

CASE STUDY

Reduction of Motor and Vocal Tics in a Female Undergoing Chiropractic Care to Reduce Vertebral Subluxation

*Pamela Stone-McCoy, B.S., D.C., CACCP*¹ *Kim Muhlenkamp, B.S., D.C.*²

Abstract

Objective: To review the effectiveness of chiropractic care in the case of a 20 year old female presenting with Tourette Syndrome (TS) symptoms, headaches and vertebral subluxations.

Clinical Features: A 20 year old female began experiencing motor and vocal tics at the age of three. She has never taken medication for TS, but has tried to control it by taking magnesium and calcium supplements.

Interventions and Outcomes: Chiropractic care was administered after initial exam revealed disturbances to the nervous system resulting from vertebral subluxation. Subluxations were diagnosed based on findings from posture, static and motion palpation, thermography and static surface electromyography. The patient was seen 32 times over the course of one year. The patient experienced significant decreases in the occurrence and severity of her motor and vocal tic episodes as well as an improvement in headaches.

Conclusion: With consistent chiropractic care directed at reducing vertebral subluxation, the patient was able to better function throughout the day with decreased motor and vocal tic episodes. Further research on chiropractic, subluxation and neurodevelopmental disorders is needed.

Key Words: *Tourette Syndrome, Chiropractic, adjustment, motor tics, vocal tics, spinal manipulation, vertebral subluxation, thermography, surface electromyography*

Introduction

Tourette syndrome (TS) is a developmental disorder characterized by unwanted, irresistible, stereotyped movements and vocalizations called 'tics'. Symptoms frequently appear around the ages of 6-7 years old and peak in intensity during early adolescence.¹ Comorbid conditions of attention, impulse control, and mood are common - particularly Attention Deficit Hyperactivity Disorder (ADHD) and Obsessive-Compulsive Disorder (OCD).²

The DSM -IV diagnostic criteria for TS requires a diagnosis prior to 18 years of age, tics not due to substances or other disorders and the presence of motor tics and vocal tics for greater than one year.¹ TS is seen in all ethnic and racial groups with a strong 4:1 predisposition for males over females. The peak incidence is in early preadolescence with resolution of symptoms in adult life in 50% of cases.³

The exact cause of TS remains unknown. Its symptoms were first recorded in 1825 by Jean-Marc Gaspard Itard, Chief Physician at the National Institute for Deaf Mutes in Paris.⁴

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1. Private Practice of Chiropractic, Kennesaw, GA
 2. Memphis, TN

The lack of knowledge on the actual etiology of TS has greatly hampered progress toward better treating the condition.⁵ Tranquilizing medications referred to as neuroleptics, have been documented as effective for the treatment of tics.⁵ In more serious cases, neurosurgical lesions targeting the cingulate cortex, thalamus, internal capsule, and hypothalamus were performed. The neurosurgical lesions resulted in reducing tic symptoms, but also in adverse affects such as mood alterations, intellectual impairment, headaches, and weight gain.⁵ Deep brain stimulation (DBS) has recently emerged as a promising alternative. Referred to as a “flexible scalpel” it is felt to have an advantage over neurosurgical lesions by being both reversible and adjustable.⁵

A variety of alternative therapies have been recommended for TS, such as dietary restrictions, vitamins A, B, C, and E, niacin, magnesium, calcium and St. Johns Wort, but none have been subjected to standard scientific testing in a controlled clinical trial.⁵ A study protocol for a randomized placebo-controlled double blind phase IV study of the effectiveness and safety of magnesium and vitamin B6 as a therapeutic approach to TS was recently published in the *Trials Journal*.⁶ It is just a proposed protocol so it has not begun, but shows alternative therapy studies for TS are occurring.

There exist only 2 case studies in the literature regarding TS in response to chiropractic care. The 2 studies both utilized the upper cervical adjusting technique and received positive results relative to decreasing tic symptoms.^{7, 8} The following report documents a 20 year old female with TS who underwent one year and 3 weeks of chiropractic care and her response to treatment.

Case Report

Clinical Features

A 20 year old female college student presented for treatment of tics and headaches. A history was taken in which the patient stated she began developing signs of TS around age 3, though she had never been diagnosed for TS by a medical specialist. Already having an uncle diagnosed with Tourette’s, the family understood and recognized the syndrome.

The patient’s parents made the decision not to see a medical provider for diagnosis due to the standard TS treatment being pharmaceutical intervention and they did not feel this treatment was in their daughter’s best interest. At around age 3, the patient began experiencing motor tics with rapid eye blinking, occasional whole body jerking, hitting her knee, and occasional movement of her upper extremities. Vocal tics included some throat clearing and blowing air through her nose. The patient continued to experience tics throughout her life.

Two years prior to beginning chiropractic care she began experiencing tics consisting of muscle contractions in her face and shoulders rather than the rest of her body. The tics occur constantly throughout the day in different time periods. When she is relaxed, the tics occur once every five minutes. The tics increase in severity and timing (once every 5 seconds) when she feels stressed and when eating a diet of too much sugar. The tics cause her to feel tense in her face and she feels a great

deal of pressure behind and around her eyes, which causes her to have headaches towards the end of the day.

In the health history, the patient stated her birth was an average natural birth with no interventions, and they were home from the hospital the next day. She fractured her left thumb at age six. She did not experience any other major trauma besides some emotional trauma during the onset of her tics when no one had recognized her tics were unwilling acts. She would be frustrated with herself, and her siblings would tease her about her symptoms.

She experienced a bout of major depression for 2-3 years as a teenager. She has always had a problem concentrating in school and the more she was required to read or focus on a subject, the harder it was to concentrate. She enjoys learning, but when it comes to the pressure of a test, she becomes stressed and the tics increase in frequency and severity.

She has never taken any medications for the TS and is not currently taking any other medications. She had been taking calcium and magnesium supplements to aid in decreasing her motor and vocal tic severity. The patient stated she ate a healthy diet and exercised 3 times a week. She saw a chiropractor 10 years ago, 1-2 times a month over a 1 year period, but treatment had not reduced her tics.

Chiropractic Examination

The physical exam revealed a healthy looking 20 year old female. Posture analysis revealed a high left shoulder, high left ilium, and anterior head translation. Foraminal compression and cervical distraction orthopedic tests both made the patient feel better. The patient stated that both tests took pressure off the head and neck. Manual palpation revealed muscle spasm and pain at occiput, T1, T2 and L2 bilaterally; C5,C6 on left; and L5 on the right.

Thermal scan on the initial visit showed asymmetrical patterns of temperature distribution and static SEMG revealed muscular hypertonicity and asymmetry at several spinal levels. (See Figure 1) Patient diagnosis consisted of cervical subluxation, headache, acquired kyphosis and abnormal involuntary movements.

Intervention and Outcomes

The patient was examined for the presence of vertebral subluxations. The method of analysis used by the doctor was a combination of Webster Analysis for sacral subluxation, in which the leg length is assessed with the patient laying prone for increased heel to buttock tension on the short leg side indicating the sacrum has rotated posterior around the y-axis on that side.

Static palpation was used in which the patients spine and paraspinal area was examined using the doctors fingertips. Higher musculature on one side of the spinous indicated vertebral body rotation to that side around the y-axis. A spinous process protruding posterior from the normal spinal curvature present with edema indicated the vertebra deviated posterior in the sagittal plane. Thompson cervical syndrome checks were used to evaluate cervical subluxation. This entails

the patient lying prone and asking the patient turn their head to side to side to see if a short leg balances. The opposite side of the cervical spine is palpated with the head still turned for taut and tender fibers (nodules). These nodules indicate cervical segment body rotation to that side. Using this type of analysis subluxations were present at C2 and atlas and were adjusted.

Typical adjustment style used by the doctor was side posture or drop table for the pelvis, side posture or Activator for the lumbar spine, prone double thenar or crossed pisiform for the thoracic spine, and supine cervical set for the cervical spine. Cranial adjustments were also performed and analyzed by palpation of the cranial bones for the cranial rhythmic impulse, a fundamental concept of cranial osteopathy. If the impulse is felt to be restricted at a cranial suture, the cranial bone is then adjusted by applying pressure to separate the cranial bones at the suture.

The patient returned for chiropractic care 5 times over the next 5 weeks with a decrease in headache occurrences from once a day to nonexistent. She also stated her motor and vocal tics had decreased by the 6th visit.

The patient continued care at once a week for a month. She began to experience more tics due to the stress of a new job. At this time it was recommended she increase her visits to two times per week. Once care was given 2 times per week, the patient was responding better and once stable, the care plan was changed to once every 2 weeks. The patient did not adhere to this care plan and returned only 3 times during the next three months.

When she returned for care the patient stated the Tourette's symptoms had increased due to stress and a "bad diet". A re-exam was performed in which the patient stated her progress thus far was a 4/10, 10 being resolved, the tics were not as bad and the headaches were better. Her overall sense of well-being had improved and no new complaints were mentioned. A follow-up thermal scan revealed persistent patterns of thermal asymmetry in the cervical, thoracic and lumbar regions. Static EMG scan revealed persistent areas of hypertonicity in the cervical and dorsal regions. (See Figure 1) For the next five months, the patient adhered to her care plan and returned for care one time per week. Each visit she was analyzed for vertebral subluxation and adjusted using the same methods as described above.

During this time the patient was compliant with her care plan and her headaches ceased. Her tics decreased in severity from an 8/10 at the beginning of care to a 3/10. With consistent chiropractic care, the patient has noticed less stress on a day to day basis and a decreased occurrence of tics. Overall, the patient was seen 32 times over a one year period.

Cervical spine subluxations were present every visit and consequently adjusted. The consistency of care played a major role in the decrease of tic symptoms. When the patient did not return for care for an extended period, her symptoms increased. Thermography and static EMG subsequently revealed persistent patterns of autonomic and motor dysfunction. (See Figure 1)

Discussion

The prevalence of Tourette Syndrome has been estimated to be about 0.1% to 1% of the general population.³ TS falls in a group of pediatric neurological disorders that is found to have a very high comorbidity relationship.

Pauc studied 100 case files of children attending a chiropractic clinic for a variety of disorders including dyslexia, dyspraxia, attention deficit disorder (ADD), Attention Deficit Hyperactivity Disorder (ADHD), obsessive compulsive disorder (OCD) and TS. He re-evaluated each patient following the criteria of the DSM -IV to find if secondary comorbid conditions existed. In the patients who had the primary diagnosis of TS, he found secondary conditions of: 80% had ADD, 10% had OCD, 38% had ADHD, 25% had dyslexia and 80% had dyspraxia.⁹

In Melillo's text, *Neurobehavioral Disorders of Childhood*, it is suggested that TS may simply be a neural pathology producing an excess of fixed action patterns (FAP). FAP are set well-defined motor patterns producing coordinated movements that allows the brain freedom to think about other processes, rather than concentrate on fixed stereotyped movement.¹⁰ It is thought that the storehouse of these FAP is the basal ganglia located in the cerebellum, so the dysfunction in TS may be stemming from cerebellar dysfunction.

This theory correlates to Pauc's study on the identification and treatment of convergence failure in a group of children with one or more neurological disorders including dyslexia, dyspraxia, ADD, ADHD, OCD and TS. He tested all children for convergence failure and dyspraxia. All children with only TS passed the convergence test, but failed the dyspraxia test. The dyspraxia test included dysmetria finger-to-nose test, dysidiadokokinesia, provoked Rhomberts and one leg standing - all cerebellar functioning tests.¹¹ It took simple exercises, such as cleaning teeth with the left hand while standing on the left leg everyday for the children to pass the dyspraxia tests months later.

These simple exercises are similar to those Melillo discusses in his brain balance program which he uses to treat children with the spectrum of neurological disorders discussed above. Children with TS who failed both convergence and dyspraxia test had a secondary condition of ADHD, ADD or dyslexia.¹¹ Children with tics alone are shown to have fewer learning problems and less hyperactivity than those with ADHD or ADD and tics.¹² This may suggest that TS is a less severe functional disorder compared to ADHD.

The question remains as to what causes the onset of TS and these comorbid disorders. During the course of early development it is likely that genetic, immunological, hormonal and environmental factors interact to establish a neurobiological vulnerability for TS and related disorders.¹³ Each of these disorders involves impaired inhibition of unwanted actions, possibly due to dysfunction within common cortical-subcortical circuits connecting the cortex to the striatum, globus pallidus, thalamus, and back to the motor cortex, which may be the substrate for tics.² Evidence from primate studies again suggests abnormalities in the basal ganglia result in disinhibition of excitatory neurons

in the ventral thalamus, which produces hyperexcitability, or disinhibition of cortical motor areas, associated with the occurrence of involuntary movements.² A large amount of neuroimaging literature also supports the involvement of subcortical structures in TS.²

Gilbert, in his study of the association of cortical disinhibition with tic, ADHD, and OCD severity in TS, found that the correlation of cortical disinhibition was greater in patients with ADHD symptoms than in patients with tics.² In Church's study comparing brain control networks in adolescents with TS compared to an unaffected control group, immature patterns of connectivity in the fronto-parietal network appeared present in the TS patients compared to the typical developmental age curves.¹

Due to the unknown etiology of motor and vocal tics in TS, the mechanism of how the correction of vertebral subluxations through chiropractic adjustments can decrease the occurrence of these tics is difficult to propose. Knowing that TS is a condition arising from supraspinal structures, and in the case of this patient, are brought on by stress, a general mechanism can be established with reasonable backing.

Everyday interactions expose the body to a wide array of stressful stimuli. The stress response has evolved for efficient functioning of the neuro-endocrine and neuronal pathways to play a vital role in adaptation of the body to homeostatic challenges brought to bear on it. Chronic stress may lead to physiological systems and the brain fluctuating to meet internal or external demands, causing deterioration and leading to maladaptation. When stress can not be normalized it may become detrimental to health.¹⁴ The environmental and emotional stress triggers the brain; the brain inefficiently handles the stress which in turn overexcites the immature functional connections in the brain resulting in motor and vocal tics.

An increasing number of studies hypothesize passive joint mobilization might also activate various areas within the central nervous system to produce activation of neural pathways. A systematic review looking at the consistency of evidence supporting an involvement of supraspinal systems in mediating the effects of passive cervical joint mobilization was led by Schmid in 2008. These studies mainly consisted of pain modulation through joint mobilization, but concluded that passive joint mobilization did stimulate areas within the central nervous system.¹⁵

It could be hypothesized that joint mobilization can stimulate the disinhibited cortical neural pathways in the brain allowing the brain to handle stress and decreasing the occurrence of motor and vocal tics. Pollard concluded in his paper on somatovisceral reflexes, that supraspinal reflexes may strongly influence spinal reflexes, although the link has not been specifically demonstrated with respect to spinal manipulative therapy. All evidence is indirect and further research should be done to investigate the role of supraspinal reflexes in treatments that utilize spinal manipulation.¹⁶

Motor and Vocal Tics

Conclusion

This case report details the history and symptoms of a young

female who had experienced motor and vocal tics since the age of 3. Over the course of one year of chiropractic care, her symptoms decreased in frequency and severity. The positive outcome in this case warrants a more extensive study to be performed on the effectiveness of chiropractic care on Tourette Syndrome.

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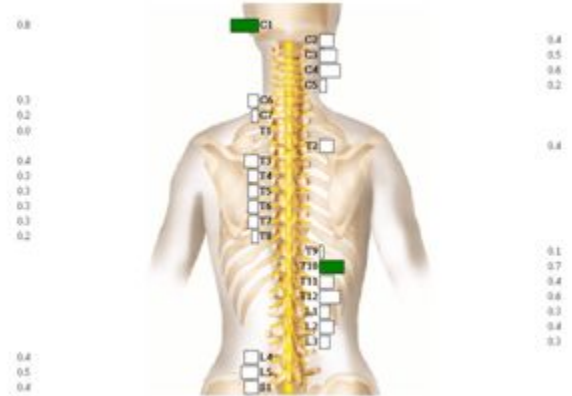
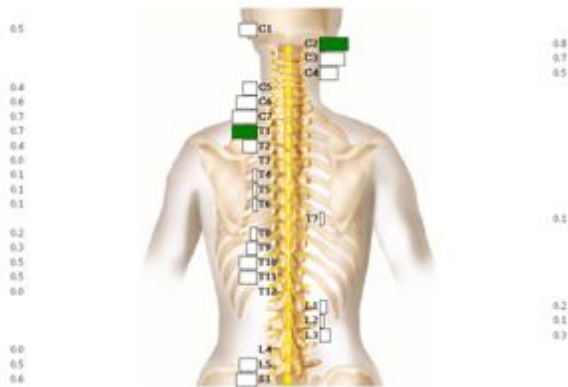
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Figure 1

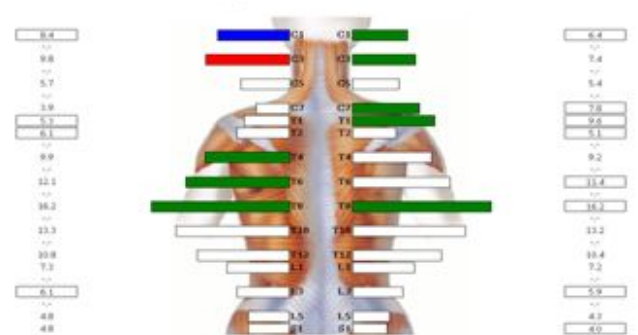
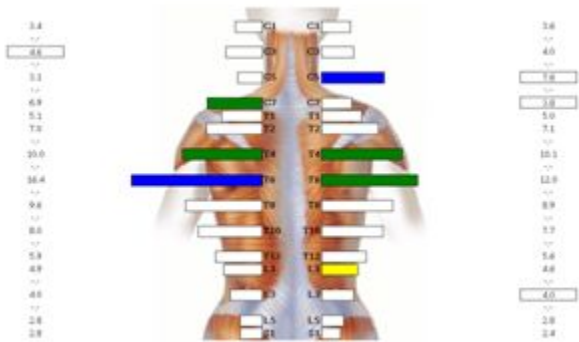
Initial Thermal Scan

Follow-up Thermal Scan



Initial SEMG Scan

Follow-up SEMG Scan



Initial & Follow-up Instrumentation: When the patient did not return for care for an extended period, her symptoms increased. Thermography and static EMG subsequently revealed persistent patterns of autonomic and motor dysfunction.