



Case Study

## Alleviation of pain and disability in a post-surgical C4–C7 total fusion patient after reducing a lateral head translation (side shift) posture: a CBP<sup>®</sup> case report with a 14 year follow-up

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**Abstract.** [Purpose] This case describes the long-term successful outcome in a chronic neck pain patient given Chiropractic Biophysics<sup>®</sup> treatment 14 years previously, and following surgical fusion of C4–C7 as performed 6.5 years prior to initial presentation. [Participant and Methods] The 56-year-old female had a severe right head translation (side shift) posture and surgical fusion of C4–7 with concomitant head and neck symptoms, high pain and neck disability scores, and low health-related quality of life scores. The patient was treated by Chiropractic BioPhysics methods in an attempt to restore the head and neck posture back towards vertical alignment by mirror image<sup>®</sup> (opposite posture positioning) exercises, adjustments and traction. [Results] The patient received 25 treatments over the course of 11 days due to special circumstances. Initial treatment resulted in a 50% improvement of posture, a marked improvement in health status and a near complete resolution of pain. Follow-up examinations at 7.5 years, 11.5 years, and 14 years, revealed the patient had lived a virtual pain-free life since those initial treatments. [Conclusion] This case illustrates what has previously been suggested in the literature, that lateral head translation postures can be overlooked and undiagnosed and these postures may play a significant role in the production of neck pain, headaches, and related disability.

**Key words:** Lateral head translation, Post-surgical rehabilitation, Neck pain

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### INTRODUCTION

Neck pain is second only to low back pain as being the most common musculoskeletal complaint<sup>1)</sup> and is a top complaint leading patients to seek spinal manipulative therapies<sup>2)</sup>. A recent study found the one-year prevalence rate of neck pain to be 68%, and that neck pain is even more prevalent in those with headaches, having a prevalence rate of 86%<sup>3)</sup>. Although not commonplace, manual therapists are sometimes faced with treating patients presenting with history of significant surgical procedures performed within the cervical spine concomitant with cervical signs and symptoms. Often, standardized cervical spine manipulation may not be an option for treatment, as in the case of total intervertebral fusion spanning several vertebral levels.

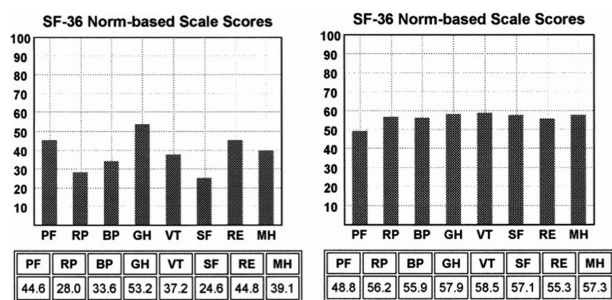
This report describes the initial, and a 14 year follow-up of the successful outcome in a patient suffering from chronic neck pain and migraines following C4–C7 surgical fusion as treated by Chiropractic BioPhysics<sup>®</sup> (CBP<sup>®</sup>) structural rehabilitation methods.

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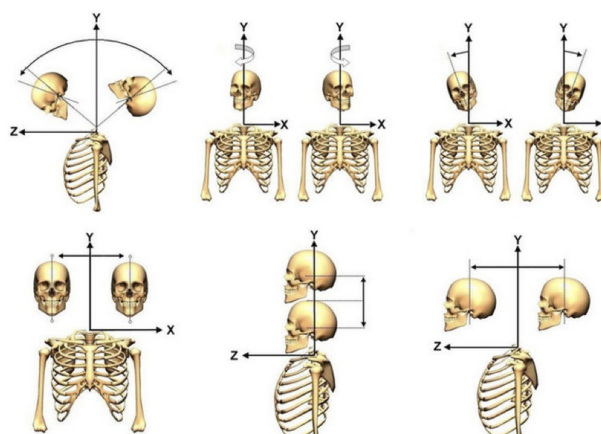


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**Fig. 1.** Norm-based SF-36 scale scores.

Left: Dec. 7, 2003; Right: Dec. 19, 2003. Norm-based scale scores are scored to have the same mean (50) and Standard Deviation (10). Any score below 50 indicates a health status scale that is below average. Note the clinically significant increases in Social Functioning (SF), Role-Physical (RP), Bodily Pain (BP), Vitality (VT) and Mental Health (MH) scales after treatment. PF=Physical Function, GH=General Health, RE=Role-Emotional. Not shown are the clinically significant improvements in both the Physical Component Summary (PCS) and Mental Component Summary (MCS) scores that occurred (PCS=36.5 vs. 51.5 after; MCS=38.6 vs. 58.9 after; 50 indicates average).



**Fig. 2.** Harrison's rotations and translations of the head.

Top: Rotations of the head about the x, y, and z-axes; Bottom: Translations of the head along the x, y, and z-axes. (The same can be described for the thorax in relation to the pelvis, and the pelvis in relation to the feet).

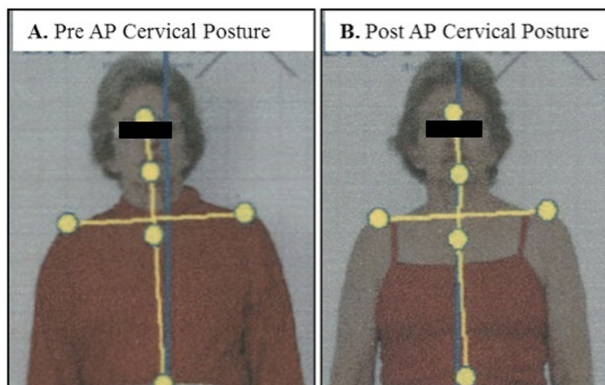
## PARTICIPANT AND METHODS

A 56-year-old female patient suffered from chronic neck pain following total fusion surgery of C4–C7 in May of 1997. A surgery was performed following an occupational injury where the patient, on sudden head rotation, heard a 'crack' and had an instant onset of pain. A Magnetic Resonance (MR) evaluation was performed and the report dated April 4, 1996 describes a congenital block vertebra of C5–6 and a reversal of the normal cervical lordosis centered at the C4–5 level. Following surgery, the patient had been prescribed considerable dosages of a variety of pain medications, and over the subsequent years had become reliant on these medications for pain relief. At presentation to one of the author's chiropractic clinic (DEH), the patient had been and was currently taking multiple medications: Tylenol 4 (acetaminophen and codeine) and Duragesic (narcotic analgesic) for pain control, Amerge (antimigraine), Desipramine and Amitriptyline (tricyclic antidepressants), Metoclopramide (antiemetic), and Zanaflex (muscle relaxant). The patient reported that she had been on Oxycontin (narcotic analgesic) for a limited time but requested to revert back to Duragesic for treating her pain as she had heard negative news about Oxycontin and her family did not want her to continue using the addictive substance.

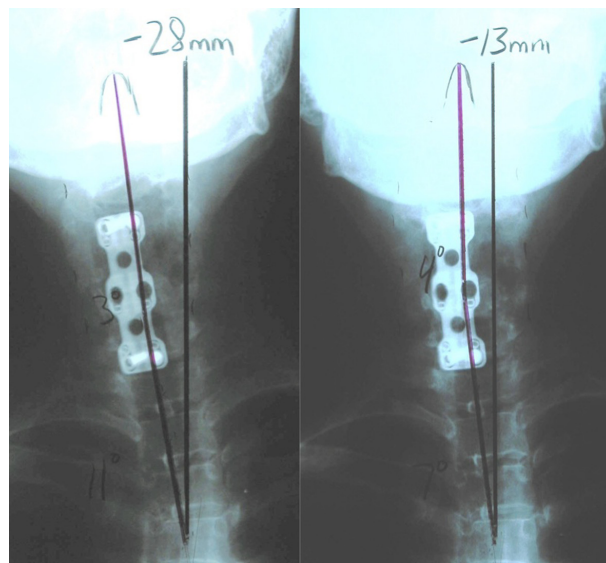
At her initial examination (Dec. 7, 2003), the patient presented with chronic neck pain and regular left arm numbness/ache (frequency of one time per day) as well as migraines (frequency of one time per week). The neck pain was rated as a 6/10 on a numerical rating scale (NRS, 0=no pain; 10=worst possible pain) at the time of the exam, a 3/10 at its best, a 9/10 at its worst, and a 3–4/10 on average. The neck pain was described as burning, aggravated by sneezing and lifting, and somewhat relieved by lying down and the application of heat. The patient also complained of left foot pain described as tingling and sharp pain brought on by excessive walking that was relieved by rest. Cervical range of motion was limited in all directions and produced a 'pulling' sensation in all motions. Muscle strength testing was normal as were reflexes. Maximal cervical compression to the right revealed neck pain on the left, while cervical distraction and Soto Hall tests produced bilateral neck pain. All other orthopedic tests were unremarkable.

Palpation of the spine revealed severe tenderness throughout the neck bilaterally. The Neck Disability Index (NDI) was administered and indicated the patient had a 'severe' (64%) disability due to her neck complaints. The short form-36 questionnaire (SF-36) revealed that the patient had significant and detrimental physical and mental health effects (Fig. 1). A posture evaluation was performed and evaluated as rotations and translations of the head, thorax and pelvis after Harrison<sup>4)</sup> (Fig. 2). Several abnormal postures were identified including: forward head translation, right head translation, right head tilt, forward thoracic translation, high left shoulder, a thorax rotation, and a pelvic rotation. Figure 3 depicts the initial front view head and thoracic postures.

Radiographic evaluation confirmed total fusion (iatrogenic block vertebrae) ranging from C4–7. There were also significant degenerative changes in the adjacent levels of C3–4 and C7–T1. The block fusion was straight in alignment, contributing to an overall reduced cervical lordosis and slight anterior head carriage. The anterior to posterior (AP) cervico-thoracic radiograph revealed a significant right lateral head shift of 28 mm with a mid-neck (cervico-dorsal or CD) angle of 3° and tilt angle of the lower neck and upper thoracic vertebra to vertical (rotation on the z-axis or Rz) of 11° to the right side of vertical (Fig. 4).



**Fig. 3.** Posture pictures.  
A. Dec. 7, 2003; B. Dec. 19, 2003. Notice the significant reduction of right head shift and tilt after treatment.



**Fig. 4.** Antero-posterior cervico-thoracic radiographs.  
Left: Initial (Dec. 7, 2003); Right: 11-day follow-up (Dec. 19, 2003). Note the surgical plate and hardware evident resulting from the total fusion of C4–C7, 6.5 years previous. The horizontal translation distance from the tip of the dens to the vertical axis line (VAL) originating from the estimated center of mass (COM) of the 4th dorsal vertebra is 28 mm right of midline before, and 13 mm right of midline after care. Note the congruence between patient x-ray and posture (Fig. 2). The Rz angle is the angle between the best fit line of the estimated COM of the lower vertebrae with the VAL; the CD angle is the angle between the best fit line of the estimated COM of the lower versus the upper vertebrae seen on the view.

The patient was put on CBP protocol utilizing mirror-image adjustments, exercises, and traction procedures<sup>5, 6</sup>. Figures 5 and 6 demonstrate the CBP mirror-image exercises and traction interventions, respectively. Regarding the patient's abnormal postures as aforementioned, mirror-image adjustments were performed on an OMNI drop table and by an electromechanical hand-held instrument. Clinically, the lateral head translation posture was chosen as the major posture to be targeted with the full CBP protocol including mirror-image exercises, and traction procedures as well as the postural adjustments. Mirror image lateral head translation drop table adjustments were performed with the patient laying on her left side, and the table headpiece was cocked; a pre-stress would be applied and with continued pressure the patient's head and neck would drop slightly, resulting in the stimulation of cervical spine mechanoreceptors (Fig. 7).

The patient began CBP structural rehabilitation from the first visit. Due to the time constraints of only a 2-week window of opportunity for treatment as the patient travelled from Toronto, Ontario to Elko, Nevada for a limited stay (arrived Dec. 6, 2003–departed Dec. 19, 2003), treatment sessions ranged from two to four per day for 11 days (Dec. 8, 2003–Dec. 19, 2003). At the end of this time a complete re-examination was performed including: an AP cervico-thoracic x-ray, posture analysis, orthopedic tests, NRS pain questionnaire and completion of the NDI and SF-36 questionnaires; all performed (Dec. 19, 2003). The initial exam was performed on Dec. 7, 2003.

Treatment sessions began with left-sided mirror image head translation exercises introduced after the second day (Fig. 5). Initially, 10 repetitions were performed increasing to 50 after the next several sessions, where the end position opposite posture was held for a 5–10 second contraction duration. Spinal manipulation of the cervical spine was not performed due to both it not being possible within the fused segments (C4–7), and the patient preferred not to get the upper cervical spine manipulated. Manipulation was performed in the low and mid back. Sustained cervical traction consisted of left translation (side-shift) traction of the head relative to the thorax (originated by Robert Berry, Montour Falls, NY, USA)<sup>7</sup>. The patient sat in a unit where her torso was secured into a bracing section and the head clamped into a separate section. The head was then slid laterally to the left as far as the patient could tolerate (Fig. 6). Every three to five minutes following relaxation and stretching of the connective tissues, the translation was increased to patient tolerance. Traction durations began with five minutes, progressing to 20 minutes to achieve maximum musculo-ligamentous creep<sup>8</sup>. The patient gave verbal and written consent to the publication of these results including all posture and radiographic images.



**Fig. 5.** Mirror image head translation exercise.

The patient translated her head to the left holding for 5–10 seconds. The patient began with 10 repetitions and progressed to 50 per session and on a daily basis during the initial treatment period.



**Fig. 6.** Lateral head translation traction. The patient was placed in the supine position and two straps held her snug and secured her rib cage. The head is held in place by two padded restraints. The table allows the ribcage to be fixed and then the head and cervical spine were translated to the left or opposite the patient's presenting right translation cervical spine posture. The time began with 3 minutes and progressed to twenty minutes over a period of several visits, never exceeding patient tolerance.



**Fig. 7.** A left lateral head translation drop table adjustment.

Pre-stressing the head to the left of mid-line; downward pressure engages the drop mechanism causing a mirror image head translation and stimulation of the cervical spine mechanoreceptors.

## RESULTS

After 11 days of treatment that included 25 complete treatment sessions, a re-exam was performed (Dec. 19, 2003) 24 hours after the last treatment (Dec. 18, 2003); in other words the patient had not been treated for a 24-hour time period prior to the re-exam. Here, the patient's chief complaint was neck pain, mild in severity being present only 10% of the time, and rated as a 1/10 (NRS). The pain was now described as 'tightness' being a 0/10 on average and at its best, and a 2/10 at its worst. Patient reported relieving factors included mirror-image head/neck adjustments and traction, as well as ice and heat. Aggravating factors included lifting. The patient reported having one headache during the course of treatment, though it was not a migraine. Cervical range of motion was decreased in bilateral rotation and extension, with a 'pulling' being noted on left rotation. Maximal cervical compression to the right revealed neck pain on the left, while cervical distraction produced bilateral neck pain. All other orthopedic tests were unremarkable.

Palpation revealed bilateral neck pain localized to the neck not including the upper shoulders. The NDI score revealed a 'mild' (12%) disability, and the SF-36 revealed significant improvements in several scales of both physical and mental health; notably in order of greater improvements: Social Functioning, Role Physical, Bodily Pain, Vitality, and Mental Health (Fig. 1). SF-36 also revealed significant improvements in both the Physical and Mental Component Summary scores (PCS=36.5 vs. 51.5 after; MCS=38.6 vs. 58.9 after; 50 indicates average). Follow-up AP cervico-thoracic radiographs showed an approximate 50% improvement (13 mm right head translation; decreased CD and Rz angles) (Fig. 4). Follow-up posture examination confirmed this improvement in right head translation (Fig. 3). Throughout the course of treatment, the patient self reduced her pain medication usage significantly; in fact, by the end of the treatment duration (11 days), she indicated that she had stopped taking all pain, headache and muscle relaxant medications.

Upon returning to Canada, she sought out a Chiropractor practicing CBP technique (PAO) and continued to get occasional treatments of an identical nature as described above (Figs. 5–7). She was first evaluated at the new clinic on April 14, 2004 with identical orthopedic results as her last check-up, four months previously (Dec. 19, 2003). She received 72 treatments between April 15, 2004 and May 5, 2005, averaging about 5–6 treatments per month.

The patient was not seen again until August 16, 2005 (3 months later) when she was assessed after having a fall. Although having mild neck pains and a sensation of numbness in the left hand on the day following her fall, she did not receive any treatment.

On August 9, 2011 the patient was contacted and asked to come in for a long-term follow-up assessment. She did and was examined on August 10, 2011, 6 years since her last exam, and over 7.5 years since first receiving CBP care initially in

Elko, NV. The patient reported to be very well with her only complaint being an inability to extend her head backward. She reported her neck did not bother her, and only on the odd occasion when she 'over does it' with lifting and turning quickly. At most her neck was rated as 1/10, on average 0/10. She reports getting headaches about 2×/month lasting a couple hours at a time and not being migraines as she used to suffer. Cervical range of motion was reduced in extension, lateral bending and rotation, where 'pulling' was reported on the left with left rotation. Muscle strength testing was normal as was reflexes. All other orthopedic tests were unremarkable. The only medication she reported as currently taking was Actonel (generic name: Risedronate sodium), which is used for treating and preventing bone loss.

Palpation of the spine revealed tightness on the left. The NDI indicated a 'mild' (14%) disability due to her neck. SF-36 revealed that the patient had average to above average physical and mental health. Posture evaluation<sup>3)</sup> revealed the following: mild forward head translation, right head translation (Fig. 3), high left shoulder and mild thorax and pelvic rotations.

On May 24, 2015 the patient was again contacted and came in for an assessment almost 4 years since the last long-term follow-up assessment, and 11.5 years since she had first been seen in Elko, Nevada prior to any treatment. The patient again reported to be very well with only a new complaint of a recent right shoulder pain and stiffness due to gardening. She reported that she still had an inability to extend her head backward, but that it did not bother her unless she 'over did it' while doing physical things like lifting. She rated her neck pain as 0/10 on average, and at most 3/10, but very seldom. She reported getting headaches about 2 times/month, but were not migraines. Cervical range of motion was reduced in extension, lateral bending and rotation. All other orthopedic tests were normal. She reported being on two medications, Effexor (anti-depressant) since her sister died recently, and Prolea for treating and preventing bone loss.

Palpation of the spine revealed tightness on the right neck. The NDI indicated a 'mild' (20%) disability due to her neck. SF-36 revealed that the patient had average to above average physical and mental health. Posture evaluation revealed the same mild postural misalignments as last assessment.

On January 9, 2018, a 14 year follow-up assessment was performed. She reported to not have neck pain or headaches except for on the very odd occasion; any headache she might get was not a migraine and would be after 'over-doing it' while sewing or knitting. The patient reported to have a new complaint unrelated to her previous neck issues, sciatic pains that travelled down the right leg. She was getting pain relief from acupuncture treatments for this new ailment. Upon assessment, she demonstrated some loss of cervical range of motion in all directions and 'felt it' in the neck during left and right rotation. She reported that her neck pain NRS was a 0/10 on average and at most a 3/10 on rare occasion; she scored a 30% on the NDI, and scored at or above average on 6/8 SF-36 health scales (pain and physical role functioning were lower than average likely due to patient's new sciatica).

## DISCUSSION

This case demonstrates a significant improvement in lateral head translation posture concomitant with improvements in NDI score, multiple SF-36 scales, overall pain reduction, and a cessation of use of pharmaceuticals for the treatment of pain in a patient suffering from chronic neck pain following occupational injury and cervical surgical fusion (C4–C7) 6.5 years previous. This all occurred in a significantly short period of time (11-days) due to patient demand and time constraints. Upon a 7.5 year follow-up, having only had treatments for 1.5 years after initial treatment, an 11.5 year follow-up, and at a 14 year follow-up having been without treatment for 12.5 years, the patient has remained well and without neck pain; only reporting mild, short lasting headaches on a very occasional basis.

Throughout the past, case studies have been viewed as falling short of providing meaningful evidence in support of a unique or novel treatment. However, because of the shortcomings of the over-rated RCT<sup>9)</sup> especially for evaluating multi-modal care regimens as used in manual therapy rehabilitative practices<sup>10)</sup>, other sources of scientific evidence must suffice<sup>11)</sup>. Concerning the case study, it should be realized that well-done case studies most often demonstrate findings consistent with that of the RCT<sup>12)</sup>. In fact, this case demonstrates findings consistent with a non-randomized clinical trial showing a 50% correction in head shift postures with pain score reduction<sup>7)</sup>. It is noted that this patient's improvement was greater than the trials reported average correction of 7 mm and was achieved in less treatments. Unlike recent case reports with emphasis on subjective patient reporting and exam tests<sup>13)</sup> this current case has implemented use of standardized questionnaires (NDI and SF-36)<sup>14–16)</sup>, reliable<sup>17)</sup> and repeatable<sup>18)</sup> line drawing procedures, as well as a rigorously evaluated protocol of care<sup>5–7)</sup>.

Since the source of neck pain remains controversial<sup>19)</sup>, and little evidence of effective interventions has been uncovered<sup>20)</sup>, a factor such as abnormal loading on the spinal tissues that occurs in lateral head translation postures<sup>21)</sup> may be a significant structural source of pain origin in those with this posture. Harrison et al.<sup>21)</sup> identified that the average participant could laterally translate their head to thorax (on AP x-rays) approximately 30 mm. The current patient's magnitude of lateral head translation posture can be considered a 'severe' lateral head posture as her displacement was 28 mm out of a total range of motion of 30 mm of displacement; thus a near maximum end-range of motion displacement was found for her neutral posture alignment.

Preliminary data supports the possibility that asymmetrical forces in lateral head shift postures may be one unrealized factor in pain production<sup>22)</sup>. In fact, Oakley and Harrison<sup>22)</sup> determined that of 335 patient AP cervico-thoracic radiographs randomly screened for head translations, the incidence rate was 53%. It was also determined that the older patients were, the longer they had tolerated painful conditions, and the greater their lateral head shift posture<sup>22)</sup>.

Considering this patient was post-surgical, one may speculate pain production from scar tissue as well as other factors resulting from the surgery. However, considering that the patient had surgery 6.5 years earlier, coupled with the improvement on NDI, SF-36 global health and well-being scales, NRS, cessation of daily left arm tingling, as well as cessation of pharmaceutical use for pain reduction following CBP treatment, it becomes apparent that the initial reduction of head shift from 28 mm to 13mm, likely accounts for these changes.

A patient having a total surgical fusion of C4–C7 was successfully treated with CBP protocol, achieving a significant reduction in symptoms and medication use lasting 14 years later, that was not obtained following prior surgery. The case illustrates what Oakley and Harrison<sup>22)</sup> have previously suggested, that head translation postures are often overlooked and in certain cases, probably play a major role in the production of neck pain. This case also illustrates that use of non-manipulative procedures such as CBP mirror-image methods can lead to clinically significant outcomes in patients presenting with chronic pain and previous history of major surgery to the spine.

The limitation to the current report is that this represents only a single case. We encourage further study in the use of these methods on post-surgical patients.

## ACKNOWLEDGEMENT

We thank the patient for her support for consenting to the publication of this case.

### *Conflict of interest*

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

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