CASE STUDY

Resolution of Trigeminal Neuralgia Following Upper Cervical Chiropractic Care Using Quantum Spinal Mechanics 3 (QSM3)

Alexandra Friedman D.C.[1]

ABSTRACT

Objective: The purpose of this study is to describe an upper cervical chiropractic mechanism, Quantum Spinal Mechanics 3 (QSM3), and its application of postural analysis, restoring a postural misalignment, leading to the improvement of Trigeminal Neuralgia (TN) symptoms.

Clinical Features: A patient formerly diagnosed with TN over the right side, experienced spontaneous, intermittent pain, aggravated by activities such as chewing, talking and stress related interactions. The algorithm that was concluded, illustrated a patient with a C1 misalignment with 10.7^{o} angulation, in relation to the head and neck.

Intervention and Outcomes: QSM3 protocol was used to acquire measurements from postural deformations done by the analysis of x-ray, supine leg check, digital posture, the bow, neck and head tilt. Post x-ray revealed the atlas to be reinstated in a balanced orthogonal position. The Posture Measuring Device (PMD) revealed an even distribution of weight with a decrease in shoulder and pelvic rotation. Since the initial visit, the patient claims to have only have experienced two TN facial pain attacks.

Conclusions: This case study revealed a substantial reduction in symptoms of a female patient with TN disorder upon the administering of QSM3 treatment. This case advocates the underlying importance in the conduction of more research on the benefits of diminishing symptoms with the use of upper cervical chiropractic techniques.

Key Words: *Trigeminal Neuralgia, tic douloureux, Quantum Spinal Mechanics 3, chiropractic, upper cervical, atlas, subluxation*

Introduction

According to The Global Burden of Disease study, the World Health Organization (WHO), the World Bank and the Harvard School of Public Health, recent evidence identifies neurological disorders as one of the greatest and biggest threats to the public's health in today's society. A well-defined message emerged from these organizations, claiming that unless direct and immediate action were to be taken internationally and worldwide, the neurological burden has been expected to become an even more serious and uncontrollable problem in all countries.[1]

Trigeminal Neuralgia (TN), "tic douloureux," French in origin meaning "painful spasm," is a widespread neurological disorder that is often misdiagnosed as a dental or jaw problem,

1. Private Practice of Chiropractic, Roswell, GA

and has been even said to be a psychological disorder.[2,3] The gross perspective in relation to the occurrence and frequency of TN in the overall population is said to be 0.015%. The exact prevalence is said to be 12.6 to 27 per 100,000 people, per year.[3] TN has marginally been seen to be more common in women, in relation to men; and uncommon in populations younger than 40 years of age, with an average onset of 60 years.[4] The depiction of facial pain has been seen to cause a substantial impact on life in those that suffer from TN. Said to be so severely disabling, one is able to see why the estimated unemployment rates for those that suffer from TN is at a high of 34%.[5]

TN is a condition derived from neurological origin involving segmental demyelination of the trigeminal nerve and its sensory branches. Advanced research has shown that injury to the myelin, caused by compressive forces on the microvasculature supplied to the trigeminal nerve, can lead to demyelination and over activity of the nerve. Demyelination of the trigeminal nerve can take place in the nerve root or at its location exiting the pons.[3,4] Although the exact etiology of TN remains unclear, several causes have been found to contribute to the formation of TN. Trigeminal neuralgia is usually caused by an intracranial artery (anterior inferior cerebellar artery and ectatic basilar artery) or, less often, a venous loop that compresses the 5th cranial (trigeminal) nerve at its root entry zone into the brain stem.[6] Less common causes include compression by a tumor, multiple sclerosis plaque at the root entry zone, an aneurysm, or by a whiplash injury, causing a subluxation to the upper cervical region.[3,6] In more recent studies 80% to 90% of patients have demonstrable focal compression of the trigeminal nerve root at the root entry zone by an aberrant vascular loop (typically the superior cerebellar artery).[3,7]

TN is classified as a "facial pain" syndrome characterized by severe convulsive, shock-like, sensations that are located in the somatosensory distribution of the trigeminal nerve. Pain distribution in TN is unilateral and typically lasts for only seconds at a time, ranging up to two minutes. However, when episodes do occur they are described to be extremely agonizing and are triggered by sensory stimuli. The International Headache Society for diagnosis of TN has recently defined a rigorous clinical criterion stating, "Diagnosis of TN can be made when at least three attacks of unilateral facial pain occur fulfilling these criteria: 1) occurring in one or more divisions of the trigeminal nerve, with no radiation beyond the trigeminal distribution and 2) pain with at least three of the following four characteristics: a) recurring in paroxysmal attacks lasting from a fraction of a second to 2 minutes; b) severe intensity; c) electric shock-like, shooting, stabbing, or sharp in quality; and d) precipitated by innocuous stimuli to the affected side of the face".[2]

In this innovative classification, further specificity also suggested two forms of TN, labeling them Type 1 and Type 2 and is coined as such: 1) Type 1 (previously referred to as classic or typical TN), which is an idiopathic episodic pain with the previously reported clinical characteristics, lasting several seconds, with pain-free intervals between attacks and 2) Type 2, describing idiopathic trigeminal facial pain that is aching, throbbing, or burning for more than 50% of the timemand is constant in nature (constant background pain being the most significant attribute) with a minor component of sharp, episodic pain.[2]

Due to the constant challenge to diagnose, misdiagnosis is often the case and what leads to further dilemmas in evaluation for treatment. The *Journal of Pain Research* claims "the treatment of patients with idiopathic TN is often challenging in clinical practice, and conservative management with drug therapy is always the first-line treatment. When drugs are not efficacious or produce intolerable adverse effects, interventional pain treatment or surgery is the possible option."[5] Drug of choice by physicians and administered to those suffering from TN, is Carbamazepine. Other sources for prescription therapy include: Oxcarbazepine, Lamotrigine, Gabapentin and Baclofen.[8] When pharmaceutical management fails, either due to unpredicted adverse effects or lack of efficiency, surgical treatment is regularly offered. Surgical treatment options include microvascular decompression (MVD) and gamma knife surgery (GKS), both being accessible for patients with TN.[5] A further discussion of these conditions is beyond the scope of this case study.

This case study will review and discuss the chiropractic and Quantum Spinal Mechanics 3 Dimensional management, of a female patient with upper cervical subluxations and trigeminal neuralgia.

Case Report

Patient's History

A 55-year-old female patient presented with a chief complaint of Trigeminal Neuralgia, affecting her right jaw region. The patient claims her symptoms were experienced at least once a day and included spontaneous, intermittent pain paroxysms that were aggravated by activities such as chewing, talking and stress related interactions. The patient reported that her symptoms began six months prior to her seeking medical treatment and was diagnosed by her neurologist with TN. An MRI revealed a negative study for compression of any vasculature involving the brain and upper spinal cord. The patient was prescribed Tramadol and Carbamazepine (CBZ), both recommended as analgesics used for neuropathic pain disorders. However she claims symptoms were unrelieved and continuous periods of remission and attacks continued to occur.

Chiropractic Analysis

Quantum Spinal Mechanics 3 Dimensional (QSM3) is a method in which postural analysis and examination is applied in a pre and post system of assessment for the evaluation of a patient's misalignment. The following will enlighten and inform the reader on the criterion for pre-assessment of a patient's misalignment. The initial means of measurement will be constructed through a pre X-ray taken prior to the first adjustment and a post X-ray acquired after the initial adjustment is given. X-rays are done in the cervical region of the patient's spine and include a lateral, vertex and nasium views. When conducted and obtained, a supine leg check, use of the posture-measuring device (PMD), and a postural grid, are all implemented to aid in the formation of a postural algorithm that will take into effect the correction of the

patient's misalignment and its correlation to head piece positioning, later discussed in this study.

The use of the supine leg check will be measured for the observation of leg length inequality and discrepancy, ultimately revealing the short leg. Next is the recording taken on what is called the posture-measuring device (PMD). The PMD measures two planes of movement: 1) the frontal plane, around the z-axis, which is seen in lateral flexion or bending and 2) the transverse plane, around the y-axis, which is seen in rotation. Its use in the evaluation is for recognition of a low shoulder or what is called the "bow", as well as, for the measurement in rotation of the shoulders and pelvis. At the base of the PMD and what the patient places their feet on, are two weight scales. The scales are used in a manner of measurement for mass and recorded in pounds (lbs.). The heavy side, or side greater in weight, is the side recorded. Lastly, is the use of the structure known as the "grid". The grid is used to evaluate the neck and head relationship, and/or distortion. With the patient standing in front of the grid and facing the doctor for assessment, the doctor is able to note which way the neck and head deviates.

Pre-Assessment

Pre-assessment x-ray analysis taken of the cervical spine first requires a lateral view as a means of exposing what is called the "s-line". The s-line, as standard procedure, was used as a preliminary reference to line up the central ray of the tube used for the angle in the nasium view. The patient presented with an s-line categorized as S3, which requires the central ray in the nasium to be centered through the inferior aspect of the orbital of the eye. The lateral view was also used to show the rotational component of atlas, as well as the integrity of the cervical spine.

Figure 1, exhibits the rotation of the patient's Atlas, C1 in the cervical spine; with reference and use of lead markers that were positioned on both inferior lobes of the ear. (Figure 1). These markers are used and placed in this location as means to line up with the atlas. The line drawn upon analysis of the lateral view is the atlas plane line. The atlas plane line is drawn through the thinnest part of the posterior arch of atlas, in conjunction with the anterior tubercle of atlas, and concluded with the linear bony structure it correlates to. The lateral film, once analyzed using the atlas plane line signified the patient to yield an S3 line of structural correlation. The S3 line was then utilized in the nasium view and the angling of the x-ray tube.

Figure 2, represents the nasium view, which is used for head angle and tilt. The image revealed a 3.2 cm head tilt to the left, relative to the cervical spine below. The atlas plane line (horizontal line) used as a reference in relation with the lower angle, formed between the neck and skull, presented with a measurement of 10.7^{o}.

Figure 3, demonstrates the vertex view, displaying rotation of atlas (C1) to axis (C2) and its indirect correspondence to the cervical spine. The image revealed a posterior translation of three degrees rotation of atlas (C1) and 1.5^{o} posterior rotation of axis (C2) on the right. The benefits in using x-ray analysis, for QSM3 protocol are the objective in identifying the compression within the cervical spine and to present an image for means of education and explanation to the patient, for connection of symptomatology and reason behind their diagnosis.

The patients postural presentation yielded a right short leg by ½ of an inch, which was retained by a supine leg length comparison. Following the leg check, the patient was positioned on the digital device (PMD), measuring the side of greater weight distribution. The PMD displaced the patient bearing more weight on the right side by 11.6 lbs. in comparison to the left side. An amenity of the PMD used for the rotational aspect of the shoulders and pelvis are two infrared lasers reading in a measurement of millimeters. The patient's rotation was recorded on the weighted side and listed the right shoulder to be placed 8mm anterior, in correspondence to the left shoulder. Upon rotational reading of the pelvis, a 6mm translation of the right ilium was recorded as anterior by 6mm in correspondence to the left ilium. Following the PMD reading, the patient was further placed in front of the postural figure ("the grid"), presenting with a right low shoulder ("the bow"), a left neck and a right head tilt. The postural listing of the patient written in an algorithmic form, is as follows: R1/2 R11.6 A8A6 RLR. The patient's postural listing was then articulated to express a headpiece listing composed as LP 1-3.

Method

The methodology is done by the evaluation and correction of abnormal posture in correlation of the short leg of the pelvis, to the neck and skull of the head. The foundation and philosophy of this technique is an association and congruency of vitalism, the unique model of tensegrity, a myofascial envelope (MFE), and the neuromuscular connection between fascia and the brain. QSM3's protocol follows a flow equation used as a means to develop a misalignment guideline, where a model of "Cause to Correction" is exemplified.[9] The flow equation incorporates three components which include: 1) Cause, implication of the trauma induced in to the human body, 2) Compensation, the sensory-motor relationship and effect following the trauma, and 3) Collapse, the gravitational aspect that leads to tension and compression within the body, over time. Thus creating a triune of understanding the body and its relationship between physical body, energetic matter, and gravitational forces over time.

This technique provides an understanding of basic to complex postural biomechanics and takes into consideration the effect of the body to rebalance from above, in respect to the "righting reflex." This understanding integrates a model of tensegrity and its relation to anatomy and biology of being. Donald E. Ingber, creator and writer of *Tensegrity and Mechanotransduction*, states in his article, "Thus, opposing muscles and bones establish a mechanical force balance and place our entire musculoskeletal system in a state of isometric tension, so that they experience this type of stabilizing pre-stress. Hence, the shape stability of our arm or leg (whether it is stiff or floppy) depends on the level of tension or "tone" in our muscles. Architects call this type of pre-stressed structural network, composed of opposing tension and compression elements that self-stabilizes its shape through establishment of a mechanical force balance, a tensegrity (tensional-integrity)

structure."[10]

Another article, printed in the *International Journal of Osteopathic Medicine*, made a much simpler definition or explanation to describe tensegrity, stating, "A tensegrity structure as a set of struts under compression, and an arrangement of cables under isometric tension, that always balances in the most energetically efficient configuration."[11] This method combines tensegrity and the tension caused from subluxation as it relates to the short leg, weight, low shoulder or "Bow of the Box", rotation in the shoulders and pelvis, neck and skull tilt. With use of a Tensegral model, the patient presented with faulty biomechanics within respect to the head and neck being in opposing directions. Due to the defective biomechanics seen in analysis, vascular torsion could be a result of the demonstrated display of pressure received where the brainstem and central nervous system lie. Significance regarding this study is the relationship between convoluted arteries, being the main cause of TN, discussed previously, and the location of the tension generated from improper biomechanics.

Case Management

The patient was assessed using the QSM3 method of approach. This method was applied in an effort to correct the vertebral subluxation by accessing pathways of interference within the body, or distortion of proper function. Mode in application was for the restoration and release of the nervous system to its proper place, where optimal function may be obtained. Resultant and following in this paradigm, is the return of joint symmetry from asymmetry, and muscle stability from instability. QSM3 is a systematic approach that takes origin from its upper cervical roots in NUCCA. This chiropractic procedure examines and analyzes a model of 3 dimensional posture, using the PMD that creates a description and illustration on how trauma is conveyed within the body, and by which a disturbance in tensegrity and orthogonality is produced. QSM3 application is the utilization of the upper cervical area for its location and insertion of these myofascial "tracks". These tracks are designed to most optimally modulate posture due to received trauma, and ultimately result in the production of tensional torsion within the body. The release of the MFE through the activation of the Golgi Tendon Organ (GTO) response within the muscle belly of contact causes a reaction of relaxation. Therefore restoring anatomical balance, thus being the ultimate purpose of the QSM3 doctor and method.[9,12]

Although an upper cervical technique, QSM3 looks beyond just the cervical spine for involvement in a subluxation. Identifying the entire body as one system that cohesively moves together makes this a closed kinetic chain relationship. When a disruption of tensegrity, or loss of orthogonality, occurs in a system that has a closed kinetic chain relationship, blood and oxygen is not properly supplied to the area in compression. Deprivation and insufficiency of vital nutrients, to an involved area or areas, leads to the inevitable process understood as "Dis-ease".[9,12,13]

Post-Assessment

After the preliminary analysis is obtained, an integrated algorithm is compiled to formulate a pattern of headpiece placement. QSM3 uses a four positional headpiece algorithm based on the postural pattern obtained in the pre-assessment.

Each one individually representing a certain section of release in the body and are listed as follows: 1) Integration, the purpose of position one is to release the vertical collapse of the "Bow", 2) Decompression, the purpose of position two is to release the compensatory line or "Bow" stabilizer; 3) Bow, the purpose of position three is to release the collapse within the core; the final headpiece 4) Frontal, the purpose of the fourth position is to release the original trauma where development of a short leg or a low pelvis was created. From origin at the feet, lines that modulate posture and generate a tension in compression model are said to all attach in the upper cervical region, base of the skull and mastoid process.

Myers model of myofascial meridians is revolutionizing the way many of us look at the body and is used in application for location of connection in contacting these lines of tension.[14] The principle of the "Anatomy Trains" model is that it shows how individual muscles link together to form functional, myofascial continuities organized along longitudinal lines of pull throughout the body and attach in the upper cervical area.[12]

The purpose of the headpiece placement is to isolate, increase, and release tension within specific pathways of the body. With precise patient placement, from skull to short leg, a creation of tension known as "isolated release," can be created and influenced through energy to most optimize this release.

Releasing Myers lines of fascia is made in the adjustment by contacting the Golgi tendon organ (GTO). GTO's are sensory receptors of the peripheral nervous system, and are located at the origins and insertions of tendons within skeletal muscle. The primary purpose of the GTO is to sense tension placed on a muscle, as a protective "negative-feedback system" and to diminish the stimulation of the force generated within the muscle. In other words, the GTO causes a relaxation mechanism to occur, which indirectly releases the compensatory tension and stabilizing lines generated in a misalignment.[9,12]

Outcomes

A chiropractic adjustment was administered to the subluxation listed at C1 vertebral segment. The Quantum Spinal Mechanics 3-dimensional method and technique was chosen as a means in removing the patient's subluxation. The adjustment was used with the sole purpose in correcting the patient's subluxation, as well as any nerve interference. The technique entails and requires the chiropractor to follow a specific protocol that designs a headpiece placement constructed by x-ray analysis and the postural reading. Upon the patient's first adjustment, post assessment was conducted by means of the PMD recording, as well as post x-ray analysis. The patient originally presented with 11.6 lbs. on the right side, with an anterior rotation of her right shoulder by 8mm and anterior rotation of her right ilium by 6mm. After the first adjustment was conducted, she was replaced on the PMD where a recording of .2 lbs. was documented on her right side. The patient's rotation was also recorded and listed

as a 1º anterior translation of her right shoulder and a zero degree rotation of her right ilium. Next, the patient was replaced for x-ray positioning where a series of two films, including a post nasium view and a post vertex view, were obtained. (Figure 4) The post nasium view revealed head tilt to the left by .1 cm, with relation to the cervical spine below, and a lower angle displaying .5 of a degree, disassociation between the neck and skull. Figure 5 demonstrates the post vertex view and was recorded as zero degrees on rotation between atlas (C1) and axis (C2).

After the initial adjustment, the patient stated that her symptoms of paroxysmal pain in her right jaw completely dissipated and she was able to remain pain free for duration of four days. The patient claimed to have encountered a remarkable experience, with respect to the fact she had been experiencing facial pain at least once per day. The patient's care plan consisted of two visits per week, designed over a period of a six-month treatment. The patient conveyed that she has been responding well to care and after only three months of treatment, denies any episodes of her previously stated TN facial pain.

From the initial visit the patient claims to have only experienced two TN facial pain attacks. Any episode or symptoms related to her condition of TN, according to the patient, has tremendously improved. The patient is currently seen for QSM3 treatment once a month and states she is beyond astonished to finally be able to have discovered relief and reestablish her life.

Discussion

Chiropractic, as a career has existed for a little over a century now and is thought to be one of the most contentious and poorly understood healthcare professions, to date. D. D. Palmer, a Vitalistic healer who articulated the philosophy and basic approach of chiropractic as it exists is considered the founding father of chiropractic. His son, B. J. Palmer, later developed the profession in its entirety as well as helped coin the term, "subluxation".[15] According to D.D Palmer and B.J Palmer a subluxation is defined as such: "A (sub)luxation of a joint, to a Chiropractor, means pressure on nerves, abnormal functions creating a lesion in some portion of the body, either in its action, or makeup."[16] Although the definition of chiropractic, as a method of correcting vertebral subluxations to restore and maintain health, remains controversial, studies have shown that spinal dysfunction or joint inflammation has the potential to lead to direct nerve compression or neuropathic pain.[17,18]

By incorporating Kent's models of vertebral subluxation, the dysafferentation model can be used to propose a theory of how the upper cervical vertebral subluxation in this case led to the relief of symptoms caused by TN. Kent explains, "as a consequence, biomechanical dysfunction may result in an alteration in normal nociception and/or mechanoreception." These alterations may result in postural abnormalities affecting tone. Furthermore, it is believed that "correcting the specific vertebral subluxation cause is paramount to restoring normal afferent input to the CNS, and allowing the body to correctly perceive itself and its environment."[16] The following will enlighten the reader on the connection between structure and its dictation on function.

Structural Consideration

The trigeminal nerve (CN V) is anatomically considered the largest of the cranial nerves; predominantly providing sensation to majority of the face, as well as supplying motor innervation to muscles located around the jaw involved in chewing and biting. CN V nuclei (a collection of cell bodies) are located in the middle portion of the brainstem; the pons.[19] According to Guyton, the importance in identifying the location of cranial nerves and its corresponding nuclei propose a significant retribution in understanding the origin of dysfunction.[20] In addition to the nuclei of CN V exists a sensory ganglia (a collection of cell bodies) located externally to the brain; comparable to the dorsal root ganglia found corresponding with spinal nerves. The trigeminal ganglion is an expansion of the trigeminal nerve connecting sensory information from the face to the brainstem, where it becomes processed in the pons.[19]

Peripherally from the ganglion, the trigeminal nerve further divides into three branches: the ophthalmic (V_1), maxillary (V_2) and mandibular (V_3) nerves. The ophthalmic branch exits through the superior orbital fissure located in the back of the eye socket. This branch carries purely sensory fibers supplying the upper portion of the face and scalp. Maxillary division emerges through the foramen rotundum to strictly supply sensation to the central part of the face on each side. The third branch, mandibular, contains both sensory and motor fibers exiting the cranium through the foramen ovale to innervate the lower third of the face and jaw. Information from these branches unites in the trigeminal ganglion, forming a large sensory root entering the brainstem at the level of the pons. It is believed that the episodic pain in TN is generated by the maxillary or mandibular branches possibly triggered by mild stimuli such as brushing the teeth or even a gentle touch to the areas on the face.[19]

Functional Variations

The trigeminal nerve functions as a mixed spinal nerve conveying signals engaged in "tactition (pressure), thermoception (temperature), and nociception (pain) originating from the face above the jaw line." As previously stated, the motor component of the trigeminal nerve involves the muscles used for chewing.[3]

Guyton describes trigeminal neuralgia as pain characterized by piercing or stabbing sensations that are perceived by people as being abrupt and electrical, shock-like. Commonly the pain from TN is triggered by overbearing stimulus placed on sensitive areas on the face, in the mouth, or inside the throat. This is usually an outcome brought upon by a "mechanoreceptive stimulus rather than a pain stimulus," such as aggravating the mandibular branch when swallowing food.[20]

According to Rodine and Aker, pain that is perceived by a patient suffering from TN ascend from "a sensitization of the wide dynamic range (WDR) neurons," permitting delivery of an overbearing stimulus to the spinal nucleus of the trigeminal nerve. Through the WDR, this excruciating stimulus is

maximized to the spinal nucleus by A-delta fibers, a type of thinly myelinated sensory nerve fibers, carrying pain signals that are sharp and acute. The trigeminal ganglion houses A-delta fiber cell bodies, composed of sensory pseudo-unipolar neurons, which synapse at the level at which they enter the spinal cord. This proposal is considered to be the "central mechanism" of TN, designed to explain how stimulus brought on by the confluence of structures can affect the trigeminal nerve. This theory can assist in offering a plausible reason as to why the patient in this case has reacted to painful stimulus, when applying a light touch to the lower jaw.[21]

The suggested mechanism, which initiates pain, involves neurological components that assemble "within the dorsal horn neurons of the upper cervical segments and the spinal nucleus of the trigeminal nerve (medullary dorsal horn), to which are not separated by definitive boundaries." This portion of the spinal cord is composed of grey matter and is referred to as the trigeminocervical nucleus.[21] The trigeminocervical nucleus is further divided into the "spinal trigeminal nucleus, the main trigeminal nucleus, and the mesencephalic trigeminal nucleus." The spinal trigeminal nucleus conveys information about pain and temperature sensed on the face and mouth.[3] Fundamentally, pain arising from the stimulation of nerve cells from the head, face, throat and upper cervical area are conveyed through afferents that "terminate on second-order neurons within the trigeminocervical nucleus."[21]

Second-order fibers will decussate and begin to travel up the trigeminothalamic tract, running parallel to the spinothalamic tract and arriving in the contralateral thalamus. These tracts send sensory information about pain and temperature to multiple thalamic nuclei.[3]

Furthermore, the "central mechanism" described, draws a possible connection between the effects of lowering the membrane potential of a nerve cell to propagate an action potential leading to an increase in sensitization within the trigeminocervical tract perpetuated by an upper cervical subluxations. According to source based chiropractic literature, patients diagnosed with TN and receiving chiropractic care, have shown to improve in pain symptomatology when receiving chiropractic adjustments in the upper cervical spine.[3, 21 ,22]

Chiropractic literature and research based upper cervical care, have shown to benefit those suffering from this condition, as well as other neurological deficits produced by spinal misalignments found in the C1 or C2 regions.[3,21-28] Although definitive treatments for TN do not currently exist, the dentate ligament-cord distortion hypothesis can suggest a mechanism to explain the benefits of receiving upper cervical adjustments to relieve pain.[22] John Grostic, one of the founding fathers of upper cervical based chiropractic offered an explanation as to how alterations of the upper cervical spine can lead to neuropathic disorders produced by mechanical irritation of the spinal cord. Studies performed on the role of the dentate ligament have demonstrated that its connective tissue properties are strong enough to even cause slight spinal cord deformation, especially in cervical flexion. In comparison to TN, perpetuations of symptoms are usually caused by compression of the trigeminal nerve, trigeminal ganglion, and/or the spinal nucleus.[23,25,26]

Grostic's approach to this hypothesis had led him to discover that alteration in the biomechanics of the upper cervical spine can ultimately lead to deformation of the spinal cord; anatomically considering the dentate ligament offers an attachment of the upper cervical spine to the spinal cord. He suggested, "If misalignments of the cervical spine are to affect the spinal cord a mechanical linkage must exist between the osseous structures and the spinal cord." Grostic observed that "anterior rotation of the atlas on the side to which the atlas has laterally deviated with the lateral traction it may be possible to put traction directly on the sensory nucleus of the trigeminal nerve at the level of the first and second cervical vertebrae." This investigation has led to the advancement in clinical chiropractic practice in effort to treat TN, as well as many other neurological deficits stemming from the upper cervical region.[23,25,26]

Continuing this further, a measurable difference of 30 mm in the length of the spinal canal occurs while performing cervical flexion and extension, placing longitudinal stretching and longitudinal compression on the cord, respectively. By observing this mechanical alteration, it is believed that dentate ligaments found in upper cervical region provide a critical role in the restriction of "downward pulling axial forces created by the lengthening of the canal when the neck is flexed from being transmitted unattenuated to the brainstem." Although this serves as a form of protection during normal movements, alterations of the cervical vertebrae can cause pathological forces to the spinal cord and brainstem.[23]

Consequently, stress exerted on the spinal cord due to cervical vertebral misalignments, along with constant mechanical irritation, may result in venous occlusion; which can lead to a depletion of oxygen and nutrients delivered and supplied to the nervous system. Also, Grostic noted that delivery of blood is critical to the nervous system and if there is an obstruction, an increase in irritability of nerve tracts will occur leading to increase sensitivity on the nerves, perceived usually as pain.[23] According to Chen et al. "the most widely accepted theory for TN is vascular compression placed on the trigeminal nerve as it exits the pons." Furthermore, this vascular obstruction potentially will lead to chronic compression of the trigeminal nerve causing demyelination of the sensory nerves in the nerve root or brainstem.[4]

Upon searching through chiropractic literature, one particular study exemplified a similar presentation of TN, congruent to the one presented in this case. The case study demonstrated significant improvement in a patient suffering from facial neuralgia. Sixteen days after receiving upper cervical chiropractic care, the patient's eye pain was 100 percent better, and the neck pain was reported to be 50 percent better. In the patient's history, since there was no indication of trauma, the use of an MRI and MRA were highly recommended, in an effort to rule out any possible pathological disturbances; such as demyelination or vascular compression. In comparison, the imaging revealed a negative study, showing no signs of vascular or trigeminal nerve root compression. Furthermore, the study believed that the cause of symptoms was likely due to "cord distortion and dysafferntation into the trigeminocervical nucleus" caused by

an upper cervical subluxation.[24]

This hypothesis proposed by Grostic, as well as several case studies, offer a simplistic explanation as to why patients are exhibiting signs of neurological compromise caused by certain structural abnormalities in the cervical region.[3,21-28] With this appreciation and understanding of how structure dictates function, chiropractic corrective treatment was shown to be effective in relieving pain symptomatology produced by TN. This study encourages the need for further research to substantiate this theory.

Tension Out of Integrity

Quantum Spinal Mechanics[3] (QSM[3]) is a tonal-based upper cervical technique evaluating the importance of correcting postural imbalances in the body, causing loss of tensegrity and orthogonality. Pulling forces produced by the fascia that surround and infiltrate all structures of the body from the head down to the feet, instigate these postural imbalances. Kuma and Bonar define fascia as an "uninterrupted viscoelastic tissue, which forms a functional 3-dimensional collagen matrix."[29] Structurally, "tensegrity depends on the integration of every part, as it has been proposed that this includes the whole body, from molecules, cells, extra-cellular and fascial matrix to the entire musculo-skeletal system.[11] Functionally, the myofascial envelope (MFE) plays a critical role in regulation of proprioception.[29]

A study performed by Kumka and Bonar, classified fascia according to their function and morphological characteristics. The classification system is divided into four categories: 1) linking, 2) fascicular, 3) compression, and 4) separating fasciae.[29] Generally, the adjustment delivered by QSM[3] addresses all categories, but most specifically the fascicular component. The fascicular fascia "forms adaptable tunnels which bundle vessels as well as fascicles within muscle, tendon, bone and nerves." This type of fascia is critical for "organization, transport, strength and locomotion," covering extramuscular, intramuscular and neurovascular sheaths. Fascicular fascia is mostly composed of collagen Types I and III and are organized as a mixture of both loose and dense regular multidirectional connective tissues.[29]

Kumka and Bonar explain, "The fascicular fascia of the muscle converges into a dense regular connective tissue link at the myotendinous junction to become fascicular fascia of the tendon, comprising of endotendon, peritendon and epitendon." This area is heavily enriched by Golgi tendon organs (GTO), which are activated by muscle contraction. Muscle contraction results in tension placed in the GTO's, causing a "reflex decrease in tonus in contiguous striated muscle fibers."[29] Activation of this reflex is the framework utilized by QSM[3] technique. By stimulating the GTO's located around the mastoid, ear, mandibular angle and the upper cervical region, muscle relaxation can occur by fatiguing the side of contraction or compression. Ultimately, this places the body in an upright position restoring tensegrity and orthogonality.[9,30]

Conclusion

The chiropractic management of a 55-year-old patient suffering from trigeminal neuralgia is presented in this case study. Comprehensive improvement and alleviation of symptoms were achieved and recorded. A substantial reduction in symptoms of a female patient with TN disorder upon the administering of QSM3 treatment is presented in this study. This case supports the evidence of chiropractic care in relieving neurological disorders based on anatomical association and interference. There are limitations present in every case study, incorporating and including this one. This case advocates the underlying importance in the conduction of more research on the benefits of diminishing symptoms with the use of upper cervical chiropractic techniques.

References

1. Janca A, Dua T, Kale R et al. Public health principles and neurological disorders. J Neurol Disord. 2006.
2. Montano N, Conforti G, Bonaventura R et al. Advances in diagnosis and treatment of trigeminal neuralgia. Ther Clin Risk Manag. 2015; 11:289-299.
3. Burcon M. Resolution of trigeminal neuralgia following chiropractic care to reduce cervical spine vertebral subluxations: a case study. J Vert Sublux Res. 2009; 26:1-7.
4. Chen G, Wang X, Wang L, Zheng J. Arterial compression of nerve is the primary cause of trigeminal neuralgia. Neurol Sci. 2014; 35:61-66.
5. Emril D, Ho K. Treatment of trigeminal neuralgia: role of radiofrequency ablation. J Pain Res. 2010; 3:249-254.
6. Berkow R, Flecher AJ, editors. The Merck manual of diagnosis and therapy. 16th ed. Rahway (NJ): Merck Research Laboratories; 1992.
7. Hilton D, Love S, Gradidge T et al. Pathological findings associated with trigeminal neuralgia caused by vascular compression. Neurosurg. 1994; 35(2):299-303.
8. Zakrzewska J, Linskey M. Trigeminal neuralgia. Journal. 2015; BMJ. 2015; 350:h1238.
9. Friedman R. Quantum spinal mechanics 3 mod 1 & 2 manual. 2012; 1-140.
10. Ingber D. Tensegrity and mechanotransduction. J Bodywork Movement Therapies. 2008; 12(3):198-200.
11. Scarr G. Helical tensegrity as a structural mechanism in human anatomy. Int J Osteopath Med. 2011; 14:24-32.
12. Meyers T. Anatomy trains. Edinburgh: Churchill Livingstone; 2001.
13. Martin-Du Pan R, Benoit R, Girardier L. The role of body position and gravity in the symptoms and treatment of various medical diseases. Swiss Med Wkly. 2004; 134:543-551.
14. Maupin E, Kagey H, Arbel R. A dynamic relation to gravity. 2005; 2:94.
15. Homola S. Inside chiropractic: a patient's guide. Amherst, NY: Prometheus Books, 1999.
16. Kent C. Models of vertebral subluxation: a review. J Vertebral Subluxation Res. 1996; 1(1):1-7.
17. Vernon H. Historical overview and update on subluxation theories. J Chiropr Humanit. 2010; 17:22-32.
18. Johnson C. Use of the term subluxation in publications during the formative years of the chiropractic profession. J Chiropr Humanit. 2011; 18:1-9.
19. Leclercq D, Thiebaut J, Heran F. Trigeminal neuralgia. Diagn Interv Imaging. 2013; 94:993-1001.
20. Guyton A, Hall J. Textbook of Medical Physiology 10th ed. Pennsylvania: W.B. Saunders Company; 2000.

21. Rodine R, Aker P. Trigeminal neuralgia and chiropractic care: a case report. J Can Chiropr Assoc. 2010; 54(3):177-186.
22. Grochowski J. Resolution of trigeminal neuralgia following upper cervical chiropractic care: A case study. J Upper Cervical Chiropr Res. 2013; 2013(1):20-24.
23. Grostic J. Dentate ligament-cord distortion hypothesis. Chiro Research J. 1988; 1(1):47-55.
24. Flory T, Chung J, Ozner J. Resolution of facial neuralgia following reduction of atlas subluxation complex: A case study. J Upper Cervical Chiropr Res. 2015; 2015(1):6-13.
25. Zielinski E, Mankal K, Pirini J. Resolution of trigeminal neuralgia following chiropractic care utilizing chiropractic biophysics and diversified techniques: A case study. A Vert Sublux Res. 2014; 177-183.
26. Zielinski E, Acanfora M. Resolution of trigeminal neuralgia following subluxation based chiropractic care: A case study & review of literature. Ann Vert Sublux Res. 2013; 2013(3):33-45.
27. Sweat M, McDowell B. Reduction of trigeminal neuralgia symptoms following atlas orthogonal chiropractic care: A case report. J Upper Cervical Chiropr Res. 2014; 2014(1):34-41.
28. Kessinger R, Mathews A. Resolution of trigeminal neuralgia in a 14 year old following upper cervical chiropractic care to reduce vertebral subluxation: A case study. J Upper Cervical Chiropr Res. 2012; 2012(1):77-84.
29. Kumka M, Bonar J. Fascia: a morphological description and classification system based on a literature review. J Can Chiropr Assoc. 2012; 56(3):179-191.
30. Silva P, Fonseca S, Turvey M. Is tensegrity the functional architecture of the equilibrium point hypothesis? J Hum Kinet. 2010; 14:1-6.

Preliminary Cervical X-Rays

Figure 1 - Lateral

Figure 2 - Nasium

Figure 3 - Vertex

Post Cervical X-Rays

Figure 4 - Nasium

Figure 5 - Vertex