CHIROPRACTIC MANAGEMENT OF A PATIENT WITH POST TRAUMATIC VERTIGO OF COMPLEX ORIGIN

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ABSTRACT

Objective: To illustrate a case of vertigo in a patient with cervical spine injury and mild traumatic brain injury following a motor vehicle accident and present chiropractic and rehabilitative procedures used for management.

Clinical Features: A 30-year-old female had neck pain, head pain, a variety of cognitive problems, vertigo, and restricted cervical range of motion following a serious motor vehicle collision. Following several weeks of chiropractic management with positive progress the patient suddenly had worsening of the vertigo and the cognitive problems. Positional vertigo was ruled out by the emergency room doctors and a neurologist. A neuropsychological assessment indicated that mild traumatic brain injury was present.

Intervention: The patient began chiropractic treatment with both passive and active care, prior to the vertigo incident. Following the vertigo incident, treatment was modified to include 6 weeks of cervical exercises in clinic and at home. The patient reported resolution of the vertigo following the chiropractic treatment plan.

Conclusion: This case reports presents an example of vertigo that improved under chiropractic management. This case illustrates the benefits of adding mild traumatic brain injury to differential diagnoses, co-managing care with other providers, and modifying treatment when necessary. Further research is suggested to study the contribution that chiropractic management could offer to those with neurological injury. (J Chiropr Med 2005;4:32–38)

Key Indexing Terms: Brain Injuries; Manipulation, Chiropractic; Exercise Therapy; Neuropsychology; Post-concussion Syndrome; Vertigo

INTRODUCTION

Despite the sparse literature on chiropractic and brain injuries, doctors of chiropractic (DC) may be the first provider seen by those suffering from spinal and or brain injuries, either acute or chronic. DCs could also see the patient more frequently than many other providers, and thus follow a patient's condition closely. With such a high level of contact, DCs could be the first to recognize and manage a variety of injuries.

Cervical spine injury and mild traumatic brain injury (MTBI) are both capable of producing vertigo. Symptoms from MTBI can be vague and may mimic other spinal and soft tissue complaints. Conceivably a health care provider could find injury in the cervical spine and then stop the clinical thought process at that point which might result in MTBI going undetected and untreated.[1] The spine and the brain are highly interconnected and interdependent, thus locating the exact injury location in the nervous system and or structures responsible for the vertigo can be difficult. Missing a MTBI can be a source of frustration for both patient and clinician.

The symptoms of vertigo from an injury may be positively influenced and managed with chiropractic care.[2,3] This paper will give an example of what a clinical presentation of MTBI looked like along with the clinical rationale used to modify the initial treatment plan. Also, the simple rehabilitative treatment program will be reviewed. The exercise treatment plan required minimal equipment and can easily be incorporated into a chiropractic clinic.

CASE REPORT

The patient was a 30-year-old female involved in a motor vehicle accident. She was the driver of a vehicle that was at a complete stop behind a large commercial truck. Her vehicle was hit from behind. Following the initial impact, her vehicle was driven into the truck ahead of her. Her vehicle then rebounded back into the initial impacting vehicle. She

0899-3467/05/1002-049$3.00/0
JOURNAL OF CHIROPRACTIC MEDICINE

experienced a total of 3 successive impacts. She stated that the collision was so violent that the two front seats were sheared from the floor of the car. She was taken to a local emergency room and diagnosed with neck sprain. She was released from the hospital and provided medications (Percocet #30 and Flexeril) and a soft cervical collar.

The patient presented to the chiropractic clinic 3 days later reporting of neck pain, headache, mid-thoracic and upper shoulder pain, inability to turn her neck, numbness and tingling into both arms, dizziness, blurry vision, difficulty reading, inability to focus attention (absent-minded), cessation of bowel movement, and general fatigue. Her initial Neck Disability Index (NDI) was 26/50 and a numerical pain scale (NPS) for neck pain was 7/10.

Anterior to posterior open mouth, anterior to posterior lower cervical and lateral cervical neutral view radiographs were obtained. A decreased cervical lordosis was visualized. There was a break in the posterior vertebral body line at C3–4 and C4–5, with an acute, kyphotic angulation of C3 on C4. In the AP view, there was a general list of the spine to the right from T7 cephlad.

Physical exam findings demonstrated guarded musculature around the cervical spine, both anterior and posterior. Active range of motion was limited with pain in all directions and reproduced dizziness. The patient reported pain upon palpation from the upper cervical through the mid thoracic region. The initial impressions were severe post-traumatic cervical, thoracic, lumbar and sacral sprain/strain; post-traumatic cervical, thoracic, lumbar and sacral segmental dysfunction; and possible lumbar nerve root impingement.

Patient management began the same day as the chiropractic exam with gentle soft tissue work, ice and interferential therapy. Within 10 days after the injury, the patient was introduced to sitting McKenzie cervical extension exercises. Eleven days after the injury, light force, supine and prone diversified spinal manipulation was introduced with heat and ultrasound over the affected upper thoracic and lower cervical spine. The patient was tolerating treatment and having decreased pain levels lasting for a few hours post-treatment. By her ninth treatment, 18 days after the injury; she subjectively noted a decrease in overall pain levels and other symptoms that lasted a half day.

She was referred to a neurologist for a second opinion regarding her cognitive symptoms. He examined her and ordered an MRI, which was viewed as negative. The neurologist's impression was severe sprain and strain. He recommended continuing the current course of chiropractic treatment.

At 19 days post-injury, she had an episode that was described as light-headedness, room spinning, imbalance, "shakes," blurry vision, shortness of breath, nausea with some emesis, and she "couldn't speak and couldn't think." She presented to an emergency room. The emergency room physicians ran tests ruling out stroke and transient ischemic attack. She had a negative neurological exam in the ER. The patient had normal blood tests, a normal EKG, normal chest x-ray, and a normal head CT scan (without contrast). She was given 10 mg of Compazine with some improvement in her symptoms. Her diagnosis was acute lightheadedness with some symptoms of vertigo, possible labyrinthitis, possible reaction to her current Serzone prescription (150 mg), and musculoskeletal chest pain. She was discharged home to rest and prescribed 12.5 mg of Meclizine to take 4 times a day, and a 75 mg dose of Serzone to take twice for 1 day.

Two days after the vertigo episode, the patient presented to the chiropractic clinic notifying us of her vertigo episode. She reported that the vertigo episode did include several new symptoms she had not experienced before. The lightheadedness and dizziness she had were similar in nature to the post-collision symptoms, but were more severe the day of the episode. The patient was then tested by the chiropractor for reproduction of vertigo by doing a pre-manipulative setup for supine cervical spinal manipulation. The response was negative for reproduction of vertigo. That day's treatment plan was modified to use lighter spinal manipulation, temporarily discontinue McKenzie, and observe her response.

On the following visit, 23 days after the initial injury, the patient's symptoms of lightheadedness and dizziness were still present and she reported minimal improvement. She reported the vertigo was her primary concern. She was re-assessed for vertebrobasiliar insufficiency using a vertebrobasiliar artery functional maneuver. The results were inconclusive. The working diagnosis was amended to include cervicogenic vertigo and possible traumatic brain injury. She followed up with the same neurologist she

saw earlier. The neurologist ruled out positional vertigo. His recommendations included ongoing chiropractic management and she was prescribed Claritin-D.

Her history of trauma combined with her initially reported short-term memory problems (such as difficulty finding car keys), difficulty processing information, combined with no clear indication from the neurologist about the cause of her new complaints of vertigo, resulted in a discussion with a neuropsychologist. Conversation with the neuropsychologist indicated a strong possibility of a brain injury based on initial symptoms of confusion and disorientation immediately following the crash along with the onset of vertigo. The patient was then referred for a neuropsychological assessment.

Prior to neuropsychological testing, the doctor obtained base line patient information from conversations with the patient's relatives who knew her prior to and after the injury, ordering all her medical records, and review of her educational performance in the K-12 educational system. A series of tests were administered, such as the Halstead-Reitan Neuropsychological Test Battery, Wechsler Adult Intelligence Scale, the Wechsler Memory Scale, and the Minnesota Multiphasic Personality Inventory – 2 (MMPI-2). While it goes beyond the scope of this paper to describe all findings, test results indicated generalized cerebral dysfunction in several areas of cognitive function. Memory testing demonstrated a pattern of mild difficulties in the learning and recall of both verbal and visuo-spatial information. She also demonstrated difficulties in complex logical problem solving. The overall pattern of results were consistent with a post-concussion syndrome from mild traumatic brain injury from the motor vehicle collision.

She was re-evaluated by the chiropractor 30 days post-injury, and her NDI was 21/50 and her neck NPS was 5/10. The vertigo was persistent and she reported that it limited many of her work and home activities. Functional examination of her neck revealed both a failed cervical flexion test and cervical stability test.[4] These findings suggested dysfunction of neurological performance and/or musculature of the deep cervical spine.

Her treatment plan was altered to include an active care program as described by Murphy.[3] The program had 2 levels of cervical exercises to be followed within a 4–6 week time frame. Following spinal manipulation, the exercises were performed immediately. The patient was taught to perform the exercises at home on days she was not in the clinic.

She performed level 1 exercises on 6 visits over 2 weeks. The rehabilitation followed the instructions in the textbook. The patient first warmed up the upper cervical spine using McKenzie type cervical protrusion and retraction exercises. During the exercises for her vertigo, the patient's posture or "postural set" of her body was emphasized. This included a "chin tuck" neck position, a small foot position (dorsiflexion of all the toes, patient noting the medial arch raising, lowering toes and actively maintaining the arch), and tongue position against hard palate and behind front upper incisors.

The level 1 exercises consisted of cervical range of motion movements performed in various positions on a chiropractic adjusting table. Following these exercises the patient performed torso and head rotation movements while standing on the floor. The last series consisted of adding a foam pad (Orthopedic Physical Therapy Products, Minneapolis MN) under the feet and performing additional full body movements.

Some of these level 1 exercises caused her to notice increased vertigo symptoms. One exercise that often increased vertigo consisted of the patient standing upright, feet on floor holding the small foot posture. The elbows were against torso and flexed 90 degrees with both fists approximating each other. She then had to rotate the torso side to side, eyes focused on her hands, at a slow rate of speed. She experienced difficulty with this exercise more than any other. She reported that the small random pattern in the grey-blue carpet in the clinic caused her to notice more dizziness if she went "too fast." She elected to continue with the exercises.

After 6 sessions in clinic, the patient was able to perform the exercises through a full range of motion, 5–10 repetitions without reproducing vertigo or having to stop secondary to pain. The patient then performed the next exercise level on four additional visits over 2 more weeks. These were similar to the first level. A gym ball replaced the adjusting table, creating a labile surface. The standing exercises were more difficult and included both standing on the floor and on the foam pad.

Within this second level, one exercise initially caused her to notice an increase in vertigo. The activity consisted of her standing on a foam pad, rotating the torso, with the eyes leading the head in the opposite direction from the torso. She found this to be difficult for her body to perform, and she needed to go slowly. She elected to continue with the exercises.

Following this course of treatment, she was released from the rehabilitation program. She reported that her vertigo was resolved. She stated she felt like her neck was stronger and more flexible following the chiropractic treatment plan. Regarding her other complaints, the neck pain and headaches were no longer her primary complaint.

Her last visit at 6 months post injury revealed that she still had resolution of her vertigo. The scores of her outcome measurement tools were 4/50 for the NDI and her neck pain NPS was 0/10. She stated she still had cognitive problems, but to a lesser degree than initially. Most of her problems were with short term memory and she still noted some personality changes. Due to litigation issues adversely affecting her access to health care, she did not follow up with the neuropsychologist regarding the areas of cerebral dysfunction.

DISCUSSION

In adults, it is generally agreed that the natural history of most mild cases of traumatic brain injury will begin to show improvement in 6–12 weeks with resolution in approximately 1 year. However, there is limited evidence in the literature on the natural history of MTBI.[5] Those that do not show improvement or that show worsening may warrant a referral to a neuropsychologist. Guidelines for MTBI[6] have been set forth to aid the clinician as initial diagnostic indicators. These guidelines include loss of consciousness, amnesia for events immediately prior to or immediately following a trauma (retrograde or post-traumatic amnesia), an alteration of consciousness (a sense of being dazed, confused, and/or disoriented), or gross neurological symptoms. Few guidelines exist to suggest a timeframe for a doctor to refer a suspected case of MTBI out for neuropsychological testing. Recent suggestions have indicated a need for improved guidelines.[7]

Anatomy reveals that the base of the skull, specifically the ethmoid, sphenoid, and anterior fossa of the frontal bones. has many bony prominences and ridges. When the brain is thrust forward, then rapidly in reverse, the soft tissue of the cerebrum can be bruised by impacting these bony areas. Additionally, rapid acceleration/deceleration of the brain can result in stretching and shearing of the large white matter tracts. This phenomenon is referred to as diffuse axonal injury.[1] Potentially there is the tractioning effect of the spinal cord through the foramen magnum. Also, the non-physiological "S" shape that the cervical spine can undergo momentarily could place high loads on the tissues of the cervical spine.[8]

The criteria from the guidelines indicate that it is not necessary for a patient to lose consciousness or even strike his/her head to sustain a MTBI. An acceleration-deceleration mechanism with resulting confusion or disorientation can be as the result of a MTBI. In recent years, the phenomenon of "shaken baby syndrome" has shown that significant brain trauma leading to death can occur without direct contact to the head or immediate loss of consciousness.[6]

Screening for MTBI includes careful attention given to symptoms experienced immediately following the trauma or accident. The second author (TM) has created a check list (Appendix 1) based on guidelines[6] that he distributes to local health care providers. The recommendation is that this is used initially and at regular re-exams to monitor progress.

In addition to the history taking and screening, a neurological exam is suggested for brain injuries and vertigo. For the practicing DC, Dalby outlined such a neurological exam for head injuries.[9] Some physical changes suggestive of MTBI exist such as a midline shift of vision. This particular test can be easily learned and used by the examining DC.[10]

Regarding cervicogenic vertigo, the exact cause is not entirely known. Various theories regarding cause and diagnostic tests have been described.[11] Generally speaking, cervical vertigo can be assessed by a presence of neck pain, possibly a history of neck trauma, and pain over the lateral mass of C1. The rotating stool test has been suggested as a way of differentiating vertigo from the vestibular nuclei versus vertigo from the muscles and joints of the cervical spine.[3]

This case also illustrates the importance of cooperation with other local healthcare providers. It is typi-

cally beyond the scope of chiropractic practice to diagnosis or directly treat brain injury issues. Medical neurologists generally provide a cursory examination of cognitive functioning within the neurological examination and may fail to diagnose MTBI. Neuropsychologists provide a comprehensive evaluation of various brain functions such as intelligence, attention, concentration, short-term memory, executive functions, verbal and language functions, and visuo-spatial functions.[12] The standardized psychometric testing of neuropsychology is particularly important, as research has shown that neuroimaging (CT, MRI) is not particularly sensitive to the detection of the neurological disruption which occurs in MTBI.[13] Patients have had their symptoms attributed to issues like interest in litigation, depression, presence of physical pain, and poor psychological make-up. Thus a working relationship with a consulting neuropsychologist can prove to be extremely beneficial for the patient and treating clinicians.

Vertigo is viewed to be a response, in part, to altered function.[2,3,11] Rehabilitation as a form of treatment is intended to restore as much function as possible, and thus reduce symptoms. In this patient's case, it could be suggested that much of the rehabilitation emphasis was on the neurological control (agility, coordination) of movement patterns with a lesser emphasis on general flexibility of the upper cervical spine. Rehabilitation of the neuromusculoskeletal system encompasses broad aspects. This includes flexibility[14], agility (rapid muscle recruitment and proprioception),[15] coordination of movement,[16] endurance, and strength.[17] When deciding how to improve her treatment plan, restoration of agility and coordination of movement were considered by the chiropractor as important criteria in selecting her exercise program.

In order to retrain the dynamic stability of movement, it has been suggested that several criteria should be met including postural set, proper somatosensory input to the nervous system and a focal motor program. This then is the rationale behind the postural set of the cervical spine, small foot and tongue position. It is suggested this would create normalized sensory input into the nervous system. The joints and the soft tissues of the feet, spine, and oral cavity are rich with sensory input to the nervous system. The intention then is to retrain a correct focal motor program in the injured areas.[18,19]

Factors in diagnosis and management to be considered in future cases would include taking lateral cervical flexion-extension radiographs. These are considered to be standard views that should be considered in trauma patients.[20] This would have added value in assessing vertebral motion segment integrity and ligamentous tearing of the cervical spine. Tearing could lead to cervical spine dysfunction. Regarding the question of vertebral artery insufficiency, imaging of the vessels of the neck and head may need to be considered for some cases of vertigo. Even though the DC in this case performed a physical test for vertebral artery insufficiency, it was inconclusive. The literature indicates that these manual tests are often invalid and unreliable.[21] A pre-manipulative setup was negative for reproducing vertigo symptoms, which convinced the clinician that it was safe to proceed.

More appropriate outcome measurement tools could be selected, such as the Dizziness Handicap Inventory.[22] The NDI is for neck disability, not vertigo. Even though cervical spine injury was a factor in her case, if a case of vertigo is due to a brain injury, then neck disability may not be an indicator of any value. Finally, a final follow up assessment with a neuropsychologist would be helpful in cases such as this to assess if more than just vertigo improved. Should cognitive abilities improve under chiropractic management, this would be helpful for future research purposes.

This paper only suggests that chiropractic care combined with cervical exercises resulted in the resolution of vertigo. There could be other factors that may have influenced the results such as spontaneous remission, natural history, and even possible phases of remission and exacerbation of vertigo. This paper did not investigate what the outcome would have been with either just the diversified chiropractic spinal manipulation or the cervical exercises. Thus, one cannot generalize beyond the context of this one patient. A larger population base, along with separate study of manipulation only, cervical exercise only, and combined cervical exercise with manipulation would give more insight.

Due to the potential benefit spinal manipulation offers to patients with mild traumatic brain injuries, it would be advantageous to investigate what role it holds to improve the various neurological functions. As there are many aspects to neurological function, various sub categories of impaired function could

exist depending on the areas of brain injury. Each one could potentially respond better to different forms of treatment. Further investigation into what occurs in neurological function with chiropractic techniques other than diversified technique is suggested. Do different chiropractic techniques affect neurological function differently? Regarding this matter, other case studies by clinicians using a technique different than diversified chiropractic manipulation would be good to add to the literature. Additionally, exercise relies on recruitment of the nervous system. Future studies regarding neurophysiological effects of differing exercises would be of benefit. Potentially, DCs would be able to build a treatment plan, selecting from various manual techniques along with exercises, based on the level of neurological injury. This may result in improved patient outcomes.

CONCLUSION

The clinical picture of those suffering from head and spinal trauma can be confusing, alarming, and complex during the course of treatment. Chiropractic physicians may be the first to establish a clinical relationship with motor vehicle trauma patients and may see them with the most frequency. Clinicians who understand the possible injury to the spine and head that can result from a motor vehicle collision, along with understanding the impaired function that may develop, could deliver better clinical outcomes for those who are injured. This case report discusses screening for a brain injury during initial and follow up history taking and physical examinations. It illustrates the need for DCs to put mild traumatic brain injury into the differential diagnosis of motor vehicle trauma patients who may screen poorly. Even though the origin of the symptom of vertigo could not be clearly established in this patient, chiropractic management may have had a beneficial impact in its resolution in this case.

ACKNOWLEDGEMENTS

We would like to thank Julie Collins BSc, Paul Osterbauer DC, MPH, and Donald Murphy DC, DACAN for their kind review and proof reading of this article.

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Appendix 1. Post-concussion checklist.

Patient Name: _____ **Date:** _____

Did the patient immediately experience any of the following (circle all that apply):

Direct blow to the head
Alteration of consciousness (dazed/confused)
Nausea
Dizziness
Gap in memory at time of collision/fall
Recalled acceleration/de-acceleration of head
Loss of consciousness

Any immediate indication of head injury (circle all that apply):

Laceration Area of swelling Scalp abrasion

Any imaging of the head (circle all that apply): CT MRI Other:

Post-concussive Symptoms	**Never**	**Occasionally**	**Frequently**	**Constant**
Cognitive				
Problems concentrating, maintaining focus	0	1	2	3
Forgetfulness and memory loss	0	1	2	3
Misplacing personal items	0	1	2	3
Problems finding words/expressing thoughts	0	1	2	3
Problems making decisions	0	1	2	3
Trouble staying organized	0	1	2	3
Slowed thinking, feeling dazed	0	1	2	3
Problems alternating attention	0	1	2	3
Problems multi-tasking	0	1	2	3
Becoming overwhelmed easily	0	1	2	3
Physical Symptoms				
Headaches	0	1	2	3
Dizziness/Vertigo	0	1	2	3
Fatigue	0	1	2	3
Slurring words, stuttering	0	1	2	3
Changed sense of hearing	0	1	2	3
Changed sense of smell/taste	0	1	2	3
Blurred or double vision	0	1	2	3
Tingling in hands and arms	0	1	2	3
Tingling in legs and feet	0	1	2	3
Ringing in the ears	0	1	2	3
Increased sensitivity to light/sound	0	1	2	3
"Black outs" or seizures	0	1	2	3
Emotional Symptoms				
Feelings of sadness or depression	0	1	2	3
Crying spells or weepiness	0	1	2	3
Suicidal Thoughts	0	1	2	3
Mood swings/irritability	0	1	2	3
Problems sleeping	0	1	2	3
Low tolerance for frustration	0	1	2	3
Decreased sexual drive	0	1	2	3
Decreased or increased appetite	0	1	2	3
Avoidance of crowds	0	1	2	3
Decreased interest in socializing	0	1	2	3
Loss of interest in hobbies and activities	0	1	2	3