Case Study
Reduction in Cardiovascular Disease Risk Factors Following Chiropractic Care: A Case Study & Selective Review of the Literature

INTRODUCTION
Cardiovascular Disease (CVD) is a multifactorial disorder with a constellation of lifestyle and biological risk factors, such as: hypercholesterolemia, hypertriglyceridemia, cigarette smoking, hypertension, obesity, physical inactivity, diabetes, and metabolic syndrome.1-4 CVD has the highest prevalence amongst males, the elderly, and smokers.1-3 CVD is the leading cause of mortality and a major cause of morbidity worldwide; particularly prevalent in the United States due to Western diets and inactive lifestyles where more than 80 million individuals are diagnosed.13-16 Recent studies have linked an independent association of CVD with hyperuricemia.6 Inflammation is a common factor that links cardiovascular disease to rheumatic disease.5 High levels of C-reactive protein (CRP), a hematological inflammatory marker, are associated and identified with increased CVD risk.6 According to Keenan et al,6 “Gout is a rheumatic disease whose underlying cause is the presence of systemic hyperuricemia” and gout patients commonly suffer from multiple comorbidities compared to other rheumatologic diseases.6 A limited body of evidence has linked gout with cardiovascular disease; however, a current study in the New York Harbor Health Care System of the Department of Veterans Affairs have observed and concluded that a typical gout patient had as many as seven comorbidities, such as: hypertension, obesity, hyperlipidemia, renal insufficiency, insulin resistance, and diabetes.6 The study concluded that these comorbidities are an independent risk factor of CVD; however, as a constellation these conditions may accumulate

ABSTRACT

Objective: This case reports on the subjective and objective improvements of a male patient with vertebral subluxation, hypercholesterolemia, hypertriglyceridemia, and gout after undergoing chiropractic care and lifestyle interventions.

Clinical Features: A 30 year-old patient with previous diagnoses of hypercholesterolemia, hypertriglyceridemia, and gout in the left ankle as well as secondary low back pain presented for chiropractic care. Hematological panels confirmed hypercholesterolemia, hypertriglyceridemia, and hyperuricemia.

Intervention and Outcome: Chiropractic care was administered using high velocity, low amplitude adjustments (i.e., Diversified technique) to reduce vertebral and lower extremity subluxations. Objective clinical findings included: motion palpation, static palpation, paraspinous thermography, postural evaluation, orthopedic tests, and neurological tests. Under discretion of the chiropractor, lifestyle interventions were carried out, such as dietary changes, nutritional supplementation, and an exercise regimen. Diversified chiropractic adjustments were conducted over a 10 week period of care. There was an overall reduction in the patient’s subluxations, in addition to marked improvement in serum cholesterol and lipid panels.

Conclusion: This retrospective case study reports on the effectiveness of chiropractic care in reducing vertebral and lower extremity subluxation findings as well as lowering the risk factors of cardiovascular disease in a 30 year-old patient. Further research in chiropractic care and cardiovascular disease is advocated.

Key Words: subluxation, chiropractic, diversified technique, hypercholesterolemia, gout, cardiovascular disease

Anthony Slinger D.C.1
Shayla Lesho D.C.2
1. Private Practice of Chiropractic, Charles City, IA
2. Private Practice of Chiropractic, Mount Pleasant, SC

Cardiovascular Disease
into metabolic syndrome, which is also known as syndrome X.\textsuperscript{6,7}

In 1923, Kylin described metabolic syndrome as a “clustering of hypertension, hyperglycemia, and gout as a syndrome.”\textsuperscript{8,9} Later, in 1988 Gerald Reaven redefined the syndrome as “the clustering of cardiovascular risk factors like hypertension, glucose intolerance, high triglycerides, and low HDL cholesterol concentrations”; subsequently, the definition was expanded to include obesity and microalbuminuria abnormalities.\textsuperscript{8} The World Health Organization (WHO) recently proposed the pathophysiological mechanism of metabolic syndrome as the following: (1) hypertension of elevated blood pressure $>$160 mm Hg systolic or $>$90 mm Hg diastolic; (2) dyslipidemia of elevated triglycerides $\geq$1.7 mmol/l and/or low HDL cholesterol $<$1.0 mmol/l; (3) obesity of a high BMI $\geq$30 kg/m$^2$; and (4) microalbuminuria of urinary AER $\geq$ 20 µg/min.\textsuperscript{8} In a current study by Isomaa et al.,\textsuperscript{8} an increased risk for cardiovascular morbidity and mortality was associated with the presence of metabolic syndrome with an odds ratio of 1.8 for cardiovascular mortality and 3 for coronary heart disease (CHD); thus concluding that “CHD morbidity risk associated with the cluster of risk factors was greater than the risk associated with the individual components.”\textsuperscript{9,10}

Obesity is strongly correlated with cardiovascular diseases, which include: coronary heart disease, heart failure, myocardial infarction, cerebrovascular ischemic stroke, and atrial fibrillation.\textsuperscript{9} Obesity is an epidemic problem in both adults and children in the United States.\textsuperscript{9} Lavie et al.\textsuperscript{8} reported that 70% of the adult population is classified as overweight or obese; whereas, forty years ago the prevalence of adult obesity was 25%.\textsuperscript{9} A body mass index (BMI) of 25 to 29.9 kg/m$^2$ is considered overweight and obesity is classified by having a BMI of $\geq$30 kg/m$^2$; however, other weight indexes include: weight circumference (WC), waist-to-hip ratio (WHR), weight-to-height ratio, and body fatness.\textsuperscript{9} Not only does obesity alter physiological structure and function, but it also has many adverse effects on hematology and hemodynamics that is analogous to increased circulating lipoproteins, LDL and VLDL, that binds to detoxify lipopolysaccharides to stimulate release of inflammatory markers within the blood.\textsuperscript{9}

Tuomilehto\textsuperscript{1} reports on a prospective study in 1960 that discovered a link between dyslipidemia and CVD which revealed the associated relationship between hypercholesterolemia and its increased risk in developing coronary heart disease.\textsuperscript{1} Recent epidemiological data has reported that dyslipidemia, especially increased levels of low-density lipoprotein (LDL-C) cholesterol, is the major independent risk factor of CVD.\textsuperscript{1} Tuomilehto\textsuperscript{1} also reports on studies which have identified “the relationship between serum cholesterol and CHD is linear and that there is no natural threshold: the increase in the risk of CHD is continuous from low to high total cholesterol concentrations.”\textsuperscript{11} Both hypercholesterolemia and elevated plasma triglycerides significantly increase the risk of developing CHD.\textsuperscript{1} Recent research reported by Blokstra et al.\textsuperscript{2} has revealed that aggressive lifestyle interventions have a high correlation in efficacy in managing CVD.\textsuperscript{2} Blokstra et al.\textsuperscript{2} described primary prevention of CVD as the modification of risk factors through a healthy lifestyle; such prevention includes: quitting smoking, choosing healthy caloric foods, increasing exercise, lowering blood pressure, lowering cholesterol, and reducing weight.\textsuperscript{2} Lavie et al.\textsuperscript{8} reported on studies that assessed mortality rates based on body fat and lean mass rather than BMI or weight alone, which suggested that subjects whom lost body fat rather than lean mass had a lower mortality.\textsuperscript{9}

Chiropractic management of a patient with vertebral and lower extremity subluxations and a chief complaint of hypercholesterolemia and hypertriglyceridemia along with ancillary complaints of gout and secondary low back pain (LBP) are discussed within the context of this case study.

CASE REPORT

Patient History

A thirty year-old male with a chief complaint of hypercholesterolemia and hypertriglyceridemia, as well as signs and symptoms of gout and secondary low back pain of six weeks duration presented into a private practice in Iowa for chiropractic and lifestyle interventional care.

Prior to chiropractic care, the patient had a history of hypercholesterolemia, hyperlipidemia, and gout for the past four years. He was under the care of his general practitioner (GP) who prescribed simvastatin for hypercholesterolemia and allopurinol for gout. Just prior to chiropractic care, the patient’s lipid panel from blood laboratory results demonstrated the following: high triglycerides of 577 mg/dL with a normal range from 35-150 mg/dL, high cholesterol of 246 mg/dL with a normal range from 130-200 mg/dL, low high density lipoprotein (HDL) cholesterol of 26 mg/dL with a normal range from 40-59 mg/dL, high cholesterol to HDL ratio of 9.5 with a normal range from 2.5-4.9, and uric acid was 8.4 with a normal range from 3.5-8.5 mg/dL. Calculated low-density lipoprotein (LDL) was not available for measurement when triglycerides exceed 400 mg/dL. In comparison to the normal values established by the Center for Disease Control (CDC), the patient’s cholesterol and triglyceride levels classified him as high risk for cardiovascular disease.\textsuperscript{10}

Chiropractic Examination

The initial chiropractic examination entailed: observation, motion and static palpation, visual postural evaluation, orthopedic tests, neurological tests, deep tendon reflexes for upper and lower extremities, and paraspinal thermography instrumentation.

Postural evaluation has been used in chiropractic analysis as an assessment tool for biomechanical integrity of the spine and the central nervous system.\textsuperscript{11} According to Harrison et al.,\textsuperscript{12} the reproducibility of neutral, standing upright posture has been studied and shown to be highly repeatable, with a method of error of 1.0° to 3.0° in both sagittal and coronal planes.\textsuperscript{12} Harrison et al.\textsuperscript{13} reported that postural stress has been correlated with low back pain; therefore, posture is a valid outcome of care and is accepted by most health care fields.\textsuperscript{13}

In the same study, pelvic orientation is also correlated with low back pain; it is noted that subjects with flexion of the pelvis and lumbar hyperlordosis had complaints of acute low
back pain, whereas subjects demonstrating pelvic extension and lumbar hypolordosis had chronic low back pain.\textsuperscript{13}

An assessment tool frequently used in chiropractic analysis is paraspinal thermography to illustrate the neurological component of the vertebral subluxation complex.\textsuperscript{1,4–15} Dysfunction of the sympathetic nerves innervating the vascular beds of the skin demonstrates asymmetrical deviations in skin temperature; which has been reported in a plethora of health problems, including involvement of peripheral innervations.\textsuperscript{15,16} A study performed by McCoy et al\textsuperscript{15} revealed that there is strong evidence of interexaminer and intraexaminer reproducibility using commercially available paraspinal thermography, such as the Insight Subluxation Station Instrumentation which produces readings of algometry, range of motion (ROM), surface electromyography (sEMG), thermal scan, and pulse wave profiler (PWP) with and overall NeuroSpinal Function Index number that determines the state of health of core neurological and spinal functions.\textsuperscript{15}

The use of static palpation enhances the clinician’s ability to recognize the sites of pain and/or tenderness in order to determine the correct regions of the spine in which a spinal misalignment may be present.\textsuperscript{17} Based on a review of literature performed by Haneline et al,\textsuperscript{17} it was determined that there was good reliability when using palpation to locate landmarks as well as the position of alignment of an osseous structure.\textsuperscript{17} However, Haneline et al\textsuperscript{17} found that the higher levels of interexaminer and intraexaminer reliability was found with palpation used to locate painful and/or tender points along the spine and sacroiliac joints.\textsuperscript{17} Similarly, motion palpation is used as an effective assessment tool for comparing normal spinal biomechanics and aberrant spinal range of motion.\textsuperscript{18} Lakhani et al\textsuperscript{18} reported that motion palpation helps the clinician to identify and localize areas of joint dysfunction or motion restriction.\textsuperscript{18}

**Chiropractic Impressions/Diagnosis**

Upon the initial exam, postural analysis of the patient revealed a high right hip and bilateral foot pronation associated with an anterior pelvis. Static palpation revealed hypertonic paraspinal muscle spasm in the upper cervical spine and the lumbar spine. Motion palpation findings indicated right fixation of atlas, C4-C6 vertebral bodies were fixated in left lateral flexion, T5-T7 and T8-T10 vertebral bodies were restricted in right lateral flexion, L5 vertebral body was restricted in left lateral flexion, as well as visible swelling, erythema, and pain of the left ankle. Bilateral Straight Leg Raiser (SLR) was positive and reproduced pain in the low back. Deep tendon reflexes were performed bilaterally on the upper and lower extremity and were graded +2/4 on the Wexler Scale. Other neurological testing was inconclusive. Blood pressure was recorded at the initial exam of 138/84 mm Hg. The initial exam instrumentation illustrated moderate thermal asymmetry on the right at L4-L5 with a skin temperature reading of 1.4°F, which is neurologically significant since the temperature was >1.0°F. Mild thermal asymmetry was noted on the right at C2-C3 with a thermal reading of 0.9°F. Static EMG scan pattern graph revealed severe muscle hypertonicity on the left and mild hypertonicity on the right within the cervical spine. The sEMG pattern reading was 76.58 of 100, symmetry 85.48 of 100, and total energy of 100 was noted at 109.20. Cervical ranges of motion were obtained; flexion 55/50°, extension 24/60°, left lateral flexion 40°/45°, right lateral flexion 36°/45°, left rotation 100/80°, and right rotation 55°/80°. Lumbar ranges of motion were not evaluated. Pulse wave profiler was graded 33.70/100 for determining the balance and tone of the autonomic nervous system, which is known as heart rate variability (HRV). The autonomic activity index was 44.08 and the autonomic balance index was 14.42 for sympathetic activity. Algometry was noted at 100/100. The overall NeuroSpinal Function Index was interpreted in the “transition” range of 70-79/100 at 70.52/100. A radiographic examination was not performed.

**Chiropractic Care**

**Intervention**

Based on the initial examination findings, it was advised by the chiropractor that the patient be assessed for segmental subluxation two times per week for three weeks then twice per week for the next six weeks using Diversified technique. Diversified technique is based on a segmental model, which views subluxation in terms of aberrant motion in specific intervertebral motion segments and is assessed by motion palpation.\textsuperscript{19} Due to the patient’s prior health history and laboratory results, the chiropractor recommended dietary changes, nutritional supplementation [see Table 1], and an exercise routine; which included implementing the following: restricted refined carbohydrates; increased vegetables, fruits, and healthy fats; lean, low purine small portions of meat; increased water intake; and moderate- intensity exercise of thirty minutes three days per week. The patient was compliant with the established care plan.

Diversified technique practitioners are full-spine chiropractors that utilize high and low-velocity, low amplitude corrective procedures.\textsuperscript{20} Subluxations for Diversified technique are described in context of how the vertebral body is misaligned within the spine.\textsuperscript{20} The concept of subluxation for Diversified practitioners revolves around the spinal misalignment and motion restriction; therefore, the rationale of this technique is centered around neurobiomechanical-orthopedic principles.\textsuperscript{20,21} The physiologic mechanism of the subluxation for Diversified technique is caused by nerve interference due to direct compression or irritation to spinal nerve roots; however, the subluxation can also result in visceral and/or somatic dysfunction.\textsuperscript{20} According to Cooperstein et al,\textsuperscript{20,21} practitioners identify subluxations by the following assessments: “patient history, motion and static palpation, postural assessment, gait analysis, X-ray line marking, thermography, leg checks, and a variety of reflex procedures.”\textsuperscript{20} Approximately 96% of chiropractors use the Diversified technique to reduce spinal subluxations in 73.5% of their patients.\textsuperscript{20,21}

At the second visit and subsequent visits, the chiropractor utilized Diversified technique for spinal subluxations as well as extremity adjusting to the patient’s left ankle to minimize and/or reduce subluxations. The chiropractor delivered supine cervical adjustable thrusts to atlas for right laterality, as well as C4-C6 for left vertebral body lateral flexion fixations. The
patient was prone for T8-10 adjustments, which the vertebral body was misaligned in right lateral flexion. The patient’s L5 vertebral body was fixated in left lateral flexion and was adjusted in the side posture position. Additionally, the chiropractor delivered an extremity joint thrust to the left talus for superiority at each visit. According to Hoskins et al., lower extremity joint dysfunctions can create back pain by kinematic and kinetic biomechanical relationships; therefore, Hoskins claims to address chiropractic care in a multimodal fashion.

Static palpation and motion palpation were assessed at each visit to determine the presence of vertebral subluxations within the spine. Subjective complaints from the patient were noted at each visit as well. Paraspinal thermography and visual postural evaluation were assessed twice throughout the care plan- the initial new patient examination and the twelfth visit for a progressive re-examination.

**Outcome**

By the second visit, the patient and the chiropractor noticed an improvement in presenting symptomatology and subjective complaints. The patient reported decreased left ankle and low back pain (LBP), increased motion in the left lower extremity and spinal joints, decreased inflammation, improved sleeping patterns, and improved digestion. Under discretion of the patient’s GP, the patient discontinued the usage of prescribed simvastatin and allopurinol. Over the course of ten weeks, the patient was seen fourteen times as a result of lifestyle changes, which included dietary changes, supplementation, and an exercise program. The patient successfully lost thirty pounds. The patient weighed 240 pounds at six foot tall at the initial examination for a body mass index (BMI) of 32.5 kg/m², which is considered obese according to the U.S. Department of Health and Human Services. At the re-examination the patient weighed in at 210 pounds. His BMI is now in the “overweight” category at 28.5 kg/m². The patient stated to his chiropractor, “I just can’t believe the change and how lifestyle affects so much of who we are and how we feel!” The patient continues to receive chiropractic and interventional care.

The patient’s GP collected a subsequent hematologic sample halfway through the course of chiropractic care and the results were as follows: normal triglycerides of 126 mg/dL with a range from 35-150 mg/DL, normal cholesterol of 188 mg/dL with a range from 130-200 mg/dL, low HDL cholesterol of 27 mg/dL with a normal range of 40-59 mg/dL, high cholesterol to HDL ratio of 7.0 with a normal range from 2.5-4.9, high calculated LDL cholesterol of 136 mg/dL with a normal range from 60-130 mg/dL, and high uric acid of 9.6 mg/dL with a normal range from 3.5-8.5 mg/dL. Therefore, it can be concluded that the patient’s triglycerides and cholesterol levels reduced to within normal risk of cardiovascular disease according to the CDC.

At the first re-examination, the patient’s paraspinal thermography scans improved, which denoted a reduction of the vertebral subluxation complex. The thermal scan illustrated mild thermal asymmetry on the right at L4 of 0.8°F. Static sEMG pattern graph revealed mild muscle hypertonicity on the right side of the upper and lower cervical spine. The sEMG pattern reading was 78.12 of 100, symmetry 81.43 of 100, and total energy of 100 was recorded at 96.71. Cervical ROM were evaluated: flexion 43°/50°, extension 47°/60°, left lateral flexion 30°/45°, right lateral flexion 35°/45°, left rotation 98°/80°, and right rotation 61°/80°. It can be concluded from the initial examination to the re-examination that the patient’s cervical extension and right rotation improved. Lumbar ROM was not evaluated. Pulse wave profiler improved from 33.70/100 at the initial examination to 69.67/100 at the re-examination with an autonomic activity index of 68.63 and autonomic balance index was 71.59 for sympathetic activity. This demonstrates that HRV improved throughout the course of care from 33.70/100 to 69.67/100. Lastly, the NeuroSpinal Function Index for assessment of neurological and spinal functions was graded 83.58/100 with an interpretation of a “good” range from 80-89/100. The NeuroSpinal Function Index number improved from 70.52/100 to 83.58/100 demonstrating improved functioning of the nervous system. It was also noted at the re-examination that the patient’s hips were balanced and pronation of the feet had resolved compared to the initial examination.

According to Cooperstein et al., the goal of Diversified outcome measure assessment reverses the examination findings, which allows the chiropractor to confirm the reduction of the vertebral subluxation. Along with the chiropractor’s objective findings, paraspinal thermography readings, and the hematological examination this can confirm and indicate a reduction of the vertebral subluxation complex.

**DISCUSSION**

**Cardiovascular Disease**

**Traditional Treatment**

Traditional medical treatment and management for cardiovascular disease (CVD) relies heavily on pharmacotherapy. The medical protocol for pharmaceutical therapy most commonly involves prescribing either a statin drug (i.e., pravastatin, simvastatin, atorvastatin, rosuvastatin) or antiplatelet therapy (i.e., acetylsalicylic acid). The main pharmaceutical benefit of statin drugs aid in lowering elevated levels of cholesterol, triglycerides, and low density lipoprotein (LDL) cholesterol. Additional benefits of statins include: enhancing arterial endothelium function, stabilizing atherosclerotic plaque, preventing thrombus formation, altering inflammatory reactions like C-reactive protein, and reducing risk factors of type 2 diabetes mellitus. A meta-analysis conducted by Mills et al. revealed that randomized clinical trials of 3-hydroxy-3-methylglutaryl coenzyme-A reductase inhibitor, also known as statin drugs, reduces cholesterol risk factor levels; which aid in both primary and secondary prevention of CVD. Patients at moderate to high-risk factor levels of CVD benefit the most from statin drugs opposed to low-risk patients.

Aspirin is a common alternative treatment to statin drugs to help reduce the risk of ischemic events in CVD. Aspirin, similar to statins, demonstrates the effectiveness in both...
primary and secondary prevention of cardiovascular events, such as: fatal and non-fatal coronary heart disease (CHD), ischemic stroke, and peripheral arterial disease (PAD). The physiologic mechanism of acetylsalicylic acid inhibits thrombocytes by an inverse relationship to bind to cyclooxygenase by inhibiting the synthesis of the platelet agonist, thromboxane A2. Sofi et al revealed results from the meta-analysis of the “Antiplatelet Trialists’ Collaboration” that antiplatelet therapy, such as aspirin, reduced the risk of non-fatal myocardial infarction by 35% as well as the risk of total vascular events by 18%.2,28

**Alternative Treatment**

Lifestyle modification is the non-pharmaceutical approach to combat established CVD or high-risk development of CVD. Current research has shown evidence of aggressive multifactorial lifestyle modifications, such as exercise training and weight loss, can reduce cardiovascular disease adverse events as well as mortality. Lifestyle and biological risk factors that lead to CVD can be prevented or reduced by quitting cigarette smoking, eating healthy foods, increasing exercise, lowering blood pressure and cholesterol, and loosing body fat. According to Lavie et al, exercise training and cardiac rehabilitation reduce the prevalence of metabolic syndrome by 37% and a 60% decrease in the risk of developing diabetes mellitus by caloric restriction, weight loss, and exercise. A study of 530 patients revealed by Lavie et al disclosed improvements in CHD risk factors, including C-reactive protein, lipids, and glucose by weight loss. In 2006-2007, the EURO-ASPIRE III survey revealed that lowering blood pressure and lipid levels by pharmaceuticals was undesirable and that lifestyle interventions should be implemented along with pharmaceutical therapy if necessary. Severely obese patients are being considered as candidates for surgical procedures, such as gastric bypass, if lifestyle modification and pharmaceutical therapy is inconclusive and have shown to be effective in short and long-term improvements in morbidity and mortality.

Nutrition is a key factor in lifestyle intervention for reversal and prevention of CVD. Evidence has shown that high-lipid based diets are the biggest threat to increasing the risk of coronary heart disease (CHD). Thus, metabolic studies have shown that diets high in saturated fat are directly related to hypercholesterolemia compared to diets that are high in polyunsaturated fats, which have the reverse effect on serum cholesterol levels. According to Lecerf et al, the main objective in managing hypercholesterolemia is decreasing low-density lipoprotein (LDL-C) cholesterol which is accomplished by low dietary saturated fat intake of less than 30% daily calories consumed. Lecerf et al argues that the risk of CHD can be attained by substituting saturated fatty acids with unsaturated fatty acids within the diet.

Since 1997, the use of complementary and alternative medical (CAM) therapies has drastically increased in the United States. Wood et al reported that the yearly expenditure for Americans was estimated to have been $21.2 billion with a usage report of 42.1%. The United States’ National Institutes of Health National Center for Complementary and Alternative Medicine defined CAM as “a group of diverse medical and health care systems, practices, and products that are not generally considered part of conventional medicine.” Natural health products (NHP) are used and implemented by CAM practitioners and have been defined as vitamins and minerals, herbal remedies, homeopathic medicines, traditional Chinese medicines, probiotics, amino acids, and essential fatty acids. Yeh et al discuss that patients diagnosed with CVD typically use CAM for noncardiac conditions, such as mind-body therapies and herbal products. However, CAM use for specific cardiac conditions, such as herbs and natural products that allegedly have cardiovascular benefits, including: fish oil, soy, ginger, garlic, and ginseng. Manipulation-based CAM therapies (i.e., chiropractic or massage) have been shown to be effective with cardiovascular patients for noncardiac conditions. Mind-body therapies, including relaxation techniques, yoga, meditation, energy healing, and biofeedback, are used for stress, emotional health, and general wellness with CVD patients. Evidence-based research on psychosocial support, stress management, and coping skills for CVD patients and how the body is influenced by stress hormones, cortisol, and the hypothalamic-pituitary-adrenal axis are mediators of CVD risk. CAM surveys have concluded that most CVD patients choose to use CAM therapies along with conventional care.

**Chiropractic Literature**

A retrospective study by Childs et al assessed the relationship of regular chiropractic care corresponding to changes in blood lipid panel (total cholesterol, HDL, and cholesterol/HDL ratio or cardiac risk factor) over a period of one to three years in ten chiropractic students that had been exposed to a stressful environment. The study concluded that total cholesterol (TC) and LDL decreased in 70% of the students. Total cholesterol in 66% of the subjects originally classified as “borderline high to high risk” by the National Cholesterol Education Program resulted in “desirable” levels. Low-density lipoprotein (LDL) levels with ranges in the “borderline high to high risk” category became “desirable” levels in 80% of the subjects. Cardiac Risk Factor (CRF) levels of “optimal” range were obtained by 50% of the students. In 90% of the subjects, triglyceride (TG) levels decreased while under regular chiropractic care. Results of this study revealed a tentative correlation between improvement in blood lipid panel levels and regular chiropractic care. It also revealed that altered blood lipid metabolism levels are a way of assessing risk of coronary heart disease.

Powell and Leonard’s retrospective case series on twenty-eight chiropractic patients with a 21-day nutritional intervention program demonstrated significant decreases in total cholesterol, low-density lipoprotein cholesterol, very low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, and serum triglycerides. The subjects’ weight decreased from 191.2 ± 38.8 to 182.2 ± 36.3 during the 21-day intervention. This study showed that lifestyle nutritional interventions demonstrate beneficial effects on serum TC, LDL-C, and triglyceride levels; which helped decrease the independent risk factors leading to CVD.

A meta-analysis of 13 randomized controlled trials by McRae et al showed that supplementation of 500 mg/d of vitamin C for a minimum of four weeks resulted in significantly reduced
serum LDL-C and triglyceride levels. Studies have revealed that vitamin C supplementation positively correlates with HDL-C levels; however, this study failed to provide increased levels of HDL cholesterol.

Nutritional supplementation for 90 days required 40 subjects at Logan College of Chiropractic to drink GreenFirst vegetable supplement shake to determine how nutrition affects cardiovascular health. Results of the study revealed a decrease in both systolic and diastolic blood pressures; whereas no significant changes were found in serum cholesterol, LDL, triglyceride levels, heart rate, and total power in the heart rate variability (HRV) analysis. However, HDL levels were significantly reduced, saliva dehydroepiandosterone sulfate (DHEA-S) and cortisol levels were slightly decreased, and a significant increase of serum dehydroepiandosterone sulfate (DHEA-S) and cortisol levels were slightly decreased, and a significant increase of serum homocysteine were noted.

Since cardiovascular disease is one of the main causes of mortality and morbidity in the United States, it is essential that chiropractors understand the neurological influence over cardiovascular tone and how subluxations interfere with neurological tone to the cardiovascular system. Masarsky et al. states that:

Subluxation may affect the rate, rhythm, and power of the heart contraction through the sympathetic efferent pathways originating from T1-T5. Cervical subluxation at any level could also affect sympathetic efferent pathways to the heart by the superior cervical, middle cervical, and stellate ganglia. Afferent and parasympathetic efferent innervation to the heart could be disturbed by upper cervical subluxation, primarily because of the passage of the vagus nerve through the jugular foramen.

Richard Koch, D.O., revealed a clinical series of 50 organic heart disease cases and 100 cases of functional heart disease. He noted that 100% of the organic group and 93% of the functional group had palpatory and radiographic evidence of vertebral misalignment at T2-T6. All cases were improved with osteopathic manipulative therapy along with cervicothoracic spine flexibility exercises. A study by Cox et al concluded that there was a significant correlation between palpation and coronary artery disease. Beal performed a study assessing 100 patients diagnosed with CVD, which found that 90% of the patients had vertebral dysfunction from T1-T5 on the left side as well as C2 on the left side, and revealed that hypertonic deep paraspinal muscles were the most important clinical finding. In a study performed by Peterson on two patients under chiropractic care, it was established that chiropractic spinal adjustments decreased serum cholesterol levels greater than 22%. Subluxations interfere with neurological tone which irritates CVD signs and/or symptoms; therefore, it is necessary that the chiropractor administers an adjunctive thrust to reduce the vertebral subluxation(s).

CONCLUSION

This case study suggests that adults with cardiovascular disease may lower the risk factors utilizing a combination of chiropractic care characterized as high velocity, low amplitude adjunctive thrusts to specific sites of spinal segmental misalignments and along with lifestyle modifications. There has only been one other case study reported within chiropractic literature regarding elevated serum cholesterol and lipid levels managed by regular chiropractic care. However, more research is advocated in order to evaluate the link between vertebral subluxation, chiropractic care, and cardiovascular disease.

REFERENCES

10. Kwiterovich PO. Laboratory procedure manual [Internet]. Baltimore, MD: Lipid Laboratory John Hopkins University School of Medicine Lipoprotein Analytical Laboratory; [Date unknown] [Cited 2011 May 27]. Available from: http://www.cdc.gov/nchs/data/nhanes/nhanes_03_04/l13_me t_lipids.pdf


41. Brimhall J, Cooter S. DSF formula nutritional support for stress [Internet]. [Place unknown]: Nutri-West; [Date unknown] [Cited 2011 May 28]. Available from: http://impachealth.com/health_info/articles/Patient%20DSF.pdf


<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Proprietary Name</th>
<th>Dosage</th>
<th>Information from the Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutri-West</td>
<td>DSF Formula</td>
<td>2 tablets/day</td>
<td>This product is nutritional support for stress. Chronic stress can deplete the immune system, impair digestion, increase epinephrine and norepinephrine production, increase heart rate and blood pressure, as well as increase vulnerability to chronic illnesses or diseases.</td>
</tr>
<tr>
<td>Innate Choice</td>
<td>Probiotic Sufficiency</td>
<td>1 tablet/day</td>
<td>Probiotics are a non-pathogenic micro-organism that promotes a positive influence on gastroenterological metabolic health and physiology. Anti-inflammatory effects of probiotics influence intestinal flora and the local immune system.</td>
</tr>
<tr>
<td>Omega Sufficiency</td>
<td></td>
<td>1 tablespoon/day</td>
<td>Supplementation of n-3 polyunsaturated fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), inhibit arachidonic acid metabolism to inflammatory eicosanoids. EPA and DHA modify the lipid mediator profile, as well as promote effects on inflammation, including: leukocyte chemotaxis, adhesion molecules expression, and inflammatory cytokines production.</td>
</tr>
<tr>
<td>Standard Process</td>
<td>Catalyn</td>
<td>3 tablets/day</td>
<td>Multivitamin (MVM) supplementation has a diverse influence in the body, such as preventing deficiency of essential vitamins and minerals, regulating metabolism, and expressing genes. MVM can also impact cardiovascular health, as studies have shown that MVM reduce serum total cholesterol, total triglycerides, and low-density lipoprotein.</td>
</tr>
<tr>
<td>Phosfood Liquid</td>
<td></td>
<td>15 drops 2x/day</td>
<td>Phosphorous supplementation aids vitality for cellular life and metabolism as it is involved in cell structure, coding information, energy transfer, and functional activation of catalytic and signaling proteins. Supplementing also assists with osseous development as it provides minerals to support soft tissue and osteoblastic growth.</td>
</tr>
<tr>
<td>A-C Carbamide</td>
<td></td>
<td>2-3 capsules/day</td>
<td>Supplementing with carbamide, also known as urea, regulates osmosis, denatures protein-calcium complexes, and acts as a buffer salt to neutralize acids.</td>
</tr>
<tr>
<td>Arginex</td>
<td></td>
<td>2-3 tablets/day</td>
<td>Arginex, consisting of buckwheat extracts, is the main proprietary ingredient in this supplement. Buckwheat seeds are a natural antioxidant that contains rutin, tocopherols, and phenolics acids; which have anti-inflammatory and anti-carcinogenic effects and can also reduce blood vessel fragility related to hemorrhagic disease and hypertension.</td>
</tr>
<tr>
<td>Okra Pepsin E3</td>
<td></td>
<td>2-3 capsules/day</td>
<td>Okra is a soluble fiber that contains antioxidant properties and is known for its rich content of unsaturated fatty acids such as linoleic acid, which promotes cardiovascular and gastrointestinal health.</td>
</tr>
<tr>
<td>Organically Bound Minerals</td>
<td></td>
<td>3 tablets/day</td>
<td>Organically Bound Minerals supplement contains minerals from alfalfa, which have antioxidative enzymes. Alfalfa includes vitamins A, K, P, and folic acid that aids in absorption and neutralizes acids in the gastrointestinal tract. Alfalfa sprouts contains the following major minerals: calcium, magnesium, phosphorous, potassium, iron, and zinc for cardiovascular, neurological, and cellular health.</td>
</tr>
</tbody>
</table>