Improvement in concussion symptoms of headache, poor concentration and photophobia in a 13-year-old male receiving chiropractic care: A case report

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ABSTRACT

Objective: The following report discusses improved concussion symptoms (headache, low concentration and photophobia) in a 13-year-old male, while receiving chiropractic care. **Methods:** An electronic search was conducted in May 2017 using the following scientific journal databases: PubMed, Google Scholar, Elsevier, ChiroACCESS, and ScienceDirect. **Clinical Features:** An adolescent male suffering from concussion symptoms after a traumatic axial impact to his head was presented by his mother to the chiropractic office in Auckland, New Zealand. **Intervention and outcome:** Following a thorough history and examination, the patient received two chiropractic visits per week, with reevaluation on the eighth visit. He was assessed for vertebral subluxations using upper cervical specific and a functional neurology approach. Care provided included upper cervical specific, full spine diversified and Gonstead chiropractic adjustments only, based on the practitioner's palpatory and clinical expertise. Spinal levels adjusted were C1-2, C6, T1-6/7, and ilium. Marked improvements were noted; 80% overall improvement, and improvements in concentration, photophobia and headache pain levels. **Conclusion:** This case illustrates how concussion symptoms, specifically headaches, concentration, and photophobia may improve in patients receiving chiropractic care. Further clinical research is warranted to investigate the efficacy of subluxation based chiropractic care in relation to the improvement of concussion symptoms.

Keywords: chiropractic, adjustment, subluxation, concussion, brain injury, vision disturbance, headache, pediatric, case report

Introduction

Concussion, which may be referred to as a mild traumatic brain injury (mTBI), is a complex pathophysiological process from a traumatic biomechanical force (a direct or indirect impact to the head or violent shaking of the whole body), sometimes causing a loss of consciousness.[1-5] The definition has been noted as vague, and at times confusing due to not being based on validated criteria and/or clarified etiology.[1,4] The following article will use the terms concussion and mTBI interchangeably to reflect current knowledge and research, however the authors acknowledge that the science concerning concussion continues to evolve and knowledge should be updated with new information.

In 2010, there were approximately 2.5 million emergency department visits, hospitalizations, or deaths associated with concussions in the United States.[6] It is estimated that 65% of these concussions and other mTBIs related to sports and recreation activities were among children aged 5-18 years.[7] It has however been noted that concussions are likely underreported by the pediatric and adolescent population, as well as the sporting communities.[1,2,5,8] In New Zealand, approximately 24,000 cases of concussion occur every year, and cost New Zealand taxpayers over $70,000,000 NZD in 2013-2014.[9,10] Concussions or mTBIs can have varying symptoms including headache, neck pain, amnesia, behavioral and cognitive impairments; and sleep, hearing and

vision disturbances.[1,2,11-15] Many of these symptoms regularly present in chiropractic offices.[3] The majority (80-90%) of concussion symptoms naturally resolve within 10 days without intervention, however the recovery time frame for children and adolescents may be longer.[1,4,12]

Complete resolution of mTBI symptoms may eventually happen without intervention, however faster recoveries may occur from cervicovestibular rehabilitation for teens and young adults.[1,16] It is recommended that any treatment considers medical, physical and psychosocial factors.[1] Preliminary evidence also supports the use of aerobic exercise and a collaborative approach with cognitive behavioral therapy.[1] There is limited evidence, especially involving pediatric cases, showing improvements of mTBI symptoms following chiropractic adjustments of vertebral subluxations.[1,17,18,20]

Annually, over 68 million children visit chiropractic offices to aid their health and healing.[18] Chiropractic is a healthcare system focused on adjusting vertebral subluxations in order to improve nervous system function.[21] For instance, a functional definition of a vertebral subluxation is: "a potentially reversible and/or preventable alteration of the intervertebral relationships of one or more articulations of the spinal column or its immediate weight bearing components of the axial skeleton; accompanied by a change in the morphology of the tissue occupying the neural canal and/or intervertebral foramina; as well as an alteration of neural function sufficient to interfere with the transmission of organizing information, believed to be homologous to the mental impulse, thus contributing to negative health outcomes."[21] The neurological component of this definition is supported by basic science, which suggests chiropractic care may influence sensorimotor integration (SMI) and processing in the nervous system.[22] Patients with neurological symptoms may benefit from chiropractic adjustments as a result of improving central nervous system (CNS) function.[22,23] This case explores the resolution of concussive symptoms, specifically, headache and disturbances to concentration and photophobia in a patient receiving chiropractic care.

Method

An electronic search was conducted in May 2017 using the following scientific journal databases: PubMed, Google Scholar, Elsevier, ChiroACCESS, and ScienceDirect. Articles were located through the New Zealand College of Chiropractic library using online databases. The search was restricted to published articles written in or translated to English. When searching, the following key words and/ or phrases were utilized: "concussion," "chiropractic," "post-concussion," "upper +cervical + chiropractic + concussion," "Gonstead," "diversified," "pediatric," "intervention + for +concussion," "concussion + cervical + spine + injuries," and "mild + traumatic + brain + injury + chiropractic."

There were limited articles or studies similar to this case returned or found from including "chiropractic" as a key word. However, there were several non-chiropractic resources that provided adequate insight into mTBIs and pediatric neurology to suggest that chiropractic care may influence the outcomes of a pediatric patient recovering from a mTBI. Other articles and resources were used to provide background information.

Clinical Features

A 13-year-old male adolescent presented by his mother to a chiropractor in Auckland, New Zealand in June 2014. The adolescent presented with concussion symptoms secondary to a traumatic axial impact to his head sustained while skateboarding five days prior. He hit the vertex of his head on a tree, which left him unconscious for 30 seconds. His presenting symptoms included a 7/10 (visual analogue scale) right orbital/occipital headache, a subjective 6/10 concentration level, a moderately sore neck and increased sensitivity to sound and light. His head pain increased with walking and laughing, but he denied dizziness. Previous medical history included recent adenoid surgery, but no illnesses or other traumas, besides the event mentioned above. He was taking 15ml Ibuprofen and 15ml Paracetamol every 4 hours. There was no mention of the patient's medicine use after the initial visit. He had no previous chiropractic care before presenting to the chiropractic practice. No other abnormalities were mentioned during a full review of systems.

Initial Exam Findings

Upon investigation, the patient was hypersensitive to light when testing right direct pupillary light reflex, and had decreased left finger-to-nose coordination and "unstable" Fukuda's Stepping Test. He had head pain when he laughed, but had no abnormalities detected while screening his motor strength.

Objective indicators of subluxations were identified using upper cervical specific and functional neurology chiropractic analysis (static palpation, motion palpation, and spinal examination).24 Subluxations were initially assessed at C1 and T3/4 spinal levels.

Intervention and Outcome

The patient was evaluated for subluxation and adjusted where necessary twice a week, with a reassessment on the eighth visit. Reassessment included re-testing positive initial findings and recording any subjective changes noticed over the course of his care. Over the eight visits, subluxations at various levels were analyzed and adjusted at each visit using upper cervical specific, full spine diversified and

Gonstead techniques based on the practitioner's palpatory and clinical expertise. These levels of subluxation included C1-2, C6, T1-6/7, and ilium (see Table 1). He noted significant symptomatic relief after the 1st visit and had near to complete resolution of symptoms after 8 visits that were performed over 5 weeks (see Table 2).

Subluxation	Technique	Visit when adjusted
C1	Upper Cervical	1st, 2nd
C2	Upper Cervical	3rd, 4th, 7th
C6	Diversified	2nd
T1	Diversified	6th
T2/3	Diversified	3rd
T3/4	Diversified	1st, 2nd, 6th, 7th
T4/5	Diversified	8th
T6/7	Diversified	7th
Ilium	Gonstead	4th, 5th

Table 1. Subluxated segments adjusted, the technique used for analysis and adjusting, and the visit when each subluxation was adjusted within the 8 visits over the 5 weeks.

Visit	Previously adjusted subluxations	Clinical details
2nd	C1, T3/4	"Improved concentration," and decreased photosensitivity
3rd	C1, C6, T3/4	Headache intermittent, not constant
5th	C1, C2, C6, T1, T2/3, T3/4, ilium	"Concentration 9/10"
8th	C1, C2, C6, T1, T2/3, T3/4, T4/5, T6/7, ilium	"8/10" overall improvement, "feeling freer," "breathing and sight" improved, "still sore head" when sneezing, concentration and photophobia within normal limits

Table 2. The visit when there was reported change, subluxations that were previously adjusted, and clinical subjective and objective details within the 8 visits over the 5 weeks.

After the first visit, subjective measures included "improved concentration" (originally rated 6/10) and decreased photosensitivity in the right eye. After the second visit, his headache was no longer constant, and within 5 visits, he rated his concentration at 9/10.

At the reassessment visit in the 5th week of care the patient reported an 80% overall improvement, and mentioned that he was "feeling freer." He also mentioned that his sight and breathing had improved, but he still had a "sore head" when sneezing. Subjectively, concentration levels and his photophobia during pupillary light reflex testing had returned to normal within 8 visits over 5 weeks.

Discussion

It is well known that many mTBIs result in altered SMI. [1,2,4,11-15] It has been theorized that restoring normal neurological function through chiropractic adjustments may contribute to improvements in symptoms caused by impact injuries to the head and neck, such as the skateboarding accident that left the boy concussed in this case.[25] Research suggests that a vertebral subluxation changes the way the CNS processes and integrates sensory information.[22,23] Recent studies have shown that chiropractic care may alter sensorimotor, cortical, visual processing and central oculomotor control, and cerebellar motor processing, all of which are known to be affected in mTBI.[23,26]

Chiropractic care, especially adjustments of the cervical spine have also been shown to improve proprioceptive input from the spine, and the upper and lower limbs.[26] It is possible that by adjusting this patient's vertebral subluxations, his SMI improved which contributed to an overall reduction in his symptoms.

Currently there is limited research on the efficacy of chiropractic care and its effects on mTBI symptoms, especially with respect to the pediatric population.[1,18] There have however been a few case studies demonstrating benefits. For instance, one case found that headache and neck pain in a young athlete may improve with chiropractic care, and another found that upper cervical chiropractic care may also help improve mTBI symptoms.[17,20]

It is important to note that it is unclear if the symptoms from a concussive impact result from damaged structures to the brain, or damage to surrounding structures.[1,4] For instance, damage to the cervical spine can result in similar symptoms, and it has been suggested that symptoms alone will not determine the diagnosis of concussion or cervical/vestibular injury.[27] It is important to recognize that when post-injury impairments are observed after a concussive impact, a proper understanding of their etiology is critical for designing appropriate care plans.[1,4,28] In other words, it is important to clinically determine if dysfunction or symptoms are directly from the brain, CNS and/or spine.[1,4] Due to the vital nature of these structures, it is imperative that the practitioner considers safety. In a narrative review, it was mentioned that while there, "are few readily available publications pertaining to the chiropractic management of concussion…," there were "… no articles reporting adverse outcomes of chiropractic management [of cases involving

concussion]."[29] This literature review however was specific to chiropractic management of sports concussion and did not discuss pediatric concussions. [29]

While an increasing body of literature has shown that children with single, uncomplicated mTBIs do not exhibit long-lasting neurocognitive impairments, there is also opposing literature suggesting that children with a history of a previous mTBI, migraines or pre-injury mental health problems have an increased risk for prolonged post-concussive symptoms.[1,28,30] Research has suggested that within 10 days the majority (80-90%) of adults' mTBI symptoms resolve, but it is inconclusive if the recovery times for children and adolescents are similar.[1,5,11,15,28] It has been suggested that adolescents, particularly females' health improvements, could take longer.[1,4] It is therefore unclear if the resolution of concussion symptoms documented above were due to chiropractic care or natural progression. It is also unclear whether chiropractic adjustments shorten recovery times after a mTBI. Further clinical research is warranted to investigate the efficacy of chiropractic adjustments and their effect on mTBI symptoms.

Conclusion

Chiropractors must recognize that each person presenting with mTBI and concussion symptoms may progress at a different rate, especially in pediatric populations. Concussion symptoms, specifically headaches, concentration, and vision disturbances may improve with subluxation based chiropractic care. Further clinical research is warranted to investigate the efficacy of chiropractic adjustments and their effect on mTBI and/or concussion symptoms.

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