CASE STUDY

Resolution of Abdominal Migraines & Improvements in Concentration & Learning in a 6-Year-Old Girl Following Network Spinal Analysis Care: A Case Study

Chris Lucks, B.Sc., BChiro[1], Lisa Lucks, D.C.[2]

Abstract

Objective: To report on the improvements in a child with difficulties in concentration, learning, and abdominal migraines while receiving Network Spinal Analysis (NSA) chiropractic care.

Clinical Features: A 6-year-old girl presented with difficulties in concentration and learning since beginning school more than twelve months earlier. She also suffered from severe stomach pain for over two months diagnosed as abdominal migraines. She received NSA care over a period of six weeks. Spinal and neural integrity (SNI) was assessed and measured weekly through palpation, visual postural analysis, and heel tension scales.

Results: Improvements were seen in concentration and learning along with a complete resolution of abdominal migraines. These improvements were consistent with greater SNI (including the reduction of adverse mechanical cord tension (AMCT) and vertebral subluxation) achieved through NSA care.

Conclusion: The results documented in this case suggest comorbidity between difficulties in concentration, learning, and abdominal migraines. NSA chiropractic care was found to be of clinical benefit in this case by improving SNI. Further research is needed to investigate the relationships between SNI and co-occurring stress related conditions.

Key words: *Learning disorders, abdominal migraines, vertebral subluxation, Chiropractic, Network Spinal Analysis, Spinal and Neural Integrity, adjustment*

Introduction

Concentration problems may be linked to various physical and psychological conditions. The hallmark condition associated with difficulty concentrating is attention deficit hyperactivity disorder (ADHD). ADHD is a complex disorder that involves impairments in focus, organization, motivation, emotional modulation, memory, and other functions of the brain's management system.[1] ADHD can be classified as predominantly inattentive type (formerly called ADD), hyperactive-impulsive type, or a combined type. Other conditions that can impair concentration include certain brain conditions and emotional conditions.[2]

In New Zealand, difficulty learning is the most common type of impairment in children.[3] Six percent of New Zealand children, including 52 percent of disabled children, have a learning difficulty, and 15 – 20 % of each classroom is reported to have children with some degree of learning difficulties.[3] In the US, about 5% of the school-age population receives special educational services for learning disabilities.[4]

Difficulty learning can be due to a specific learning disorder (SLD) such as dyslexia, dyspraxia, or dysgraphia, or due to other causes such as attention problems, family problems, stress, or anxiety disorders.[4] No single cause for learning

1. Private Practice of Chiropractic, Auckland, New Zealand
2. Private Practice of Chiropractic, Auckland, New Zealand

difficulty has been identified, but neurologic deficits are often evident or presumed. Children with learning disorders often present with additional issues such as anxiety, social difficulties, mood disorders, or psychological or behavioural problems.[5]

Learning difficulties are usually managed through special educational programs focused in the specific area the child is struggling with.[6] If other conditions are present, such as ADHD, mood disorders, or psychological or behavioural problems, they are usually treated separately with medications, behavioural therapy, or a combination of both.[5,6,7] Drugs used to enhance concentration and attention usually involve stimulants, such as methylphenidate and several amphetamine preparations.[7]

Chronic, recurrent abdominal pain occurs in approximately 9 – 15% of all children and adolescents, of which abdominal migraines represent between 4 to 15% of cases.[8] Children with chronic, recurrent abdominal pain have a high utilization of healthcare resources and can experience significant disability such as interference with school, family and social activities.

A specific treatment for abdominal migraines has not been established, but managing stress may play a role in reducing the risk. While the cause of abdominal migraines is largely unknown, there is increasing support for the theory that fluctuations in histamine and serotonin, caused by stress and anxiety, is a major cause of abdominal migraines.[9]

Common pharmacological treatments for abdominal migraines include serotonin blockers, tricyclic antidepressants, histamine blockers, and prophylactic treatments used to treat migraine headaches.[9,10] Other treatments found to be effective for treating abdominal migraines include cognitive-behavioural therapy to address psychological triggers, and peppermint oil enteric coated capsules.[9]

The purpose of this paper is to report on a case of rapid improvements in concentration, learning, and abdominal migraines in a child receiving NSA chiropractic care. Based on the results in this case, the authors suggest a connection between these co-occurring conditions and a prolonged state of stress physiology mediated through the spine.

Case Report

A six-year-old female was brought in for chiropractic care by her grandmother. She presented with problems of poor concentration and learning difficulties since beginning school fourteen months earlier. In her first year of school she was unable to achieve anything in the classroom and her grandmother was required to tutor her at home. Her grandmother reported her mood and behaviour as being anxious and withdrawn. There were no signs of hyperactivity or impulsive behaviours. No medical diagnosis was made but dyslexia was considered as a possible cause. No treatment or medication was prescribed.

The patient presented with a secondary complaint of chronic, recurrent abdominal pain lasting more than two months, with daily episodes of severe pain and nausea. This condition was diagnosed as abdominal migraines by her family medical doctor. No medications were prescribed and a conservative approach was recommended through dietary modifications.

The patient's history revealed a significant period of emotional trauma and prolonged family stress just prior to, and during the time that she began school. This period of emotional trauma coincided with the changes in her behaviour and her difficulties with concentration and learning.

Methods

The Epstein Model of Spinal and Neural Integrity (SNI) is one of the models upon which NSA care is based. SNI, which is largely based on the theory of Monohar Panjabi, suggests that there are three spinal stability subsystems which regulate a dynamic state called spinal and neural integrity.[11] These subsystems are the passive, active, and neural control subsystems.

SNI is defined by Epstein as, "that state in which the physical components and physiological processes of the spine are unimpaired, including the body's ability to develop new strategies to maintain an appropriate flow of energy through its tissues."[12] The Epstein model of SNI recognizes that stress perceived by the body as a threat to survival accounts for a variety of observable and/or somatic or visceral changes, including the facilitation of muscles and nerves, postural adaptations, bony fixations, and vertebral subluxations.[12]

The passive subsystem is composed of the vertebrae, ligaments and spinal discs. In NSA clinical assessments, tension in this subsystem suggests that the small inter-segmental muscles of the spine are acting in defense, as the individual is locked in a protective physiology.[12] Passive subsystem tension was assessed and measured weekly in the patient through static palpation in prone and sitting position and graded on a scale of 1 – 5 (Table 1).

The active subsystem is composed of the spinal muscles and tendons, especially the long muscles of the spine. In NSA clinical assessments, tension in the spinal muscles is thought to relate to adaptation to stress, including emotional tension.[12] Different structural tones in the musculature indicate various types of stressors – the primary ones being emotional, chemical, facilitated, and normal. Ropey or stringy bands in the spinal musculature indicate prolonged emotional overload, while musculature of a rubbery nature indicates chemical stress (Figure 2).[13-15] Active subsystem tension was assessed and measured weekly in the patient through static palpation in the prone and sitting position and graded on a scale of 1 – 5 (Table 2).

The neural control subsystem is composed of the spinal cord, nerve roots and peripheral nerves, as well as the attachment of the meninges to the vertebral segments.[12] The concept of Adverse Mechanical Cord Tension (AMCT), introduced by the neurosurgeon Alf Breig, is associated with a lengthening of the spinal cord in both flexion/extension or lateral bending directions.[16] AMCT is proposed by Epstein to be associated with stress physiology and expressed by an individual as a defense posture.[12]

In NSA clinical assessments, AMCT is evaluated through heel

tension resistance at the ankle as an indicator of tension in the neural control subsystem. Heel tension measurements have been shown to have strong intra-examiner reliability, and moderate to strong inter-examiner reliability.[17] Neural control subsystem tension was assessed and measured weekly in the patient through a heel tension scale for both flexion/extension and lateral bending directions, and graded on a scale of 1 – 5 (Table 3).

Initial Examination

Initial evaluation of SNI revealed very high passive subsystem tension from C5 to T2 and from L2 to L5. Active subsystem tension was very high in the upper cervical spine from Occiput to C2 bilaterally, and bilaterally from T3 to T7. Neural control subsystem tension was very high bilaterally in both flexion/extension and lateral bending directions (Tables 1-3).

Visual postural analysis in the prone position revealed an extreme fight or flight, or defensive posture.[18] While lying in the prone position, the patient clasped her hands tightly together and placed her arms under her chest, significantly increasing the thoracic kyphosis. Her lower legs and ankles were also crossed tightly over one another. No visible respiration was observed through the thoracic spine. In the sitting position, the patient placed both hands clasped tightly together between her thighs with her lower legs and ankles crossed tightly. Her cervical and thoracic spine was curved forward into an exaggerated kyphosis with her head looking down.

The overall clinical impression of this patient was extreme hyper-vigilance and stress physiology expressed as defense posture.

Intervention

Network Spinal Analysis (NSA) care is an evidence based chiropractic and wellness modality applied through specific low force contacts along the spine. Contacts to the spine involve various graduations of light force in either a vertical or horizontal direction, influencing a flexion/extension or lateral bending response of the spinal structures. NSA contacts use low force in order to initiate the brain to temporarily shift away from defensive adaptations.[12] NSA is exclusively practiced by chiropractors in relationship to the identification and self-regulation of spinal tension and vertebral subluxation patterns.[19]

The patient was initially seen for a total of seven visits over a six week period. NSA care began with two visits in the first week, followed by one visit per week for five weeks. The patient was evaluated for indicators contributing to the location and/or characterization of vertebral segments for the application of NSA care contacts according to the NSA protocol (Figure 1). Spinal levels addressed during the initial six week period of NSA care were: Occiput, C1, C2, C5, C6, sacrum, and coccyx.

Results

Weekly assessment of the passive, active, and neural control subsystems demonstrated steady improvements in SNI as an outcome of NSA care (Tables 1-3).

On the third visit, the patient began to demonstrate temporary postural changes while lying in the prone position by unclasping her hands and ankles, and removing her arms from under her chest. A visible respiratory motion was observed through the thoracic spine at this time.

On the fourth visit, a significant postural change was noted in both the prone and sitting positions. The patient was no longer clasping her hands together or placing her arms under her chest while lying prone. The legs and ankles were no longer crossed tightly together while lying prone or sitting. There was a marked reduction in the thoracic kyphosis and a return of the normal spinal curvatures. A visible respiratory motion was observed through the lumbar, thoracic, and cervical spine when lying on the table in the prone position.

On the fifth visit the grandmother reported significant changes in the child's mood and behaviour. She was reported as being much happier, more engaged, and more relaxed. This change was reported to be observed by both the grandmother and by the child's parents.

By the seventh visit the grandmother reported a complete cessation of all abdominal pain and symptoms, and a marked improvement in the child's concentration and learning. The patient was reported to be achieving at the appropriate level in school for the first time since she began fourteen months earlier.

Discussion

A study that investigated the prevalence of *DSM-III* disorders in 792 children found that fifty-five percent of all disorders occurred in combination with one or more other disorders.[20] In a review of the psychiatric and psychological literature for empirical studies dealing with the comorbidity of attention deficit disorders with other disorders, the authors stated that "the literature supports considerable comorbidity of attention deficit hyperactivity disorder with conduct disorder, oppositional defiant disorder, mood disorders, anxiety disorders, learning disabilities, and other disorders."[21]

A child's temperament and responses to stress are believed to play an important role in the development and maintenance of recurrent abdominal pain in children.[22] A study examining the relationships between anxiety, stress, and headache and abdominal pain in early adolescents found that changes in pain were positively correlated with changes in anxiety and stress.[23] One psychological variable thought to contribute significantly to the development of recurrent abdominal pain in children is anxiety. Abdominal pain and anxiety in children are thought to be distinct but comorbid disorders.[22]

A study examining the relationships between anxiety, inattention, and academic achievement found that greater anxiety symptoms were associated with decreased academic performance, especially for children who also show internalizing behaviors.[24] Two studies that assessed the impact of positive moods on students math performance both found

that children in the positive-mood condition completed significantly more problems accurately than children in the control condition.[25] A study that examined the effects of a brief positive mood induction on learning found that students with learning disabilities in a positive mood condition performed significantly better than students with learning disabilities in the neutral condition.[26]

During periods of prolonged or chronic stress, disturbances of several physiological systems may occur, and the basic survival, or 'fight or flight' state can become the baseline function for the individual.[27,28] This can lead to various illnesses and disease processes and even plastic changes to the structures of the brain.[29,30]

In regard to SNI, stress is viewed as any stimulus that directly or indirectly stimulates neurons of the hypothalamus, resulting in a central nervous system stress response and producing a wide spectrum of physiological changes.[12] CNS histamine and other mediators of the inflammatory response rise in association with endogenous or exogenous stress, and can induce an increase in cerebrospinal fluid pressure and CNS tissue inflammation.[12,31,32] This contributes to the formation of AMCT and a compromise of SNI.[13] Additionally, prolonged stretching of the dura matter due to a kyphotic spine can promote nerve root pressure and perpetuate a stress response in the body through neural input to higher brain centers.[12] Dural tension can also be set up in various sections of the dura due to pathologically increased angulations between two or more vertebrae, as in a vertebral subluxation.[13] In NSA care, vertebral subluxations are seen as one of the consequences of stress physiology and defense posture.

NSA care results in specific changes and a reduction in meningeal and/or spinal cord tension through spontaneous motor responses aimed at relieving or re-distributing tension within the spinal stability subsystems.[12] Most notable among these responses is a unique spinal wave phenomenon observed as an emergent property of NSA care which may release the anchors to stress from the spinal system.[33] Research through mathematic modelling of this spinal wave demonstrates properties of a central pattern generator (CPG) which exists on the edge between stress and relaxation within the body, and suggests a dynamic way for the body to self-regulate and maintain a more coherent state of SNI.[34-38]

Several studies involving chiropractic care have reported on improvements in learning and behaviour in children associated with the reduction of vertebral subluxations.[39-44] A case series involving NSA care reported a significant improvement in attention, as measured by objective outcomes, in nine patients after two months of care.[45]

In this case report, the child's initial difficulties with concentration and learning began during a period of emotional trauma and prolonged family stress. Twelve months later there was no improvement in the child's ability to focus or learn, and a secondary complaint of chronic, recurrent abdominal pain developed. The child's mood and behaviour were described at this time as anxious and withdrawn. A dramatic improvement in the child's mood and behaviour was reported by the grandmother and parents by the fifth visit. This positive change in mood and behaviour was immediately followed by improved concentration and learning, and a cessation of abdominal migraines. These improvements were consistent with greater SNI achieved through NSA care.

Conclusion

NSA chiropractic care was found to be of clinical benefit for improving concentration, learning, and abdominal migraines in this case through improving SNI, including the reduction of adverse mechanical cord tension (AMCT) and vertebral subluxations. The Epstein model of SNI proposes that there is an anchoring of chronic stress physiology within the anatomical structures of the spine.[46, 47] The results documented in this case suggest a connection between these co-occurring conditions and a prolonged state of stress physiology mediated through the spine.

By restoring a dynamic and coherent state of SNI, chiropractic care may play a significant role in the multidisciplinary management of children with stress related conditions, particularly those with neurologic deficits. Further research is needed to investigate the relationships between SNI and co-occurring stress related conditions.

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Table 1 – Passive Subsystem Assessment

Spinal levels	Initial Exam	1 week	2 weeks	3 weeks	4 weeks	5 weeks	6 weeks
Upper Cervical C1 – C2	4	4	4	3	2	2	2
Mid Cervical C3 – C4	3	3	3	3	2	2	1
Lower Cervical C5 – C7	5	4	4	3	3	2	2
Upper Thoracic T1 – T4	5	5	4	4	3	3	3
Mid Thoracic T5 – T8	4	4	4	3	2	2	2
Lower Thoracic T9 – T12	4	3	3	3	3	3	3
Upper Lumbar L1 – L3	5	5	4	4	3	3	2
Lower Lumbar L4 – S1	5	4	4	3	3	2	2

Tension Scale: 1 – Low; 2 – Med-Low; 3 – Medium; 4 – Med-High; 5 - High

Table 2 – Active Subsystem Assessment

Spinal levels	Initial Exam	1 week	2 weeks	3 weeks	4 weeks	5 weeks	6 weeks
Upper Cervical C1 – C2	5	4	4	3	2	2	1
Mid Cervical C3 – C4	4	4	4	4	3	2	1
Lower Cervical C5 – C7	2	3	3	3	3	3	2
Upper Thoracic T1 – T4	5	5	4	3	3	2	2
Mid Thoracic T5 – T8	5	4	3	3	3	3	3
Lower Thoracic T9 – T12	3	3	3	2	3	3	2
Upper Lumbar L1 – L3	3	3	4	3	3	2	2
Lower Lumbar L4 – S1	1	2	3	3	2	2	2

Tension Scale: 1 – Low; 2 – Med-Low; 3 – Medium; 4 – Med-High; 5 - High

Table 3 – Neural Control Subsystem Assessment

Exam Dates	Initial Exam		week 1		week 2		week 3		week 4		week 5		week 6	
Achilles Tendon	**L**	**R**	**L**	**R**	**L**	**R**	**L**	**R**	**L**	**R**	**L**	**R**	**L**	**R**
Heel Tension (F/E)	5	5	5	4	4	4	4	4	3	3	3	2	2	2
Ankle Eversion Stress (L/B)	5	5	5	4	5	4	4	3	4	3	4	2	3	2

Tension Scale: 1 – Low; 2 – Med-Low; 3 – Medium; 4 – Med-High; 5 – High

Figure 1: NSA indicators contributing to the location and/or characterization of vertebral segments for entrainment and determination of AMCT

Certain musculoskeletal changes are considered to be indicators of the effects of AMCT. This is a list of these indicators and the spinal phenomena with which they are associated. These include both observational and palpation findings. For the significance and priority of the adjustment protocol, refer to The Theoretical Basis and Clinical Application of NSA Care (Epstein 2004).

Indicator	**Segmental Level Assessed**
Short Leg	Unilateral cord tension
Cervical Syndrome Test	Tension in cervical spinal cord
Leg Crossover	Sacral or pelvic distortion
Ankle Eversion Stress	Lateral flexion cord tension
Flexion/Extension Heel Tension	Flexion/extension cord tension
Z-flick	C2, C3 lateral bending cord tension
Leg Adduction Stress	C2, C3 spinal cord tension
Leg Abduction Stress	C5, coccyx (F/E) spinal cord tension
Palpation (motion, static, muscular)	all vertebral segments
Sacrotuberous ligament tension	lateral bending sacrum
Postural analysis	all vertebral segments
Flexibility (Range of Motion)	all vertebral segments

**Positive indicators contributing to the location and/or characterization of vertebral segments for entrainment are assessed pre and post entrainment to determine efficacy of the force applied

Figure 2 – Muscle palpation for tension and tone: