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CLINICAL EVIDENCE

Improvement in Craniovertebral Angle in a patient with anterior head posture using Advanced Biostructural Correction™: A Case Report

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What is new: Advanced Biostructural Correction™ is a technique used by chiropractors through North America, Europe, Southern Africa and Australasia but has not been described well in the literature. This case report begins to add to the body of real-world evidence that documents Chiropractic Techniques and their empirical effects as recorded practice.

Indexing Terms: chiropractic, Advanced Biostructural Correction, vertebral subluxation. technique.

Introduction

Posture is increasingly being recognised as an important health determinant. Sagittal balance has been shown to correlate consistently with increasing mortality and morbidity in older individuals. (1, 2, 3, 4)

'... This case supports the evidence linking chiropractic to improvements in FHP as measured by CVA and the effect such improvements have on various health outcomes.'

Forward head posture (FHP) is a major component of poor sagittal balance has been described as one of the most common postural distortions affecting adults (5) and can negatively impact an individual's health in various ways:

FHP has been linked to neck pain. (6, 7) According to World Health Organisation The Task Force on Neck Pain and Its Associated Disorders most people can expect to experience neck pain in their lifetimes, although for the majority, neck pain will not seriously interfere with normal activities. (8) Depending on the case definitions used, the 12-month prevalence of neck pain ranged from 12.1% to 71.5% in the general population. Each year, between 11% and 14.1% of workers reported being limited in their activities because of neck pain. (8)

Out of 291 conditions studied in the Global Burden of Disease 2010 Study, neck pain ranked 4th highest in terms of disability as measured by years lived with disability, and 21st in terms of overall burden. (9)

Whilst chronic tension type headaches (TTH) have shown correlation with FHP, (10) evidence does not suggest correlation between FHP and migraines. (11) It has also been linked with functional deficits such as cervical joint position sense and balance(6, 12, 13) as well as reduced neck range of motion (ROM). (6, 7)

FHP has also been shown to negatively affect autonomic function; (13) reduced forced vital capacity, coupled with increased accessory muscle use during respiration. (6, 14)

Psychological factors such as self-esteem may also be affected. (15)

FHP is measured using the cranio-vertebral angle (CVA). (16) This measure has been shown to be accurate using lateral photographic sources in both the sitting and standing position, (16, 17) though the standing position has been described as more sensitive. (18)

It has been suggested that it is necessary to develop more efficient interventions for managing FHP. (14) Advanced BioStructural Correction™ (ABC™) is a technique used by chiropractors aimed at postural improvement. Thus far, ABC™ has not been well described in the literature beyond two previous case studies. (19, 20)

An aim of chiropractic care is to optimise the health and wellbeing of individuals through the enhancement of nervous system function brought about by reducing nerve interference caused by vertebral subluxation. (21) ABC™ is a manual therapy technique that can be used by chiropractors to achieve this end.

A 2016 survey of less than 10% of Australian Chiropractors estimated that 1.7% of practicing Chiropractors used ABC™ as their main technique in practice. (22)

According to the *American Chiropractic Association* and the *Association of Chiropractic Colleges* subluxation is defined as 'a complex of functional and/or structural and/or pathological articular changes that compromise neural integrity, and that may influence organ system function and general health.' (23)

One dimension of the Vertebral Subluxation Complex (VSC) is distorted afferent input into the CNS that may create maladaptive changes central neural plasticity and dysfunction particularly in the frontal cortex. (21, 24) Other dimensions of an operational model of vertebral subluxation as proposed by Kent include dyskinesia, dysponesis and dysautonomia. (25)

Presented below is a case-report of a patient who experienced improvement in his CVA and neck pain following a course of treatment using the ABC™ technique.

Case Report

A 48 year old white male presented with a primary complaint of mid back pain of several weeks duration that was worse after approximately 10km of running. He reported his working role as a managing director and was married with children. Other complaints included bilateral shoulder pain, generalised neck stiffness, loss of grip strength, infrequent migraines and a previous diagnosis of Scheurmann's disease. The patient noted being involved in two motor vehicle accidents. He occupied a sitting position for much of the day. He reported suffering physical abuse as a child. He was a non-smoker and was not using any medication.

Cervical range of motion is listed in Table 1and lumbar range of motion is listed in Table 2.

Neurological testing including myomotal, dermatomal and deep tendon reflexes in the upper and lower limb were unremarkable.

Table 1: Cervical range of motion

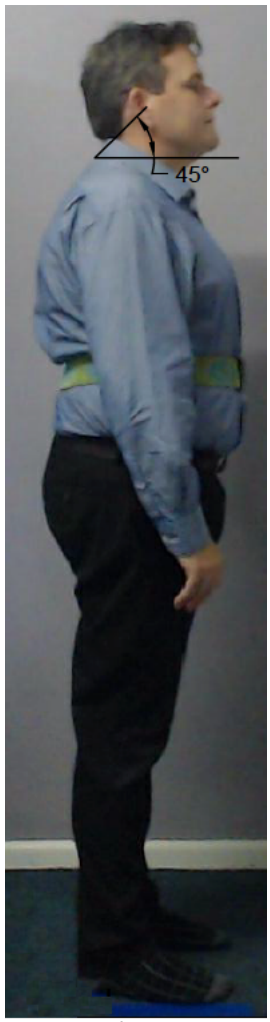
Cervical	Initial Visit	Review Visit (29 visits in 12 weeks)
Right rotation	50	65
Left rotation	50	65
Flexion	35	45
Extension	20	20

Table 2: Lumbar range of motion

Lumbar	Initial Visit	Review Visit (29 visits in 12 weeks)
Right rotation	10	15
Left rotation	10	15
Flexion	50	50
Extension	10	15

Figure 1: Initial Posture Photo

Figure 2: Review Posture Photo 29 visits in 12 weeks



Permission granted to not mask the patient's face

Posture photogrammetry was performed in the standing position. Analysis with AutoCAD revealed a craniovertebral angle (CVA) of 39 degrees where the normal is 49.9°. (26)

Radiographic analysis revealed a mild lateral curvature of thoraco-lumbar spine, convex to the right with an angle of approximately 2 degrees; mild anterior wedging of T8 vertebral body, narrowing of anterior disc spaces throughout the thoracic spine and exaggerated kyphosis. Reduced cervical lordosis and narrowed disc space throughout the cervical spine was noted.

Using Kellgren's classification of degeneration, phase 3 changes were present in the cervical and thoracic spine and phase 2 was present in the lumbar spine. (27)

Clinical Impression

A clinical impression of vertebral subluxation complex (VSC) complicated by Scheurmanns's disease and mechanical spinal pain was established.

Intervention and Outcome

Theory

Stress in the form of physical, mental or chemical macro- or micro trauma may cause structural elements of the body, especially the spine to collapse forward and create compensatory mechanisms to continue function. This loss of leverage increases tension within and along the neuroaxis (neuroskeleton). (28) ABC™ hypothesises that specific vertebra can lose optimal leverage and move in an anterior direction, causing the elements above to collapse forward. (29)

This phenomenon is consistent with a description of vertebral subluxation complex. Adhesions in the meningeal system have been visualised in cadavers (30) and are operated on for the relief of various pain syndromes (31) and are hypothesised to fix/lock these 'anteriorities' in place.

Specific adjustments to the spine, pelvis, legs and feet are used to address the 'misaligned components' while longer lever meningeal releases address the meningeal adhesions.

One of the treatment goals of ABC™ is to restore the patient to a more neutral resting posture in the sagittal plane, which would include a neutral head position. (29) The mechanisms of this technique are based on theoretical models derived from basic science studies of the biomechanics of the central nervous system and how it is distorted with movement of the spine. (28, 32)

In their 2020 paper Sillevis and Hogg report seven cadaveric dissections and confirmed tissue connections between ligament, bone and muscles in the sub-occipital region. (32) They demonstrated continuity between the nuchal ligament, the menigiovertebral ligament, and the dura, and showed passive upper cervical motion resulting in spinal cord motion within the canal and tensioning of nerve and ligamentous connection. (32)

Resting posture can be measured on photographs using the CVA. (17) This postural examination revealed a clinical presentation consisting of an anterior head translation (FHP). The adjustments were employed in such a way as to reverse the observed postural distortions with the hope of reducing spinal and muscular insult.

Description of the Manipulative Techniques

An abbreviated description of the chiropractic protocol of Advanced BioStructural Correction™ is presented. A more detailed description of the methods can be found in the ABC™ Instruction Manual. (29) The ABC™ approach to correcting structural distortions such as FHP involves adjusting or manipulating the spine including lower cervical, thoracic and lumbar spine, and ribs, pelvis, hips, feet and knees in either a standing or supine position. It includes a series of three deep full body stretches called meningeal releases, designed to breakdown meningeal adhesions. (29)

Since the patient exhibited a gross FHP, the protocol was deemed to be appropriate to attempt to reduce the patient's CVA. This protocol was applied to the patient on each office visit, 2-3 times per week over a course of 12 weeks and a total of 28 sessions.

Vertebral Adjustments C7-L5

Adjusting of the lower cervical, thoracic and lumbar spine from anterior to posterior is a major component of the ABC protocol. The C7 and thoracic adjustments are performed with the patient standing with their back against the wall and arms folded across their chest. The practitioner/chiropractor is positioned in front of the patient contacting the elbows in front and reaching around to the back of the patient to contact the vertebra below the affected level with the thumb of a closed fist. The patient is asked to breath in and out and let the body slump or roll over the shoulder of the practitioner along the sagittal plane to the level of contact on the spine. The vector of force application that facilitates the adjustment occurs through the elbows of the patient in an inferior to superior and anterior to posterior direction through the body. The point of contact on the spine acts as a fulcrum to apply force to the affected vertebra from anterior to posterior over the thumb of the contact hand.

The intention for the force application is similar for the lumbar spine. However, due to the lumbar lordosis it is not possible to create enough leverage in a standing position to achieve the desired correction. Most lumbar adjustments are performed on a table, starting with the patient seated with legs straight, their arms folded over their chest as with the thoracic adjustments. The practitioner stands next to the table in a fencer stance, facing the opposite direction to the patient. The hand furthest from the table contacts either above or below the affected vertebra, in a similar fashion to that of the thoracic spine adjustments. The other hand reaches across the patient's chest, cradling the head and neck from behind in a flexed position. The practitioner rolls the patient backwards along the sagittal plane towards the bed over the contact hand until finishing with the patient in a supine position.

Anterior Meningeal Release

The patient lies supine on the table with their hips and knees flexed to just over 90 degrees towards the chest. The chiropractor stands next to the patient and contacts the head just above the ears and lifts the head into flexion until the body gets rapidly heavy. Maintaining contact, with the head and shoulders in flexion, the chiropractor takes a big step laterally, pulling the patient in the coronal plane so their upper body is partly off the table. From this position, this chiropractor laterally flexes the head until the lateral canthis of the eye approximates the acromioclavicular joint of the shoulder furthest from the table.

The hand closest to the floor in this position remains in place just above the patient's ear to maintain angles and pressures while the other hand moves into position just above and slightly anterior to the ceiling facing ear. The hand closest to the floor then moves around to contact just behind the ceiling facing hand. The slack is then taken out by moving the body in a largely lateral direction in a wide arc away from the table, maintaining angles and pressures on the head. Once all the slack is removed the chiropractor drives along that same arc, using a full body lunge until a hard end feel is felt.

Posterior Meningeal Releases

The patient lies supine with their head and shoulders off the head end of the table and dropping into extension. How far the patient's body moves off the end of the table is determined by watching for the pelvis to rotate slightly when the head and shoulders drop into extension. The head and shoulders are then moved laterally off the edge of the table. The head is contacted in the same finishing position on the head as for the anterior. The head and body are then stretched into extension and lateral flexion away from the table until all tension is taken out of the system and

the chiropractor uses a full body lunge to drive in a wide arc away from the table until a hard end feel is felt.

Lateral Meningeal Releases

The patient is seated and allows their body to relax. The chiropractor stands perpendicular to the patient at their side with the contact hand reaching under the patient's chin to contact the mastoid process and zygomatic arch on the opposite side. The supporting hand contacts the head ipsilaterally as high up towards the crown as possible without slipping off.

The contact hand starts by pulling down towards the patient's hip on the same side. Simultaneously, the supporting hand pushes away from the practitioner in an up and over manner, causing the patient's head to laterally flex on the occiput while ensuring to keep the nose centred. This movement continues until all slack is taken out of the meningeal system and the body starts to engage.

Once this is achieved, the drive begins by pulling down with the contact hand straight towards the hip, followed immediately by an over and down movement of the supporting hand.

Follow up and outcomes

Chiropractic care was administered over 28 visits during a period of 12 weeks using the ABC™ protocol. At the end of this period at progress exam was performed.

The patient and his family noted subjective improvement in both posture and symptoms from the first adjustment. Based on these reported subjective and observed objective improvements, the treatment regimen was continued.

Assessment and follow up was conducted at every visit with adjustments as indicated. By the second visit, marked improved in posture and a reduction in mid-back pain was noted. Some tenderness was noted in the cervico-thoracic region which eased by the 6th visit.

In the next few visits the patient noted that he had hit his VO_2 goal in a 10km run as measured by his smart device and was able to carry a backpack comfortably for the first time in years.

By the 12th visit, the patient noted physical improvement and $^{7}/_{10}$ on a visual-analogue scale (0 = no change and 10 = major change) though the shoulder symptoms persisted.

At the progress exam, increased cervical and lumbar range of motion were reported (see table 1) as was the overall stability of his body in z axis from a posterior to anterior direction. Photogrammetry and analysis showed an improved CVA of 45 degrees.

Discussion

Decreased FHP and improved CVA have been linked to positive health outcomes, from improved cervical ROM (33) to TTH (34) and sensorimotor control and autonomic nervous system function. (13)

A case report by Fedorchuk et al. (35) showed that chiropractic care facilitating correction of cervical lordosis and FHP may be directly related to increased telomere length (health longevity). It also adds low level evidence documenting improved cervical spinal alignment with improved autonomic function. (13)

This case supports the evidence linking chiropractic to improvements in FHP as measured by CVA and the effect such improvements have on various health outcomes.

Previous case studies describing Chiropractic care using ABC™ have shown positive outcomes in relation to cervical dystonia (19) and cervical spinal stenosis. (20)

More research in the form of a case series or RCT's in large populations of people undergoing ABC™ treatment is needed into the effect of chiropractic and specifically ABC™'s effect on posture,

specifically FHP and the resultant health benefits as measured by standardised measurements such as radiographs, Quality of Life questionnaires, heart rate variability, skin conductance and balance.

Conclusion

This paper reports improvement in cranioverteral angle in a patient presenting with forward head posture using Advanced Biostructural Correction. Further research as noted is needed explore the health implications related to this.

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Informed consent to chiropractic care is held by the authors.

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