Case Study

Resolution of Type 2 Diabetes Mellitus in a 67 Year Old Female Patient Following Subluxation-Based Chiropractic Care: A Case Study

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Abstract

Objective: To present a case study of conservative chiropractic care of a female that presented with multiple health issues and following chiropractic care experienced improvement or resolution of several of these issues, most notably her type 2 diabetes.

Clinical Features: A 67 year old female presented with several complaints which included type 2 diabetes mellitus that had been diagnosed by a medical physician when she was 40 years of age. The patient was also found to have several vertebral subluxations throughout her spine, along with postural alterations. She had sought care from several providers with no resolution in any of her complaints.

Interventions and Outcomes: The patient received specific chiropractic adjustments according to Diversified technique in the regions of the cervical, thoracic, and lumbar spine and also pelvis. Physical rehabilitation exercises were given to address the patient's postural alterations found on her initial exam. After receiving chiropractic care the patient obtained several positive results. After four visits, the patient returned to her medical doctor and was able to stop taking insulin for her diabetes. Her blood sugar levels remained within normal limits throughout the rest of her care.

Conclusion: The use of conservative chiropractic care was shown in this case to be an effective alternative management for a patient with type 2 diabetes mellitus. Further research is required to understand the efficacy of chiropractic in management of this condition.

Key Words: *Chiropractic*, *diabetes*, *type 2 diabetes*, *diabetes mellitus*, *adjustment*, *spinal manipulation*, *vertebral subluxation*

Introduction

Diabetes mellitus is a multi-system disease which is characterized by persistent hyperglycemia that has both acute and chronic biochemical and anatomical sequelae.[1] It results from a variable interaction of hereditary and environmental factors that causes abnormal insulin secretion.[2] Insulin is the hormone responsible for the absorption of glucose into cells for energy use and into the liver and fat cells for energy storage. Insulin secretion is physiologically ruled by insulinemia, by means of a feed-back mechanism, through insulin-receptors localized on the membrane of insular Beta-cell.[3] According to the International Diabetes Federation, there are three main types of diabetes: Type 1, also known as insulin- dependent or immune-mediated or juvenile-onset, Type 2 also known as non-insulin dependent diabetes or adult-onset diabetes, and Gestational diabetes. Type 1 diabetes is caused by an auto-immune reaction where the body's defense system attacks the insulin-producing cells.[20] It is commonly seen in younger individuals and is characterized by beta cell destruction in the pancreas and has both an immune-mediated and idiopathic form.[2] People with this type of diabetes produce very little to no insulin and must get insulin injections every day in order to control the level of glucose in their

blood. If people with type 1 diabetes do not have access to insulin, they will die.[20] Type 2 diabetes can occur at any age, but usually occurs in people over the age of 40.[4] It is characterized by insulin resistance and relative insulin deficiency. Type 2 diabetes can remain undetected for many years and the diagnosis is often made from associated complications or incidentally through an abnormal blood or urine glucose test.[20] Gestational Diabetes Mellitus (GDM) is defined as glucose intolerance that is first detected during pregnancy.[18] In the United States, GDM affects approximately 2% to 4% of all pregnant women, or approximately 135,000 women each year.[18,19] GDM usually disappears after pregnancy but women with GDM and their offspring are at an increased risk of developing type 2 diabetes later in life.[20]

Type 2 Diabetes is a growing problem in the world today for people of all ages. It is thought that there are almost 17 million Americans with this disease, and only 11 million of whom have been diagnosed according to the American Diabetes Association.[1] The diagnosis is often delayed until complications are present. The number of cases of type 2 diabetes mellitus is on the rise, so prevention is essential because current treatment methods remain inadequate.[5] The purpose of this paper is to discuss the possible effects of the correction of vertebral subluxations, through specific chiropractic adjustments, on the resolution of type 2 diabetes mellitus.

Case Report

Patient History

The patient was a 67 year old female that presented with a variety of complaints on her initial intake. She was diagnosed by her medical doctor with several conditions which included: type 2 diabetes, hypertension, and was told she would soon need dialysis because her kidneys were failing. She was on several medications and stated that she was taking *92 pills* a day on her initial history. She had an extensive history of conditions that had occurred in her past, as well as the conditions she currently faced. She was experiencing headaches, digestive issues, and musculoskeletal complaints. All of these issues together pushed the patient to seek resolution. These issues were affecting every facet of her life. She was having a lot of pain, difficulty sleeping, and was psychologically distraught at the lack of results from any other medical intervention. She had seen several healthcare providers, including another chiropractor, with no resolution. Her last resort she felt was seeing another chiropractor. The patient had a strong desire to improve and get healthy. She wanted the pain reduced, so she could decrease the amount of medications, and be healthy again.

The patient was diagnosed with type 2 diabetes when she was 40 years old. She was overweight and did not have a healthy diet. The patient had been taking insulin injections since her diagnosis. She stated that her blood glucose levels were usually above 200 mg/dL. Diagnostic criteria for diabetes is a plasma or serum glucose level of greater than or equal to 140 mg/dL after an overnight fast on two occasions.[4]

Chiropractic Examination

Following the patient history, a thorough chiropractic examination was performed on the patient that same day. There were complaints of pain, discomfort and loss of range of motion found in areas of the cervical, thoracic, lumbar and pelvic regions. These same areas also revealed asymmetry found on postural analysis of the patient. Static palpation was performed on the patient's spine and para-spinal musculature to reveal muscle spasm bilaterally at segments in these same regions of pain and discomfort. There was also motion palpation performed on all areas of the spine and segmental dysfunction with a loss of segmental range of motion was found in the cervical, thoracic, lumbar and pelvic regions. Global range of motion was performed on each spinal region of the patient to reveal a loss of active range of motion in the cervical, thoracic and lumbar regions. These findings on examination led to a diagnosis of vertebral subluxations found in the cervical, thoracic, lumbar and pelvic regions. A diagnosis of pain in the cervical spine, thoracic spine, lumbar spine, and disorder of the lumbosacral region was also noted. There was also a diagnosis of abnormal posture and spasm of muscle included in the list of diagnosis for the patient. The previous diagnoses from her medical doctor are noted: hypertension, type 2 diabetes mellitus.

Interventions

The care plan assigned to the patient recommended she come in three times a week for four weeks, or until the patient reaches maximum medical improvement, to improve the activities of daily living such as sitting and functioning. The methods of treatment were discussed. The methods included spinal adjustment and low-tech physical rehabilitation. Group activities and exercises to the lumbar region were assigned for the same frequency of time to help improve the loss of muscle endurance found on the chiropractic examination. There were also exercises performed for the same frequency and duration to address muscle reeducation in the cervical spine. This was to correct the patient's forward head posture, and it was done by utilizing a wobble chair with the patient sitting.

The chiropractor located, and reduced the patient's cervical, thoracic, lumbar and pelvic subluxations that were found each visit using the Diversified technique. There were no more than three spinal adjustments performed each visit. The atlas, or C1 segment, was analyzed and a Diversified chiropractic adjustment was performed on 29 of the 33 visits the patient had. After every adjustment, the chiropractor would perform a post-check on range of motion and motion palpation to ensure a correction was made and subluxations were reduced. The patient's posture was re-evaluated using visual inspection on each visit. On each visit the patient's progress was assessed subjectively as well. The patient was asked what she felt was her percentage of improvement since the last visit, the percentage of improvement in functioning compared to the last visit, and the percentage the condition improved since the beginning of care.

Diversified Technique is characterized by a high velocity, low amplitude thrusts with the objective of restoring proper movement and alignment of the spine and joint dysfunction.[34] Diversified Technique uses a variety of adjustive techniques to

detect "subluxations" and to create motion in a vertebral joint. Some of these mobilizing techniques are effective in the treatment of back pain. Chiropractors who use Diversified technique are more likely to offer appropriate hands-on spinal adjusting than those who use a "specific technique.[33] The patient was also given exercises on a wobble chair which provides motion based therapy that is a specifically designed seat that provides 360 degrees of rotation, 40 degrees of side to side flexion and 35 degrees of front to back flexion to facilitate all possible combinations of exercise motion needed.[4] Motion based therapies, as part of a comprehensive rehabilitation program, may contribute to the restoration of daily function and the reversal of neurological insult as detected by electrodiagnostic testing.[21]

Outcomes

The patient was seen a total of 33 visits over a three month period of time, and began seeing results almost immediately. After the fourth visit, the patient saw her medical doctor and was able to stop taking insulin for her diabetes. Her plasma glucose levels had improved to within normal limits and stayed within those limits throughout the rest of her care. By the sixth visit, the patient stated she felt her condition had improved by 50 percent since she began care. There were also objective findings that indicated improvement for the patient. These findings included: decreased number and severity of muscle spasms and improvements in forward head posture. These improvements for the cervical and thoracic spine were seen by the sixth visit and for the lumbar and pelvic regions by the twelfth visit. By the end of care the patient stated that she had gotten off several of her medications. She had gone from taking 92 pills at the beginning of care to 21 pills. The patient continued to improve throughout the rest of her care, and the patient's objective and subjective findings continued to improve.

Discussion

Epidemiology of Diabetes

Type 2 diabetes mellitus makes up over 90% of all diabetic patients.[20] Diabetes has become one of the most common chronic diseases in the U.S. Using American Diabetes Association criteria, the NHANES III data indicates that diabetes (diagnosed and un-diagnosed combined) affects 7.8% of adults 20 years of age or older in the U.S. with rates reaching as high as 18.8% of individuals 60 years of age or older. In the United states Mexican-Americans and non-Hispanic blacks are almost twice the risk of developing diabetes than non-Hispanic whites.[23] Moreover, it is estimated that at least 20.1 million people in the United states (approximately 21% of the population) from age 40 to 74 have pre-diabetes.[24] The incidence of the condition is projected to increase to epidemic proportions in the next quarter century. It is safe to say that all practitioners including doctors of chiropractic will be seeing larger numbers of diabetic patients in the future.[6]

As the incidence of diabetes is on the rise, so is the national cost. According to the American Diabetes Association, the total cost of diagnosed diabetes have risen to $245 billion in 2012 from $174 billion in 2007. Amazingly this is a 41% increase in a five year span. This includes $176 billion in excess medical expenditures attributed to diabetes, as well as $69 billion in reduced national productivity. Those that are diagnosed with diabetes, on average, have medical expenditures that are approximately 2.3 times higher than it would be in the absence of diabetes. People with diagnosed diabetes incur average medical expenditures of about $13,700 per year, of which $7,900 is attributed to diabetes. Care for people with diagnosed diabetes accounts for more than 1 in 5 health care dollars in the U.S.[19] Based on these newly found statistics, diabetes proves to be a substantial concern and burden to our society.

Most patients in the United States with type 2 diabetes are obese and those that are not obese may represent a sub-category of type 1 because they often eventually need insulin. The relationship to obesity appears to be predominantly associated with an abdominal fat distribution within the viscera. This visceral type of fat is distributed mainly in the omental and mesenteric regions. Both insulin resistance and hepatic glucose production are increased with this type of obesity.[24] There are several complications that can occur in individuals that present with diabetes. These complications can range from mild to severe based on how long it takes for the patient to be diagnosed and treated. There are several musculoskeletal conditions that are associated with diabetes. These conditions include but are not limited to muscle cramps, diabetic muscle infarctions, loss of deep tendon reflexes, neurotrophic joints, carpal tunnel syndrome, Depuytren's contracture.[1] Other more severe complications include the following: Blindness, renal failure, neuropathy, gangrene of the feet and possibly death.[24] Diabetic patients have a high prevalence of comorbidities, which is the co-existence of one or more additional conditions in persons with a specified medical condition. In the United States, the majority of adults with diabetes have more than one comorbidity, and 40% have three or more.[8]

One of the more severe effects of long-standing, untreated diabetes is peripheral neuropathy. Diabetic peripheral neuropathy is common and results in great morbidity, mortality and significant economic burden.[7] Diabetes mellitus is the most common cause of polyneuropathy; it affects 50% of all diabetics within 25 years. Diabetic neuropathy from long term events include segmental demyelination and microvascular influence on nerve function.[24] While the primary symptoms of neuropathy can be highly unpleasant, the secondary complications (eg, falls, foot ulcers, cardiac arrhythmias, an ileus) are even more serious and can lead to fractures, amputations, and even death in patients with diabetes mellitus.[25] Short term, acute events include slowing of nerve condition due to hyperglycemia and acute vascular events due to hyperproliferation with occlusion.[24]

Diabetic muscle infarction is characterized by localized muscle tenderness, swelling and painful restriction of movement in patients with diabetic microvascular complications. There is strong predilection for involvement of the lower extremity, particularly the thigh with rare cases reporting of upper extremity infarctions in non-dialysis patients.[26] The onset of the pain is usually gradual, but can be sudden. The swelling is exquisitely tender and tends to resolve within a few weeks, but frequently recurs. Diabetic muscle

infarction is a rare complication of diabetes which should be suspected in any diabetic subject with atypical severe muscle pain.[27]

Diabetes is the leading cause of new cases of blindness among adults aged 20 to 74. People with diabetes are 40 percent more likely to develop glaucoma and 60 percent more likely to develop cataracts.[28] Diabetes accounts for approximately 8% or cases of legal blindness and 12% of all new cases of blindness in the United states each year.[29] A substantial proportion of vision loss caused by diabetes is preventable. Early detection of diabetic retinopathy and timely intervention with laser photocoagulation can reduce the incidence of severe vision loss by 50%-60% in patients with macular edema and by 90% in patients with peripheral retinopathy.[30]

Treatment of diabetes prevents some of its devastating complications, but does not usually restore normogylcemia or eliminate all the adverse consequences.[9] The methods of treatment for type 2 diabetes mellitus, in the traditional medical model, is focused on reducing symptoms. This usually involves the patient being prescribed medication, such as insulin therapy. Insulin therapy has been extensively used for the management of advanced type 2 diabetes. This is when the pancreas is exceedingly deficient and patients are overtly hyperglycemic. In this stage, only a third of the patients treated with insulin achieve the therapy goal, and the remainder become susceptible to complications.[10] The current medical care for chronic disease, such as diabetes, is often fragmented and uncoordinated.[2,11] This is causing patients to look into other options for care and management for their conditions. The methods of treatment for diabetes are considered inadequate and prevention is preferable.[9]

Chiropractic and Diabetes

Chiropractic care has been shown in several cases to improve and totally resolve patients presenting with type 1 and 2 diabetes mellitus as well as other complications that present with diabetes mentioned previously. One case study by Webster et al showed a stabilization of plasma glucose levels in six patients following a reduction of an upper cervical subluxation through NUCCA technique. The plasma levels decreased over a three-hour fasting period, with measurements taken each hour.[12] Another study done by Roberto and Sousley of a 61 year old male patient that presented with a long-standing history of type 2 diabetes, similar to this case. After two months of subluxation-based chiropractic care using diversified full spine, Pettibon techniques and minor modification to his diet the patient had total resolution of his symptoms.[4] After a 48 year old male received a conventional blood and urine test, by his medical doctor, he was diagnosed with Diabetes type 2. He sought for an alternative to medications to improve his health and after finding a chiropractor he got regular subluxation based adjustments with considerable dietary changes, and an exercise regimen. Within one month there was considerable positive changes associated with his blood and urine analysis to the point of normalcy.[31]

Other studies show chiropractic care is beneficial in the improvement and overall health of patients presenting with type 1 diabetes. A study by Echeveste showed a 9 year old female patient diagnosed with type 1 diabetes who received chiropractic care and minor dietary changes. High-velocity low-amplitude adjustments focused on specific subluxated segments were used. After multiple visits the patient's mother reported that her diabetes was under control with decrease need for insulin, decrease frequency of hypoglycemic episodes and improvement in sleep patterns.[13] In a different but similar study, a 4 year old female patient presented to a chiropractic office with type 1 diabetes. The patient was analyzed and treated using Gonstead technique. After 24 visits, the patient's A1C levels significantly decreased, which allowed the patient to be on less insulin medication.[14] In a study done by Valli et al showed a 46 year old female patient with a 21 year history of type 1 diabetes who received spinal manipulation with ultrasound and active rehabilitation exercises. After multiple adjustments and 3 months of rehabilitation the patient showed drastic improvement with her condition.[6] A case study done on a 46 year old patient presenting with type 1 diabetes, intraocular pressure, and total loss of vision for five years duration received network spinal analysis chiropractic care with improvement in intraocular pressure and overall vision improvements.[15]

Chiropractic is proving to be beneficial in improving not only musculoskeletal conditions but also visceral condition. Although there are not many studies done in reference to chiropractic care and improvement of diabetes and other visceral conditions, it has shown many times to be beneficial for the patient as a long term health benefit because they are able to get off multiple medications. The medical and chiropractic view on the diagnoses and care for the patient differ in many ways. The medical definition of a subluxation is defined as a partial dislocation which is commonly caused by disc degenerations, curvatures, spondylolysis, and structural abnormalities.[32,35] The chiropractic definition states an abnormal positional relationship between contiguous vertebrae resulting in abnormal biochemical and neurological function.[32] Chiropractors main concern is to adjust the segment that is causing the nerve irritation to relieve pressure on that nerve to allow proper function of the nerve itself and anything that nerve innervates. Chiropractic views the human body as a self-healing and self-regulating entity where the cause of disease comes from inside the body.[13] Removal of these interferences presented as subluxations will help to restore proper physiological function in the body.

There are several models to help explain the vertebral subluxation and its physiological effects on the body. Kent explains these various models and the components that make up each model.[16] One of the models Kent proposes helps explain the possibility of a subluxation causing diabetes, or the removal of a subluxation being capable of assisting in the resolution of diabetes. The proposed model is the neurodystrophic model which suggests that a subluxation causes neural dysfunction, which causes stress to body tissues, which subsequently lowers tissue resistance. The nervous system and immune system are thought to have a relationship together and are capable of affecting one another.[16] The model suggests that increased sympathetic tone due to a vertebral subluxation can alter organ and tissue responses to hormones, infectious agents, and blood components.[4] Another model is the Dysafferentation model which proposes that the intervertebral motion segments are endowed by nociceptive and mechanoreceptive structures. As a consequence,

biomechanical dysfunction may result in an alteration in normal nociception and/or mechanoreception. Thus, subluxated vertebral segments may cause abnormal afferent input to the CNS and may lead to dysponesis.[16]

Based on these models vertebral subluxations can have the ability to affect the body's communication processes and thus interfere with the normal mechanisms of the body. By correction and removal of these subluxation complexes the body has the ability to maintain normal function by feed forward and feedback mechanisms to maintain homeostasis. According to the neurodystrophic model and dysafferentation model, without correction of the interference (subluxation) the body is unable to function at its full potential thus continuing a declining process within the body which then presents as more severe complications stated previously.[16] As stated in multiple case reports presented in this discussion, there are a variety of chiropractic techniques that can be used to care for a patient with any presentation but generally share the common objective of correcting spinal nerve interference caused by vertebral subluxation.[16] Even if the body does not return to normal physiological function, the theories support that improvement can still occur in a patient with type 2 diabetes mellitus, which also has been reported in literature.

Conclusion

This case presented a patient with a long-standing history of type 2 diabetes mellitus that was resolved under conservative chiropractic care. Following a short frequency of visits, the patient was able to stop administering medication for her condition and complete resolution was noted. This was based on regular blood glucose level testing, which showed to be consistently within normal limits. The goal of this study is to show the possibility of specific chiropractic care as being an adequate and effective treatment for those suffering with type 2 diabetes. Resolution of this condition under subluxation based chiropractic care has only been documented in very few case studies. One limitation of this study is that the results were found on only one patient. It is important to note the prevention of this condition is equally as important as treatment for individuals that show predisposing factors for type 2 diabetes, such as obesity or hypertension. Hopefully this study will motivate others to conduct additional research that will further advance an understanding of chiropractic's efficacy on this condition. Also future research should make efforts to increase the number of participants in the study and have it reflect on a larger population. If chiropractic care can offer assistance in treatment of 5% of the diabetic population that presents to health care providers, this alone could offer significant lifestyle enhancement for those patients positively influenced.[3]

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