Case reports

Chiropractic care using a functional neurologic approach for idiopathic cervical dystonia in a 59-year-old woman

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Abstract

Objective: The purpose of this case report is to describe the care and outcomes of a patient with cervical dystonia who was treated using chiropractic and other alternative medicine interventions.

Clinical Features: A 59-year-old woman had an 11-year history of cervical dystonia. She had an uncontrollable 60° leftward head rotation upon shutting her eyes and had spasmodic contractions that caused fatigue.

Intervention and Outcome: The management consisted of blue-lensed glasses, vibration stimulation, spinal manipulation, and eye-movement exercises. Within the first week of treatment, she had a reduction in symptoms, which was documented using a functional numeric scale, and improved posture, which was assessed using measurements from her midsternal line to the center of her chin.

Conclusion: This patient with cervical dystonia responded to the use of conservative, nonpharmacological treatment procedures that consisted of chiropractic care using a functional neurologic approach aimed at improving her spasmodic contractions and function.

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Introduction

Cervical dystonia (CD), also known as *spasmodic torticollis*, is one of the most common focal dystonias.¹ Cervical dystonia is a neurological disorder of uncertain etiology, best described as sustained involuntary contractions of neck musculature resulting in

repetitive twisting movements and abnormal posturing of the head.² There are 2 forms of idiopathic CDs: primary and secondary.³ Primary CD is when an individual has no other neurological disorders besides that of the dystonia. Secondary CD is seen in individuals who have a concomitant neurological disorder.³ The condition usually occurs in the fourth to fifth decade of life and is predominantly seen in females.⁴ In the first 5 years of CD, significant progression of the condition occurs.⁴ Current literature suggests that the pathophysiology of CD is a result of a

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dysfunction in the basal ganglia, substantia nigra, pontine brainstem, and cerebellum.^{5,6}

The treatment of CD varies greatly and depends on the type of provider seen. Conservative management may consist of electrical stimulation or ultrasonographic therapy to the affected muscles, manual therapy or joint mobilization, manipulation, and passive/active therapeutic exercises.^{7,8} This disorder is also often treated with oral medications such as anticholinergics, benzodiazepines, and muscle relaxants. One of the most widely implemented biomedical treatments is injections of the contracted musculature.⁹ The use of botulinum toxin type A and botulinum toxin type B is usually effective between 2 and 4 months with varied relief.⁹ If botulinum toxin is part of the treatment plan, it requires consistent injections for continued management of the condition.⁹

At present, there are no case studies in the literature that describe alternative treatment procedures in combination with chiropractic care for CD. Therefore, the purpose of this case report is to describe the care of a patient with CD who was treated using chiropractic and other alternative medicine interventions.

Case report

A 59-year-old white woman sought care at a chiropractic clinic for symptoms from CD of 11 years' duration. The onset of the condition came after an airplane flight 11 years ago in which the patient stated that "she slept on the plane and woke up with a problem." When the patient was first seen, she was diagnosed with CD by her primary care provider and was given botulinum type A toxin injections as treatment. The injections were to the following locations: her right sternocleidomastoid, right trapezius, left posterior scalene, left levator scapula, left splenius capitis, left cervical paraspinals, and left trapezius musculature.

On initial assessment using the Patient-Specific Functional Scale, she was asked to rate her ability to perform tasks that were hindered by her condition. She rated each task on a 0 to 10 scale, with 0 meaning not able to function and 10 as being fully functional. She described the tasks as "head turning to left while driving," 3/10; "looking straight ahead," 3/10; "holding head straight," 3/10; "rigidity of neck," 2/10; and "having to hold chin," 1/10." Upon examination, she had an observable leftward spasmodic torticollis present when her eyes were opened and closed. When her eyes were closed, however, the leftward yaw positioning increased immediately. Initially upon examination, her

dystonic posturing to the left was estimated at about 60° in a leftward yaw rotation (Fig 1). The patient was asked to wear red-lensed glasses and then blue-lensed glasses. She stated that "the blue-lensed glasses created a calming effect and my neck did not feel as tight." As part of the examination, vibration therapy, in the form of a handheld massage device set on medium frequency, was used to elicit changes in her dystonic posturing while her eyes were closed. Upon stimulating the right ankle mortise joint with vibration, her dystonia worsened. Her dystonia also worsened as the therapy was done to the right lateral knee joint. However, vibration on her right lateral hip area caused the spasmodic dystonia to cease. Once the vibration was removed from her hip area, the dystonic posturing returned; however, she stated that "it felt different." Nonpathological saccadic eye movements were examined by asking the patient to actively target objects at either side of her visual field, and a mild hypometria to the right was seen. During the examination, cortical blind spot mapping was performed.¹⁰ This consisted of the patient staring at a dot on a piece of paper on the wall 7 in away at eye level; another piece of paper with a dot on the edge is then moved into the field of gaze; and the

Fig 1. Upon initial examination, the patient had dystonic posturing to the left at approximately 60° in a leftward yaw rotation.

distance is measured, giving you the blind spot distance. The patient's blind spot on the right was measured to be 2.1×9.4 cm using a tape measure. The blind spot was measured at a distance of 7 in from the wall to the patient. Based upon the presentation and previous diagnosis from multiple doctors, a tentative working diagnosis of primary idiopathic CD was given to the patient.

As part of treatment, the patient was asked to wear blue-lensed glasses at all times. She would wear the glasses throughout treatment and was told to wear them at home as much as she desired. She received in-office treatments including vibration, eye exercises, optokinetic (OPK) tape reflex therapy, and joint manipulation. Vibration stimulation was done to her right hip for 1 minute on a medium frequency throughout treatment. During this treatment, she was instructed to perform active hip flexion 10 times. This combination therapy elicited an immediate fixation of her head along the sternal midline (Fig 2). She was told to contract her right hamstring and left quadricep musculature simultaneously while resistance was added by the doctor. For eye exercises, the patient was asked to fixate on her

thumb, while slowly pursuing the moving thumb to the left for approximately 8 in. She then at the end of her pursuing movement would rapidly saccade back to midline vision at fixed point. An OPK tape was used each visit as a treatment modality to attempt to elicit the vestibuloocular reflex (VOR). The OPK tape is a series of repeating vertical stripes on a piece of cloth ($48'' \times 4''$) that is passively scanned across a patient's field of vision in a direction that provokes an OPK reflex. The direction of the tape movement was placed so that the patient performed leftward pursuits and rightward saccades. This meant that she would consciously pursue a vertical stripe to the left and subsequently refixate on the next vertical stripe immediately following. The OPK tape was also done with an upward saccadic movement patterning. Each visit, the patient would undergo a functional non-pathological Romberg sway screening, which would objectively provide the examiner with functional cues to the side of the dysfunctional cerebellum.¹⁰ Based upon this finding, chiropractic neck manipulation would be provided to the side the patient swayed to. She would lie down in a supine position; and high-velocity, low-amplitude manipulation would be given at the level of the second cervical vertebrae based on

Fig 2. A picture of the patient after therapy showing fixation of her head along the sternal midline.

Fig 3. Patient is able eliminate the spasmodic posturing of her neck when closing her eyes.

the provoked Romberg sway testing. For example, if there was significant sway when her head was placed in a posterior rightward aspect, a cervical manipulation would be given using a coupled reduction high-velocity, low-amplitude on the right side of the second cervical vertebrae. Her head would be placed in a manner that replicated the positioning that caused disequilibrium while performing the provoked Romberg test.

After a course of treatment, she no longer had spasmodic posturing of her neck when closing her eyes (Fig 3). At the writing of this case report, she had a daily average torticollis of 0.5 to 1.5 cm when closing her eyes. This is measured at her midsternal line to the center of her chin. When translated into degrees, the result is less than 10°. When reevaluated using the Patient-Specific Functional Scale, she scored all functions as 9/10. The posttreatment blind spot mapping was performed and displayed a substantial change. The right eye blind spot decreased to a 3 × 3.8-cm area. This again was measured in the exact location as done previous to the treatment and at a 7-in distance from the wall.

Discussion

The patient in this case responded positively to the care provided. However, we can draw no firm conclusions from this case report, although these findings suggest that other patients with idiopathic CD may see relief with targeted modalities such as blue light, vibration, and eye movements. Based upon the authors' opinion, it is suggested that a conservative approach should be considered an option before more invasive treatments are pursued in CD.

Current literature suggests that the basal ganglion is one of the main areas of the brain directly responsible for coordinating proper volitional movements; however, the cerebellum, substantia nigra, and thalamus also contribute.^{4,10,11} In dyskinetic patients, such as those with idiopathic dystonias, the basal ganglia have been shown to have altered function as seen on functional magnetic resonance imaging.^{12,13} With this information in mind, a patient may be able to alter cortical function with certain types of modalities to create plastic changes within the brain.^{10,11,14-17} Currently, research suggests that neurons are capable of creating and recreating synaptic connections in response to altered environmental stimuli.^{10,11,14,18} Therefore, it may be that varying forms of external stimulation, if given in specific contexts, may create new plasticity

within cortical tissue.^{10,11,14,19,20} Using modalities to create plastic changes in the brain can be both beneficial as well as detrimental.¹⁰ Thus, it is necessary that physicians understand how to examine an individual for altered functional capacities.

One of the modalities used during both the examination and treatment phase for this patient was vibration. Because of the results obtained while stimulating varying joints from side to side, it was possible that, when using vibration on the right hip, joint mechanoreceptors as well as sensory receptors were activated, which may have caused excitation of specific areas in the right cerebellar nuclei and contralateral basal ganglia.²¹ Further investigation may identify which specific areas are excited when this stimulus is given to different joints. Immediate alterations in dystonic posturing suggest that cortical tissue is influenced in some capacity, whether excited or inhibited.

Eye movements are intricate processes derived through multiple cortical circuits. When examining the accuracy and efficiency of a patient's eye movements, one area to examine is the frontal lobe. Depending on the data found when comparing movements bilaterally, one can suggest discrepancy of function to a side. For example, the patient here had hypometria of saccade to the right. The left frontal lobe activates the orbital musculature to provide that rightward saccade. It is hypothesized that variance within this examination suggested inadequate functioning of the left frontal lobe compared with the contralateral side. Not only does this suggest that eye movements are controlled partially by the frontal lobes, the movements also receive input via the basal ganglia. Because the basal ganglia affect both the initiation of volitional movement as well as its control, it is theorized that eye movements could be performed to increase activation of "weakened" basal ganglionic structures.

During treatment, the patient's right VOR was also activated using an OPK tape. The reasoning for eliciting the reflex was to evoke excitation of the patient's right vestibular system through the VOR response. Performing the reflex accentuated the patient's eye movement contralaterally, as well as excited the vestibular apparatus. This may evoke contralateral pools of neostriatal neurons through the feed-forwarding mechanism. Orbital movements can be volitionally activated through conscious perception, as in a patient consciously moving his or her eyes leftward. Eye movements also may become activated through reflexive movements via the vestibular apparatus. During this phase of treatment,

the VOR was elicited as a means of initiating cortical excitation of the patients left cortex through the right vestibulocerebellar system.

Blue-lensed glasses were also given to the patient before all treatment modalities because of the short wavelength of the blue light. Previous studies suggest that blue light has the capacity to alter an individual's moods.²² This suggests that the basal ganglia may share similar reactions to the influence of blue light. The connection between the limbic system and the basal ganglia is known as the *neostriatum*.²³ Both the limbic system and the basal ganglia are "primitive" structures deep within neuronal tissue that influence coordination of emotion and emotional responses. Therefore, if blue light can possibly alter an individual's mood, it may possibly affect the individual's basal ganglia directly or indirectly. The concept of using blue light for this patient was to evoke neostriatal excitation that would concomitantly create inhibition of the globus pallidus interna and externa.¹¹ By inhibiting these structures, proper basal ganglionic activation was hypothetically prompted through both direct and indirect pathways. Actual functional magnetic resonance imaging studies while stimulus is given would be necessary to determine if this activation is actually taking place.

Currently, it is believed that every action or stimulus affects multiple cortical systems; however, it may be that because of constant stimulation through a modality, increased blood supply and oxygen will reach a specific area more so than if nothing was done.¹¹ If longer periods of stimulus are given to the patient, it is plausible that certain areas may receive more excitation or inhibition than others.^{10,24} The aim of this care is to provide positive plastic changes within cortical tissue and understand the amount of stimulation a patient may handle, as well as which cortical areas are in need of plastic change.

Limitations

Possible limitations include that the patient subjectively completed the functional scale and may have been biased as she started to see progress with her care. The patient was also asked to wear the blue-lensed glasses while at home as often as possible. A recommendation to complete an at-home log was given; however, the patient did not follow through with this recommendation. Rendering treatment appeared to resolve the majority of her symptoms. However, dystonic posturing in some patients with CD has been known to go through periods of exacerbation and

remission; but sustained remission is not common.²⁵ Therefore, it is possible that the symptoms remitted as a natural course of the disorder.

Although the patient responded to multimodal treatment, it is unknown if the therapies in concert had an influence on her symptoms or if there was only one procedure that produced the observed changes. Additional studies will need to be performed to identify if treatments need to be combined or if only one was essential.

Future research is needed to specifically determine whether blue-lensed glasses affect a person's muscular coordination via the basal ganglia or act as a placebo. Because of the complex connectivity of the human brain, to say that we are specifically stimulating an area and inhibiting others for specific treatment is arguable. Better objective evaluations are needed as well to determine the effect of the patient's symptoms with and without these treatments. More participants will be needed to test if the modalities used in this case will effect a more vastly distributed population of patients as well. As in most case reports, we were not able to control the environment of the patient. Many other explanations may be possible as a result.

Conclusion

This patient with CD responded to the use of conservative, nonpharmacological treatment procedures that consisted of chiropractic care using a functional neurologic approach aimed at improving her spasmodic contractions and function.

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