Chiropractic Care of a 10-Year-Old Boy With Nonorganic Gait Disorder: A Case Report

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ABSTRACT

Objective: The purpose of this case report is to describe the multidisciplinary management of a boy with nonorganic gait disorder.

Clinical Features: A 10-year-old boy presented to a chiropractic clinic having had a concussion 1 week prior. He presented with lower limb muscle weakness and ataxia while weight bearing. He was referred immediately to the emergency department, from which he was sent to a neurologist at a children's hospital. The neurologist's diagnosis was nonorganic gait disorder.

Intervention/Outcome: Treatment consisted of physiotherapy, occupational therapy, and a psychiatric assessment. Chiropractic care including manipulative therapy was initiated 6 months after diagnosis. After 1 year, the gait disorder was resolved.

Conclusion: The addition of chiropractic care to conventional treatment may have been supportive in the recovery process for this patient. The condition required 1 year to resolve, with questions remaining as to whether the symptom resolution was a result of treatment or natural history. (J Chiropr Med 2017;16:175-179)

Key Indexing Terms: *Postconcussion Syndrome; Chiropractic; Psychomotor Disorders*

INTRODUCTION

Nonorganic gait disorder (NOGD) is a heterogeneous group of movement disturbances that are inconsistent and incongruous with organic gait disorders and may be associated with underlying psychiatric disease.[1] The diagnosis is made after examination fails to reveal any organic source for the presentation of a condition that follows some form of emotional or physical trauma. There are established gait patterns associated with different conditions. Nonorganic gait disorder does not fall into any of the categories and may commonly present as a hybrid combination of several different gait patterns. The condition is usually relieved with psychotherapy, but a certain percentage of cases do not respond to traditionally established treatment.[2]

Nonorganic gait disorder presents as an uncommon and challenging clinical entity. Part of that challenge seems to be simply in applying a label to the disorder. This condition may be also termed psychogenic movement disorder, conversion disorder, functional movement disorder, and conversion motor paralysis disorder. An accurate diagnosis is essential to rule out organic disease as a cause for the gait disorders. The purpose of this paper is to describe a case of a patient with NOGD that developed after mild head trauma.

CASE PRESENTATION

Presenting Concerns

A 10-year-old boy presented to a chiropractic clinic with complaints of leg weakness 5 days after hitting his head while swimming. He was previously seen after his injury in the emergency department for neck pain, tingling of the left index finger, dizziness, bilateral blurred vision, and unsteady gait. He did not report having any signs of confusion, dizziness, fever, or headache. His mother stated that the emergency department personnel diagnosed him with a concussion and sent him home. Over the next several days he developed progressive foot numbness and difficulty with walking. He was eventually unable to walk without assistance and was unable to attend school.

On observation at the chiropractic clinic, he displayed an unusual gait pattern. He appeared not able to support himself without legs buckling beneath him while walking. Because of the abrupt and potentially serious nature of the presentation, further examination was not performed at that time. The patient's mother was instructed to return him

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immediately to the emergency department for a neurologic assessment and follow-up to rule out any organic condition.

Diagnosis and Follow-Up

At the emergency department, the medical physician ordered a head computed tomography examination and head and spine magnetic resonance imaging. Differential diagnosis included an intraspinal mass lesion, intracranial lesion/hematoma, myelitis, and a neurologic organic lesion. The imaging was read as normal and the patient was referred for physiotherapy. Over several weeks he did not respond with treatment and was referred to Vancouver Children's Hospital for further workup by a medical neurologist. While at Vancouver Children's Hospital the patient was also assessed by a physiotherapist, occupational therapist, and psychologist. He was found to have normal strength and coordination in his upper extremities. Strength was normal in his lower extremities while on the bed, but the atypical gait persisted. He was unable to walk with a 4-wheeled walker but could support his body weight if he did not attempt to walk. He was only able to take several steps with assistance but appeared to wobble extensively. He was able to transfer from the bed to chair normally and had no obvious abnormal movements while supine or seated. Besides difficulty with walking, the only other abnormality found was poor coordination in heel to shin testing. The condition was subsequently diagnosed by a neurologist as nonorganic gait disorder.

The patient continued to be seen by a multidisciplinary team of health professionals for 6 months. The physiotherapist used exercise and movement therapy to maintain muscle tone and coordination. Slings with walkers and a treadmill were used to encourage the patient to use his muscles in a functional manner. Throughout that time there was little change in his condition.

Six months after the initial injury, his mother brought him into our clinic for a chiropractic assessment. The history and physical findings did not change from the initial presentation. The family did not see improvements occurring with the existing treatment protocol and subsequently sought alternative treatment with chiropractic care. While he was seated in his wheelchair he could lift his legs and move them normally. Reflexes, sensation, and lower limb strength were all equal and normal. He could transfer himself from his wheelchair to the table displaying good upper and lower body strength, and he was able to position himself without assistance into a prone position. However, he was still unable to walk on his own, displaying a bizarre leg-collapsing gait. Examination of the spine revealed mild tenderness and joint restriction in the thoracolumbar and lumbar regions, providing an indication for the use of chiropractic manipulative therapy (CMT).

The patient was seen 4 times over a 1-week period and received CMT to the tender dysfunctional segments of the lumbar and thoracic spine. The treatment consisted of side posture and supine manipulation to the indicated segments. In this specific case, manual treatment was applied as CMT (specific direction of thrust creating cavitation) directed to the T10-12 and L 4/5 segments. The patient and mother were not given any guarantees of success but were advised of the possibility that the leg weakness may be related to spinal dysfunction.

At the end of that week the patient took his first unassisted steps in 6 months. His mother reported that he was able to walk normally 2 weeks later. He then continued to steadily improve and within a month was able to participate in a limited capacity at soccer practice. He continued to be seen once per month for the next 3 months; however, there was no report of spinal discomfort or indication for further treatment at that time. Within a month after treatment his mother reported that his running was significantly improved but had not fully returned to normal. During follow-up examinations at 6 months and 1 year later he maintained normal functioning. The patient and parent gave consent for the publication of this case study.

Discussion

To the author's knowledge, this is the first case study reporting the chiropractic management of a child with NOGD. Nonorganic gait disorder is an uncommon and diagnostically challenging consequence to physical or psychological trauma. The accepted treatment protocol involves the use of a neurologist, psychologist, physiotherapist, and occupational therapist. A large percentage of these patients respond well to the treatment if they are diagnosed in a timely manner. There remain a certain percentage of patients with the condition who do not respond well or at all. There is also a wide range in recovery time, which may indicate that a certain amount of the resolution is by natural history.

The frequency of NOGD ranges from 2% to 4% in adults and 2% to 3.1% in children, with some authors claiming that frequency to be higher at 2% to 15%.[3] Most episodes of NOGD are sudden in onset and are precipitated by a physical or psychological event.[1] Although NOGD is described reasonably well in the literature with regard to adults, there is a paucity of information of the condition in children.[1-9] Nonorganic gait disorder is very uncommon before 10 years of age. However, some authors state that the mean onset age for NOGD is 11.5 years but that 38% of their patients were under the age of 10 years.[1] The datum indicates that there is a female predominance particularly after the onset of adolescence.[3]

The etiology of NOGD appears to be intricately related to a physical or psychological trauma.[6,8,10] In addition to traumatic etiology one must also consider other precipitating factors such as "childhood experience, life events,

personality, dissociation, emotional disorder, and illness beliefs."[11] In this specific case the patient's complaint was precipitated by the trauma of a concussion during a swimming accident. The patient's social history indicated that he experienced oppositional defiant disorder (a childhood disorder characterized by persistent negative, defiant, and disruptive behaviour) and anxiety. In addition, he was also the victim of bullying in his social environment and thus disliked attending school. Family history also indicated chronic anxiety disorder experienced by his mother and panic attacks experienced by his sister.

Most individuals with psychogenic movement disorder have conversion disorder, which can be described as the unconscious production of neurological complaints as a result of some form of psychological stressor.[3] It has been reported that 69% of the cases observed have had an immediate trigger; of those, 35% of the triggers were injury or accident and 15% were social stressors.[3] There also appears to be a positive family history for psychiatric disorders.[1,7]

The associated symptoms displayed in order of prevalence are tremor or shaking, dystonia, myoclonus, ataxia and other gait disorders, convergence spasm, and disrupted speech. Multiple phenotypes are common in two-thirds of affected children.[3] Ataxia and other associated gait disorders occurred in 22% of the cases. The prevalence of dystonia and tremor followed remotely by gait disorders was similar to adult presentation.[4] A key difference from the adult population is the absence of malingering in children for unclarified reasons.[3] Adults further differ from children in that adults tend to have symptoms in the nondominant limb, while the dominant limb is more prevalent with children.[4] Lateralization tended toward the dominant side because children will choose the side that is more incapacitating to maximize the disability.[5] Additionally the association of organic disease with NOGD and psychiatric disease is much higher in the adult population, whereas children tend to have more behavioral and psychiatric problems such as overt depression or anxiety.[3-6] Only 4% of cases were suspected of having a learning disorder and more than one-third possessed perfectionist personality traits with high expectations from parents.[3]

The diagnostic characteristics of this disorder are "an abrupt onset, a physical or psychosocial trigger, a static disease course, spontaneous remissions, selected disability, a history of other unexplained medical or neurological symptoms, and prominent pain."[3,7] Additionally, there is variability of movement over time, symptom reduction with distraction, selective disability, and, very importantly, movements that are not consistent with an organic movement disorder. The inconsistencies would involve deliberate slowness without fatigue, delayed or excessive startle response, false weakness, nonanatomic sensory loss, and functional ability that is out of proportion to the physical exam findings.[4]

With the inclusion of objective electrophysiological techniques and imaging, functional MRI has shown that patients with NOGD activate the motor cortex in a way that is different than the control group simulating weakness. Vibratory stimulation of the affected limb does not appear to activate the contralateral cortical sensory area.[4] This suggests that nonorganic gait disorders may be associated with real changes that result in reduced cortical responsiveness and may not be nonorganic as previously thought.[4] Electrophysiological testing, although early in its use in this disorder, has so far failed to definitively distinguish psychogenic motor disorder from organic movement disorders.[4]

This patient's symptoms and signs were consistent with a diagnosis of NOGD as described in the literature. Although there are several different conversion phenotypes and combinations that can occur in this condition, the ataxic gait disorder displayed was somewhat unusual compared with established gait disorders. From a clinical standpoint, the most interesting aspect of this disorder was the normal muscle strength and movement ability when not walking. Although this is not a common clinical presentation in a chiropractic clinic, it is something that may present and therefore should be recognized.

The literature describes multifactorial approaches to treatment.[1-19] Although various authors differ in minor points, there is a general consensus for the need to use a wide array of professionals. Per the literature there is minimal evidence in terms of treatment choices for adult NOGD.[8] In reference to children it is stated state that "a cognitive and behavioural approach to treatment and rehabilitation by multidisciplinary team, which includes a clinical psychologist, physiotherapist, occupational therapist, neurologist, and psychiatrist, proves helpful for most of the children."[8]

The literature suggests that early diagnosis and treatment is important.[1-18] It has been reported that in most clinical cases patients recovered fully or partially; in a remaining 8% of reported cases, the patient became chronically disabled.[9] It was reported that children with tremor as their main symptom had a more favorable prognosis, whereas an extended delay in diagnosis led to a less favorable prognosis.[8] Some researchers have determined that in many instances when the child was left alone and was not aware that they were being observed many of the symptoms disappeared.[12] It is interesting to note that although malingering is apparently not identified in children, that behavior may exist in some form and that this behavioral characteristic may be used as another diagnostic criterion. These authors suggest that psychotherapy be instituted as quickly as possible as a treatment.[9,12] The natural history of this disorder appears to be quite varied, with a range from 2 weeks up to 5 years with differing degrees of clinical success.[8]

There is some evidence for psychological intervention in regards to adults either in terms of psychotherapy or a cognitive behavioral therapy. It is also inferred that physical rehabilitation should be effective; however, there is only minimal evidence for its use. A suggestion had been made that the prognosis was influenced by the duration of illness, the patient's perception of the effectiveness of the treatment, and the presence of depression or anxiety, which can be treated with medication.[11]

It is also interesting to speculate on the role of chiropractic, specifically spinal manipulative therapy, in the treatment protocol for NOGD. Traditionally, after diagnosis by a neurologist, treatment consists of psychotherapy, physiotherapy, and occupational therapy.[9] In this case, it can be argued that symptom resolution was likely a result of natural history because there was no change after 6 months of therapy. However, the change in symptoms after 1 week of chiropractic care creates an academic environment for speculation and further investigation.

Several papers describe a link between spinal segmental dysfunction and its effect on somatosensory and proprioceptive interpretation by the central nervous system and altered cortical and cerebellar inhibition. They also identify that spinal manipulative therapy plays a role in restoring normal spinal function and subsequently normalizing afferent input regulation creating a positive neuromodulatory effect on the central nervous system.[19-27]

Some researchers have found that "in addition to reducing pain, high velocity low amplitude manipulation has been proposed to increase range of motion and produce neurologic changes to influence muscle relaxation, proprioception (joint position sense), and motor control."[19] They used transcranial magnetic stimulation and the Hoffman reflex to assess the central nervous system via motor evoked potential. Transcranial magnetic stimulation records communication between targeted muscles and the motor cortex, whereas the Hoffman reflex measures the excitability of the reflex pathways in the corticospinal and spinal cord neurons communicating with the muscle. They concluded that spinal manipulative therapy "may provide proprioceptive feedback signal to the central nervous system to stabilize the gain of the motor neuron pool."[19]

Various chiropractic researchers have discussed the neuromodulatory effects of spinal joint dysfunction. It has been hypothesized that a disruption in normal mechanics of the spinal joint could result in an altered afferent input leading to maladaptive central plastic changes, and, ultimately, to some form of neurologically related dysfunction.[21] Chiropractic manipulation may aid in the restoration of normal joint motion, which then leads to normal afferent input, appropriate somatosensory processing, and ultimately better motor control.[21] The authors also discuss the interactions between the sensory and motor systems and how those systems allow the body to interact with the environment and maintain proper mechanical stability. A disruption (such as joint dysfunction) anywhere in the system loop may lead to aberrant neuroplastic changes in the central nervous system.[21]

Proprioception is a critical part of the sensorimotor component of the central nervous system in terms of position sense and movement. Several papers have indicated that mechanical dysfunction within the cervical spine may alter cortical perception and sensorimotor integration of information from the upper limbs.[21-27] In reference to the lumbar spine, it has been reported that lumbosacral manipulation produced a significant decrease in corticospinal and spinal reflex excitability that was not elicited in the control group.[19]

Although there are no specific reports in the literature regarding the use of spinal manipulation as it applies to the treatment of NOGD, additional investigation into chiropractic spinal manipulation and its neuromodulatory effect on the central nervous system could be considered.

Limitations

This case study is a report of only 1 patient. Therefore the results cannot necessarily be applied to other patients with this condition. It is a possibility that the patient improved as a result of the natural course of the disorder. Thus, it is not exactly clear what may have been the essential component or combination of factors that resulted in the patient's improvement. Because this is a relatively uncommon condition it may not be seen often in chiropractic offices. When it does occur, it is possible that chiropractors confronted with this disorder might refer to other specialists and not follow up with the patient. Greater awareness and increased reporting of this condition in chiropractic clinics is therefore necessary.

Conclusion

In addition to conventional treatment, chiropractic care may have been supportive in the recovery process for this patient. The condition required 1 year to resolve, with questions remaining as to whether the symptom resolution was a result of treatment or natural history.

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Contributorship Information

Concept development (provided idea for the research): D.E.W.

Design (planned the methods to generate the results): D.E.W.

Supervision (provided oversight, responsible for organization and implementation, writing of the manuscript): D.E.W.

Data collection/processing (responsible for experiments, patient management, organization, or reporting data): D.E.W.

Analysis/interpretation (responsible for statistical analysis, evaluation, and presentation of the results): D.E.W.

Literature search (performed the literature search): D.E.W.

Writing (responsible for writing a substantive part of the manuscript): D.E.W.

Critical review (revised manuscript for intellectual content, this does not relate to spelling and grammar checking): D.E.W.

Practical Applications

- Chiropractic care may have contributed to a change in symptoms for this patient.
- The implications of this outcome indicate that there may be a role for chiropractic care in the treatment of similar conditions.

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