CASE STUDY

Reduction of Chronic Trigeminal Neuralgia Following Upper Cervical Specific Chiropractic Care: A Case Report & Review of the Literature

Jamie Cramer D.C.[1] & Andrew Persky D.C.[2]

ABSTRACT

Objective: To report on positive health outcomes in the case of a 62 year-old female diagnosed with trigeminal neuralgia undergoing upper cervical chiropractic care.

Clinical Features: A 62-year-old female presented to the clinic with a chief complaint of chronic right sided facial pain of 2 years duration. Following the initial examination the patient was diagnosed with trigeminal neuralgia.

Intervention & Outcomes: The patient received upper cervical-specific chiropractic care using the NUCCA technique. Twenty-six adjustments were performed over the course of six months. SOAP notes and surface electromyography were utilized to assess initial status and progress. Significant reductions in episodic frequency, duration and affected area were realized through this non-invasive approach.

Conclusions: The results from this case, when evaluated in the context of similar evidence, suggests that upper cervical-specific treatment for reduction and/or correction of atlas subluxation can produce positive outcomes in patients suffering from trigeminal neuralgia. These findings highlight the importance of further investigation of the atlas subluxation complex and its relationship to trigeminal neuralgia.

Key Words: *Trigeminal Neuralgia, Upper Cervical, NUCCA, Grostic, Vertebral subluxation, Atlas Subluxation Complex, Adjustment*

Introduction

Trigeminal neuralgia, also known as "tic douloureux", is a chronic neuropathic disorder characterized by intense, persistent and often debilitating shooting sensations of pain in the face. The affected area is typically a unilateral dermatomal distribution path of one or more branches of cranial nerve V, the trigeminal nerve. The maxillary division is most often affected.[1] Attacks are often sudden and violent. They may spontaneously recur or be triggered by normal facial stimuli, such as eating or brushing teeth. It is generally accepted that the condition does not remit spontaneously.[2] According to the National Institute of Neurological Disorders & Stroke, trigeminal neuralgia (TN) occurs most often in people over age 50, although it can occur at any age, including infancy.[3] The possibility of TN being caused by multiple sclerosis increases when it occurs in young adults. The incidence of new cases is approximately 12 per 100,000

1. Private Practice of Chiropractic, Troy, MI
2. Private Practice of Chiropractic, Stillwater, MN

people per year. The disorder is more common in women than in men.[4] Neurologic tests are normal. No specific test exists for the diagnosis of trigeminal neuralgia. However, the symptoms are considered almost pathognomonic.[1] Differential diagnosis would include migraine headache, post-herpatic neuralgia, oral infection, and trigeminal autonomic cephalgias. This report discusses the chiropractic management of a patient with atlas subluxation and trigeminal neuralgia of two years duration in the right mandibular division of cranial nerve V.

Chiropractic Technique Overview

Upper cervical-specific chiropractic is a specialized field within the chiropractic profession. The work requires precise radiographic positioning, special manual adjusting skills or specialized adjusting instrumentation, and employs complex geometric theories for radiographic analysis and skeletal manipulation. While upper cervical-specific chiropractors now have several techniques from which to choose, such as Orthospinology, NUCCA and Atlas Orthogonal, all acknowledge having their roots in the original work of Dr. John F. Grostic.[5]

Using the concept that the atlas could be seen to move laterally on the occipital condyles 'as if on the rim of a circle', Grostic developed an analysis and adjustment technique which yields a specific adjustment vector unique to each patient.[1] In general, Grostic used his knowledge of anatomy and geometry to develop a method for determining the three-dimensional pose of components of the upper cervical kinetic chain and subsequently derive a vector for chiropractic correction of the misalignment.

The adjustment is performed with the patient in a side-lying position on a specially designed table, with the patient's head precisely placed on a headpiece. In the NUCCA technique, a doctor stands over the patient and uses the pisiform bone in his wrist to contact the patient's C1 transverse process. The doctor then applies a gentle force to the contact at a specific correction vector. Dr. Grostic's approach enables doctors trained in his technique to perform specific realignment of the atlas and thereby reduce / correct various geometric expressions of the Atlas Subluxation Complex (ASC).

NUCCA specifically defines the ASC to mean "the atlas vertebra in all its planes of misalignment, its positional relationship to the occiput, subjacent vertebrae and pelvis…and resulting in concomitant detriment to the susceptive neurological components."[1] NUCCA rationale for care is "based upon the premise that the spinal column, skull, and pelvis deviate from the vertical axis resulting in tractionization to the central nervous system."[1]

When an upper cervical subluxation is suspected, a complete set of upper cervical-specific radiographs is taken. Images are acquired on radiographic equipment with calibrated alignment of the X-Ray imaging hardware. The patient is in a static seated position with the head stabilized with gentle clamps. The series consists of a lateral cervical view, a nasium, and a vertex view of the patient's head and upper cervical region. The lateral cervical image is acquired first to determine the angle at which the atlas is positioned in the saggital plane relative to external facial features. This angle is referred to as the "S" line. Once the S line is determined, the nasium view is acquired along that angle. By doing so, it is possible to visualize the inferior attachment points of the posterior ring for analysis.[5] The nasium view also provides data for determining the individual angles of the head, atlas, and lower cervical spine in the coronal plane, and rotation of the axis (C2) spinous process in the transverse plane.

Altogether, these images provide a three-dimensional visualization of the patient's upper cervical region. Using NUCCA methodology the images are analyzed to determine the specific orientation of the components of the occipital-atlanto-axial area and generation of a specific correction vector. During the upper cervical adjustment, the doctor uses his pisiform to apply a gentle force along this vector to the appropriate (right or left) transverse process of the Atlas to reduce the misalignment.

In a study by Rochester, the inter- and intra-examiner reliability of the upper cervical radiographic measurements was observed. Ten sets of upper cervical films were read and re-read twelve times by four Grostic practitioners. The analyzed components were: Cl laterality, Cl rotation and lower angle, odontoid, C2 spinous, height factor calculations (i.e., plane line, condylar surface circle, axial surface circle), and the S-Line measurement. The standard deviation for atlas laterality ranged from 0.36 - 0.55 degrees with a mean of 0.45 degrees (approximately 0.30 mm). The lower angle ranged from 0.50 - 0.74 degrees with a mean of 0.59 degrees. The atlas rotation ranged from 0.44 - 0.70 degrees with a mean of 0.59 degrees. The height factor standard deviation ranged from 0.35 inches to 0.93 inches with a mean of 0.50 inches.[6] Essentially, the study demonstrated that the Grostic-based procedure for x-ray image analysis is reliable and repeatable.

Scanning Palpation

Upper cervical-specific practitioners often perform tactile scanning palpation of the cervical spine before and after treatment. The examination begins with fingers medial to the sternocleidomastoid muscle area and lateral to the posterior arch of atlas. The doctor seeks to detect underlying muscular spasms, trigger points, or osseous protuberances. These findings are used in conjunction with the supine leg check to determine whether or not to adjust the patient. Following an adjustment, resolution of inflamed or hypersensitive regions is frequently observed.

Surface Electromyography

Surface electromyography (sEMG) measures myoelectrical signals recorded from sensors placed on the skin surface. In the context of a chiropractic assessment it is often used for the examination of paraspinal musculature to detect regions of hypertonicity or spasticity. Surface EMG provides objective, quantitative data concerning the changes in paraspinal muscle function that accompany vertebral subluxation.[7]

As stated by Guyton, "Even when muscles are at rest, a certain amount of tautness usually remains. This is called muscle tone. Because normal skeletal muscle fibers do not contract without an action potential to stimulate the fibers, skeletal muscle tone results entirely from a low rate of nerve impulses

coming from the spinal cord. These, in turn, are controlled partly by signals transmitted from the brain to the appropriate spinal cord anterior motor neurons and partly by signals that originate in muscle spindles located in the muscle itself."[8]

Literature also supports the use of baseline tonal patterns for paraspinal musculature for clinical comparison.[9] The soft tissue structures of the upper cervical region contain a very high density of muscle spindle content and spindle density.[10]

These signals feed into the central nervous system via the dorsal columns of the spinal cord for autonomic postural control. sEMG is of specific interest to chiropractic examination since aberrant muscle activity is generally accepted as one manifestation of vertebral subluxation.[11] Segmental vertebral misalignment can result in efferent signals to paraspinal musculature in an attempt to maintain the body in a proper posture. Hypertonicity or muscular spasticity - and therefore increased sEMG readings - can result when segmental fixation associated with postural distortion impedes the body's ability to self-correct.

Leg Length Inequality & Postural Distortion

NUCCA and other Grostic-based techniques consider supine measurement of functional leg length inequality (LLI), also referred to as functional pelvic distortion (FPD), to directly correlate with alignment/misalignment of the upper cervical spine.[1] Typically when an underlying subluxation exists, a patient will consistently exhibit the same leg as being functionally short. These characteristics provide a pattern to their distortion and an analysis tool for assessing patient status.

In his Dentate Ligament Cord Distortion Theory, J.F. Grostic hypothesized that spinal cord irritation caused by traction on the dentate ligaments may affect the muscles of the pelvic girdle and lower extremities producing hypertonicity and even spasticity of the involved muscles. This increased muscle tone in the large muscles of the pelvis and thigh may cause the pelvic distortions manifesting as a functional short leg.[12]

According to Grostic, if traction disrupts cord function it does so first in the spinocerebellar tracts, tracts responsible for muscle tone and joint position sense. Grostic calculated that the patient must have an atlas misalignment of at least 0.75 degrees before neurologic manifestations are noted.[3] His theory provides a model to explain how a misalignment of C-l or C-2 can produce neurological insult directly via mechanical irritation of the spinal cord, and indirectly via vascular or cerebral spinal fluid compromise of the central nervous system.

Another theory posits that the atlas / leg length correlation involves the reticular formation of the central nervous system. The reticular formation consists of more than 100 small neural networks with varied functions including somatic motor control. Some motor neurons send their axons to the reticular formation nuclei, giving rise to the reticulospinal tracts of the spinal cord. These tracts function in maintaining tone, balance, and posture.

In their article on upper cervical influence on the reticular system, Crowe and Kleinman hypothesize that misalignment of the proprioceptor-rich upper cervical region results in modified equilibrium, physiologic motion and awareness of oneself in space, resulting in a shift in weight-bearing of the entire skeletal structure.[13] In a study of inter- and intra-examiner reliability of leg length inequality measurements, Hinson, et al, determined overall intra-class agreement among examiners was high (>0.9), as was intra-examiner reliability.[14] In addition to assessing leg length inequality, upper cervical doctors also evaluate for postural distortions visually or with specialized equipment. This particular office utilized a SpineMaster™ platform to measure pelvic tilt and rotation and lateral neck tilt or translation in the horizontal plane. The device also has the ability to measure side-to-side weight-bearing differential with bi-lateral weight scales; however the latter feature was not utilized in this case.

Case Report

Patient History

A 62-year-old retired female presented to the clinic with chief complaints of chronic right-side facial pain of two years duration, pain in her left knee of 6 months duration, and "irritation" on the bottom of her right foot.

The patient reported co-morbidities of anxiety, bilateral cold hands and feet, and carpal tunnel syndrome on her right side. Irritation on the bottom of her right foot was attributed to biopsy of a dark lesion at that location several years prior by a dermatologist. The biopsy results were negative but sensitive scar tissue replaced the normal skin over the biopsy site. That procedure also included biopsies of her right breast and right upper gum, both with negative results and no similar complications.

The right knee pain was rated at 5/10. The joint had sustained injury on two occasions, both while walking– first in 2002 when she fell to her knee on ice, and then in 2010 when she tripped and fell. According to the patient, her medical doctor concluded that minor but permanent ligamentous laxity had resulted and recommended that she be more careful walking.

The patient had been involved in three separate automobile accidents: Twenty-seven years prior she was the driver of a stationary vehicle hit from the rear at approximately 10mph. No injury was noted. According to the patient, she informed her medical doctor of the incident several months later during a routine physical exam and asked about the possibility of whiplash. The doctor performed a manual palpation of the cervical spine and concluded she was fine. No radiographs were taken, and no specific orthopedic tests were performed.

Fifteen years prior she was the driver of a car sideswiped by a drunk driver. The car was dented but no injuries were detected. She did not seek a physical examination. Ten years prior she was the driver of a stationary car hit from the rear at approximately 3 mph. No injuries were detected. She did not seek a physical examination.

The chief complaint of chronic pain on the right side of her face began two years ago. Four months prior to onset she had oral surgery. The patient was unclear as to the specific dental

procedure, but believes it was either a filling or root canal on a wisdom tooth on the right side of her face. Pain symptoms initially began as a headache in her forehead rated at 6/10 and occurring 3-4 times per week and always at 2am. The pain would wake her from sleep. This continued for 3-4 weeks at which time the pain moved to the right side of her face, increased in intensity to 10/10, and began occurring every morning at 2am with duration of one hour. By three months the episodes had increased to six episodes per day each with a one-hour duration and intensity of 10/10. Temporally the episodes occurred on a constant schedule of 2am, 7am, 10am, 2pm, 7pm, and 10pm.

Over the course of two years numerous prescription pharmaceutical drugs and alternative supplements had been prescribed by numerous doctors and specialists, all with no significant relief. Medical and alternative therapies explored included:

- Pain Management medical doctor: Made a preliminary diagnosis of trigeminal neuralgia at a pain support group event.
- Medical doctor: Prescribed Neurotin™[1] 300mg, 3 times daily for 2 weeks. No relief was achieved. Neurotin™ Dosage was increased to 600mg taken 3 times per day for 3 weeks. No relief.
- Ear, Nose & Throat Specialist: Diagnosed her with "migraine of the face" and prescribed a different medication, which she declined.
- Oral Surgeon: Diagnosed infection. Performed surgical curettage of her gum. No relief was achieved.
- Acupressure: Exacerbated symptoms.
- Acupuncture: Minor relief.
- Reiki: No relief.
- Massage: No relief.
- Lymphatic massage: No relief
- Herbal doctor: Prescribed an "all-natural pain juice". This provoked an increase in the frequency of episodes to 14 times per day.
- Diversified chiropractic: No relief

The patient stated that she had spent over $9,000.00 in personal funds seeking relief.

Quality of the pain was described as a constant stabbing and throbbing, "like a bunch of pitch forks." The pain did not radiate, instead occurring simultaneously from the temporal area above the right ear contiguously across her face and jaw to the chin. Essentially, the pain pattern followed the path of the mandibular division of the trigeminal nerve. Duration of each episode was typically 60 minutes without medication. On her own initiative the patient discovered that Excedrin™ Extra Strength reduced the duration of episodes by approximately 50%.

Affected activities of daily living (ADLs) during an episode included:

- Inability to eat or drink.
- Interrupted sleep
- Inability to brush her teeth.
- Inability to drive a car.
- Reduced ability to function in public.

The patient confided that the cumulative effect of persistent pain gave her face a sickly and drawn appearance. People told her they could "see the pain" on her face, which affected her self-esteem and made her reluctant to be seen in public. She also described the pain as "eating at my heart", indicating an overall depressed mood. Clearly her ability to function was being impaired.

Chiropractic Examination

According to the National Upper Cervical Association (NUCCA) Standards of Care and Practice Guidelines, chiropractic assessment involves the "integrating of patient history with physical, imaging, and instrumentation examinations."[15] The patient's initial examination consisted of radiographic analysis, static electromyographic analysis, and leg length inequality measurement.

Results of the radiographic analysis determined the atlas was misaligned laterally to the right relative to the skull by 2.8 degrees, causing the head to have a lateral tilt to the left of 2.1 degrees. Atlas rotation was measured at 2.5 degrees to the anterior on the right. Inferiorly the Atlas was misaligned relative to the lower cervical vertebrae. This created an acute lower angle on the ipsilateral side relative to the upper angle. Altogether this analysis yielded a NUCCA classification as a Type 1 atlas subluxation and a patient-specific NUCCA listing expressed as RH4A2.5. Essentially this listing indicates that the doctor could correct the misalignment by applying a gentle force onto the right transverse process of the patient's atlas at a vector starting with the doctor's episternal notch located 4 inches superior and 2.5 inches anterior to the contact point.

Surface Electromyography

Examinations were performed using a CLA "Subluxation Station." The system measures baseline status and changes in the electrical activity of paraspinal musculature at multiple sites along the spine. This provides objective data regarding muscular changes associated with vertebral subluxations." sEMG readings were taken of the paraspinal postural musculature at vertebral levels C1, C3, C5, C7, L1, L3, L5, and S1. Readings were taken at the initial examination and at periodic reassessments.

The patient's initial sEMG readings indicated severe anomalous neuromuscular activity in the upper cervical and lower lumbar regions. Normative sEMG data provides a tonal reference level of 3.8uV for the left side and 3.9uV on the right side at the C1 cervical level. In contrast, the patient exhibited readings of 77.9uV on the left and 65.0uV on the

right at that level. This suggested the presence of significant regional hypertonicity. Copies of the patient's sEMG data are included with this paper as Attachment 2.

Leg Length Inequality & Postural Distortion

At the initial examination, a check for leg length inequality indicated the patient had a functional short leg of ¾ inch on the left. Using the SpineMaster™ platform, postural evaluation revealed the left iliac crest to be lower than the right by 3 degrees and rotated anterior by ½ degree. The neck also exhibited a left lateral lean of 1.5 degrees. The patient was instructed to avoid lifting of any objects overhead and to avoid sleeping on her stomach.

Chiropractic Management

At each office visit the patient was assessed for indications of atlas subluxation by performing an evaluation for leg length inequality. If the patient displayed a functionally short leg, an upper cervical-specific adjustment was performed using the NUCCA technique. A post-adjustment evaluation of leg length was performed to verify resolution of pelvic distortion. If the leg length inequality had resolved, it indicated that the adjustment had been successful. The patient was then taken to a recovery room to rest supine in a reclined antigravity chair for ten minutes.

Prior to the first adjustment, a leg length check revealed a ¾ inch functionally short leg on the left. An upper cervical specific adjustment using the NUCCA technique was performed. After the adjustment, the patient reported that her neck felt looser. Post-adjustment leg length evaluation revealed that the legs were balanced. The patient was seen two more times during the first week.

One day after her first adjustment the patient reported right neck and facial pain along the affected area, still rated at 10/10. She also reported that her knee pain had improved, decreasing from the initial rating of 5/10 to 3/10. Examination revealed a leg length inequality of ¼ inch on the left. Post-adjustment leg length check revealed that the legs were balanced, indicating that the adjustment had been successful. A leg length check three days later revealed a $^{1}/_{8}$ inch functionally short leg on the left. The patient received her third successful adjustment.

The patient was seen two times per week during the next three weeks. At the fourth visit, pain was still 10/10 and episodes were still occurring six times per day on a consistent schedule. From this point forward almost all subsequent leg length inequalities were measured to be a no more than $^{1}/_{8}$ inch short on her left leg.

During the fifth week, the patient was seen twice. At the seventh visit the patient reported pain still at 10/10 over the smaller area, but the affected area had decreased to the size of "a half dollar piece over the right ear, and duration of episodes had decreased from 60 minutes to 25 minutes. Additionally, the frequency of episodes had decreased from six episodes per day to three. The patient was only seen once during the fifth week.

During the sixth week the patient was seen twice. The patient's sEMG readings indicated significant changes in postural tone. Normative sEMG data provides a tonal reference level of 3.8uV for the left side and 3.9uV on the right side at the C1 cervical level. It should be noted that prior to the patient's first adjustment these readings were 77.9uV and 65.0uV, respectively. The new readings at C1 indicated 4.6uV and 9.5uV respectively. Lower cervical readings on the right were resolved, while readings on the left were relatively unchanged.

At the tenth visit the patient reported pain intensity during the episodes had decreased from 10/10 to 8/10, and the duration of each episode had again diminished, this time from 25 minutes to 15 minutes. At the eleventh visit the patient reported that the right side of her face perspired for the first time since the symptoms had originally emerged. She also noted that her fingernails were harder.

By the seventh week the patient was being seen once per week. On week nine, the patient reported that the pain in her right knee had resolved. On week twelve the patient was reporting that the affected area had decreased further, now down to the size of "a fifty-cent piece". On her 22nd week of care, prior to her 24th adjustment, the patient described the affected area as being "the size of two dimes." The patient also reported that the frequency of the episodes had decreased to two episodes in the morning, one in the afternoon, and one in the evening, down from the initial six times per day.

The patient is still under care. To date, the results of upper cervical specific care for this patient could be described as a 33% reduction in frequency of symptoms, 20% reduction in intensity, 75% reduction in duration, and approximately 90% reduction in affected area. The patient still cannot eat, brush her teeth, or drive a car during an episode. However, with the overall reduction of her symptoms, the patient has regained almost full function in her activities of daily living.

Discussion

Though widely hypothesized, the etiology and fundamental pathophysiology of trigeminal neuralgia is largely unknown. All sensory information from the face occurs via the three branches of the trigeminal nerve arising from cranial nerve V. These converge at the apex of the petrous part of the temporal bone to form the sensory ganglion of cranial nerve V.

Sensory signals from the trigeminal ganglion are then sent to the trigeminal nucleus. The trigeminal nucleus extends throughout the entire brainstem from the midbrain to the medulla and continues into the cervical cord downward as far as the 4th cervical vertebra where it merges with the dorsal horn cells of the spinal cord. With its dural attachments and proximity to related vascular, both a mechanical and vascular relationships exist between the trigeminal nerve, the brainstem and the atlas. It is possible that torsional forces are induced on the brainstem by dentate ligament tension created by misalignment of the atlas. This could result in direct traction of the sensory nucleus of the trigeminal nerve, creating irritation and sudden neuronal discharges interpreted as facial pain.

A review of literature was performed to find further evidence supporting a causal relationship between atlas rotation and trigeminal neuralgia, and positive outcomes through upper cervical-specific treatment. A case study by Kessinger, et al documented resolution of TN in a 14-year-old female after a single upper cervical-specific adjustment.[16] One year later at a follow-up visit, the patient reported she had not had any facial pain since the first adjustment.

Burcon published a case study on a 57-year-old female who presented with right sided trigeminal neuralgia of two years duration.[17] After eight weekly visits, the patient was completely off Gabapentin™ pain medication and pain free. After two years of monthly maintenance care, she was still pain free.

Sweat and Wallace reported on a 54-year-old male patient who experienced full resolution of TN symptoms following one month of Atlas Orthogonal upper cervical-specific care.[18]

Grochowski reported on a 58-year-old female with TN of 6 years duration. During her nine weeks of care she received 18 upper cervical-specific adjustments and subsequently reported no recent episodes.[19]

Another clue to understanding the relationship between the atlas subluxation complex and trigeminal neuralgia can be found in several case reports on patients with Arnold Chiari malformations exhibiting symptoms of trigeminal neuralgia. This suggests that either brain position or caudal traction of the dura is related to the etiology of trigeminal neuralgia. An interesting data point is a report by Vince, Bendzus, et al, in which bilateral trigeminal neuralgia was associated with an Arnold Chiari malformation.[20]

In a report by Caranci, et al, trigeminal neuralgia was the sole manifestation of an Arnold Chiari Type I malformation.[21] MRI imaging of the patient showed the cerebellar tonsils shifted downward through the foramen magnum into the upper cervical spinal canal to within 2 cm of the C2 vertebra, completely obliterating the cisterna magna. Herniation of the cerebellar tonsils has been shown to resolve through upper cervical-specific chiropractic reduction of an atlas subluxation.[22] This suggests a mechanical relationship between atlas misalignment and caudal tension on the dura mater. Furthermore, it substantiates the previously-mentioned NUCCA concept of an Atlas Subluxation Complex causing tractionization to the central nervous system.

Clearly there is a need for more extensive research supporting the link between the Atlas Subluxation Complex and relief of trigeminal neuralgia and other neurologic pathologies.

Medical Alternatives

With the exception of acute care, the medical approach to most disease involves treatment of symptoms for resolution of chief complaints. Trigeminal neuralgia is no exception. Treatment often involves chemical injections, surgical resection or directed energy designed to destroy nerve fibers.

Pharmacological options

Trigeminal Neuralgia does not respond to the usual drugs used to treat other neuropathic pains. Carbamazepine 200-1200mg/day and oxcarbazepine 600-1800mg/day is considered a first-line therapy for trigeminal neuralgia. Common side effects include drowsiness, nausea, dizziness, diplopia, ataxia, elevation of transaminases, hyponatremia. Potentially serious but less common side effects include myelosuppression, hepatotoxicity, lymphadenopathy, systemic lupus erythematosis, Stevens-Johnson syndrome, and aplastic anemia. Initial efficacy is approximately 80%, however higher doses may be needed to maintain relief and efficacy ultimately falls to 50% due to autoinduction of carbamazepine.[23] The mechanism of their analgesic effects is unknown.

Surgical Options

Injection of alcohol into the Gasserian ganglion has been shown to relieve pain, but only temporarily for up to two years. Recurrence of symptoms is thought to be due to nerve regeneration.[24]

Resection or gamma knife obliteration of the gasserian ganglion and microvascualr decompression are a few of the major contemporary surgical approaches to trigeminal neuralgia. In the case of the resections the goal is clearly a matter of destruction of the offending nerve structures, as opposed to a resolution of an underlying cause.

Microvascular decompression has a fairly high success rate, with 90% of patients reporting initial relief and 73% still pain free after five years.[25] However, the procedure entails a major surgical craniotomy to reach the trigeminal nerve in the posterior fossa. In a review of 525 articles by Obermann, mortality rate was estimated to be as high as 0.5% and up to 4% of patients suffer major complications such as cerebrospinal fluid leakage, infarcts and hematomas, aseptic meningitis.[23] Long-term complications included sensory loss (7%) and hearing loss (10%). Furthermore, an article by Jannetta speculated that the initial good results from compression and decompression operations can be explained not by the direct vascular compression but rather by release of the nerve entrapped in the dural sheath.[25]

Limitations

Limitations of this study include lack of follow-up data for the initial postural measurements, lack of records in the patient file for pre- or post-adjustment scanning palpation, and the fact that this study was limited to a single patient. Additionally, some improvements noted by the patient, such as resolution of right sided facial anhydrosis and hardening of nails could not be confirmed due to lack of initial data.

Conclusion

The results from this case, when evaluated in the context of similar evidence, suggest that upper cervical-specific chiropractic treatment for reduction and/or correction of atlas subluxation can produce positive outcomes in the treatment of trigeminal neuralgia. These findings highlight the importance

of further investigation into the atlas subluxation complex and its potentially causal relationship to trigeminal neuralgia. Upper cervical-specific chiropractic treatment for trigeminal neuralgia should be considered an effective, non-invasive alternative to traditional medicine.

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