Effects of Upper Cervical Subluxation Concomitant with a Mild Arnold-Chiari Malformation: A Case Study

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ABSTRACT

A 39 year old woman had complaints of intermittent bouts of fatigue, dizziness, facial numbness, ataxia, headaches, difficulty speaking, and diffuse arthralgias during the last two years. She had already undergone extensive medical testing through which a mild Arnold-Chiari Type I malformation was found. Upon further investigation, it was decided that the A-C malformation was an incidental finding, unrelated to her symptoms. Medically, no solution or explanation of her symptoms could be found.

Chiropractic examination revealed a postural left head tilt, and left high shoulder. She had a supine functional leg length inequality on the right approximately 3/8". Palpation revealed tenderness in various areas from the suboccipital to the gluteal regions. X-ray analysis showed a military neck with anterior translation. Using the Grostic method of upper cervical analysis, we measured an occipito-atlanto-axial subluxation.

We managed the patient using the Grostic procedure of hand adjusting for the upper cervical region. Following the first and subsequent upper cervical adjustments she experienced significant relief of her symptoms. She has not felt the need to seek medical intervention since beginning chiropractic care.

The patient had an array of diffuse symptoms, most of which could be explained neurologically by the effects of an upper cervical subluxation. Because she had the Arnold-Chiari malformation all of her life, it was considered an incidental finding, so the onset of her symptoms during the past two years was difficult medically to understand. When the occipito-atlanto-axial subluxation was corrected, her symptoms improved, showing the efficacy of chiropractic care in this case.

When surgery or medication is not of medical urgency, then a trial of upper cervical chiropractic care should be considered. Further studies need to be conducted on the efficacy of chiropractic among persons who have an Arnold-Chiari malformation with undefined or associated neurological symptoms.

Key Words: Arnold-Chiari malformation, chiropractic, chiropractic adjustment, Grostic procedure, occipito-atlanto-axial subluxation

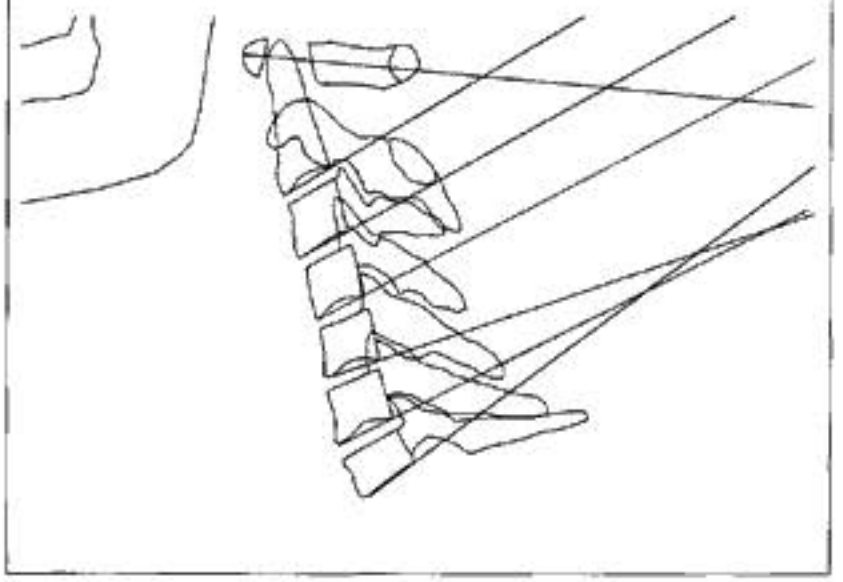
INTRODUCTION

An Arnold-Chiari (A-C) malformation is a variable congenital defect of the brainstem. It was originally described in 1894 by Arnold and by Chiari in 1895 (1). The most plausible explanation of this malformation is developmental arrest and overgrowth of the neural tube in embryonic life(1). A-C malformations are classified into four types. Type I, "adult" consists of elongated cerebellar tonsils that extend into the upper cervical canal. Type I has no brainstem abnormalities and is without an associated myelomeningocele (2). It is generally referred to as an "adult" malformation because the severity of the other three types usually does not allow the patient to reach adulthood. In type II, the cerebellar vermis is hypoplastic, the tonsils are elongated, the 4th ventricle is elongated, and the choroid plexus and medulla are displaced into the cervical canal. Type II is often associated with syringomyelia. In type III the entire cerebellum is displaced into the cervical canal. Type IV has a hypoplastic cerebellum (3).

The clinical manifestations of a type I malformation are related to cerebellar involvement (ataxia), obstructive hydrocephalus (headache and vomiting), brain stem compression (vertigo, nystagmus, and lower cranial nerve palsies) and syringomyelia (capelike distribution of defective pain and temperature sensation) (3). Other studies have noted associated symptoms of pain, and upper extremity weakness with a type I malformation (2,4). Diagnosis is determined by a CT scan or ventriculography (5).

When severe neurological symptoms occur, surgical approaches have been used on the various types of Chiari malformations, involving decompression of the posterior fossa, as well

FIGURE 1
Lateral Cervical X-Ray Analysis Showing Divergence of the Disc Plane Lines on the Posterior Side, Indicative of a Straightened Cervical Curve



as high cervical laminectomy (3,4). Surgery for type I depends on the degree of severity of the malformation, and the degree of debilitation, if any, caused by the symptoms. Types II, III, and IV generally require surgery for the patient's survival. Untreated patients do exhibit periods of exacerbation followed by periods of remission or stabilization of their symptoms (2).

In the chiropractic literature there has been one published study by Murphy, Goldstein and Katz on the care of patients with incidental findings of Type I A-C malformation (6). This study looked at two cases in which patients presenting with headache, neck and arm pain, lightheadedness, and vertigo also had incidental findings of Type I ACM malformation. The patients were treated with adjustments to the cervical spine at the levels of C2 and C3 with some success. The authors concluded that an asymptomatic A-C malformation is not necessarily a contraindication to high-velocity, low-amplitude adjustments of the cervical spine.

There have been no reports of care for patients with A-C malformation using specific upper cervical adjustment to the occipito-atlanto-axial region.

PATIENT HISTORY

The patient, a 39-year-old, white woman works as a certified occupational health nurse. During the past two years, she experienced intermittent bouts of fatigue, dizziness, and numbness on the left side of her face and in her upper extremities. She also noted mild intermittent ataxia, daily headaches, difficulty speaking, and diffuse arthralgias. The symptoms seemed heightened during menses.

The patient underwent extensive medical testing by a general practitioner and a neurosurgeon to determine the cause of the symptoms. An MRI scan demonstrated a mild adult Arnold-Chiari malformation (Type I), and cervical stenosis at C5-6 with minimal changes in the cord at that level. A cervical myelogram was essentially normal. Her cerebellar tonsils were low, but thought not to be a surgical lesion capable of producing her symptoms. Her physical exam demonstrated the cranial nerves to be within normal limits. She had diminished pin prick sensation from C5-C8 bilaterally, but more so on the left.

Blood work, including evaluation of her electrolytes and sedimentation rate was normal. A follow-up cranial MRI and CSF examination was used to rule out multiple sclerosis, and Lyme disease. Finally, it was decided that the A-C malformation was an incidental finding unrelated to her symptoms and that she had an "undefined neurological disorder, and findings compatible with an idiopathic peripheral neuropathy." The medical doctors took a wait and watch approach from there and told the patient to follow up as needed.

During the initial chiropractic consultation, the patient stated that she had been involved in two motor vehicle accidents in the past four years. In the first accident, she ran off the road and went into a ditch. There was no other car involved, and she did not damage her car. She reported that she did hit the left side of her head on the side window, however. Following the accident, her neck and shoulders had moderate stiffness. In her second auto accident, she was involved in a front-end collision. She was sore following that accident, but did not seek any medical or chiropractic treatment.

EXAMINATION FINDINGS

Postural Analysis

A functional leg length inequality (LLI), right short 3/8", was found in the supine position. Visual observation of the patient's upright posture, aided by the use of a grid-lined posture board, showed a moderate left head tilt, and a moderate left high shoulder.

Palpation

Static palpation revealed mild tenderness on the left suboccipital and upper thoracic spine and moderate tenderness on the right suboccipital, upper thoracic, left iliolumbar, and gluteal regions.

X-Ray Analysis

A computer-aided analysis (Spinalyzer Plus, Spinalyzer, Inc.) of the lateral cervical x-ray showed a hypolordosis with anterior translation (Figure 1). Nasium and vertex views were analyzed by the Grostic Procedure, which involves using a template to measure the occipito-atlanto-axial misalignment factors (Table 1).

PROGRAM OF CORRECTION

The patient was primarily managed using the Grostic procedure of upper cervical care. Care involved a light force adjustment delivered through a specific vector to minimize the occipito-atlanto-axial subluxation. The criteria for determining when an upper cervical adjustment was needed was the presence of more than 3/16 inch LLI in the supine position and the presence of tenderness and hypertonus on palpation of the suboccipital and cervical musculature.

TABLE 1
Pre- And Post-Adjustment Atlas Listings from Grostic Analysis

Misalignment Factor	Pre adjustment	Post first adjustment
Atlas Laterality	L 1.25 degrees	L 0.5 degrees
C2 Spinous Deviation	R 9.25 degrees	R 2.0 degrees
Lower Angle (C2-C7)	L 3.0 degrees	L 0.5 degrees
Atlas Rotation	Ant. 2.5 degrees	Not taken

We positioned the patient for adjustment on her right side with her head supported by a fixed headpiece. The segmental contact point was the left atlas transverse process, the contact point was the left pisiform. Once positioned over the predetermined vector, we applied a light, nonrotatory force. Three thrusts using this procedure were generally applied at each visit during which an adjustment was performed.

Over three months the patient returned for eight visits. On those visits an upper cervical adjustment was necessary and administered four times. On three of the four visits when an upper cervical adjustment was not necessary, an Activator™ adjustment was given to the lower cervical spine. For those adjustments, the expansion control knob was set to 1 ring (1.0 mm translation) or less, and the contact was very light. The Activator™ adjustments did not influence the supine LLI.

RESULTS

Immediately following the first and subsequent upper cervical adjustments the LLI became balanced. Also, paraspinal palpation showed a decrease in tension, with more symmetrical and fluid end-feel. As she arose from the table after her first adjustment, the patient reported that she felt a change in her facial numbness. A follow-up nasium x-ray taken immediately after the first adjustment showed the misalignment factors to be reduced significantly (Table 1). On the following three visits, spanning nine days, the patient reported no facial numbness, vertigo, ataxia, difficulty speaking, or fatigue.

The patient's last four visits occurred over two months time. There was a strong correlation between the return of the patient's fatigue and neurological symptoms of facial numbness and vertigo, and the recurrence of her upper cervical subluxation. On three of the four visits when she was holding her upper cervical adjustment (no LLI), she reported having experienced none of her previous symptoms. Under her own initiative, as soon as she began to experienced symptoms, she scheduled a visit. Following each upper cervical adjustment the symptoms abated. She also noted that during her menses she no longer experienced an exacerbation of her symptoms. Since being under chiropractic care she has felt no need to seek further medical intervention for her symptoms.

DISCUSSION

The onset of this patient's symptoms began at age 37. In searching for the cause of her symptoms a congenital defect of a Type I Arnold-Chiari malformation was detected. Surgical and pharmaceutical solutions were considered, but the case had vague characteristics and the medical doctors could not determine the exact nature of the problem or suggest a proper treatment. My viewpoint is that an upper cervical subluxation was overlooked as a possible cause of the patient's complaints. As noted, she had been involved in two motor vehicle accidents that may have produced an upper cervical subluxation. Also, the patient's response to specific upper cervical adjustment was immediate and dramatic.

What, then, is the relationship between the A-C malformation, the upper cervical adjustment and the production of symptoms? Although the symptoms were not unlike those reported in the literature as arising from Type I A-C malformation, they might also be explained by chiropractic subluxation theory. It may be that the underlying mild anomaly is a weakness that potentiates the effects of upper cervical subluxation on certain neuronal pathways.

Subluxation of the upper cervical region has been postulated to cause a vast array of symptoms. The Dentate Ligament-Cord Distortion Hypothesis proposed by Dr. John D. Grostic, offers a mechanism by which an upper cervical subluxation, by means of the dentate ligaments, produces mechanical stress on the spinal cord. Dr. Grostic noted that while the ligaments appear to protect the central nervous system during normal motion, that in the presence of misalignment, they may be capable of transmitting pathologic forces to the spinal cord and brainstem (7).

There are at least 16 different fasciculi in the upper cervical region. An upper cervical subluxation causes increased noxious input to the posterior horn and reflex connections that can contribute to a variety of effects (8). Some anatomic studies indi-

cate that at least one third of the total spinothalamic tract originates from the upper cervical spinal cord, and there are at least five different somatosensory pathways that lie within, travel through, or cross in the upper cervical spinal cord (9). This complex neurology, as well as the effects of the dentate ligaments, helps to explain the varied symptoms and results that this patient experienced.

There is a neurological link between an upper cervical subluxation and facial numbness. Jackson noted in 1977 that numbness of the head, face, and tongue indicate involvement of the posterior branches of the second and third nerve roots, which make synapses with the afferent branches of the trigeminal nerves and communications with the sympathetic nerves (10). Grostic noted that the spinal nucleus of the trigeminal nerve may extend downward as far as the fourth cervical vertebra. By combining anterior rotation of the atlas on the side to which the atlas has laterally deviated with the lateral traction, it may be possible to put traction directly on the sensory nucleus of the trigeminal nerve at the level of the first and second cervical vertebrae (7).

Subluxation of the upper cervical area can have a neurological effect on gait, coordination, and positional sense, leading to increased fatigue and clumsiness (11). Subluxation can also cause posterior column signs and symptoms (11). This array of symptoms can arise from adverse afferent input that affects neck proprioception, the reticular formation, and the pyramidal tracts. Since 1845, the importance of neck proprioceptive information has been recognized for the coordination of body, head, and eye movements (12). More recently, abnormal proprioceptive function has been believed to be caused from a posterior column abnormality (13).

The reticular formation and pyramidal tracts play a vital role in maintaining posture and coordination. The reticular formation begins at the upper end of the spinal cord and extends into the hypothalamus and to the sides of the thalamus (14). It provides a basis of support of the body against gravity. The main function of the pyramidal system is regulation of voluntary motor control (14). Therefore, as subluxation affects these areas resulting symptoms include unsteadiness of gait, paraesthesias, muscle weakness and clumsiness (15).

The adjustment of the upper cervical subluxation in this patient produced a dramatic and immediate resolution of her neurological symptoms. It seems that Type I A-C malformation is an anomaly that may predispose a patient to certain neurological symptoms later in life or following a secondary incident. When an A-C malformation is present, an assessment of vertebral subluxation should also be done. The patient underwent an array of medical tests to no avail or solution. If conservative chiropractic care had been initially administered, many of these tests, along with the fear and expense associated with them, may have been avoided.

CONCLUSION

Once the surgical urgency of an upper cervical malformation is ruled out, then conservative chiropractic care should be sought. Upper cervical subluxation and the myriad symptoms often associated with an Arnold-Chiari malformation appear to have a neurological link. Medications generally affect the symptoms temporarily, but do not correct the vertebral subluxation. Surgery, unless there is an urgency for survival, should only be considered when other more conservative options have been tried. More studies could further document the effects of chiropractic care on patients with Type I A-C malformation who experience undefined or associated neurological symptoms. ◆

REFERENCES

1. Rowland L. Merritt: Textbook of neurology, Baltimore: Williams and Wilkins Publishing, 1995:528-529.
2. Bridwell D. Textbook of spinal surgery, Vol 2., Philadelphia: J.B. Lippencott, 1991: 402-1127.
3. Simon R, Amnoff M, Greenberg D. Clinical neurology, Appleton and Lange Publishing, 1989: 104.
4. Kamal S, Lye R, Strang F, Dutton J. Arnold-Chiari malformation: review of 71 cases. J Neurosurg 1983; 58:183-187.
5. Merck Manual, 16th edition, Merck Research Laboratories, 1992: 1488-1490, 2077.
6. Murphy DR, Goldstein D, Katz M. Chiropractic adjustment to the cervical spine and the Arnold-Chiari malformation. J Manipulative Physiol Ther, 1993; 16(8):550-555.
7. Grostic JD. Dentate ligament – cord distortion hypothesis. Chirop Res J, 1988; 1(1):47-55.
8. Backman Z. Neurological foundations of the upper cervical subluxation. Upper Cervical Monograph, 1979; 2(7):6-8.
9. Smith M, Hodge C. Response properties of upper cervical spinothalamic neurons in cats: a possible explanation for the unusual sensory symptoms associated with upper cervical lesions in humans. Spine, 1992; 17(105): S375-S382.
10. Jackson R. Cervical Syndrome, Fourth Edition. Charles C. Thomas, 1977.
11. Atlantoaxial instability in Down syndrome: subject review. American Academy of Pediatrics Committee on Sports Medicine and Fitness. Pediatrics 1995; 96(1), 151-154.

12. Neuhuber W, Zenker W. Central distribution of cervical primary afferents in the rat, with emphasis on proprioceptive projections to vestibular, perihypoglossal, and upper thoracic spinal nuclei. J Comparative Neurology, 1989; 280:231-253.

13. Kent C. An overview of pediatric radiology in the chiropractic practice. ICA Internat Rev Chiropr, 1990; 46(4):51.

14. Williams H. An anatomical-function review of selected cns motor control structures. Upper Cervical Monograph, 1976; 2(1):1, 3-8.

15. Turek S. Orthopaedics, principles and their application. Third Edition. Philadelphia J.B. Lippincott Company; 1977: 749.

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