

8

Resolution of Chronic Whiplash Associated Neck Pain and Disability Resulting from a Motor Vehicle Crash Following Correction of Sagittal Cervical Spinal Alignment and Posture Using Chiropractic BioPhysics® Structural Spinal Rehabilitation: A Case Series

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Abstract

Objective: To present a case series documenting resolution of chronic whiplash associated neck pain (NP) and disability resulting from a motor vehicle crash (MVC) following correction of sagittal cervical spinal alignment and posture using Chiropractic BioPhysics® (CBP®) structural spinal rehabilitation in 7 patients.

Clinical Features: Seven adult patients (4 female and 3 male) between the ages of 33 and 67 years with a mean age of 43.0 ± 10.3 years (95% CI), height of 173.5 ± 5.7 kg, and weight of 97.2 ± 13.3 presented to a chiropractic practice with a history of a whiplash associated NP and disability resulting from a MVC and lasting between 6 and 9 months. No patient was included with less than 3 months of NP and disability or significant disability that required alternative management than that described in this study. The selection was based on a clinical examination indicating NP and disability using outcome assessments and spinal alignment and posture findings using plain radiography of the spine. Whiplash associated pain and disability lasting 3 months or longer is considered chronic [1]. Little recovery is expected to occur outside of 3 months following a MVC [2]. All initial exam findings were obtained after 3 months or longer of neck pain and disability.

Using a numeric rating system (NRS) to document pain on a scale of 0 to 10 where 0 is no pain and 10 is maximum pain, the patients rated their neck pain at initial and final exams. The mean initial NRS score was 5.7 ± 1.6 . The patients completed a neck disability index (NDI) questionnaire used to determine how neck pain affects a patient's daily life and to assess self-rated NP disability. The mean initial NDI score was $34.9 \pm 16.8\%$ indicating moderate disability due to neck pain (Table 1).

Spinal alignment and posture findings were assessed using plain radiography of the spine. Initial radiographic examination and analysis revealed decreased sagittal curvatures of the cervical spine from C2 to C7 (ARA C2-C7) with a mean measurement of $-13.3 \pm 8.6^\circ$ (ideal is -42°) and anterior translation of C2 with respect to C7 (+Tz C2-C7) with a mean measurement of 21.1 ± 4.3 mm (ideal is 0 mm) (Figures 1A and 2A, Table 1).

Intervention and Outcomes: The patients were treated over a range of 36 to 90 in-office visits with a mean of 58.1 ± 18.0 in-office visits using CBP® technique protocols consisting of Mirror Image® chiropractic spinal adjustments, exercises, and corrective traction. The Mirror Image® adjustments involved adjusting the patient with their neck in an extended position to account for the loss in cervical curvature. Mirror Image® traction was performed using a Cervical Denneroll™ (Denneroll™ Spinal Orthotics, New South Wales, Australia) to restore cervical extension (Figure 3). Mirror Image® exercises were performed including neck extension exercises using a Pro-Lordotic Neck Exerciser for spinal stability (Figure 4). The patient was prescribed a Cervical Denneroll™ for home Mirror Image® traction as well in which the patient would lie supine with Cervical Denneroll™ Spinal Orthotic for cervical spine correction.

Final outcome assessments revealed improved NRS scores with a mean of 0.7 ± 0.7 and improved NDI scores with a mean of $4.6 \pm 6.0\%$ indicating minimal or resolved disability due to neck pain. Six of 7 patients saw NDI improvements that meet the minimally clinically important difference (MCID) that reflects the change in an outcome which a patient would identify as meaningful or important. The other patient saw complete resolution of his NDI from 12% to 0% (Table 1). Final radiographic examination revealed improved ARA C2-C7 with a mean measurement of $-23.2 \pm 7.6^\circ$ (9.9° improvement) and improved +Tz C2-C7 with a mean measurement of 14.1 ± 4.8 mm (7.0 mm improvement) (Figures 1B and 2B, Table 1).

Conclusions: This case series shows that using CBP® corrective chiropractic technique to restore normal sagittal cervical spinal alignment and posture can result in resolved chronic whiplash associated neck pain and disability of 3 months or longer. There is limited research demonstrating resolution of chronic pain and disability in patients with chronic whiplash associated disorders (WAD) after 3 months. More research is needed to investigate the implications of CBP® structural spinal rehabilitation for patients with chronic WAD and who have failed rehabilitation programs without a focus on spinal alignment and posture.

References

1. Treede RD, Rief W, Barke A, Aziz Q, Bennett MI, Benoliel R, et al. A classification of chronic pain for ICD-11. *Pain*. 2015 Jun;156(6):1003-7.
2. Ritchie C, Sterling M. Recovery Pathways and Prognosis After Whiplash Injury. *J Orthop Sports Phys Ther*. 2016 Oct;46(10):851-61.

Table 1. Initial and Final Spinal Alignment and Posture Measurements and Neck Pain and Disability Outcome Measures

Patient	Spinal Alignment and Posture Measurements				Neck Pain and Disability Outcome Measures			
	Initial ARA C2-C7 (°)	Final ARA C2-C7 (°)	Initial Tz C2-C7 (mm)	Final Tz C2-C7 (mm)	Initial Neck Pain (NRS)	Final Neck Pain (NRS)	Initial Neck Disability (NDI %)	Final Neck Disability (NDI %)
1	-5.5	-19.2	19.1	6.2	7	0	34	6
2	-29.4	-36.1	17.2	10.1	3	0	12	0
3	-13.3	-16.3	22.1	15.3	7	1	48	6
4	-6.4	-16.9	18.1	13.2	5	1	26	0
5	-9.6	-33.2	30.2	18.4	5	0	30	2
6	-6.4	-16.9	18.1	13.2	5	1	26	0
7	-22.6	-23.6	23.0	22.0	8	2	68	18
Average	-13.3	-23.2	21.1	14.1	5.7	0.7	34.9	4.6
\pm 95% CI	8.6	7.6	4.3	4.8	1.6	0.7	16.8	6.0

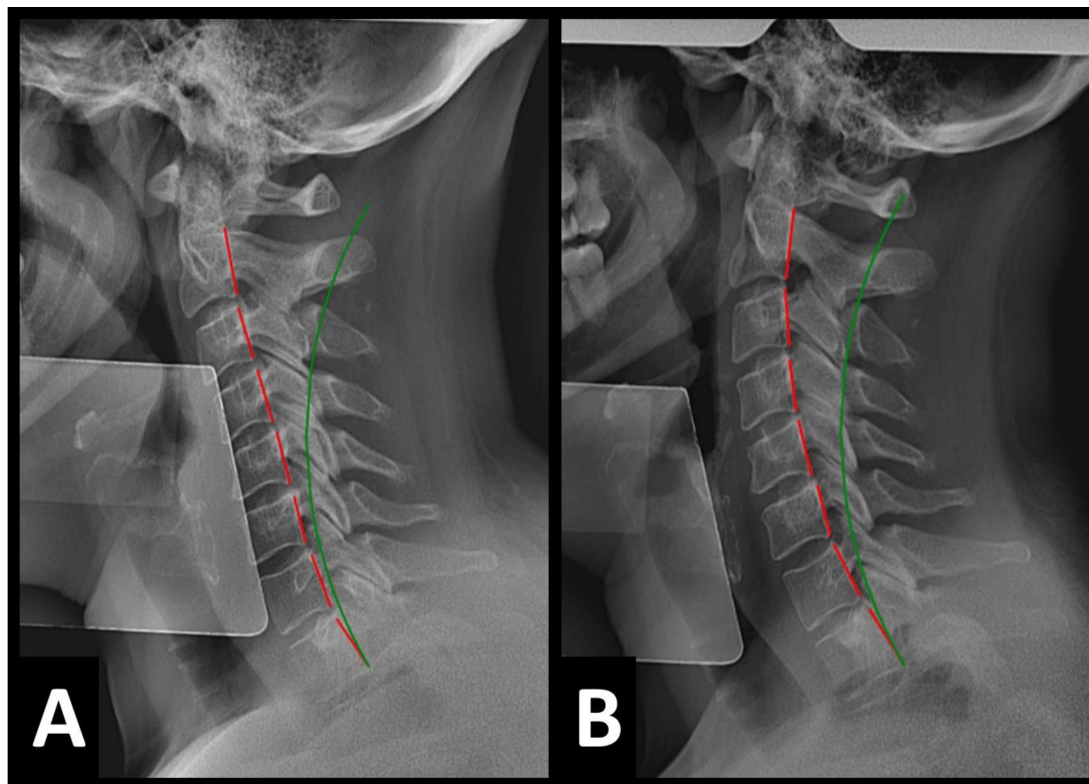
Figure 1A-B. Initial and Final Neutral Lateral Cervical Radiographs Example 1

Image Features: The green line represents a normal, ideal sagittal cervical spinal alignment. The red line represents the actual posterior tangent lines of the C2-T1 vertebrae.

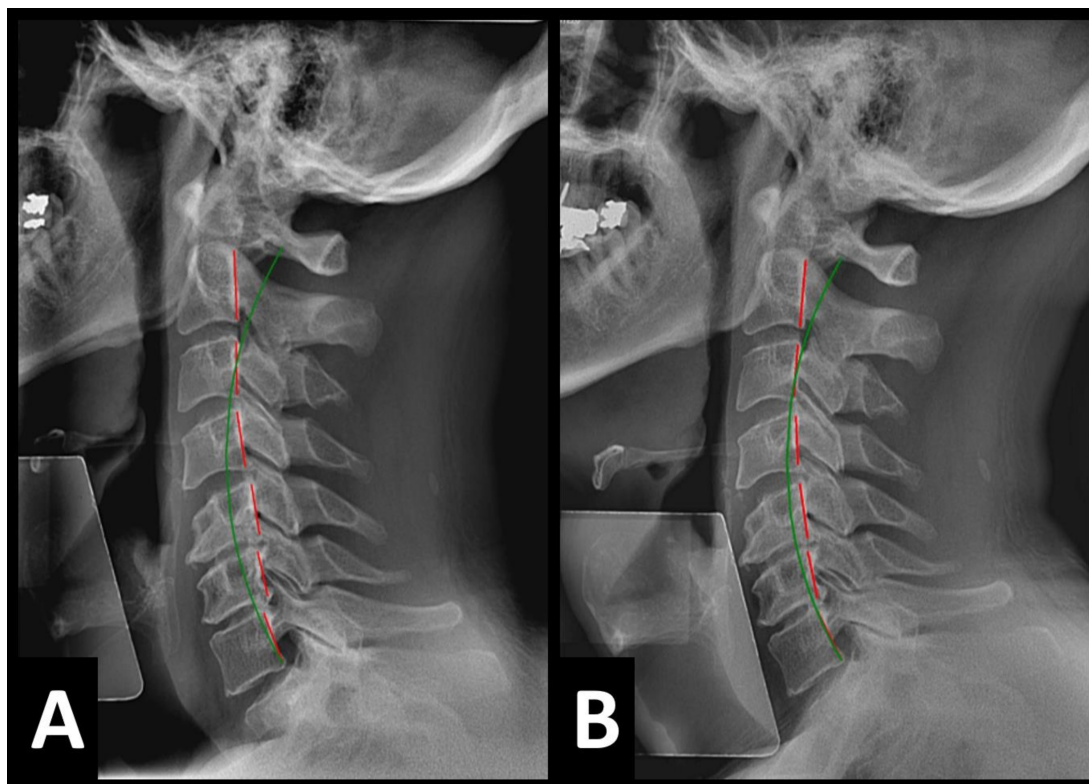
Figure 2A-B. Initial and Final Neutral Lateral Cervical Radiographs Example 2

Image Features: The green line represents a normal, ideal sagittal cervical spinal alignment. The red line represents the actual posterior tangent lines of the C2-T1 vertebrae.

Figure 3. Effects of Cervical Denneroll™ Spinal Orthotic on NLC Radiographs

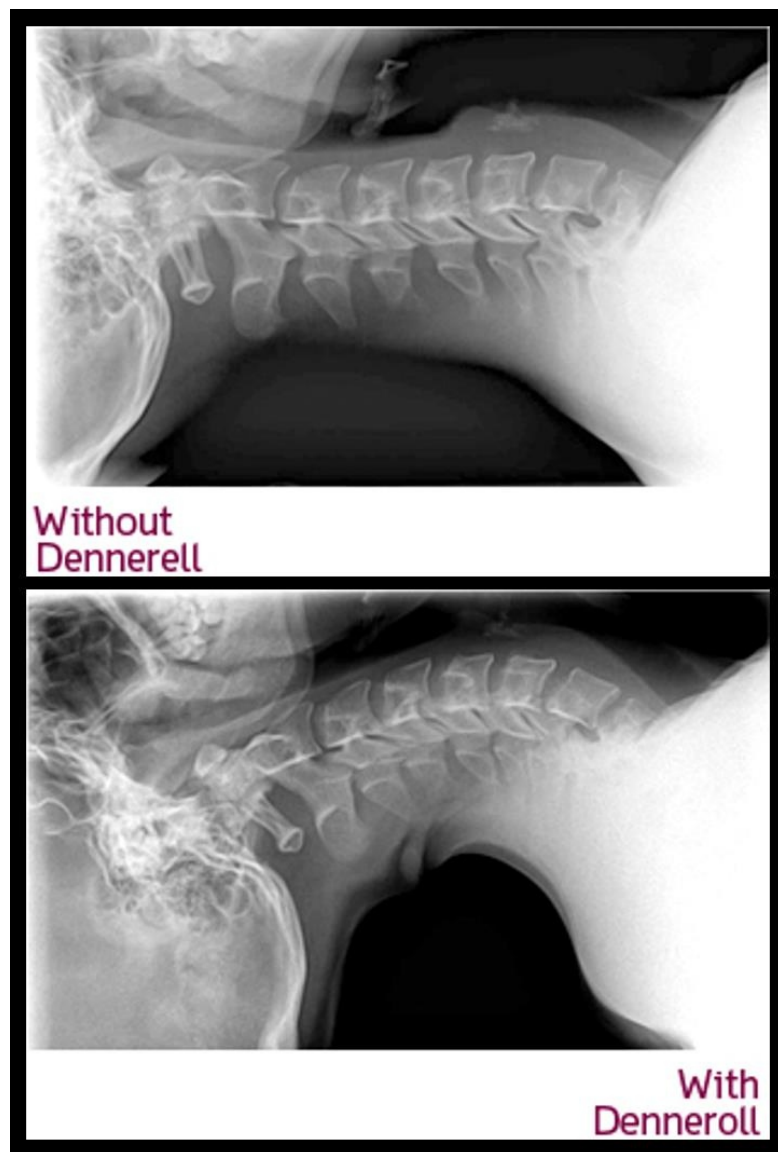


Figure 4. Pro-Lordotic Neck Exerciser

