

CASE STUDY

An Interdisciplinary Approach to Juvenile Idiopathic Scoliosis, Craniosynostosis, and Chiari I Malformation

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Abstract

Objective: To describe a successful interdisciplinary approach in the case of a patient with Juvenile Idiopathic Scoliosis, craniosynostosis, and Chiari I malformation.

Clinical Features: Patient was a 4 year old male with previous diagnosis of right craniosynostosis, mild Chiari malformation and scoliosis. Examination and radiographs confirmed a 25 degree scoliosis.

Intervention: The patient received regular interdisciplinary structural care for his growing body involving Craniosacral Therapy, Raindrop Therapy™, and regular visits for chiropractic adjustments and educational office visits. The interdisciplinary approach using Hole-in-One Chiropractic, Cranial Orthodontia, Craniosacral Therapy and Raindrop Technique™ resulted in resolution of the medical diagnosis for craniosynostosis and Chiari malformation and a reduction in the curvature of the juvenile idiopathic scoliosis by the age of 10.

Conclusions: This case study demonstrates an interdisciplinary approach as a practice model for an overall cost effective approach for idiopathic juvenile scoliosis as well as craniosynostosis and/or chiari malformation. More research is warranted in this area.

Keywords: *Juvenile idiopathic scoliosis, subluxation, Chiari malformation, craniosynotosis, interdisciplinary approach, chiropractic, craniosacral therapy, cranial orthodontia, raindrop therapy*

Introduction

According to Tabers Medical Dictionary, craniosynostosis is defined as a union of separate bones by osseous tissue.¹ This is also referred to as the early closure of sutures. Mild – I Chiari malformation is a condition in which the inferior poles of the cerebellar hemispheres and medulla protrude through the foramen magnum into the spinal cord.²

The pediatric population in America is particularly vulnerable to medical interventions that may not correct the underlying imbalance or encourage the natural development of the child. The authors will put forth an interdisciplinary approach demonstrating how the patient overcame the medical odds using a gentle hands-on approach.

According to the National Scoliosis Foundation (NSF) “scoliosis affects 2-3% of the overall population, or an estimated 6 million people in the United States, and there is no cure.”³ Each year an estimated 30,000 children are put into a brace for scoliosis, while another 38,000 patients of all ages undergo spinal fusion surgery.³

Scoliosis is an ancient disease that remains incompletely understood despite a collective medical experience that approaches 4000 years.⁴ Thus, more than a modicum of uncertainty remains associated with selection of recommended treatments for idiopathic scoliosis.

The main treatment options for idiopathic scoliosis may be summarized as the 3 O’s (1) observations (2) orthosis, and

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(3) operative intervention.⁴ In one study researchers found that children diagnosed when they are aged 3-10 have juvenile idiopathic scoliosis, and those older than 10 years have adolescent idiopathic scoliosis. These age distinctions, while seemingly arbitrary, have prognostic significance.

For instance, Robinson and McMaster reviewed 109 patients with juvenile idiopathic scoliosis and found that nearly 90% of curves progressed and almost 70% of these patients went on to require surgery.⁵ NSF writes “scoliosis is a multifactorial disorder, which requires multidisciplinary research and treatment”³

Multidisciplinary approaches for healing complex diagnoses are needed, but how professionals work together cooperatively through the independent perspective of their unique discipline poses many obstacles. For instance, communication between practitioners in the natural healthcare field varies; who recognizes and decides what a patient needs and when; how practitioner services are cooperatively delivered for the benefit of the patient’s process.

The authors will put forth an interdisciplinary approach focused on gentle hands-on removal of interference through the vertebra and cranium allowing the posture to right itself over the course of natural childhood growth and development. This interdisciplinary approach is put forth as new model of care called “*Structural Hygiene for the Developing Human™*” model developed by Brigette Bowler, DC and applied in this case study that successfully addressed these issues and provided a desirable outcome that was also cost effective for the family.

The authors’ respective practices are guided by the agreed upon importance of an interdisciplinary approach based on the correct sequencing of care. This is founded on the long term and repeated experience in this team of practitioners, that adjustment of the Occipito-Atlanto-Axial Complex (OAA) to remove interference to the mental impulse is foremost before any other corrective care so that all other care works more effectively.

Chiropractically speaking, the term “mental impulse” refers to a philosophical concept. The purpose of the mental impulse is to carry instruction for adaptive action from the brain cell to the tissue cell.⁶ It is hypothesized that the removal of interference in the structure allows the mental impulse its fullest expression.

This is followed by the observance of natural developmental forces at work in children which is crucial so as to not interfere in the process of Innate Intelligence in the body. The proper orchestration of these principles while derived from upper cervical Hole in One technique (HIO), includes the theory and practice of Craniosacral Therapy, and Cranial Orthodontia which are vital to the overall correction of structural alignment above the spinal vertebrae in the cranium.

It places importance on the connection of sphenoid to the basilar portion of the occiput known as the sphenobasilar joint. Also taken into consideration is the symmetry and balance of the rest of the cranial bones as an important part of whole body structural balance.

If necessary, the interdisciplinary approach also addresses the cranium via the teeth to put together a more complete structural understanding of the head and how the bones of the head and spine impact one another. The pediatric population’s use of orthodontia continues to grow in America.

According to the American Association of Orthodontists, the number of patients under the age of 18 undergoing orthodontic treatment in North America increased from 2.6 million in 1989 to 4 million in 2006.⁶

When consideration is given to the impact of orthodontia to the overall cranium, as in the specialty Cranial Orthodontia, the authors’ observe better outcomes for the alignment of head, neck and spine as in Chirodontics® developed by W. Robert Walker, D.C., Cranial Orthodontia proved especially useful in the successful healing of this patient.

This report demonstrates how the successful application of complementary modalities, including Hole-in-One (HIO), Craniosacral Therapy (CST), Raindrop Technique (RDT), and Cranial Orthodontia, healed a young boy of craniosynostosis, mild-I Chiari malformation, and a 25 degree juvenile idiopathic scoliosis measured using the Cobb Angle in radiographic studies.

Case Report

History

The patient was a four year old, who presented to a pediatrician with symptoms of scoliosis and was referred for further evaluation. After a series of MRIs with and without contrast, scoliosis series x-rays, and CT scans by medical practitioners, he was diagnosed with right craniosynostosis, mild Chiari malformation (5-6 mm of tonsillar herniation below the foramen magnum with decreased Cerebral Spinal Fluid (CSF) within the foramen magnum that is compatible with a mild chiari -malformation) and 25 degrees of scoliosis (Cobb Angle).

The physician also stated in his notes that the patient has “an apex to the right thoracic curvature with very limited thoracic kyphosis.” A summary of physician’s notes also stated the patient has “plagiocephaly from his closed cranial suture.”

The patient was 4 years 1 month in age when these x-rays were taken. Diagnosis was determined to be 25 degrees Scoliosis (Cobb Angle). All the radiographs in this paper are medical x-rays taken at hospitals prescribed by the patient’s pediatrician. They are not consistent so each figure is described in chiropractic terminology.

The medical prognosis was to evaluate for neurosurgical intervention of the mild-I Chiari malformation which was decided as unnecessary at the age of four. The family consulted with five different orthopedic and neurosurgeons and were told something like the following at each appointment:

“Patients with juvenile idiopathic scoliosis (between ages 3 and 10) many of these patients will have highly progressive curvatures requiring bracing and often surgery. The key to

success in the treatment of these conditions is early aggressive treatment with bracing in order to control curves and to maximize the patient's growth. Often surgery is required, but this is delayed for as long as possible."⁸



Figure 1. Standing A-P x-ray revealing 25 degree scoliosis.

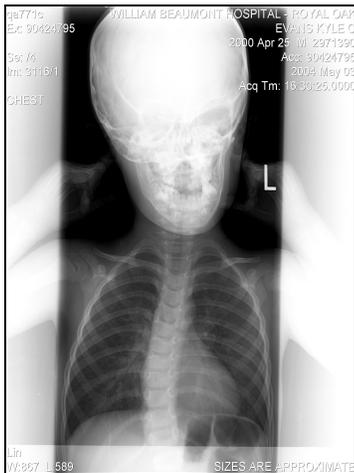


Figure 2. Standing chest PA x-ray with arms up.

The family was inspired to look for other treatment options due to the fact that nothing had been offered by the traditional medical model. The family consulted with a friend who worked at a hospital, who referred the case subject to a hospital-based physical therapist who provided in-home craniosacral therapy for about 1 year.

Intervention & Outcomes

The patient received regular interdisciplinary structural care for his growing body involving Craniosacral Therapy, Raindrop Therapy™, Cranial Orthodontia and regular visits for chiropractic adjustments or educational office visits.

After 9 months of only craniosacral care, an AP x-ray revealed a 9 degree reduction from 25 degrees to 16 degrees. Also noted was reduced head tilt and better alignment between occiput and the mandible. (Figure 3)

Following a 4 month lapse in craniosacral care administered by the PT, the patient was referred to the massage therapist for Craniosacral Therapy. Following the principals of the *Structural Hygiene for the Developing Human Model*™, the

case subject was immediately referred for chiropractic care before Craniosacral was continued or Raindrop Therapy was introduced.

Scoliosis progression was monitored on an annual basis, by a pediatric orthopedic physician. Approximately 11 months from the last x-ray, a standing A-P x-ray revealed an increase from 16 degrees to 22 degrees from x-rays taken prior. (Figure 4)



Figure 3. A-P x-ray shows 16 degree scoliosis, 9 months later.



Figure 4. Standing A-P scoliosis x-ray 11 months later revealing 22 degrees of scoliosis.

Continued bi-annual exams with the orthopedic doctor showed the degrees of scoliosis worsened from 22 degrees to 25 degrees of scoliosis, Figure 5, and improved slightly to 23 degrees of scoliosis, as seen in Figure 6.

As the scoliosis on x-ray seemed to show little progression, it was important to apply chiropractic principal; "retracing is the course of restoration from dis-ease back to health."⁹ As Dr. BJ Palmer's HIO research showed, the body is supported in correcting itself and curves increase and decrease on the way to resolution - a concept that is discussed throughout the Green Books as *retracing*.

"More is accomplished today, under present solution, because all dis-ease is disappearing under its use (chiropractic). That which was chronic in point of age and degree is retracing back to incipency."¹⁰

At age 8, he was referred for evaluation and treatment with a Cranial Orthodontist whose training also included principles of cranial manipulation and observation of orthodontia related to promoting cranial and maxillary bone symmetry and balance. A maxillary arch expansion appliance is used to widen the maxilla transversely to close the open bite in the anterior portion of the maxilla to stimulate growth of the pre-maxillae. (Figure 7)



Figure 5. Standing A-P scoliosis x-ray revealed 25 degree scoliosis, an increase of 3 degrees from a year prior. Improvement was noted about head tilt and the occiput and mandible in comparison to Figure 2.

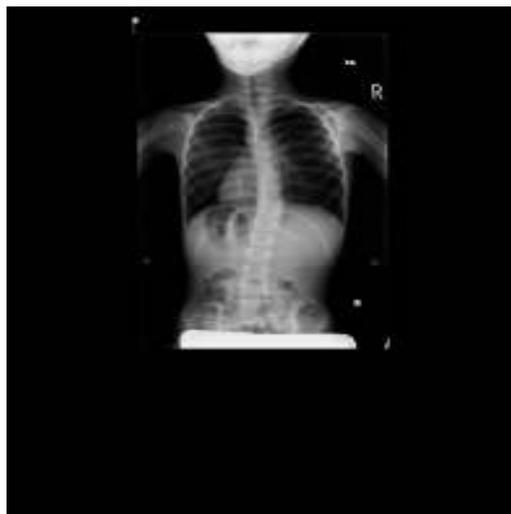


Figure 6. Standing A-P standing scoliosis x-ray revealed a 23 degree scoliosis, a decrease of 2 degrees since x-ray taken a year prior from 25 degrees to 23 degrees. The occiput and mandible are aligned but different than Figure 2 because 6 year molars are fully erupted and much facial bone growth has occurred.

From the ages of 4 to 9, the patient had bi-annual visits with an Orthopedic Surgeon with x-rays being taken at each visit in January. At his 9 year old visit x-rays were deferred with a note of appearing clinically improved and a decrease of scapular asymmetry. One year later at age 10, the orthopedic

physician notes a standing “P-A scoliosis x-ray revealed reduction in his spinal curve”. (Figure 8)

Of the 19 total chiropractic visits over a 4 year and 5 month period of time, 8 chiropractic adjustments were delivered. The other 11 visits focused on parental education or assessment and treatment of cranium. A Maxillary Arch Expansion Appliance was worn for 9 months.

This patient was seen by a physical therapist certified in Craniosacral Therapy for 16 home visits from the age of 4 years to 5 years. As is indicated in the x-ray there was an overall reduction in the scoliosis from 25 degrees to 16 degrees (Cobb Angle). He received 28 additional craniosacral sessions and 7 Raindrop Technique Therapy sessions for a total of 35 sessions from the massage therapist certified in craniosacral therapy.



Figure 7. Standing Lateral Cervical Flexion with Maxillary appliance in place.

PHYSICIAN’S NOTE FROM OFFICE VISIT

- ▣ **Subjective:** Patient presents for clinical evaluation of his mild scoliosis. Eight years 9 months. 4 ft 6 ½ inches tall 60 Lbs in weight. Last seen in January of ‘08. CSF flow study was done and no significant syringomyelia or Arnold-Chiari malformation noted.
- ▣ **Objective:** Patient looks clinically improved today. Less scapular asymmetry is present. No significant clinical deterioration is noted.
- ▣ **X-Ray**
- ▣ X-rays were deferred today.
- ▣ **Assessment:** Stable Juvenile scoliosis
- ▣ **Plan:** Recommended continued clinical follow up. Recheck one year x-rays only if clinically indicated. Mother has been charged with bringing him back sooner should they notice a difference.

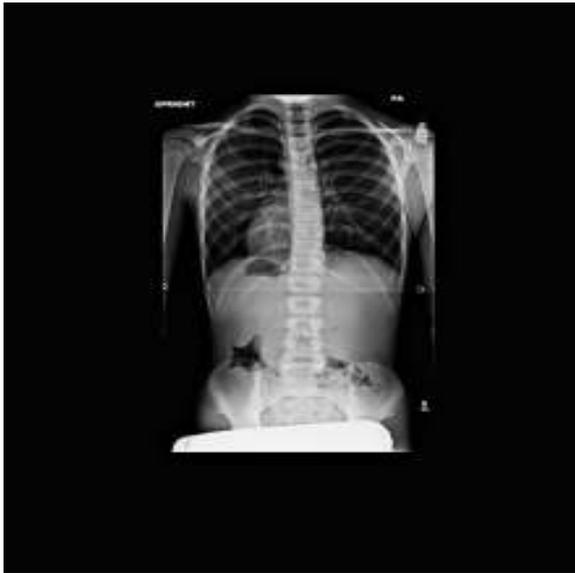


Figure 8. Standing P-A x-ray at three years later.

Discussion

Chiropractic

Hole-in-One (HIO) and other upper cervical techniques are increasingly popular and respected as a best practice for balancing the OAA Complex by chiropractically correcting vertebral subluxation. The Occiput, Atlas and Axis vertebrae, make up the OAA Complex, which a transitional area for the brainstem to become the spinal cord. Chiropractically speaking, the importance of the brainstem juncture in general physiology causes the body to change the posture of the pelvis, compensating for a misaligned or subluxated OAA joint.

B.J. Palmer, DC, Ph.C did extensive research at the Palmer Clinic, in Davenport, Iowa from the 1930-1950's causing much controversy over the importance of the brainstem area. Palmer states that "a torque subluxation of atlas, or axis, so occludes the spinal canal at various places in various ways, that it makes it impossible for a normal, full quality of mental impulse supply to flow onward from brain to body thru the obstruction. It can readily be understood that such an obstruction located at a vital intermediate space between brain and body, such as location of atlas and axis predetermines, would at once dam back an onward flow out of the brain, thus producing "brain congestion" of forces."¹¹

This is a vital intermediate space between brain and body. According to the anatomy book The Human Brain by Rita Carter, the brain stem area as seen via "MRI that the upper brain stem is at about level with the eyes, and its lower region joins the spinal cord at a gap through the base of the skull, the foramen magnum."¹²

Therefore, balancing the posture through the OAA joint is crucial and prioritized in the *Structural Hygiene for the Developing Human™* model. This is the reason for the sequencing of care to ensure that balance at the OAA is first to ensure that all other corrective care is done around a balanced OAA.

The pediatric application of the HIO technique in Bowler's office is a cranial hold of the occiput mastoids and transverse processes of atlas with the neonate to 6 year old patient lying supine in the practitioner's hands. Then, due to the young age and immaturity of educated intelligence, the child's innate instinct causes them to engage surrounding muscles to pull the atlas or axis into a proper articulation using the practitioner's hands as a fulcrum or just matched resistance.

A force is never introduced into an articulation. The practitioner encourages and allows the patient to move, wiggle, pull or push against the properly placed hands of the practitioner. The adjustment process is signified as complete by the pediatric patient resetting their respiration and lying flat and obviously relaxed. The nonverbal gratitude is apparent to the observer.

Craniosacral Therapy

The importance of osseous articulation at the basilar portion of the occiput does not come into direct consideration in HIO chiropractic analysis of the OAA Complex. The importance of this portion of the occiput was initially taught as part of traditional Osteopathic cranial manipulation. Chiropractic students today still are taught that the junction of the occiput and sphenoid is immovable. It is referred to in the Green Books, Volume 9, Anatomy, the sphenobasilar junction is described as follows: "the basi-sphenoidal suture is formed by the junction of the basilar surface of the occipital bone with posterior surface of the body of the sphenoid; *in early life a thin plate of cartilage exists between these bones* but in the adult they become fused into one."¹³

Today, the chiropractic teaching remains that this area is referred to as the sphenobasilar syndesmosis, and is immovable. However, William G. Sutherland, D.O., a pioneer in osteopathy referred to it differently. In the book Osteopathy in the Cranial Field, he refers to this area writing: "the sphenoid and occiput, together with the petrous portions of the temporals, make up the true base of the cranium. They are modified vertebrae joined by a modified intervertebral disc in a synchondrosis which persists up to the age of twenty five. Even after synostosis occurs there is flexibility in the symphysis."¹⁴

Inspired from the work of Sutherland and others in the cranial field, Craniosacral Therapy, taught by the Upledger Institute, shows this anatomical area is correctly referred to as the sphenobasilar synchondrosis (SBS), which is movable and has natural physiological motion, referred to as flexion and extension. "We speak of craniosacral motion as physiological because it is unconscious and involuntary; it is inherent in the individual's biological system. Those motions which are physiological and inherent are necessary for the continuation of life."¹⁵ It has also been demonstrated that sutural immobility impacts the normal physiological motion of the SBS such as in the case of early craniosynostosis and may impact the skeletal structure including but not limited to scoliosis.

In this case study, the practice protocol applied for evaluation and treatment of the SBS is consistent with John Upledger, D.O., founder of the Upledger Institute. This protocol is

taught in Craniosacral Therapy II, which is derived from William G. Sutherland, D.O.'s work defining normal physiological motion and abnormal motion or lesion patterns of the SBS. The importance of analysis and correction of the sphenobasilar synchondrosis lesion patterns is important to restore natural physiological motion at the basilar portion of the occiput. The correction of these patterns improves the balance and symmetry of the rest of the cranial bones, sutures, membranes, and the posture of the OAA Complex.

Chirodontics®

Another method in the interdisciplinary approach involves Cranial Orthodontia, a form of Orthodontia also derived from Dr. Sutherland's work. It is based on identifying imbalance in the relationship of the teeth, maxilla, mandible and soft and hard palate to the cranium and corrections based on a gentle non-invasive approach. This session work in adults takes into account childhood growth patterns and creating ease in painful adaptations.

Raindrop Therapy

Finally, the use of Raindrop Technique™ (RDT), developed by Gary Young, ND, an application of nine specific therapeutic-grade essential oils to the feet and spine was used based on the idea that microbes can lie dormant along the spine and create inflammation, which in turn contort the spinal column. Researchers in Germany at the University of Bonn, and also the Western General Hospital in Edinburg, Scotland, have found that virus-like particles can lodge in the spinal ganglia throughout life and when activated, can lead to idiopathic scoliosis.^{16,17}

Summary

The early elimination of the Chiari malformation and crainiosynostosis combined with the reduction of the patient's scoliosis as a diagnosable condition by the medical field by the age of 10 demonstrates a successful patient outcome.

Patient progress involved steadfast observation of pattern work, strict observance of HIO vertebral subluxation correction, integration of CST to reduce SBS and other cranial sutural restrictions along with normalization of physiological motion of cranium. Also used was Raindrop Technique™, timely intervention with a Cranial Orthodontist and adherence by the authors to practice protocols known as *Structural Hygiene for the Developing Human™*, a theory of sequencing of care based on natural human development which allowed the normalization of the spine away from scoliosis, as well as the elimination of craniosynostosis and Chiari malformation..

Fundamental to success was parental education which allowed persistence in care even when structural gains on an x-ray fluctuated or were minimal. The benefits to the case subject's long term health through the elimination of diagnosable conditions are clinically significant. Further consideration of the timing of intervention with the participants in the *Structural Hygiene for the Developing Human* model of care seemed to be key. As was mentioned earlier in the research study by Robinson and McCaster, 90 % of curves progressed in the juvenile idiopathic group. With timely intervention, this

patient beat the odds of juvenile idiopathic scoliosis despite the complex diagnosis of right craniosynostosis and mild- I Chiari malformation.⁵

The socioeconomic impact of a successful application of this practice model is substantial as well. The overall cost analysis of this interdisciplinary approach is noteworthy. The summary of care below demonstrates age of case subject at the time of visit, number and type of visits with each respective practitioner, cost of the visit with a total cost of \$5,005.00 from age 4 to age 10. If any of the diagnoses had involved a worsening of the condition for the scoliosis, mild-I Chiari malformation or craniosynostosis the medical cost of surgical or other interventions would have been costly.

As medical costs skyrocket in America, the need to identify cost effective solutions to disease grows. The Journal of Pediatric Orthopaedics recently published an article entitled: Does the Outcome of Adolescent Idiopathic Scoliosis Surgery Justify the Rising Cost of the Procedures?¹⁸ It highlights the increasing concern related to costly medical procedures. In a retrospective study of 76,741 patients to determine the variability in cost and surgical treatment of idiopathic scoliosis per patient average charge was \$113,303 with a 5.6 day length of stay in the hospital.¹⁹ Juvenile idiopathic scoliosis is likely to progress into adolescents with many requiring surgical intervention.

This interdisciplinary approach demonstrates a cost effective and potential practice model as well as one that helped remove interference from the head and spine effectively correcting the underlying imbalance and creating the possibility improvement. The combination of analysis and correction of OAA and SBS, addressing both major articulations of the occiput, allowed postural correction and healing for the case subject whose early in life assessment of posture compelled the family to consider alternative solutions to the medical approach of allowing the boy to wait and develop into the dysfunction then surgically correct the problem later. Furthermore, the timely identification of the need for Orthodontic intervention with an Orthodontist that understood the relationship of the mouth to the cranium allowed optimal results.

Conclusion

This case demonstrates that the human potential will self correct and possibly flourish when the practitioner focuses on increasing flow of mental impulse by reducing interference. The cost benefit analysis of this interdisciplinary approach was substantially less than the potential of a worsening scoliosis that may have required surgery.

Principal Number 6 of Chiropractic states that "there is no process that does not require time". This Chiropractic Principle, when understood in the context of childhood development, may assuage pressure for immediate diagnosis and associated clinical outcomes.

Early in life intervention using hands-on modalities may offer less invasive and more successful options to patients. The removal of interference in the cranium and vertebrae allows the posture to right itself over the course of natural childhood

growth.

Evaluation and treatment of the SBS combined with HIO may provide new clinical outcomes related to scoliosis especially with an interdisciplinary approach including Cranial Orthodontics and Craniosacral Therapy. This addresses issues related to cranial bone imbalance and asymmetry creating greater outcomes for the patients under HIO chiropractic care. This case study demonstrates an interdisciplinary approach as a practice model for an overall cost effective approach for idiopathic juvenile scoliosis as well as craniosynostosis and/or Chiari malformation.

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