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Case Study

Improving the cervical lordosis relieves neck pain and chronic headaches in a pediatric: a Chiropractic Biophysics® (CBP®) case report with a 17-month follow-up

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Abstract. [Purpose] To present the case of a dramatic improvement in the cervical lordosis and relief from chronic headaches and neck pain in a pediatric having a recent neck trauma. [Participant and Methods] A 10 year old male presented with recent neck trauma, neck pain and pre-existing chronic headaches. Cervical range of motion was limited with pain. X-ray analysis showed dramatic loss of cervical lordosis and an acute atlantoaxial rotatory fixation. Chiropractic Biophysics technique methods incorporating spinal manual adjustments, cervical extension traction and corrective exercises were used to restore normal cervical lordosis. Treatments were performed intensively over 6.5-weeks, with a 17-month long-term follow-up. [Results] The pediatric patient responded well to treatment with near complete resolution of cranio-cervical complaints. The cervical lordosis was corrected to age-appropriate magnitude, the coronal symmetry was restored, and both were maintained after nearly 1.5 years. [Conclusion] Chiropractic Biophysics technique which includes the cervical extension traction using the pediatric Denneroll orthotic was effective in restoring lordosis in a pediatric patient with cervical kyphosis and chronic headaches presenting with recent neck pains from a traumatic origin. Routine X-ray of the cervical spine is recommended for patients presenting with craniocervical symptoms as spine alignment is often overlooked as pathognomonic for these conditions.

Key words: Pediatric, Cervical lordosis, Headache

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INTRODUCTION

The cervical lordosis develops early in-utero, as early as 7- to 9.5-weeks[1)]. A lordosis is essential for enabling full cervical range of motion (ROM), allowing optimized biomechanical joint loading, protecting the cervical nerve roots and spinal cord, and preserving upright horizontal gaze[2–6)]. A recent systematic review of 21 studies determined that even in asymptomatic cohorts, a cervical lordosis is the normal alignment[7)].

To model the shape of the cervical lordosis, Harrison et al. determined that it was best represented by a circular cervical spine model[8, 9)]. This model was then shown to be valid as discriminant analysis statistical methods could successfully identify pain subjects from normal subjects based on the magnitude of cervical lordosis (i.e. patients with hypolordosis having symptoms)[10)]. Other studies have also determined that those having cervical hypo-lordosis (i.e. straight neck) were 18 times more likely to suffer from cervicogenic symptoms[11)]. The normal cervical lordosis for an adult is recommended to be in the range of 31–42° (posterior tangent method)[11)].

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The pediatric cervical lordosis is known to be less curved than adult lordosis. Kasai et al. presented data on the pediatric cervical lordosis between the ages of 2 to 18 years [12], adjusting for the measurement method, it is determined that a normal lordosis curve (C2-C7 posterior tangents) for a 10 year old should be about 22.7°[13]. Although the correction of cervical lordosis in adults is becoming well supported in recent randomized trials[14–16], the improvement in lordosis in children is underreported with no clinical trials, and only the odd case report[13].

The purpose of this paper is to describe the successful use of Chiropractic BioPhysics® (CBP®) technique to improve the cervical lordosis and relieve symptoms in a pediatric who suffered from chronic headaches and neck pains.

PARTICIPANT AND METHODS

A 10 year old male patient presented with a recent complaint of neck pain after tumbling onto the back of his head and neck. Chronic headaches were also reported to have been present prior to the recent neck injury. The patient reported his neck to be a 9/10 with most movements (0=no pain; 10=most pain ever). There was also a history of caesarean birth.

Physical assessment showed loss of flexibility in cervical extension (unable to perform), slight limitation in right lateral flexion and severe limitation in left lateral flexion (unable to perform); there was also pain reported during all head movements with the exception of head flexion. Reflexes were normal. Posture assessment showed mild anterior head translation (AHT) and a slight right head tilt. Palpation revealed bilateral paraspinal tenderness throughout the entire cervical spine area. Cervical and shoulder compression tests were positive eliciting severe pain bilaterally.

Cervical X-rays (Fig. 1) were taken and analyzed using the PostureRay software (PostureCo Inc., Trinity, FL, USA). The cervical lordosis is measured by the Harrison posterior tangent method which uses lines drawn contiguous with the posterior vertebral body margins[17], where the angle between C2-C7 is used for global lordosis. AHT is measured as the horizontal distance between a line drawn vertically from the posterior-superior C2 body corner and the posterior-inferior C7 body corner. The atlas plane line (APL) is measured by the best fit line made between 3 points representing the anterior tubercle of C1, the mid-height of the posterior margin of the dens, and the anterior portion of the posterior spinous process. These measurement methods are reliable and repeatable[17, 18]. The cervical X-ray showed a −2.3° C2-C7 hypolordosis (versus 22.7° normal[13]), a 5.1 mm AHT and a −12.3° APL (Table 1). The patient also had a left head translation with a right head tilt indicative of an acute atlantoaxial rotatory fixation (AARF)[19].

The patient was treated using a multimodal cervical spine rehabilitation program designed to increase the cervical lordosis and reduce the AARF. CBP technique methods is a full-spine and posture correcting program that uses the concept of mirror image® to stress the spine and related tissues towards the unique opposite to achieve the goal of improving the spine alignment to more ideal/normal[20–23]. Regarding the cervical lordosis, a unique form of cervical traction in an extension position has proven effective for increasing the lordosis in many clinical trials[14–16].

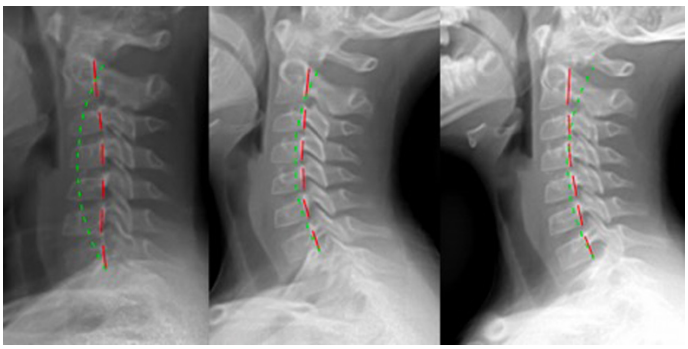

Fig. 1. Lateral cervical images. Left: Initial image showing a −2.3° lordosis; Middle: Post-treatment image showing a −25.2° lordosis; Right: 17-month follow-up image showing stability of the lordosis at −22.9° with minimal maintenance treatment.

Table 1. Cervical spine alignment parameters from the pre-, post- and follow-up radiographs

	Pre-treatment	Post-treatment	Follow-up
Lordosis (°)	−2.3	−25.2	−23.8
AHT (mm)	5.1	5.1	12.1
APL (°)	−12.3	−22.0	−23.8

Lordosis measured by the posterior tangent method from C2-C7, AHT: anterior head translation; APL: atlas plane line.

The patient received manual spinal manipulation on an Omni drop table as well as mirror image postural adjustments using an Impulse hand-held adjusting instrument (Neuromechanical Innovations Inc., Chandler, AZ, USA). Specifically, the instrument was used to stimulate the joints in the upper cervical and sacroiliac area while the patient was positioned prone on a table with the headpiece of the table elevated forcing their neck into an extended position.

The patient was also prescribed a pediatric Denneroll traction orthotic (Denneroll Spinal Orthotics, Wheeler Heights, NSW, Australia), which is a cervical extension traction block. The recommendation was for the patient to lay supine with the block positioned under the neck for 10–20 minutes per day. The patient received 18 treatments over 6.5-weeks (Mar. 8, 2018 to Apr. 25, 2018) as well as performed the home Denneroll orthotic traction daily from Mar. 14, 2018 to Apr. 25, 2018. The patient and parents gave verbal and written consent for the publication of these results.

RESULTS

The treatment was reported to have relieved all the patients neck pains as well as reduced the number of reported headaches significantly in both severity and frequency. In fact, an assessment performed on Mar. 30, 2018 showed dramatic improvement in range of motion, by observation the right head tilt and left head translation were reduced, and the patient reported a 2/10 for average neck pains and 0/10 for headaches. Also, all orthopedic tests originally positive for pain were now negative. A follow-up assessment on Apr. 25, 2018, included an X-ray and showed a 23° improvement in cervical lordosis (−25.2° vs. −2.3°). Of note, a 9.3° C3-5 kyphosis was corrected to a lordosis after treatment. At this point the average neck pains were reported to be 0/10 as well as the headaches were reported to be very rare. The boys head posture in the coronal plane remained improved and symmetric.

A long-term follow-up was performed to 17-months post-treatment. An X-ray taken at this time showed that the lordosis was maintained within the error of the measurement at −23.8°. The child also remained well having no neck pains and headaches were only reported to occur very rarely. It is noted that this patient did attend maintenance in-office treatments, approximately once per month, and also performed home Denneroll traction periodically as he was motivated by the reduction in headaches which he feared would return.

DISCUSSION

This case documents the successful increase in lordosis and resolution of chronic headaches and recent neck pains in a 10 year old who presented with upper cervical AARF and upper cervical kyphosis. A 17-month follow-up showed preservation of the lordosis correction, maintenance of symmetrical craniocervical posture and maintenance of symptomatic relief.

Altered cervical lordosis, particularly kyphosis, has been found to be associated with neck pains and headaches[10, 11, 24, 25]. As re-alignment of the cervical spine in adults has been shown to be effective at long-term headache symptom resolution[15], it seems logical that paralleled successful outcomes would be expected in children presenting with cervical hypolordosis and chronic headaches as shown in this case.

A key difference in treating a pediatric versus an adult for cervical curve correction is the magnitude of lordosis goal. Generally, from limited data, a pediatric cervical curve is less pronounced than an adult curve. Thus, the target lordosis in a pediatric should be age-appropriate, to the best estimate. Kasai et al.[12] present a good dataset to be used as a general guideline, but it should be noted that their pediatric population was not without cervical complaints. It is also noted that Kasai et al. used the Cobb angle, and also only presented data from C3-C7; thus, to account for the angle between C2-C3, one should add 2.7°[26]. Also, since the Cobb angle has been criticized for not being congruent with an engineering analysis[17], we suggest use of the Harrison posterior tangent method, which would involve converting the Kasai et al. data by first adding the 2.7° (to account for C2-3), then adding 9° to any age group Cobb angle measure[21].

It is important to assess the cervical spine in patients who present with craniocervical complaints, as has been recently stated that many healthcare providers fail to image the cervical spine to screen for biomechanical malalignment[27, 28]. A failure to diagnose a spine subluxation pattern will lead to ineffective treatment. As has been shown in several randomized trials in adults[29], a failure to improve cervical lordosis by many physiotherapeutic modalities may lead to temporary relief, but symptoms regress towards baseline levels within 3-months to 1 year. Thus, the same pattern could occur in children, albeit, more research is needed to elucidate this hypothesized trend.

It is important to note that a patient reserves the right to present with multiple subluxation patterns (e.g. head postures)[30]. This patient presented with cervical kyphosis with AHT and a left head translation with a right head tilt indicative of AARF. Although chronic AARF that fails to reduce after physical therapy procedures may require surgery in extreme cases[19], acute AARF that can produce an acute exaggerated postural deformity[31] may have its associated symptoms relieved rapidly even after a single treatment[32] and also may be reduced with conservative care as in this case[33].

The limitations to this case include the lack of a home traction diary to track the accuracy of the frequency and duration of traction performed that was verbally reported by the parent. Also, although cervical manipulation as well as cervical extension traction were performed, we acknowledge that although the lordosis correction is theoretically possible from either treatment, recent trials by Moustafa et al.[14–16] demonstrate that it is the extension traction that is responsible for lordosis increase; as well, manipulation of the spine has not been shown to change spine alignment[34–36]. Although natural recovery

is always a possibility regarding symptoms resolution, the simultaneous symptom relief with the current treatment occurred, and recent clinical trials also show this form of treatment leading to symptom resolution in those with co-existing cervical loss of lordosis and cranio-cervical symptoms[14–16]. Future research is needed as the non-surgical treatment of cervical spine deformity correction in pediatrics is virtually non-existent.

Conflict of interest

Dr. Paul Oakley (PAO) is a paid consultant for CBP NonProfit, Inc.; Dr. Deed Harrison (DEH) teaches chiropractic rehabilitation methods and sells products to physicians for patient care as used in this manuscript.

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