Case Study

Improvement in Cervical Curve and Hypothyroidism Following Reduction of Subluxation Utilizing Chiropractic Biophysics: A Case Study & Selective Review of the Literature

Abstract

Objective: This case study describes the effects of Chiropractic Biophysics (CBP) based chiropractic care on a 44-year-old patient with hypothyroidism.

Clinical Features: A 44-year-old female presents to the chiropractor with complaints of upper trapezius and inter-Scapular pain stemming from a motor vehicle accident that occurred 23 years prior. In addition to the chief complaint, the patient had been prescribed Armour Thyroid in order to treat hypothyroid symptoms. Cervical radiographs confirmed 80.7% loss of structural cervical lordosis.

Intervention and Outcomes: CBP protocol/care was utilized to reduce symptoms associated with VSC, improve spinal and postural alignment. CBP care was conducted over a seven month period. Thirty days into care the patient began exhibiting hyperthyroid signs/symptoms, at which time the patient was instructed by the attending chiropractor, to have the patient's endocrinologist re-evaluate the patient's prescribed hypothyroid medication. After serum lab evaluation, the patient's endocrinologist instructed the patient to significantly reduce exogenous thyroid support.

Conclusion: CBP treatment regimen is shown to be effective in reducing vertebral subluxation as well as improve cervical curve in a 44-year-old patient with hypothyroidism. The reduction in signs and symptoms of VSC, in this case, correlated to a reduction in hypothyroid symptoms and an overall increase in thyroid function. Further research on chiropractic care reducing mechanical stress on spinal structure in association with improved thyroid function is suggested.

Key Words: Subluxation, chiropractic, adjustment, vertebral subluxation, Chiropractic Biophysics, CBP, hypothyroid, spinal rehabilitation, spinal corrective care, mirror image therapy, posture, traction

Introduction

Thyroid deficiency is the number one endocrinological condition seen world-wide. It is a disease process characterized by arthralgia, cold intolerance, constipation, depression, difficulty concentrating, dry skin, fatigue, hair thinning, hair loss, memory impairment, menorrhagia, myalgia, weakness and weight gain. It is a common condition seen in the primary care setting, most often affecting women. Pharmacological approach for hypothyroidism is one of the most prescribed interventions in many areas of the developed world. Many patient's express dissatisfaction in persistent symptoms while under biochemical management, which is the preferred method and established policy in the US, Great Britain and Australia. Consequently, there is a considerable market demand to establish alternative methods of care.

Historical Overview

Healthcare professionals have been devising means of managing thyroid issues since the late 19th century, using sheep and porcine tissue sources with multiple administration protocols. These efforts worked toward accomplishing that task to varying degrees of efficacy, however it was in the beginning of the 1930's when thyroxine (T4) was successfully
states suffer from hypothyroidism, however, this dogma has been continued support through agencies such as the Royal College of Physicians in Great Britain, the Endocrine Society of Australia, as well as the American Association of Clinical Endocrinologists.1-3,8,10 Despite hegemonic support for current methodologies of care, there is a recognized consternation regarding the number of hypothyroid patients whose thyroid assays have been medically managed to a modicum of stability, yet report continued signs and symptoms of thyroid dysfunction. In an effort to address the needs of this subgroup of hypothyroid sufferers, alternatives to status quo treatments have developed. These alternatives range from exogenous mono or combination supplementation of different hormones in the thyroid cascade, xenobiotic versus synthetic hormone supplementation, bio-psycho-social approaches and chiropractic care.

Epidemiology

According to the National Health and Nutrition Examination Survey (NHANES III), about 1 in 300 (1.1 million) people in the United States suffer from hypothyroidism, however undiagnosed hypothyroidism has been estimated to be 13 times that number.1 Women are more often than men to be effected, and the likelihood of receiving a hypothyroid diagnosis increases with age.2

Prognosis

Primary Hypothyroidism is a life-long disease process. Once diagnosis has been established, the current methodology of care is oral levothyroxine (T4) for the remainder of the patient's life. Careful monitoring of subclinical hypothyroidism is conducted at regular intervals in order to determine if the patient's condition has developed into primary hypothyroidism.11,12 While most patient's diagnostic lab values normalize post-medication, many patients report malaise and dissatisfaction with their treatment protocol's management of their symptoms, a limitation of hormone therapy's inability to account for metabolic demands.

Autoimmune thyroid disease sufferers can sometimes present as euthyroid, and while antibodies characteristic of this disease process persist throughout a patient's lifespan, spontaneous disappearance can infrequently occur. A goiter, or hyperplasia of thyroid tissue, may or may not occur however it is pathognomonic of this autoimmune condition.3

Diagnostic Considerations

Diagnosis is made via serum thyroid-stimulating hormone (TSH), when levels are elevated beyond 10mIU/L. Hypothyroid diagnosis is either overt/primary or subclinical, the former using the aforementioned metrics while the latter is made when TSH levels exceed normative ranges while free T4 (FT4) remains normal. If FT4 is elevated, in the presence of elevated TSH then it is not primary or subclinical hypothyroidism, but rather secondary or central hypothyroidism.13 Secondary hypothyroidism is present only in 5% of total hypothyroid patients.1,5 Clinical and laboratory criteria is listed in Table 1.

Autoimmune thyroiditis diagnosis is a further stratification of a pre-existing hypothyroid diagnosis. This classification in diagnosis is made after determining the elevated presence of the following anti-thyroid antibody titer: anti-thyroglobulin antibodies (TgAb), anti-microsomal/antithyroid peroxidase antibodies (TPOAb) and TSH receptor antibodies (TSHRAb).3

Etiology and Pathophysiology

Worldwide, the most common cause of primary hypothyroidism is iodine deficiency, while in the US the cause is more often chronic autoimmune thyroiditis or hashimoto's thyroiditis. This autoimmune issue is characterized by thyroid autoantibodies that attack healthy thyroid tissue decreasing its ability to translate TSH signaling into the production of triiodothyronine (T3) and T4. Rare genetic variants cause an issue with conversion of T4 to T3 (which is how 80% of endogenous T3 is obtained). Pituitary and hypothalamus dysfunction, potentially neoplastic in nature, resulting in insufficient production of TSH is determined to be central hypothyroidism. Central hypothyroidism requires endocrinologist referral and is outside the scope of the primary care practitioner.13

Treatment

Mature, uncomplicated hypothyroid patients are prescribed 1.6μg/kg body weight/day of levothyroxine, usually dosing in the morning. Some studies have shown significant benefit to nocturnal dosing regimen, however a number of additional studies have conflicted with these findings.5 For patients that have difficulty with compliance, a weekly dosing strategy, which is seven times the daily dose, has demonstrated efficacy. Interestingly, despite the significant difference in dose, patients do not report adverse effect.

There are various special populations that require adjusted dosing parameters: pregnant patients, elderly patients and those with previous ischemic heart events. Due to increased metabolic demands of pregnancy patients are increased to 2.0-4.0μg/kg body weight/day. Dose is adjusted throughout gestation, typically increasing with each trimester. Recommendations are that pregnant women maintain a TSH level <2.5mIU/L, in order to avoid potential birth defects as a result of thyroid deficiency. Elderly patients are typically maintained on 25-50μg/day. The risk for osteoporosis and fibrillation with over-replacement of T4 rises with age, therefore recommendations for the elderly are much less than younger patients. Even lesser than the elderly, patients with previous ischemic heart issues are prescribed 12.5-25μg/day, as the risk for fibrillation in this population is considerable.1,3

Medical Costs

According to the Medical Expenditure Panel at the Agency for Healthcare Research and Quality (AHRQ) $4.3 billion is spent annually on thyroid diseases, with more than half ($2.2 billion) of the expenditures related to ambulatory visits. A third of the total ($1.4 billion) was spent on prescribed medications. Among women the average expense per treatment of thyroid disease was $343 with the mean prescriptive cost around $116. 58% of money spent by age 18-65 year old women came from private insurance, 27.2%...
came from out-of-pocket sources. For women over the age of 65, Medicare paid for more than half (52.4%) of total expenses.14

Case Report

Patient History

A 44-year-old female presents to the chiropractor with complaints of upper trapezius and inter-scalpular pain stemming from a motor vehicle accident (MVA) that occurred 23 years prior. The MVA, which occurred in 1991, was a head-on collision which resulted in a concussion with essential tremors, loss of consciousness (LOC), anterograde and retrograde amnesia. The patient also reported five previous concussions, however none of the prior concussions were to the same degree of severity as the 1991 MVA. All previous concussions lacked LOC or memory deficits. In addition to the aforementioned neurological and myoskeletal complaints, the patient noted loss of function in the left shoulder. She cited this lack of function as the grounds for her 2010 surgical labral repair. Additional surgeries include gallbladder removal, six laprotomies, six larterscopicos and a hysterectomy.

The patient had previously been prescribed Armour Thyroid by her endocrinologist after her serum lab scores indicated elevated TSH. She was referred to her endocrinologist by her GP after she reported a battery of symptoms including lethargy, weight gain, depression and temperature intolerance. The endocrinologist diagnosed the patient with Hashimoto or Autoimmune Thyroid Disease (AITD). Prior to this patient’s visit to the chiropractor she had been medically managed for her hypothyroid symptoms for over 4 years. For the last two years the patient had been taking Armour Thyroid, a desiccated thyroid replacement in lieu of levothyroxine. The patient’s endocrinologist had switched her to the desiccated thyroid replacement due to persistent symptoms in spite of regulated TSH levels, which according to ATA is a management strategy, though not one preferred or recommended.3

In addition to the thyroid medication the patient was prescribed progesterone and an estrogen patch for premenopausal symptoms. She was taking Lamictal, an antiseizure medication, for her essential tremors. The patient also reported the use of over-the-counter supplements such as potassium and vitamin D3.

Chiropractic Examination

The patient’s exam included a new patient intake form, orthopedic and neurological testing, sEMG, thermography, anteroposterior as well as lateral plain film views of the cervicothoracic and thoracolumbar spine, static/motion palpation, and standing postural evaluation.

Chiropractic Biophysics (CBP) is a structurally based technique wherein posture and spinal alignment are assessed and measured against an established normal or ideal model.15,17 Harrison et al holds that deviations from this ideal increase risk factors for spinal health.13,18,20 As such it is vital to the correct execution of CBP protocol that accurate cervical and lumbar plain film radiographs be taken, with much care given to reduce and eliminate distortion when possible.16 These films are then used for comparison with follow-up films taken in between three and six months after the initiation of care. Cervical and lumbar radiographs were obtained via digital x-ray as part of patient in-processing, and digital lines of mensuration were overlaid using a CBP software program which measures deviations from ideal in anteriorposterior (A-P) and lateral cervical and lumbar films.21,22 X-ray line drawing analysis for CBP has been demonstrated to be reliable and repeatable according to the literature.21,23

Gross posture, in addition to spinal alignment as seen on plain film radiographs is also vitally important to the determination of healthy structure.15,24 Posture, as measured through plumb line analysis or digitally-assisted visualization programs such as PostureRay®, have also been determined to have a high degree of intra- and inter-examiner reliability.24

Digital thermography and static Electromyography (sEMG) were also measured during the initial patient visit. Digital thermography has been found to have a high degree of validity, with ICC values between 0.91-0.98, in measuring capillary dilation, which is hypothesized to provide a metric for autonomic nervous system function.25 Subluxation-based chiropractors hold that ANS dysfunction can often be a symptom of vertebral subluxation. SEMG is a determination of paraspinous muscle activation, and it provides objective data regarding muscle hypertonia. Hypertonic muscles are a facet in spinal segment dysfunction and part of the overarching Vertebral Subluxation Complex (VSC), and logically related to the vertebral subluxation. Static EMG has been found to be a reliable method of determining hypertonicity of paraspinous musculature.26

Chiropractic Impression

Lateral cervical films demonstrated that the patient’s cervical lordosis was -8.1°. Normal spinal models having a -42.0° meant that the patient had an 80.7% reduction in total cervical curve, placing the head a total of 17.2mm forward. A-P cervical films revealed 4.8mm of head shift to the right, with a 3.5° mid-neck tilt and a 3.4° lower-neck tilt. Lateral lumbar films show the patients lumbar curve to be -30.6°, which is a deviation of 23.4% from the ideal -40.0° lumbar curve. This loss of lumbar lordosis shifted the patient’s ribcage 26.0mm forward. A-P lumbar films demonstrated an overall 4.4mm rightward shift in the low back, a mid-back tilt angle of 10.9° and a low-back tilt of 1.6°.

Chiropractic subluxation was assessed in C5/6/7 segments using static and motion palpation, and after considering data from plain film radiographs, thermography and sEMG. Static and motion palpation have been successfully determined to accurately segregate between normal and abnormal spinal motion.27,28 Motion palpation is used to assess spinal joint motion and determine if dysfunction or fixation is present. Static palpation has been determined to have a high intra- and inter-examiner reliability in determining painful and tender points along the spine.29

Digital thermography displayed a unilateral rightward distribution of heat asymmetry. All digital thermography
values can be seen in Table 2. These metrics suggested a considerable dysfunction in the patient’s ANS. Static EMG can be seen in Table 3. Static EMG were recorded bilaterally and values complemented other assessments in identifying C5/6/7.

**Intervention**

The patient was adjusted via full-spine/diversified protocol in the C5/6/7 regions in order to address chiropractic subluxations. The patient was then set up in Mirror-Image® adjusting in order to introduce a corrective left translational force in order to correct the regional right cervical translation. Post Mirror Image® adjustments she would perform 10 repetitions of left lateral translation physical rehabilitative exercises against gravity. She was then placed into a TargetForce® traction unit at the level of C5/6 in order to address her deficient cervical curve, starting at three minutes her first visit and increasing 30 seconds with each successive visit. The patient was instructed to repeat the Mirror-Image® exercises and cervical traction using a Denneroll® at-home traction device. Traction and Mirror-Image adjusting are essential to the correction of spinal alignment in the patient, and to ensure that postural deviations are corrected.22,30,33

The patients care plan included thrice weekly office visits for the first month of care, graduating to lesser frequency of care after every 10-12 visits. Each office visit included evaluation for the presence of subluxation, adjustment, exercise and traction.

Mirror-Image®, TargetForce® and Denneroll® are all devices that have been separately evaluated for validity and reliability.30,34

**Outcomes**

One month into care, the patient presented to the office in a manner not previously seen by the attending chiropractor. The patient's teeth were chattering, and her hands were shaking in a way different than seen during episodic periods of her essential tremors. The patient described herself as feeling “flush and jittery.” When the chiropractor inquired as to the patient status, she revealed that she had been experiencing this sensation for the previous week and a half. Considering the patient's previous history, the chiropractor suggested that the patient schedule a consult with her endocrinologist. Upon doing so, her lab tests revealed that her TSH levels had dropped into hyperthyroid parameters. The endocrinologist suggested reducing Armour Thyroid intake from 90mg once daily to 60mg. The patient was compliant with the recommendations of her endocrinologist and subsequently felt relief of her recent symptoms.

The patient's six month progressive examination revealed structural improvements in concert with her previously documented functional improvements. Lateral cervical curve was improved from -8.1° to -15.0°, consequently forward head displacement went from 17.2mm forward to 13.7mm forward. The lumbar lordotic curve changed from -30.6° to -27.4°, however the overall change in rib change positioning went from 26.0mm forward to the more optimal 25.0mm forward. A summary of postural and radiographic changes are noted in Table 4. Thermography progressed from unilateral temperature asymmetry to the right, with very severe to mild involvement at every spinal level aside from three (L3, L4 & S1) to a left moderate asymmetry at C1 (1.0), a right severe asymmetry at C2 (2.4) and a right mild asymmetry at L5. Static EMG went from severe hypertonicity in the cervical region and moderate hypertonicity in the lumbosacral region to mild hypertonicity noted bilaterally at C3 and left-wise at C7, very severe right hypertonicity at T1, and mild right hypertonic muscles from T4-10 & L1-3.

**Discussion**

**Chiropractic Literature**

The volume of literature regarding chiropractic care for the management of hypothyroidism is definitely sparse. A broad search of the term “Thyroid” in the Index of Chiropractic Literature yields only 24 results, of those 24 only two results concerned themselves with using a chiropractic technique in the treatment of hypothyroid. Those two articles were Jacobs et al's 1985 study on the use of Applied Kinesiology (AK) in the diagnosis of hypothyroid, and Babis and Pollard's 2009 case study on NET and the treatment of hypothyroid.4,35-36 ICA's 2013 Best Practice guideline makes no claims on the treatment of hypothyroid in specificity, however a review of the literature used to create the document reveals a 2008 case study by Eceveste on using Diversified chiropractic adjustments on the treatment of a 9-year-old with Diabetes Mellitus and hypothyroidism.36-37 Upon review, Jacob's study only provides limited evidence on the use of AK in the diagnosis of hypothyroid, with no discussion as to the chiropractic management of a patient with hypothyroidism. While Eceveste does make claims on the amelioration of symptoms related to hypothyroidism, objective evaluation of those claims (ie normalized TSH values or biochemical therapy reduction) is not discussed. Therefore, the only study that objectively discusses management of hypothyroid via chiropractic care, is Babis' NET study.4,35-36

Babis and Pollard's case study discusses the management of two separate instances wherein hypothyroidism symptoms were ameliorated using Neuroemotional technique (NET). Both cases involved patients with substandard thyroid function. The first patient had been objectively determined via TSH to have primary hypothyroidism, however she had not at that time elected to engage in biochemical treatment of her condition, instead deciding on alternative methods of care. Her pre-adjustment TSH was 13.9mIU/L and following 8 weeks of NET treatments she was tested at 5.81mIU/L, which is just outside the threshold for nominal thyroid function. A long-term follow-up was conducted nine months post treatment, and the patients TSH was measured at 1.45 mIU/L. The second patient had been medically managed for her hypothyroid for one year. Her pre-adjustment TSH was 14.8. She was then seen four times over the course of two months. Her post intervention TSH was 5.81. Longterm follow-up was conducted and the patient’s TSH was 0.82.4

NET is a bio-psychosocial model of care where chiropractic adjustments are used as a means of reconditioning emotional responses which have been patterned to produce dysfunction. The author posits that just as the hypothalamus plays a role in

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regulating the release of TSH, it also plays a role in memories and emotions, in particular fear and anxiety, consequently there could be a relationship between TSH release and the memory of fear and anxiety. NET further posits that this dysfunction is caught in a feedback loop with the vertebral subluxation. Addressing the vertebral subluxation allows for a reset window, where the dysfunctional emotion is reconditioned to one leading to adequate function.

There have yet to be any case studies outside of NET that purport the use of chiropractic adjutant technique to aid in the management of hypothyroidism.

**Hypothyroidism**

**Subluxation Model**

The Neurodystrophic model of subluxation suggests that tissue stress can relay stress into specific and nonspecific immunologic systems. As the body attempts to compensate with said stress, there is a systemic toll that the body must pay. Just as there has been a documented rise in cytotoxic T-cells, and consequent immune system dysfunction, it is possible to describe how stresses may affect other areas of the body. Thus, as conformational deviations in spinal articulation away from an established ideal will manifest as mechanical stress on these same structures. It is due to the body's effort in accounting and managing this mechanical stress that there is a consequent loss of ability to accommodate systemic stress. This essentially forms the pathophysiological architecture to CBP.

In the case of the patient with hypothyroidism, it is possible that the patient's 80.7% loss of cervical lordosis played a significant role in her inability to properly regulate her own thyroid function. There are essentially two viable explanations for how this could take place. The first of which would be that the patient's hypothyroidism seeing as it is a result of an autoimmune issue, and as such, according to the ATA/AACE, “Autoimmune Thyroid Disease) are characterized pathologically by infiltration of the thyroid with sensitized T lymphocytes and serologically by circulating thyroid autoantibodies. Autoimmunity of the thyroid gland appears to be an inherited defect in immune surveillance, leading to abnormal regulation of immune responsiveness or alteration of presenting antigen in the thyroid.” Therefore, Brown's demonstrated chiropractic effect on psychoneuroimmunology, provides a logical stepping stone on exactly how this may have occurred. Bringing the patient's cervical lordosis closer to an ideal alignment would then alleviate stresses caused by alterations in conformation, which would in turn correct errant psychoneuroimmunology which produced thyroid autoantibodies, and thus relieving thyroid tissues from autoimmune insult.

The second option would borrow the operative mechanism suggested by Bablis' case study. Essentially as an insult to the hippocampus causes retrograde and anterograde amnesia (both expressed by the patient in question), that same insult becomes a learning experience which also stimulates the adrenal gland which releases epinephrine and glucocorticoids, which can in turn affect the hypothalamus and thus TSH release. This change in TSH release could affect receptor regulation, which could later manifest as an inability for the thyroid to read TSH signals which would cause an increase in TSH levels as measured in the blood. This mechanism could explain the patient's presentation to her GP which triggered the referral to the endocrinologist, and the subsequent hypothyroid diagnosis and biochemical management. Vertebral subluxation correction could provide the impetus for supplanting the “learning experience,” and therefore correcting the onset for systemic dysfunction resulting in thyroid deficiency. The patient's 12 elective surgeries, in concert with her management of pre-menopausal via oral and topical hormone replacement, could provide the grounds for an argument towards a definite psychological role in the patient's thyroid condition. As such a mind-body approach toward the disease process could be entirely appropriate.

**Limitations**

The limitations to this case study are the outside effects of reduction in symptomatology. Considering the correlations between subluxation removal versus curve correction and restoration of normative TSH it is impossible to differentiate which treatment had the ultimate outcome, or whether it was some extraneous source of amelioration. Limitations in health care driven by pure empiricism are evident. Arguably, some researchers have shown limitations present in palpation skills used to detect vertebral subluxations, however, the x-ray analysis has acceptable kappa scores of .4 and inter-examiner reliability. The patient did follow the care plan as stated, however, considering the patient's multitudinous elective surgical history, it is difficult to ascertain if and to what degree some bio-psycho-social mechanism played a role. Due to the patient's level of symptomatology during her chiropractic treatments, the amount of corrective stress that she was able to endure was limited. Additionally, the patient's oral estrogen therapy does have a demonstrated effect on the efficacy of exogenous thyroid replacement, however seeing as estrogen's binding effect on levothyroxine (T4) decreases the drugs efficacy, it is highly unlikely that this drug interaction would play a role in the remittance of hypothyroid symptoms.

**Conclusion**

The evidence garnered in this case study would suggest that CBP care may contribute to improvement in overall thyroid function by improving spinal alignment and posture. As of the writing of this case study, there have been only one case study within the chiropractic literature that has reported efficacy in managing hypothyroid complaints. This is the first study to use CBP in the management of hypothyroidism. Further research will be needed to quantitatively determine the role that spinal alignment and postural correction play in regulating thyroid function.

**References**


### Table 1: Diagnostic Criteria for Hypothyroidism

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<thead>
<tr>
<th>Physical</th>
<th>Laboratory</th>
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<td>Bradycardia</td>
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<td>Hyperprolactinemia</td>
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<td>Cognitive impairment</td>
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Table 2: Digital Thermography

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### Table 3: Static Electromyography

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### Table 4: Postural Changes through Chiropractic Care

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<th>Six Months</th>
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<td>Cervical Lordosis</td>
<td>-8.1°</td>
<td>-15.0°</td>
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<tr>
<td>Rib Cage displacement</td>
<td>26.0mm forward</td>
<td>25.0mm forward</td>
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</tbody>
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Pre and Post Radiographs
Initial views taken: 2/3/2014  Follow-up view taken: 9/17/2014