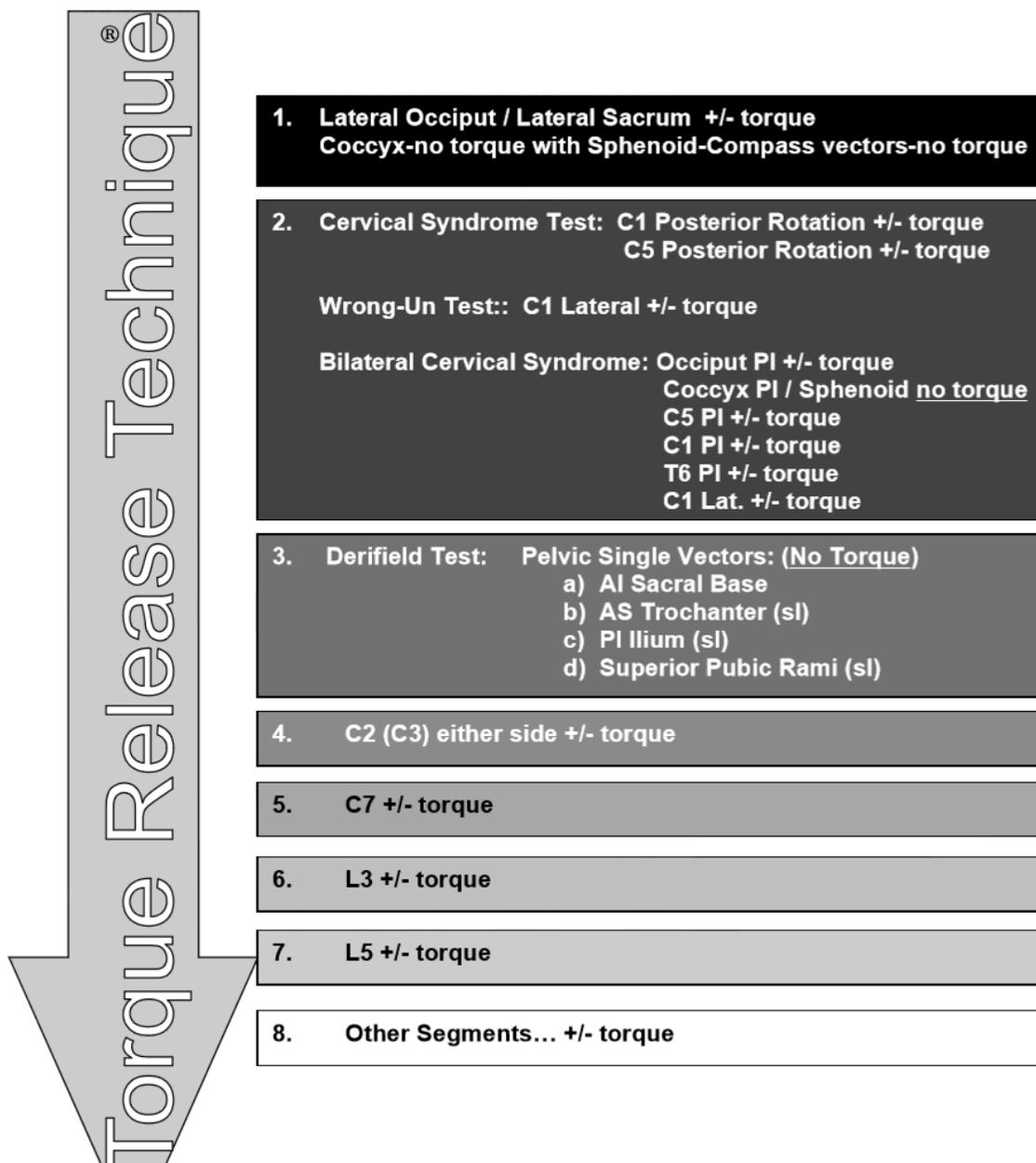
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## Appendix

Specific IgE	2.5 months prior to chiropractic care*	38th week of care*
Peanut	0.65	0.11
Pecan Nut	0.26	0.20
Walnut	0.65	0.43

\*units = kU/L

**Table 1.** Allergen-specific IgE levels prior to and after 38 weeks of regular subluxation based chiropractic care.



**Figure 1.** TRT Protocol nonlinear testing priorities.<sup>15</sup>