



Case Study

Alleviation of neck pain by the non-surgical rehabilitation of a pathologic cervical kyphosis to a normal lordosis: a CBP[®] case report

ALYSSA K. DENNIS¹⁾, PAUL A. OAKLEY^{2)*}, MICHAEL T. WEINER¹⁾, TARA A. VANVRANKEN¹⁾, DAVID A. SHAPIRO¹⁾, DEED E. HARRISON³⁾

¹⁾ Private Practice, USA

²⁾ Private Practice: Newmarket, ON, L3Y 8Y8, Canada

³⁾ CBP NonProfit, Inc., USA

Abstract. [Purpose] To present a case of the therapeutic reversal of a cervical kyphosis into a lordosis in a patient who presented with neck pain and headaches. [Subject and Methods] A 24-year-old male irritated his neck while dancing. Upon examination it was revealed he had an excessive, 45 mm forward head translation and a 15° cervical kyphosis from C3–C6. The patient was treated with Chiropractic BioPhysics[®] methods aimed at restoring the cervical lordosis by mirror image[®], neck extension exercises, cervical extension traction, and spinal manipulative therapy. [Results] After two weeks of treatments the patient reported a complete resolution of neck pain. After 24 treatments over 10-weeks, a lateral radiograph demonstrated the restoration of a cervical lordosis and a complete reduction of forward head translation. [Conclusion] This case demonstrates that a cervical kyphosis may be reversed into a lordosis in as little as 10-weeks by specific care incorporating cervical extension protocols. This case also supports the biomechanical literature that suggests those with cervical kyphosis may be predisposed to spinal injury. We suggest that correcting even asymptomatic patients with obvious cervical spine deformity should be accomplished prior to future injury and/or degenerative changes.

Key words: Cervical kyphosis, Cervical lordosis, Cervical rehabilitation

(This article was submitted Jan. 7, 2018, and was accepted Jan. 29, 2018)

INTRODUCTION

The presentation of neck pain is common in clinical practice^{1, 2)} however, the treatment for neck pain remains controversial³⁾. Although treatment approaches may vary widely between manual therapists, the structural alignment of the cervical spine is becoming a well recognized pathognomonic feature of neck pain^{4, 5)}.

The alignment of the cervical spine influences its load-carrying capacity, and therefore, abnormal curves, such as hypolordosis or kyphosis will affect injury mechanics^{6, 7)}. This occurs as abnormal cervical spine alignments exert non-physiologic loads onto the associated soft tissues; injuries would be sustained during biomechanically traumatic insults (i.e. whiplash-type event) in non-neutral head and neck positions⁸⁾.

A recent non-surgical method for increasing the cervical lordosis has emerged and involves extension traction as a part of Chiropractic BioPhysics[®] (CBP[®]) methods. Evidence includes recent case reports^{9–11)}, non-randomized clinical trials^{12–14)} and randomized clinical trials^{15–19)}. In general, the evidence suggests an average increase in cervical lordosis of up to 18° with 30–40 treatments over 10–14 weeks with use of cervical extension traction as part of a multimodal rehabilitation program.

We present a case showing a reversal of pathologic cervical kyphosis to a lordosis over a 10-week period in a patient who presented with acute neck pain and headaches following a self-induced injury.

*Corresponding author. Paul A. Oakley (E-mail: docoakley.icc@gmail.com)

©2018 The Society of Physical Therapy Science. Published by IPEC Inc.



This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives (by-nc-nd) License. (CC-BY-NC-ND 4.0: <https://creativecommons.org/licenses/by-nc-nd/4.0/>)

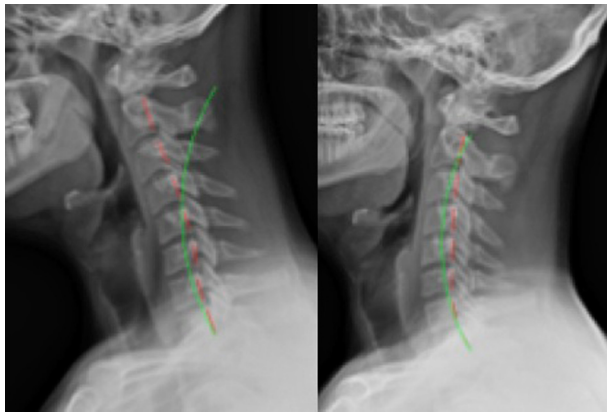


Fig. 1. Lateral cervical radiographs. Left: Initial (7/3/17) showing a $+14.8^\circ$ kyphosis between C3–C6, and an overall kyphotic C2–C7 ARA of $+3.0^\circ$. Right: Follow-up (9/19/17) showing an overall lordotic C2–C7 ARA of -18.6° (C3–C6 now -3.0°).



Fig. 2. Traction set-up.

SUBJECT AND METHODS

A 24-year-old male presented on July 3rd, 2017 complaining of neck pains and stated he had “messed his neck up” while dancing at a wedding. He reported severe and constant neck and upper back pain for 3 days. He also reported to suffer from headaches, difficulty sleeping and had a ‘sensitive stomach.’

Upon assessment, it was determined the patient had a generalized decrease neck range of motion with pain, positive shoulder compression and cervical compression tests, and cervical muscle weakness in flexion, extension and bilateral bending motions. The patient scored a 66% on the neck disability index (NDI)²⁰, which correlates to ‘complete disability.’ The NDI has ten sections scored out of five points (0=no difficulty; 5=worst disability), specifically the patient scored a 4/5 pain intensity, 1/5 personal care, 4/5 lifting, 4/5 reading, 0/5 headaches, 5/5 concentration, 3/5 work, 3/5 driving, 5/5 sleeping, and 4/5 recreation.

Cervical radiographs were taken and digitized using the PostureRay system (Trinity, FL, USA) that incorporates the Harrison posterior tangent method to measure intersegmental and global lateral spine angles of the cervical lordosis²¹. It also measures forward head translation as the horizontal distance between the superior-posterior C2 body to a vertical line drawn from the inferior-posterior C7 body corner⁴. These methods are repeatable and reliable as is standing posture^{21–23} (Fig. 1).

The patient demonstrated severe forward head translation (44.9 mm vs. 0–15 mm normal⁴), and had a global kyphosis (C2–C7 ARA= $+3.0^\circ$ vs. -31 – 42° normal^{4, 5, 24}) with a severe kyphosis between C3–C6 ($+14.8^\circ$) as seen on the lateral view. The antero-posterior cervical view demonstrated near perfect vertical alignment and was unremarkable.

The patient was treated with CBP technique to restore the cervical lordosis^{25, 26}. The patient was treated for 24 treatment sessions consisting of neck extension exercises, spinal manipulation and cervical extension traction. These methods have been well studied and are proven to increase the cervical spine curve^{12–19}.

The corrective exercises were performed using the Pro-lordotic neck exerciser (Circular Traction Supply Inc., Huntington Beach, CA, USA). The patient would perform 100 repetitions positioning the band low on the neck and first posteriorly translating their head and then extending their head and upper thoracic spine.

The traction set-up was performed on a Denneroll table (Denneroll Spinal Orthotics, Wheeler Heights, NSW, Australia) (Fig. 2). The patient was laying supine with a medium lumbar Denneroll placed at L1–L2, a small block was positioned behind the thorax, and a cervical Denneroll was placed at C7 with the head hanging off the end of the table with a head weight to extend the head posteriorly. The head weight was built up to 15 lbs over the initial few sessions. A strap was placed over chest and another at the femur heads to increase sacral base angle. Traction time was 15 minutes per session.

Spinal manipulative therapy was also performed for the cervical, thoracic, and lumbar spine each session. The patient gave verbal and provided written consent to the publication of these results including the radiographic images.

RESULTS

On September 19, 2017 a re-assessment was performed. The patient reported to be completely pain free within two weeks after receiving treatment, and remained so thereafter. All orthopaedic tests were unremarkable and he scored a 0% on the NDI. A lateral cervical radiograph demonstrated a dramatic reduction of forward head translation (-5.6 mm vs. $+44.9$ mm)

and a restoration of the cervical lordosis (C2–C7 ARA= -18.6° vs. $+3.0^\circ$). Of note, the excessive kyphosis between C3–C6 had become lordotic (-3.0° vs. $+14.8^\circ$).

DISCUSSION

This case illustrates the complete resolution of neck pain and restoration of cervical lordosis in a patient with mid-cervical kyphosis in 10-weeks.

Although the current patient had only had neck pain for 3 days, the cervical spine radiograph revealed a cervical kyphosis located at C3–C6. The patient reported ‘messing his neck up’ at a wedding while dancing. Since it is known that those with cervical misalignment who are subjected to trauma, for example, as in motor vehicle collisions are subject to more cervical spine damage^{6, 7}, it is assumed this patient was predisposed to injuring his neck. Although not a typical injury, dancing can be very vigorous, and a kyphotic cervical spine rapidly moving in various directions could easily exert stress and strains onto the soft tissues (i.e. facet joints, discs, muscles) causing sufficient micro-trauma to initiate an acute neck pain episode.

Despite a particular treatment, the course of acute neck pain has traditionally been assumed to be self-limiting, however, there is evidence that acute neck pain often leads to chronic neck pain²⁷. So despite our patient reporting neck pain relief after 2-weeks of treatment, care was continued to address the underlying cervical kyphotic deformity. Unfortunately, cervical kyphosis is often under-diagnosed, first, because many manual therapists do not take radiographs, and second, because medical radiologists erroneously state loss of lordosis is normal or completely omit cervical alignment information on radiology reports²⁸.

Another long-term consequence of cervical kyphosis deformity is osteoarthritis. It has been demonstrated that a cervical kyphosis exerts 6–10 times the stresses onto the vertebral bodies versus when in the normal lordotic position²⁹. This becomes the source of how degenerative changes may occur over the long-term via Wolff’s Law^{30, 31}. It becomes obvious that the correction of a cervical kyphosis deformity should be a goal of treatment if diagnosed, regardless of initial complaint.

Limitations to this case include this being only a single patient, as well as there is no long-term follow-up. Multiple treatments were performed to rehabilitate the cervical lordosis, thus it is not known exactly which of the treatments (manipulations, exercises, or traction procedures) contributed to the correction of the cervical lordosis. However, other studies have substantiated that although exercises and manipulation have their benefits, the extension traction to the cervical spine results in the correction of the lordosis^{15–19}. Future studies should seek to ascertain differences between correcting versus monitoring long-term follow-up of patients with cervical kyphosis.

Conflict of interest

PAO is paid by CBP NonProfit for writing the manuscript; DEH teaches chiropractic rehabilitation methods and sells products to physicians for patient care used in this manuscript.

REFERENCES

- 1) Coulter ID, Hurwitz EL, Adams AH, et al.: Patients using chiropractors in North America: who are they, and why are they in chiropractic care? *Spine*, 2002, 27: 291–296, discussion 297–298. [[Medline](#)] [[CrossRef](#)]
- 2) Dagenais S, Haldeman S: Chiropractic. *Prim Care*, 2002, 29: 419–437. [[Medline](#)] [[CrossRef](#)]
- 3) Rao R: Neck pain, cervical radiculopathy, and cervical myelopathy: pathophysiology, natural history, and clinical evaluation. *Instr Course Lect*, 2003, 52: 479–488. [[Medline](#)]
- 4) Harrison DD, Harrison DE, Janik TJ, et al.: Modeling of the sagittal cervical spine as a method to discriminate hypolordosis: results of elliptical and circular modeling in 72 asymptomatic subjects, 52 acute neck pain subjects, and 70 chronic neck pain subjects. *Spine*, 2004, 29: 2485–2492. [[Medline](#)] [[CrossRef](#)]
- 5) McAviney J, Schulz D, Bock R, et al.: Determining the relationship between cervical lordosis and neck complaints. *J Manipulative Physiol Ther*, 2005, 28: 187–193. [[Medline](#)] [[CrossRef](#)]
- 6) Stemper BD, Yoganandan N, Pintar FA: Effects of abnormal posture on capsular ligament elongations in a computational model subjected to whiplash loading. *J Biomech*, 2005, 38: 1313–1323. [[Medline](#)] [[CrossRef](#)]
- 7) Maiman DJ, Yoganandan N, Pintar FA: Preinjury cervical alignment affecting spinal trauma. *J Neurosurg*, 2002, 97: 57–62. [[Medline](#)]
- 8) Penning L: Acceleration injury of the cervical spine by hypertranslation of the head. Part II. Effect of hypertranslation of the head on cervical spine motion: discussion of literature data. *Eur Spine J*, 1992, 1: 13–19. [[Medline](#)] [[CrossRef](#)]
- 9) Fedorchuk C, Lightstone DF, Andino H: Failed neck surgery: improvement in neck pain, migraines, energy levels, and performance of activities of daily living following subluxation correction using Chiropractic BioPhysics® technique: a case study. *Ann Vert Sublux Res*, 2017, 1–2: 93–100.
- 10) Fedorchuk C, Lightstone DF, McCoy M, et al.: Increased telomere length and improvements in dysautonomia, quality of life, and neck and back pain following correction of sagittal cervical alignment using Chiropractic BioPhysics® technique: a case study. *J Mol Genet Med*, 2017, 11: 1–5.
- 11) Oakley PA, Harrison DE: Restoration of barefoot gait in a 75-year old female with cervical spondylotic myelopathy: a case report utilizing chiropractic biophysics (CBP®) technique. *Chiropr J Aust*, 2017, 45: 16–27.
- 12) Harrison DE, Harrison DD, Betz JJ, et al.: Increasing the cervical lordosis with chiropractic biophysics seated combined extension-compression and transverse load cervical traction with cervical manipulation: nonrandomized clinical control trial. *J Manipulative Physiol Ther*, 2003, 26: 139–151. [[Medline](#)] [[CrossRef](#)]
- 13) Harrison DE, Cailliet R, Harrison DD, et al.: A new 3-point bending traction method for restoring cervical lordosis and cervical manipulation: a nonrandom-

- ized clinical controlled trial. *Arch Phys Med Rehabil*, 2002, 83: 447–453. [[Medline](#)] [[CrossRef](#)]
- 14) Harrison DD, Jackson BL, Troyanovich S, et al.: The efficacy of cervical extension-compression traction combined with diversified manipulation and drop table adjustments in the rehabilitation of cervical lordosis: a pilot study. *J Manipulative Physiol Ther*, 1994, 17: 454–464. [[Medline](#)]
 - 15) Moustafa IM, Diab AA, Hegazy FA, et al.: Does rehabilitation of cervical lordosis influence sagittal cervical spine flexion extension kinematics in cervical spondylotic radiculopathy subjects? *J Back Musculoskeletal Rehabil*, 2017, 30: 937–941. [[Medline](#)] [[CrossRef](#)]
 - 16) Moustafa IM, Diab AA, Taha S, et al.: Addition of a sagittal cervical posture corrective orthotic device to a multimodal rehabilitation program improves short- and long-term outcomes in patients with discogenic cervical radiculopathy. *Arch Phys Med Rehabil*, 2016, 97: 2034–2044. [[Medline](#)] [[CrossRef](#)]
 - 17) Moustafa IM, Diab AA, Harrison DE: The effect of normalizing the sagittal cervical configuration on dizziness, neck pain, and cervicocephalic kinesthetic sensibility: a 1-year randomized controlled study. *Eur J Phys Rehabil Med*, 2017, 53: 57–71. [[Medline](#)]
 - 18) Moustafa IM, Diab AA, Harrison DE: Does improvement towards a normal cervical sagittal configuration aid in the management of lumbosacral radiculopathy: a randomized controlled trial. Proceedings from the 13th biennial congress of the World Federation of Chiropractic, Athens, Greece, May 13–16, 2015, p 138.
 - 19) Moustafa IM, Diab AM, Ahmed A, et al.: The efficacy of cervical lordosis rehabilitation for nerve root function, pain, and segmental motion in cervical spondylotic radiculopathy. *Physiotherapy*, 2011, 97: S846–S847.
 - 20) Vernon H, Mior S: The Neck Disability Index: a study of reliability and validity. *J Manipulative Physiol Ther*, 1991, 14: 409–415. [[Medline](#)]
 - 21) Harrison DE, Harrison DD, Cailliet R, et al.: Cobb method or Harrison posterior tangent method: which to choose for lateral cervical radiographic analysis. *Spine*, 2000, 25: 2072–2078. [[Medline](#)] [[CrossRef](#)]
 - 22) Harrison DE, Holland B, Harrison DD, et al.: Further reliability analysis of the Harrison radiographic line-drawing methods: crossed ICCs for lateral posterior tangents and modified Risser-Ferguson method on AP views. *J Manipulative Physiol Ther*, 2002, 25: 93–98. [[Medline](#)] [[CrossRef](#)]
 - 23) Harrison DE, Harrison DD, Colloca CJ, et al.: Repeatability over time of posture, radiograph positioning, and radiograph line drawing: an analysis of six control groups. *J Manipulative Physiol Ther*, 2003, 26: 87–98. [[Medline](#)] [[CrossRef](#)]
 - 24) Harrison DD, Janik TJ, Troyanovich SJ, et al.: Comparisons of lordotic cervical spine curvatures to a theoretical ideal model of the static sagittal cervical spine. *Spine*, 1996, 21: 667–675. [[Medline](#)] [[CrossRef](#)]
 - 25) Harrison DD, Janik TJ, Harrison GR, et al.: Chiropractic biophysics technique: a linear algebra approach to posture in chiropractic. *J Manipulative Physiol Ther*, 1996, 19: 525–535. [[Medline](#)]
 - 26) Oakley PA, Harrison DD, Harrison DE, et al.: Evidence-based protocol for structural rehabilitation of the spine and posture: review of clinical biomechanics of posture (CBP) publications. *J Can Chiropr Assoc*, 2005, 49: 270–296. [[Medline](#)]
 - 27) Mäkelä M, Heliövaara M, Sievers K, et al.: Prevalence, determinants, and consequences of chronic neck pain in Finland. *Am J Epidemiol*, 1991, 134: 1356–1367. [[Medline](#)] [[CrossRef](#)]
 - 28) Oakley P, Sanchez L, Kim G, et al.: A comparison of subjective qualitative assessment of cervical alignment vs. objective quantitative mensuration: how do medical radiologists fare? Proceedings from the 13th biennial congress of the World Federation of Chiropractic, Athens, Greece, May 13–16, 2015, p 161–162.
 - 29) Harrison DE, Harrison DD, Janik TJ, et al.: Comparison of axial and flexural stresses in lordosis and three buckled configurations of the cervical spine. *Clin Biomech (Bristol, Avon)*, 2001, 16: 276–284. [[Medline](#)] [[CrossRef](#)]
 - 30) Frost HM: Wolff's Law and bone's structural adaptations to mechanical usage: an overview for clinicians. *Angle Orthod*, 1994, 64: 175–188. [[Medline](#)]
 - 31) Frost HM: A 2003 update of bone physiology and Wolff's Law for clinicians. *Angle Orthod*, 2004, 74: 3–15. [[Medline](#)]