CASE STUDY

Resolution of Torticollis, Neck Pain and Vertebral Subluxation in a Pediatric Patient Undergoing Chiropractic Care

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Abstract

Objective: To present the chiropractic care of a patient with torticollis and neck pain concomitant with spinal subluxations.

Clinical Features: A 10-yr-old male presented with torticollis and complaints of neck pain as a result of muscle spasms in the cervical spine. The previous day, the patient had awakened with severe neck pain and the inability to lift his head from his pillow due to pain. The patient was taken to the emergency room where he was examined and given a prescription of Motrin and Valium prior to being released.

Interventions and Outcome: The patient was treated with low force, site-specific, full-spine chiropractic care using the Torque Release Technique in combination with Activator Methods at a frequency of 3 times per week for 4 weeks. Adjunctive therapies using interferential and moist heat to the cervical or thoracic spine were utilized for 3 visits along with proprioceptive-neuro-facilitation (PNF) stretching on one occasion. Icing home instructions for 10 minutes at least twice per day were given along with instructions to cease participating in any sports activity. Following 12 visits, the patient was pain-free with improved posture and full range of motion in the cervical spine.

Conclusion: This case report provides supporting evidence on the use of site-specific chiropractic adjustments to sites of vertebral subluxations in the care of patients with acquired torticollis.

Key Words: *Torticollis, vertebral subluxation, surface electromyography, thermography, chiropractic, neck pain*

Introduction

According to the most recent publication of the National Board of Chiropractic, the percentage of patients under 17 years of age attending the healthcare services of chiropractors has increased by 8.5% since 1991.[1]

The study by Lee et.al.[2] extrapolated that some 30 million visits were made by pediatric patients to chiropractors in 1997. In a recent similar study, the International Chiropractic Pediatric Association found a higher percentage of pediatric visits among its practitioners than responders in the Lee et. al. study.[4] Using similar calculations, estimates of pediatric visits to chiropractors in 2007 estimate a doubling at 60 million visits. As such, one may extrapolate that the trend in pediatric chiropractic utilization has increased, rather than decreased.

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With respect to the types of morbidity addressed by chiropractors; there are indications that these are for musculoskeletal problems and, in comparison to the adult population, a disproportionately greater number and types of non-musculoskeletal conditions.[3] As it pertains to musculoskeletal conditions in children under chiropractic care, there is a dearth of published literature on this subject. In the interest of evidence-based practice, we describe the care of a pediatric patient with neck pain.

Case Report

A 10-yr-old white male, in the accompaniment of his mother, presented for chiropractic consultation and possible care with a chief complaint of acute onset torticollis. The day before, the patient awakened with severe neck pain with the accompanying inability to move his head and neck and had great difficulty lifting his head off his pillow due to pain. The patient was taken to an emergency care facility and according to his mother, was examined and released with a prescription of Motrin and Valium.

Using a verbal pain scale of 0-10 (with 10 rated as maximum pain), the patient provided a neck pain rating of 5/10. Upon further questioning, the patient characterized his pain complaint as constant with intermittent increases in pain intensity due to provocation and/or exacerbation such as when he moves his head and neck. His pain complaint was localized throughout the left side of the cervical spine with rest being palliative insofar as it did not provoke and/or exacerbate his pain complaints. The patient denied any radiating pain to either upper extremity. In addition to the prescribed medication, the patient had been icing the left side of his cervical spine.

Additional pertinent past history included the use of forceps during his delivery and a history of "stiff necks." The patient was currently wearing dental braces on the top and bottom teeth and using a cervical headgear for 8 hours every night attached to the upper palate braces. The patient had been wearing the cervical headgear for about 2 years and was near completion of this dental process. A review of systems revealed the patient as having a history of mild asthma with use of medication on an as needed basis. He is the second of 4 male siblings, played organized hockey and was currently playing baseball 2-3 times per week as a second baseman or pitcher.

Physical examination revealed a well-developed and communicative 10-yr-old, 80 lb male with a 45^0 right lateral flexion in the cervical spine with concurrent ipsilateral rotation of the chin to same side with a slight forward flexion. The patient was unable to straighten his head to a neutral position without severe pain on the left side of his neck. Postural examination demonstrated a low right occiput, elevated right shoulder, and elevated right hip. Examination of the feet in a weight bearing position demonstrated severe bilateral pronation of the feet with thickening at the medial malleolus, bilaterally. Cervical spine ROM revealed restriction and asymmetry on extension, left lateral flexion and left rotation (see Table 1). Orthopedic testing was not performed due to the obvious discomfort of the patient and the avoidance of further provocation/exacerbation of the patient's pain complaints.

Palpation of the cervical spine revealed hypertonicity and tenderness with gross muscle spasm of the right sternocleidomastoid (SCM). This was also evident with the left cervical paravertebral musculature and more specifically localized at the C_{4-7} vertebral levels. The spinous processes at C_{4-7} vertebral bodies were also tender to palpation. Global joint fixation of segmental or functional spinal units were notable in the cervical and upper thoracic spine.

Initial paraspinal rolling thermal scanning via the Subluxation Station Millennium® demonstrated severe asymmetrical temperature differences at 2-4 standard deviations (SD) above normal on the right side at C_1, C_3, and C_4 vertebral bodies (VBs). Moderate asymmetrical temperature differences of 2-3 SD above normal were observed at the C_2 VB on the left side. Mild asymmetry temperature differences of 1-2 SD above normal were observed at the right side at C7 and T1 VBs[4] (see Figure 1).

Paraspinal static surface electromyographic (sEMG) scan using the Subluxation Station Millenium® demonstrated muscle tension to 1 SD above normal at the following vertebral levels: C_1 (right side), T_1 (left side), T_{10} (right side), T_{12} (left side), L_1 (left side), L_3 (right side) and on the right side of the S_1 tubercle. Mild muscle tension (to 1-2 SD above normal) at the following vertebral levels: at the C3 VB (left side), at the right side of T_1, T_2, T_4, T_6, T_8, L_5 VBs and at the left side of the S_1 tubercle. Moderate muscle tension (2-3 SD above normal) was noted on the left side of C_7, T_{10} and L_5 VBs. Severe muscle tension (> 3 SD above normal) was notable at the left side of C_1, C_5, T_2, T_4,T_6,T_8 and L_3 VBs and at the right side of C_3, C_5, C_7 VBs.[5] The greatest percentage of muscle imbalance (based on sEMG measured muscle activity) was observed at T_8 at 496% (See Figure 1).

Based on the history and physical examination findings, cervical spine radiographs were obtained. Weight bearing anterior to posterior (A-P), neutral, and a lateral view of the cervical spine along with an anterior to posterior open mouth (APOM) radiographs were performed to rule out fractures, dislocations, congenital anomalies and neurogenic causes of the patient's clinical presentation. The radiographs revealed a right lateral head tilt (see Figure 2) along with a left cervical spine convexity with the apex at C_{4-5} (see Figure 3). Left spinal rotation was noted at C_2-C_5 as well as right spinal rotation at T_1-T_2. The lateral cervical radiograph (Figure 4) demonstrated a reduced cervical lordosis, often consistent with muscle spasms in the cervical spine.[6] "Stairstepping" of George's line as seen on the lateral view at C_2-C_6 was apparent due to rotation of the cervical spine as described by Yochum and Rowe.[7] In addition, the tilt of the atlas on axis was visualized on both sides of the posterior arch (as oppose to being superimposed) signifying a sign of atlas rotation.[7]

Based on the diagnosis of vertebral subluxations, the patient was cared for using site-specific low force chiropractic spinal adjustments using the Torque Release Technique[8] and the Activator Technique.[9] A trial of care was scheduled at a frequency of 3 times per week for 4 weeks or 12 visits with continual reassessment of the patient's response to care.

On the first visit, using the Torque Release Technique[8] analysis and treatment protocol, the patient was adjusted with a coccyx inferior to superior on the right side, an S_4 sacrum inferior to superior on the right, and a C_1 VB superior to inferior on the right. The T_1 was adjusted as a spinous process right listing. Proprioceptive neurofacilitation (PNF) technique[10] was applied to the patient's cervical spine with 3 sets to a maximum count of 10. Interferential and moist heat was applied to the patient's cervical spine thereafter for 10 minutes with further instruction to the patient's mother to apply ice at home to the same region for 10 minutes at a time at 2-3 times per day. The patient was also instructed to cease his sports activity until further notice.

On the 2nd visit, the patient reported that his symptoms were much improved with minimal neck pain. The patient's antalgic posture of the head and neck had improved, particularly from the anterior to posterior view of the cervical spine. The patient's previous right lateral flexion with ipsilateral rotation was barely noticeable. Static and dynamic palpation revealed gross muscle spasms were still present in the upper and middle trapezius musculature, bilaterally. Similar to the care described previously, the S_2 tubercle was superior to inferior on the right, the coccyx was inferior to superior on the right, and the T_4 VB was spinous left. Similarly, interferential and moist heat was applied to the thoracic spine for 10 minutes. At this time, orthotics to address the patient's bilateral hyperpronation, was discussed with the mother.

On the 3rd visit, the patient demonstrated a reduction in myospasm in the cervical and thoracic paraspinal musculature with improved global and intersegmental motion. The patient reported being pain free. The following subluxation findings were evident from the chiropractic examination and adjusted accordingly: the coccyx inferior to superior on the right, the S_4 tubercle inferior to superior on the right, and the T_2 VB was spinous left. Interferential and moist heat was applied to thoracic spine for 10 minutes.

On the 4th visit, the patient continued to demonstrate improved cervical and thoracic spinal intersegmental motion with a decrease in cervical and thoracic paraspinal muscle spasm. The following spinal subluxation listings were evident from the chiropractic examination and adjusted: the sphenoid was superior to inferior on the right, the occiput superior to inferior on the right, the coccyx was posterior, and the trochanter was superior to inferior on the right. Interferential and moist heat was discontinued and the patient was instructed to resume his normal activities of playing baseball.

On the 5th visit, the patient returned with a complaint of an increase in upper and middle trapezius muscle spasms after playing a baseball game. However, the patient had no complaints of neck pain. The following chiropractic subluxations were evident and adjusted accordingly: the coccyx was inferior to superior on the right, the S_4 inferior to superior on the right, the occiput superior to inferior on the right and the T_1 VB was spinous right.

On the 6th and 7th visit, the patient was cared similarly and on the 8th visit, the patient had played in a baseball tournament the previous weekend and presented with increased right cervical spine and thoracic spine muscle spasm.

The following chiropractic subluxations were evident from the chiropractic examination and addressed accordingly: the C_1 VB was superior to inferior on the right, the C_2 VB was superior to inferior on the right, the coccyx was inferior to superior on the right and the S_4 was inferior to superior on the right.

On the 9th visit, the patient indicated that his muscle spasms in the cervical and thoracic spine were reduced and the following subluxations were evident and adjusted: the coccyx was inferior to superior on the right, the S_4 was inferior to superior on the right, the occiput was superior to inferior on the right, and the T_2 VB was spinous left. The patient continued to demonstrate improvements with each subsequent visit and by the 13th visit, a reassessment of the patient's condition and response to care was performed.

Rolling paraspinal thermal scan demonstrated a pattern change and improvement overall. Severe asymmetry, temperature differences of 3-4 SD were observed on the left of the C_2 VB. Mild asymmetry, temperature differences of 1-2 SD above normal were observed on the right of the C_1 VB (see Figure 5). sEMG examination demonstrated mild muscle tension with readings of 1-2 SD above normal at the left side of the C_7 VB, and at the left and right side of L_3. Moderate muscle tension with readings of 2-3 SD above normal were observed at the left and right of the T_1 VB, and at the left side of T_6 VB. Severe muscle tension (with readings of >3 SD above normal) were observed at the left and right side of C_1 VB and S_1 tubercle, at the right side of C_3 and T_2 VBs and at the left side of the C_5 VB. The greatest percentage of muscle imbalance was now observed at the L_5 VB at 506% (see Figure 5).

Postural examination revealed a leveled occiput, a slightly elevated left shoulder and very slightly elevated right iliac crest. The cervical spine ROM was restored to normal (i.e., ROM was symmetric) with the patient reporting pain free and back to normal activity.

Discussion

Musculoskeletal pain is very common in children.[11] Prevalence varies depending on the kinds and types of musculoskeletal disorders under consideration and of course, the age group addressed. In a 1-year follow-up of children with musculoskeletal pain, M ikkelsson et. al. [12] determined that 32% of 10-12 year olds reported musculoskeletal pain in the preceding 3 months. As they pertain specifically to neck pain in children or in the age group appropriate for the patient presented, insofar as to the best of our knowledge, no epidemiological data is available.

The contributing factors to musculoskeletal pain in children are not unlike those in the adult; these are genetic[13], anatomical and structural[14], physical deconditioning[15], injuries[16], continuous mechanical overload[17], psychological distress[18], social and cultural factors[19, 20], biological disease processes[21] and illness or pain behavior[22]. Interestingly and of more importance in this day and age of prevention and health promotion strategies, addressing pain complaints in the early years are of paramount importance to prevent chronicity and the development of these pain complaints in adulthood. Studies by Harreby et al. [23], Leboeuf-Yde and Kyvik[24] and

Salminen et al. [25] support the possible association between musculoskeletal pain in childhood and development of musculoskeletal disorders in adults.

Unlike that in adult patients, what becomes immediately apparent to the experienced clinician, is that pain evaluation in children is challenging and difficult and unlike those in the adult. Outcome measures for the different aspects of pain as typically applied to adult patients may be inappropriate or uncertain for the pediatric population. Patient observation and self-reported measures are essential components in the examination of pain. According to Hadjistavropoulos and Craig[26], nociceptive stimulation is first modulated by a person's internal experience. Dependent on the development of the individual, this internal experience is then encoded in expressive behavior that is either verbalized or non-verbalized. Verbalization requires higher mental processing whereas non-verbalization is more automatic in nature. These behaviors are then communicated to others with the attempt to decode (understand) the pain.

Observational behaviors of pain are more automatic and less prone to voluntary control and therefore more useful and credible when self-reported measures are in question or not possible. As is often performed in clinical research and practice, patient assessments are done in proxy with the thinking that the clinician or the parent(s) are adequate measures. Singer and Thode[27] studied 63 children brought to an emergency department. The children were asked to assess their pain severity using the Smiley Analogue Scale. Parents and practitioners assessed the child's pain independently, using a 10-cm visual analogue scale. There was no significant correlation between the children's and the practitioners' scores; the correlation was better, but still poor, between the children's and the parents' scores. The level of agreement between the members of individual child/parent dyads was not evaluated. In the patient reported, both self-reported measures and observation were applied to assess his pain complaints. Objective and subjective outcome measures (insofar as the attending clinician can determine) correlated and were internally consistent with the patient's presenting complaints.

The Medical Approach to Pain in Children

The patient presented was initially attended to by emergency department (ED) personnel on the day he awakened with neck pain. He was examined and prescribed, according to his mother, Motrin and Valium. Oral medications are preferred modes of treatment in the ED since they eliminate distress of intravenous or intramuscular injections and have a lower risk of adverse events such as apnea and aspiration. It is outside the scope and purpose of this paper to comment on the appropriateness of this approach to patient care but insofar as we can determine, the use of analgesia for pain management in ED pediatric patients is quite prevalent.

Friedland et.al. reviewed the issues surrounding acute pain management in their ED for pediatric patients and found suboptimal analgesic use and home analgesic instruction among its personnel. Motrin™ is a non-steroidal anti-inflammatory medication with ibuprofen as the active ingredient[28]. Valium™ (or diazepam) is from a class of drugs called benzodiazepines to address anxiety, nervousness, and tension associated with anxiety disorders as well as seizure disorders and muscle spasms.[29] Studies exist comparing pain relief with oral analgesics in children postoperatively.[30]

Prior to the study by Clark et.al. [31], no randomized controlled clinical trial (RCTs) studies existed examining the use of common oral analgesics to treat acute musculoskeletal pain for pediatric patients in the ED. Examinations of the use of oral analgesics for acute musculoskeletal pain in adults have not been examined as they are prescribed for children under similar circumstances. Clark et.al. [31] in an RCT examined acetaminophen, ibuprofen, or codeine (given as a single dose), to determine the most efficacious analgesia for children presenting to the emergency department with pain from acute musculoskeletal injuries. They found that ibuprofen provided the best analgesia of the 3 medications.

Implications of Chiropractic Care

Prior to a discussion on the chiropractic implications of the case report presented, a selective review of the scientific literature was performed using the databases MANTIS (1965-2007) and Pubmed (1966-2007). Pubmed was searched using the search terms "neck pain AND chiropractic" limited to Humans and the following Types of Article (Clinical Trial, Randomized Controlled Trial, Case Reports, Clinical Trial, Phase I, Clinical Trial, Phase II, Clinical Trial, Phase III, Clinical Trial, Phase IV, Controlled Clinical Trial, Multicenter Study) and Ages 0-18 years. MANTIS was similarly searched terms "neck pain" in ALL specified to the English language and the specialty of Chiropractic. MANTIS provided 300 citations. Following further examination for the age group criteria of children 0-18 years of age, only a handful of studies were selected. The following narrative is the result of our literature review.

Jonasson and Knaap[32] described the care of an 8-yr-old boy with an initial complaint of headaches and neck pain. The focus of the paper however was the diagnosis of gastroesophageal reflux disease and the patient's referral to a "specialist." The patient received care described as upper cervical spinal manipulation in combination with cranial technique and dietary advice.

Elster[33] described the care of a 9-yr-old boy suffering from asthma and upper respiratory infections since infancy; headaches since age 6 years; Tourette Syndrome, ADHD, depression and insomnia since age 7; and neck pain since age 8 years. Upper cervical spine technique was used resulting in resolution of symptoms at five months since initiation of care. Hunt[34] described the care of a 12-yr-old female with complaints of cystic hygroma at the right submandibular muscle since 5 years of age and neck pain and headaches. All surgical procedures had failed to relieve her severe sinus drainage or contain the development of the mass. Following seven months of conservative chiropractic care, the patient's mass completely remised and has not recurred during 2 years of wellness care. The patient's neck pain and headaches had also completely resolved.

Rowel et.al. [35] presented the case of an 18-year-old female with complaints of neck pain and stiffness of 3 months duration. Approximately 1½ months prior the patient was

evaluated at a local hospital with multiple diagnostic procedures, including blood and urine analysis, Doppler ultrasound of the lower extremity, an AP and lateral chest X-ray, and an ECG. The patient was later released with a tentative diagnosis of "arthritis." She had not been able to move her neck for approximately 1 week and just wanted her neck "cracked." Following a trial of chiropractic care, the patient's neck pain and stiffness resolved.

Bussieres et.al. [36] presented the case of a 14-yr-old boy with a 6-month history of neck pain, torticollis and increasing neurological deficit. Past physiotherapy and chiropractic treatment had not helped. A myelogram and MRI scan revealed a large intramedullary lesion. A medical referral was made with this case illustrating the importance of a proper examination.

Hewitt[37] described the care of a 13-year-old female suffering from severe headaches and neck pain for five days. Following a series of four chiropractic treatments over a 2-week period, her headache and neck pain resolved. For completeness, we further describe two studies since they involve subjects less than 18 years of age with neck pain.

Van Schalkwyk and Parkin-Smith[38] evaluated the possible effect of the supine cervical rotary manipulation and the supine lateral break manipulation in the treatment of mechanical neck pain, according to subjective and objective clinical findings. Their inclusion criteria involved patients greater than 15 years of age. Two groups of 15 subjects diagnosed with mechanical neck pain were the study subjects. Group A received a cervical rotary manipulation(s) on the ipsilateral side of the lateral flexion fixation(s), while group B received a supine lateral break manipulation(s) on the contralateral side of the lateral flexion fixation(s). Subjects received a maximum of 10 treatments over a 4-week treatment period. The outcome measures were subjective (i.e., numerical pain rating scale 101, McGill Short-Form Pain Questionnaire and the Canadian Memorial Chiropractic College Neck Disability Index) and objective (i.e., cervical range of motion goniometer and algometer) measurement parameters at the initial consultation (before any treatment), the final consultation, and at a 1-month follow-up consultation. Intra-group analysis indicated a significant difference between the initial consultation data and the final consultation data for the subjective data, indicating an effect.

Analysis of the objective data did not reveal any significant difference. Inter-group analysis did not reveal any significant difference between the 2 groups when comparing the data of the initial consultation and the final consultation, indicating that both treatments had a similar or equal effect. Power analysis was not satisfactory for most data, indicating the possibility of many Type II errors. The authors concluded that statistically, the results suggest that both treatments had an effect but that neither group showed a benefit over the other.

Strender and Lundin[39] evaluated the inter-examiner reliability of clinical tests used in everyday clinical work, where the examiners base their evaluations on a comparison between left and right sides. A total of 50 volunteers (aged 16-60 years) were examined by two physiotherapists. The inter-examiner reliability of clinical tests included in the physical examination of patients with symptoms from the cervical spine was evaluated. An acceptable reliability was found for two of 10 clinical tests. When it was possible to compare left and right sides, it was possible to show acceptable reliability for some clinical tests.

In the case reported, the patient awoke with severe neck pain localized to the left side of the cervical spine and spasms in the right sternocleidomastoid muscle. His mother had to assist him to lift his head off his pillow in order to move upright off his bed. In addition to the static and motion palpation performed, radiographic, thermographic and sEMG indicated for the presence of spinal subluxations in the cervical, thoracic and lumbosacral spine. The approach to patient care was full spine adjusting as described above with successful resolution of the patient's complaints.

Of interest in this case report was the history examination findings that the patient, at the time of presentation, was wearing dental braces on the top and bottom teeth and using a cervical headgear for 8 hours every night attached to the upper palate braces for the past 2 years. An appreciation of the intimate anatomical and biomechanical relationship of the temporomandibular and craniocervical systems would lead one to suspect the interplay of this system as a possible pathophysiology of the patient's neck pain complaints. Just as head posture is proposed to lead to changes in the upper and lower jaw as espoused by the sliding cranium theory[40], we contend that this effect is bidirectional in nature as previously proposed.[41]

Reflex activities in the cervical spine musculature have been reported following stimulation of the trigeminal nerve branches.[42-43] Furthermore, mandibular movements and clenching have been observed to result in activation of the jaw and neck-shoulder muscles.[44] This is further corroborated by the findings of Eriksson et.al. [45] where "functional jaw movements" are the result of coordinated activation of jaw as well as neck muscles, leading to simultaneous movements in the temporomandibular, atlanto-occipital, and cervical spine joints. We propose that the dental braces and the cervical headgear attached to the upper palpate braces resulted in direct and reflexive activation of the cervical spine musculature. This effect occurring over a prolonged period of time (i.e., 8 hours per day at the very least) would necessarily result in muscle spasms. Hence the patient's symptoms of neck pain.

On first impression, the attending clinician thought that she was attending to a patient with typical signs of torticollis. However, upon closer examination of the antalgic posture of the patient, the pathognomic presentation of lateral flexion with rotation to the contralateral side was not present. Instead, the patient had a lateral flexion of the head with ipsilateral rotation/forward flexion which are more consistent with the examination findings of muscle spasms in the SCM and cervical spine paraspinal musculature as well as positive radiological findings of hypolordosis and rotation of the cervical spine vertebral bodies (i.e., at $C_{2\text{-}6}$ and the atlas) at multiple levels. This patient presented similarly to patients undergoing macrotrauma to the cervical spine with concomitant "muscle splinting." Yet no frank trauma was reported by the patient.

The improvements in the patient's symptoms following the trial of chiropractic care as described in the body of the case report is strongly suggestive of cause and effect inferences. However, we caution the reader in making such inferences as case reports, by their very nature and limitations cannot be generalized. This is so despite the temporal association of care provided and improvement in symptoms.

Biological plausibility of the salutary effect of the chiropractic adjustment is within accepted anatomical and biomechanical relationship of the temporomandibular and craniocervical systems. As with all case reports, several variables provide for competing explanations in the improvement seen in this patient. These may be attributed to (a) the natural history of neck pain in terms of remission and self-limitation of the disorder, (b) regression to the mean and (c) the result of placebo. Furthermore, as a result of a "self-fulfilling prophecy," both the clinician and the patient may make incorrect inferences from treatment due to (d) the demand characteristics of the therapeutic encounter and (e) subjective validation. Research studies incorporating randomization, a control group and manipulation of the independent variable (i.e., the active ingredient of the chiropractic adjustment) would assist in delineating the most effective treatments available for such patients and the role of chiropractic care.

In the meantime, further documentation of other cases or case series and higher level research design studies are needed to fully elucidate the effectiveness and safety of chiropractic care in such patients. We again echo the finding that children with musculoskeletal problems may carry these problems into adulthood.[24]

Conclusion

We described the successful outcome of a child with neck pain through the use of site-specific chiropractic spinal adjustments and adjunctive therapies. This case report provides supporting evidence on the possibility of chiropractic care as a viable option for similar patients. Further research is needed to fully assess the role of chiropractic care on patients presenting with the general symptom of neck pain.

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Table 1. Cervical spine ROM examination findings

Direction of Motion	Patient ROM	Comment/Observation
Flexion	60^0	pain in the left cervical spine C5-C7
Extension	50^0	
Right Rotation	80^0	
Left Rotation	5^0	pain throughout the left cervical spine
Right Lateral Flexion	40^0	
Left Lateral Flexion	5^0	pain throughout the left cervical spine

Figure 1. Pre-treatment thermography & sEMG of the spine

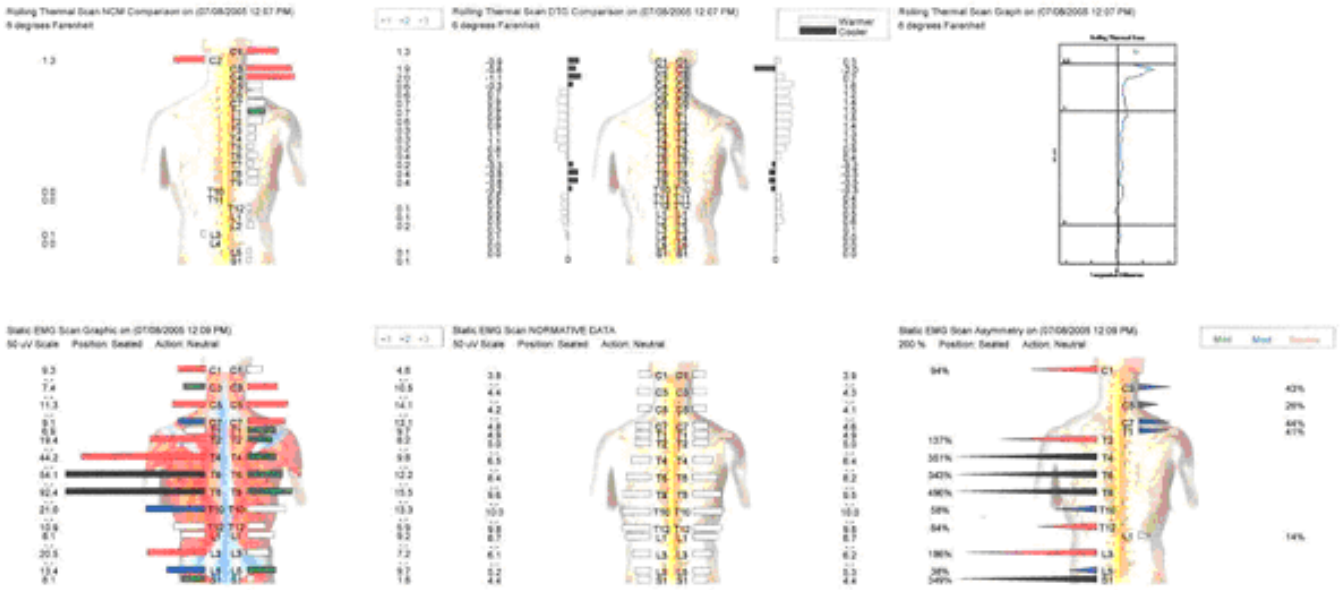

Figure 2. Radiographic examination demonstrating a right lateral head tilt

Figure 3. Radiograph demonstrating a left cervical spine convexity with the apex at C_{4-5}

Figure 4. lateral cervical radiograph demonstrating hypolordosis

Figure 5. Rolling paraspinal thermography & SEMG at the 13th visit