Concussions and Osteopathic Manipulative Treatment: An Adolescent Case Presentation

Iris Castillo, DO
Kimberly Wolf, DO
Alexander Rakowsky, MD

From the Dual Pediatric Residency Program at Nationwide Children's Hospital and Doctor's Hospital in Columbus, Ohio (Dr Castillo) and Pediatric Ambulatory at Nationwide Children's Hospital, Primary Care Network Associates in Columbus, Ohio (Drs Wolf and Rakowsky).

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Address correspondence to Iris Castillo, DO, Nationwide Children's Hospital, 700 Children's Dr, Columbus, OH 43205-2664.

E-mail: iris.castillo@nationwidechildrens.org

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Concussions commonly occur in adolescents. Although the majority of adolescent patients' symptoms resolve, about 11% continue to experience symptoms at 3 months. Standard treatment options for prolonged symptoms are not available, and the role of osteopathic manipulative treatment in the management of adolescent concussions is unclear. The authors describe a case of a 16-year-old girl with a history of 3 head injuries who presented with concussion symptoms. After 6 weekly osteopathic manipulative treatment sessions, the patient was able to return to her normal activities. Further research on the role of osteopathic manipulative treatment to manage concussions is needed.

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Concussions occur frequently in adolescents, and traumatic brain injury is one of the leading causes of death and disability in children, adolescents, and young adults.[1] Current recommendations for concussion treatment involve rest with stepwise return to activity and adjunctive medications to manage individual symptoms.[2] However, research has shown that strict rest may not improve outcomes.[2] Although 80% to 90% of patients have resolution of symptoms within 7 to 10 days of the initial injury, other patients experience prolonged concussion symptoms despite adequate trials of rest and aggressive physical and vestibular therapy.[1,3] Approximately 11% of patients continue to have symptoms at 3 months and 2.3% at 1 year.[4] The pathophysiologic mechanism of prolonged concussion symptoms is not well understood, and clear management guidelines remain to be undefined.

The role of osteopathic manipulative treatment (OMT) in the management of concussions is not clear. However, somatic dysfunction in the cranium and other affected regions of the body could contribute to the prolonged symptoms leading to a possible role for OMT in helping patients to recover sooner. One recent retrospective review of medical records supported the effectiveness of OMT at reducing symptom burden related to concussion.[9]

In our Osteopathic Manipulative Medicine (OMM) Clinic, adolescent patients with prolonged symptoms of concussion have had notable improvements in their symptoms after serial OMT sessions. We describe a case of an adolescent patient with prolonged postconcussive symptoms, which substantially affected her quality of life. Through the use of adjunctive OMT, resolution of symptoms occurred, allowing her to resume all activities.

Report of Case

A 16-year-old girl with a history of 3 head injuries presented to the OMM clinic of a national pediatric hospital as a referral from a pediatric sports medicine practice. Her chief complaint was headaches. The most recent injury occurred 5 weeks before the initial visit to the OMM clinic as a result of a head-to-head collision while riding a school bus, with the force directed at her right temple. She denied loss of consciousness but admitted to transient posttraumatic amnesia. She was advised by the athletic trainer at her school to seek medical attention at the local emergency department. She went to the emergency department the day of injury. She did not have any focal neurologic signs, and no imaging was indicated. She was discharged home with concussion precautions and a referral to the hospital's Sports Medicine Concussion Clinic.

After her injury, the patient's symptoms limited her participation in school and band. At her initial visit to the Sports Medicine Concussion Clinic (3 weeks after injury), she showed symptoms of headache, fatigue, and labile mood. We used a modified Initial Concussion Symptom Score (CSS) assessment tool to calculate her score of 53 on a scale of 0 to 144, with 144 being most severe and a score above 10 being clinically significant. An athletic trainer discussed 24 symptoms with the patient, who rated each symptom on a scale of 0 to 6. The goal of this scoring system was to monitor the progression of symptoms, rather than to gain a clear distinction of mild vs severe symptoms. We also used the Balanced Error Scoring System (BESS) to determine the degree of vestibular dysfunction. The patient was asked to complete balancing techniques while on both feet and on 1 foot, all with a tandem gait. The patient followed the instructions on firm and foam ground, with eyes open and closed. The athletic trainer observed the tests and quantified the number of times the patient needed to stabilize herself from lack of balance. On a scale of 0 to 30, with 30 being most severe, the patient's score was 22. A score higher than 12 is clinically significant.

The patient experienced additional symptoms, including nausea, vertigo, drowsiness, photophobia and phonophobia, emotional instability, mental fogginess, memory and concentration problems, neck pain, dizziness, insomnia, irritability, feeling slowed down, and vision changes. She was given activity restrictions, including all extracurricular activities. Academic accommodations, including prolonged test times, were prescribed.

At 1-week follow-up with the Sports Medicine Concussion Clinic, her CSS improved from 53 to 49. The patient continued to have headaches, photophobia and phonophobia, and insomnia, and she was instructed to continue to refrain from participating in academic and extracurricular activities. She was referred to physical therapy, vestibular rehabilitation, and the OMM clinic.

During her initial OMM clinic visit (5 weeks after injury), she complained of constant, pressure-type headaches located near the vertex and temporal region, as well as vertigo, dizziness, and neck and back pain. The headaches had been severe several times, necessitating a visit to the emergency department on 1 occasion. Results of head computed tomography showed no intracranial pathologic change. At this point, she was unable to tolerate a full day of school and continued to be prohibited from participating in extracurricular activities.

Examination at Initial OMT Visit

The patient was alert and was meeting all developmental milestones appropriately. The neurologic examination revealed no focal deficits, nystagmus, or gait abnormalities, and the cranial examination revealed diminished cranial rhythmic impulse. The sphenobasilar synchondrosis was compressed and restricted in all planes of movement. The right temporal bone was internally rotated. The right temporoparietal, temporozygomatic, and temporo-occipital sutures were compressed and without any passive motion. The temporal bone dysfunction likely contributed to her symptoms of dizziness and vertigo secondary to trauma,

which directly altered the vestibular apparatus' location and orientation within the petrous portion of the temporal bone. Her cervical paraspinal musculature was hypertonic and worse on the right. The occipitoatlantal joint was flexed, rotated right, and sidebent left, with tenderness on the right. Regional cervical dysfunction was found with restriction in flexion, right sidebending, and right rotation. The key lesion was noted at C3. Bilateral trapezius muscles were hypertonic but worse on the right. Thoracic inlet restriction was noted, with restriction in all planes of motion. This somatic dysfunction was likely contributing to the patient's headaches and chronic neck and back pain.

Treatment at Initial OMT Visit

On the basis of the examination findings, OMT was initially directed at cranial and cervical dysfunction. Sphenobasilar synchondrosis decompression and compression of the fourth ventricle were performed. Restricted suture decompression was performed using direct techniques. Muscle energy, soft tissue, balanced ligamentous tension, articulatory techniques, and myofascial release were performed on the cervical region. Trapezius inhibition was performed bilaterally, along with a myofascial thoracic inlet release. All specified methods are gentle techniques that rely on the evolving tissue texture changes palpated by the health care professional in response to the force applied to the areas of most restriction (ie, muscles, fascia, ligaments, joint articulations).

The techniques performed were chosen to address the patient's somatic dysfunction, restore motion in areas of restriction, reduce pain, and promote the body's natural ability to heal. Sphenobasilar synchondrosis was managed to encourage cranial rhythmic impulse improvement and decrease restriction of all cranial bones. Individual suture dysfunction was addressed for the same reason. Compression of the fourth ventricle was done to enhance the inherent fluctuation of cerebrospinal fluid, thus promoting the interchange of fluids throughout the cranium and the body.[6] Encouraging fluid movement can decrease edema, clear neurotoxic byproducts, and enhance inherent immune responses.[6] The cervical somatic dysfunction was managed to decrease hypertonicity to alleviate muscle tension-type and cervicogenic headaches. Finally, thoracic inlet myofascial release was performed to allow for improved fluid mechanics.

The patient tolerated the treatment without complications. She reported immediate resolution of her headache after treatment. She was instructed to continue follow-up with the Sports Medicine Concussion Clinic and therapies and return to the OMM clinic for serial treatments, as well as maintain adequate hydration.

Follow-Up Visits

The patient had a sports medicine follow-up appointment the day after the initial visit to the OMM clinic. She reported that her headache had improved. She continued to experience vertigo, dizziness, memory and concentration problems, and photophobia and phonopbobia, but these symptoms had all subjectively improved. Her CSS decreased to 22 and BESS improved to 17.

The patient's weekly OMM clinic visits focused on additional cranial techniques with a focus on the temporal bone to address balance and vertigo concerns. Muscle energy, articulatory techniques, and myofascial techniques were performed in the sacrum and pelvis to address somatic dysfunction. The patient tolerated OMT without complications, and pain improved substantially.

At her next sports medicine follow-up visit, which occurred after 3 successive weekly OMT sessions, her CSS was 7. Although the patient continued to experience some vertigo and concentration problems, these symptoms had improved. Her mother noted that the patient was back to her physical and emotional preinjury baseline level.

The patient was seen an additional 2 weeks in the OMM clinic (for a total of 6 weekly visits), after which she had a final appointment at the Sports Medicine Concussion Clinic. At this visit, she had a CSS of 0 and BESS of 14. She was cleared to return to her normal activities.

Discussion

The mechanism of concussions, particularly in those who have symptoms for longer than 1 month, is not fully understood.[3,7] However, physiologic changes, such as trauma-induced metabolic changes that lead to neurotoxic byproducts, altered blood flow, and intraneuronal metabolism disturbances, have been hypothesized.[3] Minimal research has been completed to determine how physical trauma alters anatomic functions of the cranial bony components.

Somatic dysfunction from trauma inflicted on the cranial vault is suspected to be related to prolonged concussive symptoms, as described in the current case. The dysfunction in the patient's temporal bones was thought to coincide with her vertigo and balance issues, as well as her phonophobia because the temporal bone is close to the vestibulocochlear nerve and houses the vestibular apparatus. Furthermore, the dysfunction in her cranial bones likely led to inherent compensatory mechanisms in the cervical, thoracic, pelvic, and sacral regions, causing additional pain and worsening symptoms.[8] This pattern has been demonstrated before and is largely attributed to the continuity of fascia throughout the body.[8] When these areas were addressed from a comprehensive osteopathic perspective, the patient's symptoms resolved, and she was able to return to her normal activities.

Conclusion

As illustrated by this case, OMT as part of a multidisciplinary team approach to concussion can help quicken recovery and improve quality of life. Further research is needed, and we hope to implement a large, randomized controlled study to evaluate the role of OMT in adolescent patients with prolonged concussion symptoms.

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