

CERVICAL LORDOSIS RESTORATION FOR LATE WHIPLASH SYNDROME ALLEVIATES CHRONIC HEADACHES 13-YEARS AFTER MOTOR VEHICLE COLLISION: A CBP® CASE REPORT WITH A 1-YEAR FOLLOW-UP.

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ABSTRACT

Objective: To present a case of the alleviation of chronic headaches and neck pain following a multimodal rehabilitation program aimed at improving the cervical lordosis by mirror image exercises, adjustments, and cervical extension traction as part of Chiropractic BioPhysics® technique.

Clinical Features: A 29-year-old female suffered from late whiplash syndrome featuring chronic headaches, neck pain, and many other bodily symptoms. The patient failed to respond to previous traditional chiropractic and physiotherapy treatment following her collision 13 years prior. Radiography revealed upper cervical kyphosis.

Intervention and Outcome: The patient received Chiropractic BioPhysics mirror image® corrective exercises and cervical extension traction. Spinal manipulative therapy and drop table adjustments were also given. After 36 treatments over 15 weeks, the patient reported reduced post-concussion syndrome-related neck pain and headaches as well as improvement in many other bodily functions. Post-cervical x-ray showed marked improvement of the cervical lordosis. A one-year follow-up indicated a slight regression of cervical posture with minimal treatment, though she remained well despite having a recent pregnancy.

Conclusions: Our case suggests that correcting cervical lordosis by Chiropractic BioPhysics methods, in those with late whiplash syndrome and cervical kyphosis, may alleviate the symptoms typically experienced by those suffering from previous whiplash. (*J Contemporary Chiropr* 2020;3:21-27)

Key Indexing Terms: Cervical kyphosis, Late whiplash syndrome, CBP

INTRODUCTION

Cervical kyphosis is the reversal of the normal lordosis. It has traditionally been described as a secondary spinal curve during early development but has been demonstrated to occur at 7.5-9 weeks in utero. (1) Cervical kyphosis is associated with a range of symptoms, including headaches and neck pain; (2) these two symptoms are often related and coexistent.

Tension-type headaches are the most common headache worldwide (3) affecting greater than 40% of the population, (4). Neck pain is also prevalent and will affect up to 70% of the population. (5) Those suffering from headache have a high chance of also having neck pain, a 90% prevalence rate, (5) particularly following motor vehicle collisions (MVCs). (6)

It is common for those in MVCs to experience cervicogenic symptoms even years after the initiating event. (6) While 'whiplash' refers to neck sprain-strain injury caused by a sudden acceleration-deceleration movement of the head typical in MVCs, 'late whiplash syndrome' (LWS) refers to the collection of symptoms and disabilities seen more than 6 months after a neck injury resulting from a MVC. (7) LWS is more common in women between the ages of 21-40 years. (7)

Cadaveric studies have shown that a classic whiplash force to the cervical spine creates an S-shaped configuration, specifically causing an upper cervical spine flexion and a lower cervical spine hyperextension. (8) At the moment of impact, damage to the involved tissues will occur, but we believe (Oakley P, Harrison D, Manuscript in preparation) that the instantaneous alteration of cervical alignment during a MVC will lead to a perpetual source of stress-strain spinal tissue trauma that may ultimately lead to delayed recovery from whiplash-type events

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Table 1. Short Form-36. (17) Initial, post-treatment, and follow-up scores.

Date	Health Perception	Physical Functioning	Role-Physical	Role-Emotional	Social Functioning	Mental Health	Bodily Pain	Energy/Fatigue
Normal	72	84	81	81	83	75	75	61
1-29-16	57	65	0	0	13	12	23	5
5-20-16	87	95	100	100	63	72	78	70
3-4-17	92	100	100	100	88	80	78	70

and to the classic lingering symptoms typifying post-concussion syndrome (PCS).

Identifying altered cervical spine structure in those with whiplash is important as its correction may lead to better outcomes. Ferrantelli et al, (9) for example, demonstrated complete symptomatic improvement in a 40-year-old male who had experienced whiplash. Treatment resulted in a 25° improvement in cervical lordosis and reduction of forward head posture after 64 sessions of Chiropractic Biophysics® (CBP®) technique (10-12) over an 18-week period. (9) Fortner et al (13) presented the case of a 13° improvement in cervical lordosis in a 31-year old female after 30 treatments over 5 months who had also suffered from whiplash; CBP treatment was given and the patient had a dramatic resolution of symptoms.

We discuss the successful resolution of LWS featuring chronic headaches, neck pain, and many other bodily symptoms in a 29-year old, 13-years following an MVC. Treatment involved CBP technique, and a 1-year follow-up was also provided.

CASE REPORT

A 29-year old mother of 3 had a chief complaint of severe headaches. She suffered from headaches since being involved in a rear-end impact MVC 13-years previous, at which time she was diagnosed with ‘severe whiplash.’ She was treated by a physiotherapist as well as a chiropractor, for 3 months. The headaches persisted, and seeking a second opinion, she was again diagnosed with ‘severe whiplash.’ She claims the headaches have slowly worsened over the years.

On the numeric rating scale (NRS) for pain, her average neck pain was 5/10 (0=no pain; 10=worst pain ever) and 8/10 at its worst. Her headaches were 8/10 with dizziness and nausea, her upper back averaged 4/10, and her low back pain 8-9/10. All these ailments were chronic and bothersome on a daily basis. The headache disability inventory (HDI) revealed a score of 98%, where a score of >60 is considered a significant disability due to headaches. (14) The Neck Disability Index (NDI (15)) indicated a score of 70%. The SF-36 (16) demonstrated several categories having extremely low scores (Table 1).

She also reported numbness in her feet and legs. Her overall pain prevented her from being able to hold her infant. She also reported having cold fingers, right arm pain, tinnitus, difficulty digesting greasy foods, low energy, restless legs, cramping, irregular periods, and pelvic floor weakness.

She had limited muscular strength for cervical flexion (4/5), left cervical rotation (4/5), and left hip flexion (4/5 with pain). There was loss of pinwheel sensation perceived as dull in the right arm dermatomes C5- C8. Positive orthopedic tests included Jackson’s, maximum cervical compression, Soto-Hall, Yeoman’s, and Hibb’s tests. Grip strength was 28lbs on the right and 29lbs on the left. Posture analysis (17) revealed a flexed head position (+RxH), a high left shoulder (+RzT), a left posterior pelvis rotation (+RyP), and right translated pelvis (-TxP).

Full spine radiographic assessment was performed including an anteroposterior (AP) and lateral cervical, thoracic, and lumbar series. All radiographs were digitized and analyzed using the PostureRay system (New Port Richey, FL). This system uses the Harrison posterior tangent method for lateral spine images, (18,19) and the modified Risser-Ferguson method for AP spine images. (19) These mensuration methods are repeatable and reliable, as is posture. (18-20)

The lateral cervical spine view revealed an S-shaped alignment with an upper cervical kyphosis and lower cervical lordosis (Figure 1). The C2-C3 relative rotation

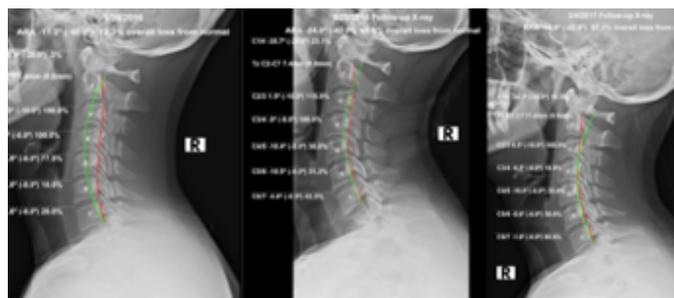


Figure 1. Lateral cervical radiographs. Left: Initial taken on 1/26/16. Middle: Follow-up taken on 5/20/16. Right: Follow-up taken on 3/4/17. Green line indicates ‘normal’ alignment, (22) red lines drawn on the posterior vertebral bodies indicates patient alignment.

angle (RRA) measured $+9.0^\circ$; the normal angle of this joint should be $7-9^\circ$ of extension. (21) The overall cervical C2-C7 alignment absolute rotation angle (ARA) measured -11.2° (negative indicates extension), where normal is -31° to -42° (22-24). The atlas plane line (APL) was -28.9° (normal = -24° to -29° (22,23)), and the forward head translation (+TzH) was within normal limits (WNL) at 2.4mm (normal 0-15mm (23,24)).

Stress films were performed to determine the flexibility of the cervical spine in extension, while the patient was performing a neck extension exercise (Figure 2) and while laying on a Denneroll® (Wheeler Heights, Australia), a firm rounded block (Figure 3). These films were deemed sufficient to recommend CBP cervical spine protocol (11,12) as the patient could tolerate cervical extension.

The patient was treated with CBP protocol (11,12) at a frequency of up to 3 times a week over 15-weeks, receiving 36 treatments before being reassessed. She was given neck extension exercises with resistance using the Prolordotic™ neck exerciser (Circular Traction, Huntington Beach, CA) while standing on the PowerPlate® (Northbrook, IL) while in the office (Figure 2). Other exercises included single leg stands and Russian twists on the PowerPlate. She was also asked to perform 100 daily neck extension exercises at home.

In-house, Pope 2-way cervical extension traction (25) was performed starting at 15lbs progressing to 25lbs for 20-minutes duration (Figure 3). She was also prescribed cervical Denneroll traction (26,27) for home use starting at 5-minutes progressing up to 20 minutes daily with a mid-cervical placement (Figure 3). She was also adjusted manually with the cervical spine in extension as well as with a hand-held adjusting instrument (Arthrostim®: Impac Inc., Salem, OR) into the upper cervical spine while having the neck extended in the prone position. She reported no pain caused by the treatment throughout her program and consented to the publication of these results, including all images.

Outcome

On re-examination, her right grip strength improved to 34lbs., Soto-Hall was normal, Hibb's test was negative bilaterally, Yeoman's test was negative bilaterally, right pelvic translation has reduced, left head flexion reduced as well, all cervical ROM was improved to normal, cervical flexor strengths were

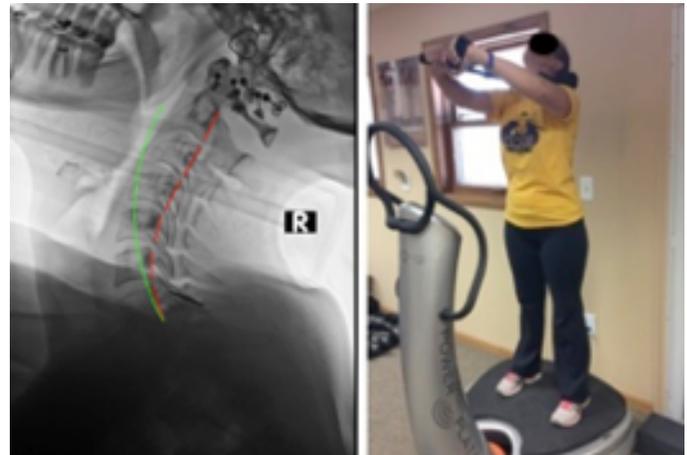


Figure 2. Left: Lateral cervical stress film. Patient is performing a neck extension with resistance using the Prolordotic. Right: Demonstration of exercise on the PowerPlate®.

5/5, left cervical rotators were 5/5, right hip flexor was 5/5, dermatomes of right C5, C6, C7 and C8 were improved to normal using pinwheel sensation. The NDI score was 24% and the HDI was 40%. The SF-36 was not given. At this point, the patient had performed 15 in-office treatment sessions.

Following her 36th treatment session, she was reassessed on May 20, 2016. She reported her neck pain to have improved by 90%, her headaches with dizziness and nausea resolved but still had occasional mild headaches, her low back pain improved 70%, the numbness in her feet and legs as well as her upper back pain had fully resolved. She also reported that her cold fingers, tinnitus, and restless legs had fully resolved, her cramping and irregular Periods had resolved, while the difficulty to digesting greasy



Figure 3. Left: Lateral cervical stress view. Patient is laying supine with a Denneroll under the mid-cervical spine. (26,27) Right: Pope 2-way cervical extension traction. (25)

foods, her low energy, and weak pelvic floor had each improved 80%.

Disability questionnaires revealed a score of 10% on the NDI and a score of 4% on the HDI. The SF-36 revealed a significant improvement in all categories with a minimum of 30 points improvement (out of 100) in each category (Table 1).

All orthopedic tests were now normal other than her reporting minimal but localized pain on maximum bilateral cervical compression. Her grip strength had improved 6lbs on the right.

She had improved posture only having a high left shoulder (+RxT) and a left head tilt (-RxH). A lateral cervical x-ray showed dramatic improvement in increasing lordosis (C2-C7 ARA: -24° vs. -11.2°), the forward head position was slightly increased (TzH: +7.4mm vs. +2.4mm), but still WNL, the APL increased to -35.7° . The C2-C3 segmental angle was reduced from $+9.0^\circ$ to $+1.5^\circ$, not yet normal but improved by 7.5° . Again, the patient reported to have continued to perform her daily home prescribed routine.

Approximately 13 months after the initial assessment, a follow-up assessment was performed. She had just given birth 2 weeks prior; there were no significant exam findings associated with her recent childbirth other than her increased weight. She felt well and rated her pain levels in her neck and low back 1/10 on average and scored a 10% on the HDI and a 6% on the NDI. Her SF-36 scores (Table 1) were at or improved (4 attributes) compared to her last results and overall each of the 8 attributes scored greater than the normative data indicating the patient is healthy in all attributes.

Physical examination indicated that all ROM for cervical and lumbar areas were WNL and all orthopedic tests were negative. A lateral cervical radiograph (Fig. 1) indicated her alignment values had regressed slightly with only 8 treatments over the timespan May 20, 2016 to March 4, 2017. The cervical C2-C7 ARA was -18° , the +TzH was 11.6mm, the APL was -34.3° , and the RRA between C2-C3 was $+6.5^\circ$. She noted she had been only casually compliant with

her home exercises and neck traction (approx. 3x/week) throughout her pregnancy.

DISCUSSION

This report shows a successful outcome in a 29-year-old patient suffering from LWS including chronic headaches and neck pain, 13-years following an MVC. Use of CBP technique protocol increased the overall lordosis and reduced the excessive kyphosis between C2-C3, restoring the cervical alignment closer to normal/ideal. (21-24)

Fortner et al., (13) Oakley and Harrison (Manuscript in preparation) propose that symptoms persisting following those experiencing LWS and having a cervical hypolordosis/kyphosis may have a direct relationship. The MVC causes the whiplash, the whiplash causes the kyphosis, (8) and the persisting kyphosis will contribute to persistent symptoms. (2) To break this chain, one needs to restore the physiologic lordosis. We feel that the patient's initial presenting cervical alignment was in an upper kyphosis position due to the previous whiplash experienced years prior, since it is known this is a typical traumatic spinal buckling pattern induced during whiplash. (8)

The structural correction of cervical lordosis is an emerging evidence-based practice within surgery and manual therapies. Contemporary cervical spine surgical approaches attempt to preserve and/or re-establish the cervical lordosis (28,29) for superior patient outcomes, in terms of both the avoidance of neurologic symptoms, (30,31) as well as preventing adjacent segmental spinal disc disease. (32,33)

Advances in CBP technique involving cervical extension traction methods have demonstrated consistency in the non-surgical structural re-establishment of cervical lordosis in symptomatic patients in several clinical trials. (25-27,34-37) CBP is a full-spine and posture rehabilitation approach to correct poor posture and deviation of normal spinal alignment through incorporating mirror image® exercises, spinal adjustments, and traction procedures. (10-12)

These trials (25-27,34-37) have demonstrated that in 30-60 treatments over 2.5-3.5 months, an improvement of up to 18° in cervical lordosis may be achieved. All

these trials were multimodal rehabilitation programs aimed at improving the cervical lordosis utilizing cervical extension traction methods as well as other manual procedures. Theoretically, as outlined by Oakley et al. (11) and clinically demonstrated in the case by Ferrantelli, (9) treatment of this nature may continue until the desired magnitude of cervical lordosis is re-established to WNL.

The fact that the long-term follow-up showed the patient was quite well despite having the cervical spine alignment values slightly regress, may indicate there may be a threshold of tolerance for the body. In other words, if there is more regression of these values, the patient's symptoms may again rise toward her initial symptomatic pain scores. It would be prudent now that she has given birth, to treat the patient more frequently to provide more correction to the cervical spine, as the patient only received 9 treatments over the 9.5 months following her initial intensive 15 weeks, where she received 36 treatments, which provided the initial correction to her posture. Also, the fact that she was pregnant between her 2 last assessments (5/20/16 - 3/4/17) may indicate that during pregnancy, due to hormones, the spine may have become loose and this may have resulted in the slight regression of her cervical posture, although the overall alignment still remained significantly better than how she initially presented (1/29/16).

The findings resulting from the treatment in this case are obviously limited by the fact it is only a single case. Another limitation is that multiple treatments were given to the patient. Exercise (38) as well as manipulation to the spine, (39-41) however, has not been proven to routinely correct structural spine alignment, and is most likely due to the extension orientation of the cervical traction that causes ligamentous creep deformation. (42)

CONCLUSION

Our case suggests that correcting cervical lordosis by Chiropractic BioPhysics methods, in those with late whiplash syndrome and cervical kyphosis, may alleviate the symptoms typically experienced by those suffering from previous whiplash.

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