CASE STUDY

The Care of a Teenage Girl with Migraine Headaches with the Advanced Orthogonal Procedure: A Case Report

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ABSTRACT

Objective: To describe the chiropractic care of an adolescent girl with chronic migraine headaches (HAs) without aura.

Clinical Features: A 16-year-old female presented with a chief complaint of migraine HA since kindergarten. Magnetic resonance imaging, computer axial tomography scans of the cranium and a dental consultation were unremarkable. The frequency of HA attacks occurred 1-2 times per week, lasting approximately 2-3 hours per episode.

Intervention and Outcome: The patient was cared for with the Advanced Orthogonal Procedure characterized as instrument assisted SMT to address atlas subluxation. The patient attended a total of 16 visits in a period of one year and received 5 corrections to the atlas. Ongoing care resulted in independence from the use of medications and abatement of HA attacks to 2-4 per month of mild intensity.

Conclusion: The care of an adolescent with chronic migraines with Advanced Orthogonal Technique was presented. This case report provides supporting evidence that patients with migraine HAs may benefit from this type of chiropractic care.

Keywords: *Migraine Headaches, Advanced Orthogonal, Children, Chiropractic, Upper Cervical*

Introduction

The prevalence of migraine headaches among school-aged children have previously been placed between 4%-5% but recent estimates place it much higher. [1-2] Among children between the ages of 5-15 years, the prevalence of migraine headaches (HAs) are at 10.6% while among those 15-19 years of age, it is as high as 28%.[3-4] Prior to puberty, the prevalence of migraine is considered equal in both genders. However, following puberty, the prevalence favors the female gender by 2:1.[5]

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As with all HAs in children, the attacks are a great source of stress and anxiety, not only for the child and their parents but also for the attending practitioner, who must decide the degree, comprehensiveness and appropriateness of the care rendered.

Consequences of HA attacks on a child's quality of life (QOL) have been documented. Powers and colleagues[6,7] found that QOL of children with headaches is significantly affected and the impact was similar to that found for other chronic illness conditions such as cancer and arthritis with impairments in school and emotional functioning.

Medical care of migraines in children involves both non-pharmacologic and pharmacologic approaches.[8] Data on safety

efficacy of medications for children in general and specifically for pediatric headaches remains limited.[10] Therefore, off-label prescribing remains common and is a concern to parents. A common reason provided by parents on the use of complementary and alternative therapies (CAM) for their children are fear of drug side-effects and the perceived safety of alternative therapies.[11]

Of the various practitioner-based CAM therapies, chiropractic is the most popular and highly sought after in the care of children.[12-15] To further contribute to evidence-informed practice, we describe the successful care of a pediatric patient with migraine HAs.

Case Report

With consent from her parents, a 16-year-old female presented for chiropractic consultation and possible care with a chief complaint of migraine HA without aura. Given the patient's age and ability to communicate, the history examination revealed the onset since kindergarten and she described suffering from HAs for as long as she could remember.

The frequency of her HA attacks occurred at a rate of 1-2 per week, lasting approximately 2-3 hours per episode that occurred primarily at night. She characterized her HAs as throbbing pain located in the frontal area, but would sometimes radiate posteriorly to the occipital region. Furthermore, her HA attacks were associated with extreme photophobia, phonophobia, and heat intolerance. The patient indicated that there were times when the only relief she experienced was from "sleeping on the cold tile floor".

Upon reaching puberty, the patient's HA frequency and intensity increased. In the 9th grade, the patient recalled experiencing a fall and trauma to the head resulting in severe bruising of her neck. Approximately a month following her traumatic fall, the patient's HAs were relentless over the next two years. Other associated symptoms with her HAs included dizziness, fever, and extreme fatigue. Changes in barometric pressure also increased the severity of her HA symptoms.

The patient recounted, at minimum, 30 visits to the emergency department to seek relief from her HA attacks. As a result of her headache attacks, the patient's school performance had been affected, missing classes 2-3 times per week when her HAs were at their worst. Over-the-counter medication in the form of Aleve® provided only temporary and minor relief while all other over-the-counter medications were ineffective.

The patient had been prescribed at least 15 different types of medications. According to the patient and her parents, magnetic resonance imaging (MRI) and computer axial tomography (CAT) scans of the cranium were unremarkable. Dental specialists were also consulted for the possible etiology of dysfunction of the temporomandibular joint but the consultations proved to be unremarkable.

Chiropractic physical examination revealed the following. Visual postural examination found the patient's head as laterally flexed to the left and her right shoulder elevated compared to the contralateral side. Digital palpation revealed tenderness and hypersensitivity to palpation in the patient's suboccipital region, particularly on the right side. Active range-of-motion (ROM) examination of the cervical spine revealed restrictions on left lateral flexion and right rotation, with pain at end-range. Digital palpation further revealed right-sided hypertonicity at the lower cervical spine (i.e., C_5-C_7 vertebral levels) paraspinal muscles, at the lower thoracic spine (i.e., at the T_{10-12} vertebral levels), and the entire lumbar spine, bilaterally.

In the supine position, the patient demonstrated a leg length discrepancy with a short left leg by a magnitude of ¼ inch. The Advanced Orthogonal (AdvO) Technique[16] was utilized as the care protocol care for this patient. The theoretical and clinical framework of AdvO is predicated upon upper cervical dysfunction and reflected in the presence of leg length disparity along with clinical findings of hypertonicity and/or tenderness in the suboccipital region.

Based on the history and physical examination findings, radiological examination was indicated with the AdvO protocol followed in this regard. The AdvO radiological view utilizes four radiographs: a lateral view, a horizontal view (modified submentovertex projection), a frontal view (modified Towne's projection), and an axial view (modified anteroposterior open mouth). From these views, rotational and translational misalignment of the atlas with respect to the skull is measured, as well as any abnormal positioning of the cervical spine.

The measurements are assessed using digital analysis software, and are used to define misalignment of the occipito-atlanto-axial complex around the z-axis, as well as misalignment of the atlanto-axial joint around the y-axis. Based on the coordinates derived from the radiographic analysis, the table-mounted Advanced Orthogonal percussion instrument is used to deliver a specific vectored, low force, low velocity impulse to the atlas vertebra.

The patient is placed in the side-lying position on the adjusting table. The metal stylus of the instrument is placed at the level of the atlas transverse process, approximately 1/8" above the patient's skin. A mechanical impulse is imparted to the stylus, which transmits a compressional wave through the skin towards the atlas vertebra. Immediately following the procedure, post-adjustment radiographs are taken of the patient in the frontal and horizontal views.

These films are then analyzed to determine the magnitude of correction to the cervical spine. The lateral view radiograph of the patient's cervical spine demonstrated a reduced lordosis, measuring -2°. The frontal, horizontal and axial radiographs demonstrated subluxation of the upper cervical spine functional spinal units (i.e., C_0-C_1 levels).

Four misalignment factors are measured in the AdvO analysis. The Atlas-Cephalic Displacement (ACD) measures abnormal rotation of the atlas vertebra with respect to the skull around the z-axis. It is assessed on the frontal radiograph by measuring the acute angle between a line drawn vertically through the center of the skull, and a line drawn horizontally along the plane of the atlas. In this patient, the ACD measured 1.50° to the left.

The Atlas Horizontal Rotation (AHR) measures abnormal rotation of the atlas vertebra with respect to the skull around the y-axis. It is assessed on the horizontal radiograph by measuring the acute angle between a line drawn vertically through the center of the skull, and horizontally along the plane of the atlas. In this patient, the AHR measured 2.50° to the left.

The Cervical Spine Angle (CS) measures the vertical position of the cervical spine with respect to the atlas vertebra. It is assessed on the frontal radiograph by measuring the acute angle between a line drawn through the centers of the lower cervical vertebrae (C_2-C_7) and a line drawn horizontally along the plane of the atlas. In this patient, the CS measured 1.00° to the left.

The final measurement in the AdvO procedure looks at any abnormal rotation of the C_2 or Axis spinous process (AxSP) while the patient is in a neutral position. It is assessed on the frontal radiograph by measuring the lateral deviation of the C_2 spinous process in relation to the vertical cervical spine line used in the CS analysis. In this patient, the AxSP was deviated 1.00mm to the right, which converts rotationally to 3.00°

The parents consented and the patient assented to a trial of chiropractic care. The patient's upper cervical subluxation was corrected using the AdvO instrument as described above. Following the adjustment, the patient was re-examined for leg length discrepancy and tenderness/hypertonicity in the upper cervical region. The patient's leg length discrepancy was no longer detectable and the tenderness previously reported by the patient had reduced.

Comparative radiographic examination revealed that the ACD had reduced from a rotation of 1.50^0 to the left to only 0.50^0. The AHR reduced from being rotated 2.50 to the left to 1.50 to the left. The AxSP changed from 1mm to the right to 2mm to the right, and the CS changed from 1.00 to the left to 1.75 to the left.

On the day following the patient's first visit, the patient reported noticing "some" improvement in the intensity of her HA complaint. On her second visit and 5 days since her initial visit, the patient indicated no subjective complaints of headache that day.

Overall, the patient attended a total of 16 visits in a period of one year and received 5 corrections to the atlas utilizing the AdvO instrument. The patient during this trial of chiropractic care reported progressive improvements in her HA complaints with respect to the frequency and intensity of her HA attacks.

Over the next five years, the patient attended care at an average of four corrections annually to address upper cervical subluxations. According to the patient, these visits resulted in her HA intensity being bearable without the need for medication and her headache attacks abated to approximately 2-4 migraines per month.

Discussion

Given the breath and width of the topic pediatric HAs, we will focus our discussion only as they pertain to pediatric migraine HAs.

As alluded to earlier, migraine greatly affects the quality of life of those affected. The World Health Organization (WHO) ranks migraine among the world's most disabling medical illnesses.[17] According to Lipton and colleagues[18], approximately 28 million Americans have severe, disabling migraine headaches. The yearly cost of migraine to employers has been placed at US $13 billion and yearly medical costs exceed $1 billion.[19]

Using a validated headache questionnaire mailed to 120,000 households representative of the US population, Bigal et al.[20] found a 1-year prevalence of migraine at 6.3% (i.e., 5.0% in boys and 7.7% in girls). In other countries such as Germany, Fendrich et al.[21] found the 3-month prevalence for migraine at 2.6% (i.e., boys 1.6%, girls 3.5%) applying strict International Headache Society criteria and 6.9% (i.e., boys 4.4%, girls 9.3%) with a modified criteria; while some 12.6% (i.e., boys 8.3%, girls 16.7%) suffered from probable migraine.

In Turkish adolescents between the ages of 12 and 17 years of age, Karli et al.[22] found a prevalence of recurrent headaches at 52.2% with a slight female predominance and a steady increase from 42.2% in 12 year olds up to 60.7% in 17 year olds. The patient presented in this case report would seem to support the adolescent female as more affected.

The diagnosis of HAs in children and migraine in particular, can be challenging. The clinical manifestations of certain disorders vary widely and are expressed differently or incompletely. Furthermore, the history evaluation of the child is by proxy of the parent's interpretation, distortion and editorial. When the child can communicate, there is the challenge of articulating their symptoms.

With HAs, it is said that children are often presented for clinical evaluation at the onset of transient neurologic, autonomic, gastrointestinal, or visual symptoms prior to the establishment of a clear, recurrent pattern with HA as the primary symptom. The key to recognizing pediatric migraine HA is to appreciate episodic nature of the disorder separated by intermittent symptom-free periods.[23]

The diagnosis of HAs was codified in the International Classification of Headache Disorders (ICHD-I) criteria. However, the ICHD-I has been criticized for its lack of sensitivity and specificity in diagnosing pediatric headaches, particularly migraine. In 2004, ICHD-II was adopted by the International Headache Society. Modifications to the ICHD-I involved providing criteria to differentiate pediatric from adult migraine diagnosis in its footnotes.

At issue was the duration of the HA attacks in that in children, many pediatric headache specialists have observed that they are of shorter duration, tend to be bilateral rather than unilateral, and that children more often report either photophobia or phonophobia, rather than both.[24]

Hershey et al.[25] evaluated the sensitivity of the new International Classification of Headache Disorders-2nd edition (ICHD-II) criteria in the diagnosis of childhood migraine and

found that if one included bilateral headache, headache duration of 1 to 72 hours, and nausea and/or vomiting plus 2 of 5 other associated symptoms (photophobia, phonophobia, difficulty thinking, lightheadedness, or fatigue), in addition to the usual description of moderate to severe pain of a throbbing or pulsating nature worsening or limiting physical activity, the sensitivity of migraine diagnosis improved to 84.4%. The diagnostic criteria for pediatric migraine with and without aura are provided in the Table 1.

Chiropractic Care

To provide context for discussion on the chiropractic care of children with HAs in general and migraine HAs in particular, we performed a systematic review of the literature on publications describing the use of upper cervical technique in the chiropractic care of patients with headaches. We consulted the databases Pubmed [1984-2012], MANTIS [1984-2012] and Index to Chiropractic Literature [1984-2012] with the search terms "chiropractic", "headaches" and "upper cervical technique." Inclusion criteria for our review include: (1) a primary investigation report (2) published in the English language and (3) chiropractic care specified the use of an upper cervical technique.

Our systematic review found 8 articles consisting mostly of case reports[26-30] a case series[31] and two retrospective case series.[32-33] The upper cervical techniques utilized were upper cervical technique as per the International Upper Cervical Chiropractic Association[26-28], Atlas Orthogonal Chiropractic[29], Blair Technique[30], the Palmer Upper Cervical Specific Technique[31], National Upper Cervical Chiropractic Association (NUCCA) Technique[32] and Toggle Recoil.[33] To date, this is the first publication in the scientific literature describing the clinical outcome of the care of a patient with the Advanced Orthogonal Procedure.[16]

As with all case reports, we caution the reader on the lack of generalizability of the case has presented. Many competing explanations (confounders) exist to challenge the salutary effects of the chiropractic care described. The placebo effect, regression to the mean, demand characteristics of the clinical encounter, and subjective validation challenge cause and effect inferences.

The temporal association between improvements in the patient's HA symptoms concomitant with chiropractic care provide support for possible cause and effect. However, a temporal association is a necessary but by itself is insufficient to make any inferences. A number of clinical and epidemiological studies have been published on the long-term course of primary headaches in children and adolescents.

In terms of the natural history of pediatric migraines, outcomes research is limited but a multidisciplinary approach has been found to be effective for children and adolescents with improvements in the frequency and severity of symptoms, and school days missed.[34]

According to Ozge and colleagues[35], the diagnoses of primary headache subtypes can change over time due to overlapping symptoms and possibly related to maturation. The long-term prognosis of headache is adversely affected by an initial diagnosis of migraine and by changing headache location, and it tends to be affected by an increasing time between headache onset and first presentation.

Girls and children with frequent headache have a poorer prognosis and therefore intervention is particularly important in these groups. Stressful life events in childhood have an impact on the course of migraine and increase the possibility of combined headaches. Headache onset early in life increases the risk of an unfavorable clinical course and also genetic factors play an important role in the phenotypic expression of the disease.[35] More long-term comprehensive population-based studies are needed in this area.

Conclusion

This case report provides supporting evidence for the possibility that children with pediatric migraines may benefit from chiropractic care using the Advanced Orthogonal technique. We encourage further research in the determining the safety and effectiveness of AdvO in the care of patients with headaches.

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Table 1. Diagnostic criteria for pediatric migraines with and without aura.[23]

Pediatric Migraine Without Aura	Pediatric Migraine With Aura
A. At least five attacks fulfilling criteria B through D B. Headache attacks lasting 1 to 72 hours C. Headache has at least two of the following characteristics: 1. Unilateral location, which may be bilateral or frontotemporal (not occipital) 2. Pulsing quality 3. Moderate or severe pain intensity 4. Aggravation by or causing avoidance of routine physical activity (i.e., walking, climbing stairs) D. During the headache, at least one of the following: 1. Nausea or vomiting 2. Photophobia and phonophobia, which may be inferred from a child's behavior E. Not attributed to another disorder	A. At least five attacks fulfilling criteria B through D B. Headache attacks lasting 1 to 72 hours C. Headache has at least two of the following characteristics: 1. Unilateral or bilateral (in children younger than 15 years of age) 2. Pulsing or throbbing quality 3. Moderate or severe pain intensity 4. Aggravation by or causing avoidance of routine physical activity (i.e., walking, climbing stairs) D. During the headache, at least one of the following: 1. Nausea or vomiting 2. Photophobia and phonophobia, which may be inferred from a child's behavior E. Not attributed to another disorder