Case Study

Improvement in GERD Following Reduction of Vertebral Subluxations & Improved Sagittal Alignment Utilizing Chiropractic Biophysics Protocol

Abstract

Objective: To report on the case of a patient with lumbopelvic and cervical postural distortions utilizing Chiropractic BioPhysics® (CBP®) protocol of care.

Clinical Features: A 27-year-old female hair stylist presents to a CBP® chiropractic office with a history of upper and mid-back pain, and gastro-esophageal reflux disease. X-ray revealed a 17.5mm anterior head-to-thorax translation (+T2), a 6° cervical lordosis, and a 17° lumbar lordosis, with a 9mm posterior translation of the thoracic cage over the pelvis. All measurements were based on CBP® protocol for x-ray line drawing.

Intervention and Outcomes: The patient received high velocity low amplitude adjustments using the CBP® protocol of care over a 2-month period, receiving 19 sessions. Mirror-image® adjustments, mirror-image® exercises, and mirror-image® traction were administered to reduce the patient’s spinal subluxations and postural distortions. The patient was seen 3 times per week for the 2 months at which time follow-up radiographs were taken, showing noticeable improvement in postural measurements toward normal sagittal spinal alignment as well as concomitant improvement in Gastro-esophageal reflux (GERD) symptoms.

Conclusion: Improvement in the patient’s abnormal posture and reduction of GERD symptoms as well as reductions of the radiographic vertebral subluxations were achieved using Chiropractic BioPhysics® rehabilitation protocol.

Key Words: Chiropractic, Chiropractic Biophysics, CBP, Posture, Mirror-image, Anterior Head Translation, Gastro Esophageal Reflux Disease, Subluxation, GERD.

Introduction

Abnormal Posture

Abnormal posture or any type of spinal misalignment can wreak havoc on the body. Abnormal spinal alignment has been correlated with poor general health, physical function, emotional function, lower back pain and social function. The curves in the spine act as levers, shock absorbers, and as resistance to gravity; they also protect and reduce forces acting on the spinal cord and nerve tissues.

Abnormal sagittal alignment has been shown to have a detrimental effect on health. Kado et al. reported that in the Rancho Bernardo study, with 1,578 participants of men and women over the age of 55 with hyperkyphotic postures, older persons with hyperkyphosis are more likely to have physical functional difficulties as well as an easily increased risk of injurious falls.

Other studies have indicated that positional loading in a reversed or reduced lordosis is a mechanism by which compressive, tensile, and shear loads, when applied to the lumbar spine, can create injury and pain.
Many doctors of chiropractic are taught that their role in patient management should go beyond pain relief. Arguably, a chiropractor’s role is to restore normal spine structure such that the body systems will function at optimum.10

It has been clearly demonstrated in the literature that abnormal posture causes stresses and strains in the neural elements and vascular supply, which are directly related to the function of the sensory, motor, and autonomic nervous systems. It has also been clearly shown that prolonged loading of the neural tissue may lead to a wide variety of degenerative disorders or symptoms.11

The spontaneous self-resolution of postural abnormality without intervention is unclear in the literature and considered a rare occurrence.12 However the use of Chiropractic Biophysics protocol has proven to be able to restore structure of the spine towards normal,13-15 hence restoring function and decreasing risk of future degeneration and disease.

A subluxation was originally described by D.D. Palmer, the founder of Chiropractic as “a slight deviation from its normal relation to adjacent vertebrae.”16 There has since been many additions and variations by different authors within chiropractic, but for the purpose of this paper, the Harrison definition of “deviations from normal upright posture”17 will be used.

The Harrison Spinal Model follows the path of the posterior longitudinal ligament and describes ideal postural alignment as when the center of mass of the skull, thorax, and pelvis are in a vertical line with respect to gravity. In the anterior to posterior (A-P) view, the spinal column is vertically aligned. In the lateral view, the spine has three primary curvatures, including a cervical lordosis, thoracic kyphosis, and lumbar lordosis.1,18,19

Gastro Esophageal Reflux Disease (GERD)

Gastroesophageal reflux disease is arguably the most prevalent clinical condition of the gastrointestinal tract. The main symptom is heartburn - a retrosternal burning sensation aggravated by eating, lying down, or increased intra-abdominal pressure.1,20

A study by Richter and a Gallup Organization National Survey estimated that 25-40% of healthy adult Americans experience symptomatic GERD. The most common typical manifestations include pyrosis (heartburn), regurgitation and dysphagia, while atypical symptoms include non-cardiac chest pain, asthma, pneumonia, hoarseness, and aspiration.19 Furthermore, approximately 7-10% of the adult population in the United States experiences such symptoms on a daily basis.20,22

Lack of definitive diagnostic or treatment standards complicate management, which often leads to multiple specialty consultations, procedures, pharmaceuticals, and diagnostic tests. Francis et al, showed the economic burden associated with extraesophageal symptoms, which is a common presentation with GERD. Of 281 patients, the overall cost per improved patient was $13,700. This showed a substantial contribution to health-care cost, with the single greatest contributor being proton pump inhibitors.23

Case Report

Patient Presentation

A 28-year-old female hair stylist presented to a Chiropractor’s office that utilized Chiropractic BioPhysics Technique. The patient reported having chronic headaches, neck pain, dry skin, GERD, and back pain since she was 15 years old, after a rear end collision. Symptoms of all of the above flared up three weeks prior to her first visit due to repetitive stress from an increased workload.

The patient could not recall the details of the accident and did not seek medical attention or have x-rays taken at the time. She also reported having surgery on her right big toe for an ingrown toenail. Medications included birth control, thyroid and gastroesophageal reflux pills that were taken daily. The visual analysis of the patient’s posture was not documented, so it is not included in this study, and only the lateral views of the cervical and lumbar radiographic evaluations will be used to define spinal alignment and posture, as it was determined by the treating chiropractor to be the patient’s most significant spinal deviations from normal.

Radiographic Evaluation

Lateral cervical x-ray showed a 17.5mm anterior head-to-thorax translation (+Tz⁰) and a -6.2° absolute rotation angle between C2-C7. There was also a notable segmental kyphosis at C6-C7 measuring +4.5° (Figure 1). Lateral lumbar film showed a -8.5mm posterior thorax-to-pelvis translation, a -16.7° (-Tz⁰) lumbar lordosis, and a 26.1° Sacral Base Angle (SBA) (Figure 2). All radiographic lines and measurements were done using PostureRay® EMR software which is based on CBP® analysis and have been reported to be reliable.24-30

Intervention and Outcomes

The patient was analyzed for subluxations based on Chiropractic Biophysics® (CBP) Technique protocols. CBP® emphasizes optimal posture and spinal alignment as the primary goals of chiropractic care, with a focus on the structural rehabilitation of the spine and posture.1

The patient received CBP® care over a 2-month period, receiving 19 treatment sessions. Mirror-image® adjustments, mirror-image® exercises, and mirror-image® traction were administered to reduce the patient’s global spinal subluxations and postural distortions. The patient was seen 3 times per week for the 2 months, at which time follow-up radiographs were taken. The patient was also monitored using static paraspinous surface electromyography (SEMG), which has been proven to be reliable.31

The patient received full spine adjustments using high velocity low amplitude adjustments, as well as instrument and drop table adjustments in the cervical and lumbar regions. Anterior-type adjustments were performed in the thoracic region at T4-T8, and then specific global mirror-image® adjustments were administered.

A mirror-image® adjustment is a specific and researched chiropractic adjustment where the patient is placed in the
opposite posture of what their presenting posture is, while a
light force to the skin is applied by the chiropractor.14 The
posture is assessed using the Cartesian coordinate system,
which is based on the x, y, and z-axes.32 The patient originally
presented with an anterior head-to-thorax translation (+Tz)
with a cervical kyphosis starting at C6, and a posterior thorax-
to-pelvis translation (-Tz). The global adjustments rendered
were as follows: Using a drop table and the patient prone, the
head was posteriorly translated and extended by elevating the
headpiece and tilting the cephalad aspect of the headpiece
superiorly to put the lower cervical region into extension. 3-4
light drop adjustments were then given. For the posterior
translation of the thorax-pelvis, the drop table was utilized by
raising the lumbar aspect to bring the thorax and pelvis level
while prone, and then adjusted in the lumbopelvic regions
using the Impulse Instrument.

The Impulse Instrument has been FDA approved for
manipulation and adjustments.33 Using an instrument to
induce intersegmental motions produced by spinal
manipulation may play a prominent role in eliciting
physiologic responses,34 and has been shown to have
beneficial effects associated with reducing pain and disability
and improving range of motion.35

Following CBP® protocol,14,36 mirror-image® exercises and
traction were utilized in-office at every visit, and also
recommended for home care. Cervical and lumbar traction
were done using the Denneroll, which is a patent pending
spinal remodeling device based on Chiropractic BioPhysics®
(CBP) technique, used to help restore proper sagittal plane
spinal curvatures.37 For each region, the patient initially started
with 4 minutes of traction on the Denneroll, and her time was
increased by two minutes each visit, until she was able to lay
reasonably comfortable on the Denneroll for 15 minutes per
treatment. Sustained loading periods of 10–20 minutes is
necessary to cause visco-elastic deformation to the resting
length of the spinal muscles and ligaments.14,38

For the cervical region traction, the patient was placed in
cervical extension by lying supine with a Denneroll under her
neck, specifically at the segmental kyphosis (C6-C7). The
patient was also instructed to perform standing cervical
extension and posterior translation exercises, (mirror image®
posture) in which the patient held for 10 seconds and then
relaxed, doing this for 20 repetitions, 5 times throughout the
day. All recommended exercises and traction were given to
follow the CBP® protocol.39

For the lumbar traction the patient was placed supine on the
lumbar Denneroll, with the fulcrum specifically at L2, as it
was the most significant deviation from normal lumbar
lordosis. Recommended exercises included the use of a six
inch wedge placed between the wall and the standing patient,
with the posterior aspect of her mid thorax against the foam
wedge, as to bring her abnormal posture of posterior
translation of the thorax to pelvis back to neutral.

The patient was then instructed to posteriorly translate the hip
in relation to the thorax (her mirror-image®) in which the
patient held for 10 seconds and then relaxed it, repeating this
20 times per set, with 5 sets throughout the day. Improvements
in structural alignment are the primary intervention goal of
CBP®,39 After only two months of care the patient showed
postural changes towards normal.

The normal spinal model is based, in part, on average values
from normal subjects and has been published in orthopedic
and chiropractic journals.19,40-45 The normal values are listed
in the patient progress table (figure 1) which shows the
following positive changes towards normal: On the lateral
cervical projection: The Relative Rotation Angles (RRA)
between C3-C4 – showed a 557.1% improvement (moving
from -0.7° to -4.6°). C5-C6 showed a 172.4% improvement
(2.9° to -2.1°). C6-C7 showed a 200% improvement (-4.5° to
4.5°).

As well as an Absolute Rotation Angle (ARA) between C2-C7
showed 351.6% improvement (-6.2° to -28°). There is also a
noteworthy 77.1% (17.5mm to 4mm) global change
demonstrated in improvement in anterior head translation
of C2-C7. Along with the reduction in cervical subluxation,
subjectively, the patient reported improvement in neck pain
from moderate to slight.

Lumbar normal values are shown in figure #2. In the lumbar
projection the most noticeable improvements were seen
segmentally with RRA at L1-L2 changed 149.2% (6.5° to
3.2°), L2-L3 showed a 60% improvement (-2.4° to -5.9°), and
L4-L5 showed a 34.2% improvement (-12.5° to -14.9°).

For the thorax region traction, the patient held a thorax-wedge, as to bring her abnormal posture of posterior
thorax (her mirror-image®) in which the

The concept of subluxation has been a cornerstone of the
theory and practice of chiropractic since its inception, and has
been a controversial topic both inside and outside of the
chiropractic profession.46 DD Palmer, the founder of
Chiropractic originally proposed that the subluxation of a
vertebrae “is a slight deviation from its normal relation to
adjacent vertebrae,”47 which is considered a vitalistic model.

This then evolved through BJ Palmer's model of blocked
mental impulses, and then most recently, with contemporary
comprehensive theories of Vertebral Subluxation Complex
(VSC) involving “kinesiopathology, neuropathology,
myologic and connective tissue involvement and vascular and
inflammatory processes from their anatomic, physiologic, and
biochemical perspectives.”48
A variation of the VSC is most commonly used in the modern era. This is demonstrated with the American Chiropractic Association and the Association of Chiropractic Colleges’ definition of a subluxation as “a complex of functional and/or structural and/or pathological articular changes that compromise neural integrity, and may influence organ system function and general health.” The largest chiropractic college in the world, Life University, states that the mission of Life University's College of Chiropractic is centered on the Vertebral Subluxation Complex. The International Chiropractic Association and the Association of Chiropractic Colleges' definition of a subluxation as 'a complex of functional and/or structural and/or pathological articular changes that compromise neural integrity, and may influence organ system function and general health.'

The commonality amongst the various chiropractic definitions of subluxation, or the vertebral subluxation complex, is the concept which emphasizes a relationship between mechanical joint dysfunction and the establishment of nerve interference. One must first know what normal alignment is in order to discuss what would be abnormal. This research was done by Don Harrison, the founder of Chiropractic Biophysics® (CBP®) in his publications in 1992. Later published research by CBP® explained the biomechanics of the spine, and how any abnormality would have an effect on the central nervous system and all of the various components of the VSC.

**Chiropractic BioPhysics**

CBP® technique can be best described as a full spine and posture rehabilitative technique where the primary goal of care is to restore normal alignment to the human spinal column and body posture. Subluxation is characterized as one or more structural displacements of the spine and posture as rotations and translations relative to a normal alignment position.

Normal alignment of the human spine is with the centers of mass of the skull, thorax, pelvis, and feet vertically aligned to produce minimal stress and strain on tissues. Normal sagittal posture is described as vertical alignment of the external auditory meatus, acromio-clavicular joint, acetabulum, and lateral malleolus. The normal curvature of the spine follows the path of the posterior longitudinal ligament and involves a 42 degree cervical lordosis measured from C2-C7, a 44 degree thoracic kyphosis from T1-T12, and a 40 lumbar lordosis measured from L1-L5. This ideal and statistical average model is based on a linear algebra approach and mechanical engineering principles, and has a mean and a random error component (variation around the mean).

Alterations in posture, especially in the sagittal plane, have both direct and indirect effects on the central nervous system and its associated structures. CBP® uses the Cartesian coordinate system to describe global postural translations and rotations of the head, thorax, and pelvis around x, y and z axis, in three planes; coronal, sagittal and transverse.

An example of rotation around the x-axis would be any type of flexion or extension, rotation around the y-axis would be right or left rotation, and rotation around the z-axis would be right or left flexion. A translation is a linear motion or any motion along a straight line. Therefore, translation along the x-axis would be any linear movement to the left or right, translation along the y-axis is any movement upward or downward, and translation along the z-axis would be any movement going forward or backward. There are nearly 130 million posture combinations possible.

CBP® uses posture and radiograph line drawing as methods of analysis which has been proven to be reliable and repeatable, with inter-examiner correlation coefficient values greater than .70 (as high as .99), which is considered accurate enough for use in the clinical and research context.

Many monotherapies have been found to have either limited effectiveness or complete lack of success. This has been taken into consideration by CBP® technique as it uses a multi-modality approach to care, in order to address all the tissues involved in spine and posture alignment. This consists of three primary procedures: mirror image® exercises, mirror image® adjustments, and mirror image® traction.

The mirror image® adjustment is a specific chiropractic adjustment that places the patient in their exact opposite or mirror image posture while applying a certain adjusting force. In this case study, forces applied were done using diversified, drop table and the use of an adjusting instrument. Mirror image® exercises are prescribed to stretch shortened muscles and to strengthen those muscles that have weakened in areas where postural muscles have adapted to asymmetric or ill-positioned postures.

Mirror image® extension traction uses sustained loading periods of 10–20 minutes and is necessary to cause viscoelastic deformation to the resting length of the spinal muscles, ligaments, and discs. For this patient, the method of traction used was the Denneroll.

The Denneroll is a spinal remodeling device used by Chiropractic BioPhysics® to help restore proper sagittal plane spinal curvature and correct other conditions. The Denneroll products are patent pending designs which are specific to each region of the spine (cervical, thoracic and lumbar), with precisely engineered contours, carefully tested firmness and flexibility, to enhance treatment. Cervical and lumbar spine was assigned to the patient in this case study to be performed both in office and at home.

**Posture**

Abnormal posture or any deviation from normal spinal alignment causes increased stress on the spinal cord. The stresses and strains in the neural elements and vascular supply are directly related to the function of the sensory, motor, and autonomic nervous systems. Prolonged loading of the neural tissue may lead to a wide variety of degenerative disorders or symptoms.

The central nervous system is made up of the brain and spinal cord, which control every function of the human body, including cardiovascular function, digestive function, endocrine, immune, adrenal, and bladder function. Therefore, it can be asserted that any compromise may be manifested as pain or in conditions such as asthma, hypertension, otitis media, sinus infections, dyslipidemia, Tourette’s.
fatigue and gastroesophageal reflux disease, all of which have been documented to show improvement or resolution under CBP® protocol of corrective care and restoring spinal alignment and posture to normal.

The reliability, reproducibility and harmful effects of abnormal posture have not only been studied by CBP®, but posture as a valid outcome of care is universally accepted by almost all health care sciences. Harrison et al. explains how posture has also been studied by ergonomists, medical doctors, and physical therapists, and he also used published literature to elucidate the correlation between postural stress and the following conditions; scoliosis, work-related lifting injuries, driving, sitting, space flight, sports injuries, back pain and various other degenerative diseases (including DJD). This can have a significant impact, not just on the quality of life of the individual suffering from the effects of bad posture, but also the national economy. According to the CDC, Degenerative Joint Disease/Osteo Arthritis (DJD/OA) alone, affects over 39 million adults with an estimated cost of $7.9 billion for knee and hip replacements, $3.4 to $13.2 billion annually on job-related costs.

Degenerative changes can possibly be explained using Wolff’s law, which states that bone remodels to stress and Davis’ law, which shows that soft tissues remodel to stress. Bone is a piezoelectric material that has the property of electric polarization under applied load. Abnormal compressive forces stimulate osteoblastic activity and can be seen in the body as osteophytosis associated with degenerative joint disease usually found on the anterior vertebral bodies of those with a military or kyphotic necks. Therefore, with an understanding of principles of stress, strain, deformation, piezoelectricity and streaming potentials, by restoring or maintaining a normal posture, perhaps degenerative joints disease and nerve interference can be avoided.

Gastroesophageal Reflux Disease

Gastroesophageal reflux is one of the most prevalent clinical conditions affecting the gastrointestinal tract. It occurs when the lower esophageal sphincter is weak or relaxes inappropriately, allowing the stomach’s contents to flow up into the esophagus. Its spectrum ranges from the postprandial heartburn experienced at times by most adults (as was the original patient presentation in this case) to severe pain. Complicated disease characterized by ulcerative esophagitis, esophageal strictures, and Barrett's esophagus (replacement of squamous epithelium with columnar epithelium) with a propensity to become malignant.

Gastroesophageal reflux disease affects 15% to 40% of people in Western countries and is increasing in incidence. GERD is most commonly treated with lifestyle changes, medication and surgery. The most common medications aim to reduce gastric juices output using proton pump inhibitors.

This method of treatment however fails to treat regurgitation, and has to be continued indefinitely to avoid a consequent 75% to 90% relapse rate at discontinuation of the drugs and as a result, the patient usually ends up needing surgery. The calculated annual expense for GERD in the US is $9.3 billion dollars, most of which is due to the direct costs of anti-reflux medications.

The postural model of vertebral subluxation as described by Kent was used in this case study, as CBP® Technique protocol of care was used to correct global subluxations. Since the patient experienced improvement in GERD symptoms after two months of chiropractic care, a possible mechanism can be postulated using the Neurodystrophic model, which states vertebral subluxations associated with exaggerated sympathetic activity (which will decrease motility and contraction of sphincters in the stomach and intestine) and paraspinal muscles (as seen table 2 SEMG scans). Hence correction of these vertebral subluxations will allow for a reduction in the exaggerated response, and allow proper function.

Along with chiropractic care, nutritional changes were incorporated to avoid further exacerbation of her GERD symptoms. Although the patient did note that previous attempts of dietary restrictions alone were unsuccessful in controlling symptoms in the past.

There are limitations to this case study; the most significant being the small sample size. Several case studies were documented improved in functional outcomes with the correction of abnormal posture using Chiropractic BioPhysics® protocol of care. However, more research is needed with a greater sample size to substantiate improvement in physiologic function with concomitant reduction of global subluxations using CBP® corrective care.

Conclusion

This case report suggests that successful correction towards normal of a patient’s sagittal plane postural deviations can be achieved utilizing Chiropractic BioPhysics® Technique (CBP®) protocol of mirror-image® adjustments, mirror-image® exercise, and mirror-image® traction. This change was documented using posture, X-ray analysis and SEMG, which have all been proven to be reliable. These forms of analysis are also accepted as forms of assessing outcomes of care amongst all health care sciences.

After two months of treatment, the patient’s cervical curve is no longer kyphotic, and is now moving closer toward a cervical lordosis, with a significant decrease in anterior head translation, which may have reduced tension, stress, strain and abnormal streaming potentials, in and around the spinal cord, possibly leading to an overall improvement in all body functions. When dietary changes were combined with chiropractic care there was a reduction in GERD symptoms, whereas the same dietary restrictions without chiropractic care had been unsuccessful in the past. There was also continuous improvement in neck pain, back pain, and overall quality of life.

This patient is still under care, and based on the results we have seen thus far, we are confident that with the correction of her vertebral subluxations using Chiropractic BioPhysics® protocol of care, she will continue to make strides towards normal posture, and hence increase her body’s ability to function at optimum.
This study adds to the evidence that chiropractic care can aid in the treatment and resolution of common visceral complaints. More research is suggested in this arena to benefit patients with visceral complaints that are otherwise usually treated with drugs and surgery.

Acknowledgments

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References


**Figure 1. Initial Lateral Cervical & Follow up Lateral Cervical.** The x-ray located above on the left was taken during initial exam. These are lateral cervical projections. The x-ray on the right hand side was taken at approx. 2 months of care. The green line indicates a normal curve, while the red line indicates the actual curve of her lumbar spine. The tables above represent the changes that were made to her cervical spine.

![Figures](image-url)
Figure 2. Initial Lateral Lumbar & Follow up Lateral Lumbar. The x-ray located above on the left was taken during initial exam. These are lateral lumbar projections. The x-ray on the right was taken at approx. 2 months of care. The green line indicates a normal curve, while the red line indicates the actual curve of her lumbar spine. The tables above represent the changes that were made to her cervical spine.

Figure 3

Fig. 1-A and 1-B represent the initial Static EMG scan for Amplitude and Asymmetry respectively. The most significant findings are at C1, C2, C3, C7, T2 and L5.
Fig. 2-A and 2-B represent the follow up Static EMG scan for Amplitude and Asymmetry. Note the significant difference of improvement in amplitude at C3, C5, C7, T2 on the SEMG scan. Also note the most significant difference in C5 and T2 in asymmetry, which demonstrates that bodily adaptive changes are being made.