

CASE STUDY

Resolution of a Motor Tic Disorder in a 7-year-old Female Following Subluxation Based Chiropractic Care: A Case Report

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Abstract

Objective: To describe the clinical changes that occurred following subluxation-based chiropractic care in a 7-year-old child medically diagnosed with a motor tic disorder of unknown etiology.

Clinical Features: The patient was a 7-year-old girl who presented to a chiropractic office after being diagnosed by her pediatrician with a motor tic disorder. The patient's history revealed that she was diagnosed with torticollis at 6 weeks of age. Her tics began at the age of 5 and progressively worsened over time. Upon observation and examination, the patient had a notable motor tic and signs of vertebral subluxation.

Intervention/Outcome: The treatment plan for the patient utilized the Thompson technique to locate vertebral subluxation, and Diversified technique to deliver a high velocity, low-amplitude adjustment applied to the areas of vertebral subluxation as indicated by chiropractic analysis. The management resulted in complete resolution of the patient's tics following 3 chiropractic adjustments.

Conclusion: This study describes complete resolution of motor tics in a 7-year-old female following subluxation based chiropractic care. More evidence with larger sample sizes following a specific chiropractic technique is recommended to further highlight chiropractic treatment and its effectiveness for the resolution of neurological tic disorders, as well as the comorbid behaviors that are commonly associated with its diagnosis.

Key Indexing Terms: *Neurological tics, chiropractic, motor tics, subluxation, tic disorder, neurological tic disorder, Diversified Chiropractic Technique, Thompson Chiropractic Technique, motor tic disorder*

Introduction

Tics are defined as sudden repetitive motions or vocalizations, non-rhythmic movements or sounds that are produced by an individual, which serves no true purpose.¹ Tics are classified by their quality and complexity.¹ Almost any movement, sound, or combination of both that the body can produce has the ability to become a tic. There are two types of tics reported in the literature: motor tics and vocal tics.² The onset of a tic(s) typically occurs between the ages of 3 and 8 years old,

and 93% of patients are symptomatic by the age of 10.³ Motor tics are said to progress rostral-caudal, and are contractions of several groups of muscles repetitively. Vocal tics, or phonic tics, typically appear after the occurrence of motor tics, and are described as meaningless sounds that consist of grunting, sniffing, and squeaking.^{1,2} When vocal tics become more complex, they can progress into mumbling or uttering words or phrases.²

It is also found that tics appear to occur less frequently in public, and are more pronounced in a "comfortable"

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environment.³ Tics typically are preceded by an unpleasant “premonitory urge”, and the feeling disappears as soon as the tic is produced.¹ Based on the Diagnostic and Statistical Manual – IV (DSM-IV), tic disorders can be classified as:^{4,5}

- 1) Transient tic disorder (TTD):
 - a. Single or multiple motor or vocal tic(s) or both occur many times a day, on most days, over a period of at least 4 weeks.
 - b. Duration of the disorder is less than 12 months.
 - c. There is no history of Tourette’s syndrome, and the disorder is not the result of physical conditions or side effects of medication.
 - d. Onset is before the age of 18 years.
- 2) Chronic Motor or Vocal tic disorder:
 - a. Motor or vocal tics, but not both, occur many times per day, on most days, over a period of at least 12 months.
 - b. No period of remission during that year lasts longer than 2 months.
 - c. There is no history of Tourette’s syndrome, and the disorder is not the result of physical conditions or side effects of medication.
 - d. Onset is before the age of 18 years.
- 3) Tourette syndrome (TS):
 - a. Multiple motor tics and one or more vocal tics have been present at some time during the disorder, but not necessarily concurrently.
 - b. The frequency of tics must be many times a day, nearly every day, for more than 1 year, with no period of remission during that year lasting longer than 2 months.
 - c. Onset is before the age of 18 years.
- 4) Other tic disorder: Tic disorder, unspecified.

Tics may remit partially or completely during adolescence, or may continue to be problematic as an individual matures.⁶

Comorbid Behaviors

Tics may have comorbid conditions which they are associated with such as: obsessive-compulsive disorder (OCD), Tourette syndrome (TS), and attention deficit hyperactivity disorder (ADHD).^{6,7} The literature states that ninety percent of children with conditions related to TS also have one of these comorbid conditions.² Evidence suggests that obsessive-compulsive disorder (OCD) and tics may be related etiologically, with the interaction of genetics and environment being the determinants for symptom expression.⁶ It has been hypothesized that there is an involvement of acquired lesions of the basal ganglia and its related counterparts for OCD and tic disorders.⁶

It has also been speculated that there may be close relation between children that have had streptococcal infections and those that develop a tic disorder and/or obsessive-compulsive disorder.⁶ Patients with Tourette syndrome (TS) often report characteristic sensory experiences, also called premonitory urges (PUs), which precede tic expression and have high diagnostic relevance.

Tourette syndrome is a neurodevelopmental disorder characterized by the presence of multiple motor tics and one

or more phonic tics lasting at least one year, with onset before 21 years of age.⁷

ADHD and tic disorder commonly co-occur. ADHD is known as the most frequently encountered psychiatric condition in children and adolescents.^{8,9} ADHD is defined as a persistent pattern of inattention and/or hyperactivity and impulsivity that is more frequent and severe than is typically observed in individuals at a comparable level of development.¹⁰ Children with ADHD have high rate (8–14%) of concurrent tic disorder, and around 35–50% of children with TD also meet the diagnosis of ADHD.¹¹

In this case, an analysis of the patient was performed utilizing the Thompson Technique to detect areas of subluxation, followed by an adjustment using Diversified Technique to correct the subluxation. Chiropractic has been defined as having the primary goal or intent to correct subluxations in order to remove structural and/or tonal interference to nervous system function in order to allow the patient to heal him/herself and to experience increased overall health and function.¹²

Essential when considering the topic of interference is the importance of timing, as subluxations can and often do occur during childhood, even birth, and if unchecked and unresolved can alter the course of a life, or a family.¹³ The patient in this case was provided care based on this definition of subluxation and its effects on the human body.

Case Report

Patient History

The patient was a 7-year-old female whose parents brought her to a chiropractic office after being diagnosed with a tic disorder by her pediatrician. It was stated by the pediatrician that if the patient’s symptoms continued, an MRI would be performed to rule out a physical injury, and she would be prescribed medication to stop the tics from occurring. The mother explained that her daughter began having symptoms of tic disorder at the age of 5.

Her symptoms began with a shoulder raise and neck movement which occurred approximately every 30 seconds. The patient’s mother was told by the pediatrician to apply alternating heat and ice to her daughter’s neck every evening, and to give her Advil if there was any presence of pain. After trying the recommendations of the pediatrician, the tics persisted and the parents sought chiropractic care. She was not taking any medications at the time of her initial chiropractic visit and was not receiving any other care.

The mother stated that she had a normal and uncomplicated pregnancy. She did not experience any illnesses or trauma during her pregnancy. She also avoided medications, alcohol and smoking for the duration of her pregnancy. She delivered her daughter vaginally with the use of vacuum intervention while also receiving an epidural for pain during the delivery.

At delivery, the child weighed 7 lbs. and 6 ounces. Following the birth, the child was diagnosed with torticollis at the age of 6 weeks. The term torticollis is derived from two Latin words,

tortus meaning twisted and *collwn* meaning neck. The presentation is also called Wry-Neck.^{14,15} It typically presents as lateral flexion and rotation of the head with the head tilted to the involved side and the chin tilted toward the opposite side of involvement.¹⁶

The child's torticollis was treated using physical therapy, chiropractic care and myofascial release for two years following her diagnosis. The parents felt that the combined care resolved the torticollis; therefore, they decided to stop the treatment. The child's immunization history was up to date at the time of her presentation according to the Division of Public Health in her home state.

It was also stated that the child met the developmental milestones of standing at 10 months and walking at 12 months. The mother breastfed the child until she was 1 year old, and she occasionally gave her formula. Her first exposure to cow's milk was at the age of 14 months. The child had no reported food allergies or intolerances. Since birth, the child had received approximately 6 antibiotic prescriptions for various ailments. The mother denies the child having any accidents, trauma, falls, surgeries, or childhood diseases.

Chiropractic Examination

After reviewing the patient's history, a physical examination was performed on the patient by the chiropractor. It was found that the patient had a right head tilt, right elevated shoulder, and right elevated hip which we all gathered from observation of the patient standing in a neutral position, and by comparing side-to-side analysis.

Upon motion palpation, multiple subluxations with spasm, hypomobility, and end point tenderness were found. These subluxations were located at: C1 on the left, T6, and left pelvis. Palpation of the paraspinal muscles revealed hypertonicity along the right cervical dorsal area and occipital region, which agreed with the patient's posture appearing to have a right head tilt and right elevated shoulder due to muscle contracture.

A prone leg check was performed to assess the patient's leg length. The patient had a left short leg with the hypomobility noted within the left side of the pelvis. The identification of a shorter leg on the left side with accompanying hypomobility revealed that there was a posterior-inferior (PI) subluxation of the left ilium. This means that the left ilium is stuck in a posterior-inferior position in relation to the right side of the pelvis. A study by Schwartzbauer and Hart states that the reliability of leg length inequality has been studied and it has been found to have good reliability for prone and prone-knees-flexed leg length analysis.¹⁷

Motion palpation has been shown to be an effective assessment tool to detect aberrant joint mobility; therefore, it was used in the analysis of this patient to assist with the detection of areas of subluxation. The cervical spine was motioned with the patient lying in a supine position while the doctor placed posterior to anterior (P-A) pressure on the individual spinal segments as well as left to right and right to lateral flexion of the neck and left and right rotation. It was found that the C1 vertebra was mal-positioned to the left, and

had decreased left lateral flexion and left rotation in the cervical region. There was also a palpable tender nodule at C1 on the left.

Intervention

The patient's care plan was created with her visits being one day a week. Each visit consisted of observation of the patient's motor tics, chiropractic analysis utilizing Thompson Technique leg checks, and Diversified Technique to provide all chiropractic adjustments in order to correct vertebral subluxation if and when detected.

Thompson technique utilizes leg checks to determine primary subluxations within the spine and pelvis. The first leg check is provided with the patient lying prone, and the legs in extension. Cervical syndrome must be ruled out prior to proceeding. If the patient has a short leg in extension, they are instructed to turn their head to one side. If the leg balances in either direction a cervical syndrome to the side of the head rotation is indicated.¹⁸

The combination of observed leg length inequality after the cervical syndrome has been cleared involves checking the length in both extension and flexion. This combination of observed leg length inequality in the 2 positions is theorized to offer information that may be of help in making clinical decisions about the nature of vertebral subluxation detected in the spine, pelvic torsion and the type of corrections that should follow.^{19,20}

The patient was adjusted using Diversified technique. This technique takes into consideration the size difference between the doctor and patient, management of frail patients, doctor's injuries as well as doctor and/or patient preference. Adjusting modifications such as drop tables, adjusting instruments, alternate contact points, and patient positioning are all used when and if needed at the discretion of the chiropractor.²¹

At the time of examination, the patient had a PI left ilium subluxation. This subluxation was adjusted with the patient lying in a side-lying position with her right side on the table. The doctor flexed the top knee while stabilizing the patient at her elbow with her arms crossed. A posterior to anterior, inferior to superior high velocity, low-amplitude thrust was applied to the patient slightly inferior to her left posterior superior iliac spine using the pisiform of the doctor's right hand.

The left C1 subluxation was adjusted with the patient lying supine while the doctor contacted the left side of the C1 vertebra with her left hand applying a high-velocity, low amplitude thrust in posterior to anterior and left to right directions. Finally, the thoracic subluxation located at T6 was adjusted utilizing a knife-edged contact to correct the T6 vertebra's posteriority. For the remainder of the patient's care, Thompson protocol was utilized to detect subluxation and the patient was adjusted with Diversified technique.

Outcome

The patient's mother stated that she began noticing immediate results following chiropractic care for her daughter's tics.

After her first adjustment (left C1, T6, left pelvis), it was reported that the patient was experiencing 25% less tics which continued for three days, followed by an increase with the tics occurring every 30 seconds. The patient stated that she felt a little better, but that her neck was still bothering her during reading and test taking at school. After the second adjustment (left C1, T6, left pelvis), the patient was having 50% less tics, with one tic occurring every minute.

At this time, the patient's mother stated that she rarely complained of neck discomfort. Following the third adjustment (right C1, left C3, T6, right pelvis), she was no longer experiencing motor tics. She also did not complain of any neck discomfort. The patient is currently tic free, and has no discomfort in her neck region. She is still under regular chiropractic care in which she is evaluated one time a week, and adjusted as needed.

Discussion

Etiology

Discomforting bodily sensations, known as sensory phenomena or premonitory urges (PUs), are thought to instigate an involuntary urge to tic, followed by a voluntary capitulation, which results in the actual tic expression.⁷ According to the literature, it remains possible that abnormal perception or filtering of these sensory phenomena may be central to the pathogenesis of tic disorder and "sensorimotor gating". Sensorimotor gating describes the neurological processes of filtering out redundant or unnecessary sensory stimuli from all possible environmental stimuli.²

Patients with tic disorders have the ability to suppress tic temporarily, but only at the expense of discomfort like suppressing a sneeze, itch, or the urge to urinate. With prolonged suppression, the urge to tic can become so great that the action occurs beyond the patient's control. The urge to tic is different from normal urges in the sense that the sensory input that generates the urge to tic is unknown.²

One of the most commonly accepted hypotheses related to Tourette Syndrome (TS) and tics relates to dopaminergic dysfunction.²² This was also the reasoning behind the medications used to treat TS and tics, which involve the modulation of the dopaminergic system through the blockage of post-synaptic D2-receptors.²²

Medical Intervention

Despite the familiarity with tic disorders, their management remains challenging.⁵ There are several pharmacological approaches that are involved in the treatment of neurological tics. The goals of therapy and the appropriate choice of medication must be individualized.⁵ Clonidine and guanfacine are alpha-2-adrenergic agonists. Both are used more commonly in Anglo-American countries as first line treatment for mild to moderate tics.²²

Clonidine is frequently considered the medication of first choice for the treatment of tics because of its low incidence of side effects, and because it can also be of benefit in ameliorating comorbid ADHD. Clonidine is effective in about

50% of patients.⁵ The most common adverse reactions are fatigue, sedation, dizziness, drowsiness, depression, headache, irritability, confusion, hypotension, constipation, and dry mouth.²² Donepezil, a centrally acting reversible acetylcholinesterase inhibitor has also been used for medical intervention due to the improvement of tics with use of central cholinergic activation. Donepezil has also shown improvement for ADHD symptoms.²³

When alpha-2-adrenergic agonists are unsuccessful in managing tics, treatment with D2 antagonists should be considered. Haloperidol has been recognized as effective in the treatment of tics for over 45 years.⁵ Controlled studies have shown many neuroleptics, including haloperidol, pimozide, risperidone, ziprasidone, and olanzapine, to be effective in treating tics.⁵ Generally, the pharmacotherapy approach begins with drugs having the least side effects.⁴ Other pharmacotherapies used are: Fluphenazine, clonazepam, tetrabenazine, ondansetron, tiapride, sulpride, and botulinum toxin injections.^{5,22,23} Many of these medications are listed as being used for the combined treatment of tic disorders and their co-morbidities.

Chiropractic Intervention

Chiropractic was founded in 1895 upon the philosophy of the removal of vertebral subluxation. Kent defines vertebral subluxation according to Stephenson's 1927 text.²⁴ According to the literature based on Stephenson's text, a vertebral subluxation occurs when there is:

1. Loss of juxtaposition of a vertebra with the one above, the one below, or both
2. Occlusion of an opening
3. Nerve impingement
4. Interference with the transmission of mental impulses.²⁴

With this type of research, we are able to hypothesize that the central nervous system can have a direct effect on our body's ability to understand and respond to specific stimuli properly and function at 100%. When the nervous system is not functioning at 100%, this can be attributed to the Nerve Root Compression Model. This model of vertebral subluxation states that: "A pressure of only 10mm Hg produced a significant conduction block, the potential falling to 60% of its initial value in 15 minutes, and to half of its initial value in 30 minutes. After such a small compressive force is removed, nearly complete recovery occurs in 15 to 30 minutes."²⁴

A limited number of studies have shown positive effects of chiropractic care for the treatment and resolution of neurological tics.^{4,25,26} Following is a selective review of literature regarding the outcomes of chiropractic treatment of tic disorders.

A study by McReynolds describes a patient complaining of a "tickle" in his throat causing him to clear his throat. The patient reported that the "tickle" occurred a couple of times per day up to several times per hour. He also had observed head jerking, grunting and eye blinking. The patient received upper cervical chiropractic care using the Activator adjusting tool. He received positive improvements mainly when he was

adjusted at C1 vertebral level. The patient later experienced a complete resolution of his neurological tics.²⁵

Stone-McCoy and Muhlenkamp discussed a reduction of motor and vocal tics in a patient that was diagnosed with Tourette syndrome utilizing Webster Technique to evaluate the sacrum and Thompson leg checks to evaluate cervical syndrome.

Adjustments were performed on the using side posture, a drop table, and Activator. Cranial adjustments were also performed if indicated. The patient was seen for a total of 32 visits in one year, in which she had decreased frequency and severity of her tics.²⁶

Alcantara et al also reported on a 6-year-old girl presenting with transient motor tics. The patient presented with bilateral eye blinking and eye rolling in multiple directions that began approximately on month prior to seeking chiropractic care. She also had a left head tilt and dryness in her eyes. She also displayed bilateral shoulder shrugging, and arching of the head and neck posteriorly with an open mouth.

A combination of Toggle and Gonstead techniques were used to analyze and adjust the patient's subluxations. After a total of 10 visits, the patient's tics were completely resolved.⁴

Limitations

Limitations of this case include: a small sample size, as this is a case study. No measurement data was performed at the time of the patient's examination, which means that these parameters could not be observed. There was also a combination of chiropractic techniques used in the management of this patient. Although both techniques used are chiropractic techniques, one has not been proven to be more effective in the treatment of tic disorders than the other.

Conclusion

This case report demonstrates the immediate resolution and successful chiropractic treatment of a neurological tic disorder in a 7-year-old female. The review of literature shows the positive effects of chiropractic care for the treatment of tic disorders, and provides supporting evidence for the use of chiropractic for tic disorders using Thompson and Diversified techniques.

More research with larger sample sizes following a specific chiropractic technique is recommended to further highlight chiropractic treatment and its effectiveness for resolution of neurological tic disorders and the comorbid behaviors that are commonly associated with its diagnosis.

References

1. Ludolph AG, Roessner V, Munchau A, Muler-Vahl K. Tourette Syndrome and Other Tic Disorders in Childhood, Adolescence and Adulthood. *Dtsch Arztebl Int.* 2012;109(48): 821-828.
2. Cohen S, Leckman JF, Bloch MH. Clinical assessment of Tourette syndrome and tic disorders. *Neurosci Biobehav Rev.* 2012 Dec: 1-11.

3. Knight T et al. Prevalence of Tic Disorders: A Systematic Review and Meta-Analysis. *Pediatr Neurol.* 2012 Aug;47(2): 77-90.
4. Alcantara J, Davis A, Oman RE. The Effects of Chiropractic on a Child with Transient Motor Tics using Gonstead & Toggle Techniques. *J. Pediatric, Maternal & Family Health.* 2009 June: 1-9.
5. Dooley JM. Tic Disorders in Childhood. *Semin Pediatr Neurol.* 2006;13(4): 231-242.
6. Hamilton CS, Swedo SE. Autoimmune-mediated, childhood onset Obsessive-compulsive Disorder and tics: a review. *J Clin Neurosci.* 2001: 61-68.
7. Crossley E, Seri S, Stern J, Robertson MM, Calvanna AE. Premonitory urges for tics in adult patients with Tourette syndrome. *Brain Dev.* 2013: 1-6.
8. Schlender M, Schwarz O, Rothenberger A, Roessner V. Tic disorders: Administrative prevalence and co-occurrence with attention-deficit/hyperactivity disorder in a German community sample. *Eur Psychiatry.* 2011 Sep;26(6): 370-374.
9. Stone-McCoy PA, Przybysz L. Chiropractic Management of a Child with Attention Deficit Hyperactivity Disorder & Vertebral Subluxation: A Case Study. *J. Pediatric, Maternal & Family Health.* 2009 March: 1-8.
10. Cassista G. Improvement in a Child with Attention Deficit Hyperactivity Disorder, Kyphotic Cervical Curve and Vertebral Subluxation Undergoing Chiropractic Care. *J Vert Sublux Res.* 2009 April: 1-5.
11. Lin YJ, Lai MC, Gau SS. Youths with ADHD with and without tic disorder: Comorbid psychopathology, executive function and social adjustment. *Res Dev Disabil.* 2012 May-Jun;33(3): 951-963.
12. Chestnut, J. Designing, Conducting, & Publishing Research within the Chiropractic Wellness Paradigm – Part I. *J Vert Sublux Res.* 2008 Jan: 1-3.
13. Sims LE, Lee J. Resolution of Infertility in a Female Undergoing Subluxation Based Chiropractic Care: Case Report & Review of Literature. *J Vert Sublux Res.* 2008 Aug: 1-6.
14. Stone-McCoy P, Grande NA, Roy I. Reduction of Congenital Torticollis in a Four Month Old Child with Vertebral Subluxation: A Case Report & Review of Literature. *J Vert Sublux Res.* 2008 Jan: 1-8.
15. Alcantara J, Fleuchaus S, Oman Resolution of Torticollis, Neck Pain and Vertebral Subluxation in a Pediatric Patient Undergoing Chiropractic Care. *J. Pediatr, Maternal & Fetal Health.* 2009 Nov: 1-9.
16. McWilliams JE, Gloar CD. Chiropractic Care of a Six-Year-Old Child With Congenital Torticollis. *J Chiropr Med.* 2006 Summer;5(2): 65-68.
17. Schwartzbauer M, Hart J. Inter-Examiner Reliability of Leg Length Inequality Assessments. *Ann Vert Sublux Res.* 2011 Jul: 51-56.
18. Kennamer A. Chiropractic Management of a Man with Bipolar Disorder, Depression, Hemichorea & Subluxation. *J Vert Sublux Res.* 2008 Oct: 1-4.
19. Holt KR et al. Interexaminer Reliability of a Leg Length Analysis Procedure Among Novice and Experienced Practitioners. *J Manipulative Physiol Ther.* 2009 Mar-April;32(3): 216-222.

20. Cooperstein R, Lew M. The relationship between pelvic torsion and anatomical leg length inequality: a review of the literature. *J Chiropr Med.* 2009 Jun: 107-118.
21. Gleberzon BJ. Putting the diversity back into diversified technique: Strategies for common clinical challenges. *DC Tracts.* 2012 Summer;24(2): 3;4.
22. Roessner V et al. Pharmacological treatment of tic disorders and Tourette Syndrome. *Neuropharmacol.* 2010: 1-7.
23. Cubo E et al. Donepezil Use in Children and Adolescents with Tics and Attention-Deficit/Hyperactivity Disorder: An 18-week, Single-Center, Dose-Escalating, Prospective, Open-Label Study. *Clin Ther.* 2008 Jan;30(1): 182-189.
24. Kent C. Models of Vertebral Subluxation: A Review. *J Vert Sublux Res.* 1996 Aug;1(1): 1-7.
25. McReynolds MW. Resolution of Neurological Tics and Reduction in Vertebral Subluxation in a Pediatric Patient Undergoing Chiropractic Care: A Case Report. *J. Pediatr, Maternal & Family Health.* 2010 Oct: 154-158.
26. Stone-McCoy P, Muhlenkamp K. Reduction of Motor and Vocal Tics in a Female Undergoing Chiropractic Care to Reduce Vertebral Subluxation. 2009 Sep: 1-6.