MANAGEMENT OF A 30-YEAR-OLD MALE MIXED MARTIAL ARTS FIGHTER PRESENTING WITH SPINAL CORD CONTUSION

Adam Sergent, DC[1], Scott Self, DC[1], Matthew Richardson, DC, DACBR[1]

[1] *Palmer College of Chiropractic Florida, 4777 City Center Parkway, Port Orange, FL 32129 USA*

MANAGEMENT OF A 30-YEAR-OLD MALE MIXED MARTIAL ARTS FIGHTER PRESENTING WITH SPINAL CORD CONTUSION

ABSTRACT

Objective: To describe diagnosis and management of a 30-year-old Mixed Martial Arts fighter who experienced a hyper-extension injury to the cervical spine resulting in contusion of his spinal cord.

Clinical Features: A 30-year-old man was struck in the face, causing his head and neck to be forced into extreme extension. He presented with swollen hands that were hypersensitive to touch, cold, air, and temperature. Muscles in his forearm and hand were in spasm, with inability to extend his fingers.

Intervention and Outcome: He was initially examined at the clinic and cervical spine radiographs were taken and interpreted as negative for fracture. An MRI of the cervical spine was ordered due to the neurologic presentation. It showed findings consistent with spinal cord contusion. The patient was referred to a neurosurgeon for further evaluation and management. Over a 3-week period his symptoms started to decrease; however, at the time of this reporting he remains a candidate for cervical surgery.

Conclusion: The patient was referred to a neurosurgeon and no chiropractic manipulation was rendered. A doctor of chiropractor served as a primary provider in the patients care and management by recognizing the signs and symptoms of a cervical cord injury and through the implementation of appropriate follow-up care, including advanced imaging and consultation with a neurosurgeon. (Chiropr J Australia 2017;45:28-37)

Key Indexing Terms: Chiropractic, Cord Contusion

INTRODUCTION

There are approximately 12,500 new cases of spinal cord injuries in the United States each year, of which 55% are cervical spinal cord injuries, and of those, 8.7% are sports-related. (1,2) The prevalence of these sports-related spinal cord injuries are greater in males than in females and the average age of injury is 42. (1)

Signs and symptoms of traumatic spinal cord injury (TSCI) vary depending on the extent and mechanisms of the injury. Acute spinal cord injury results in varying degrees of paralysis and or sensory disorders. (3) Mild to moderate injury may result in spasticity, hyper-reflexia, and motor and sensory deficits, while moderate to severe injury may result in cardiovascular, gastrointestinal, sexual dysfunction and quadriplegia. (1) Injury to the spinal cord causing interruption of the descending pathways may affect the

functional use of muscles as well as visceral function. (4) This hyper-excitability stretch injury may be accompanied by structural changes in muscle fibers, connective tissue, and a reduction in range of motion leading to contracture. (4-6) Patients with this contracture or spastic state may still function well in areas other than the affected area. Though this is uncommon, the doctor of chiropractic may still see this, and those who see sport-based populations may see this more frequently. Radiographic imaging is usually the first, most readily available and most cost-effective option available. While this imaging does not directly show spinal cord or soft tissue injuries, it also demonstrate fractures and dislocations that may have led or injury. The gold standard imaging for assessing spinal cord injury is MRI. MRI can help can determine if there is injury and the extent of damage. (7,8)

The severity and location of the injury determines the most appropriate referral. Patients showing signs of cord injury will most likely be referred out for further evaluation and management, such as MRI imaging or neuro-surgical consultation, as most chiropractors do not have access to such imaging in house.

There is little information in the current literature related to athletes seeking chiropractic care after experiencing spinal cord injury. The purpose of this case report is to demonstrate the management of spinal cord injuries seen in the chiropractic office.

CASE REPORT

A 30-year-old male semi-professional mixed martial arts fighter sought care 3 days following a blow to the face that brought his head into extension during a sparring match. He had been in numerous fights as a MMA fighter and had excessive injuries in his career as a firefighter and former Marine before this particular injury. Upon initial history he stated that immediately following the blow he felt a shock-like feeling throughout his entire body. He reported that following the blow he was knocked unconscious for a few minutes and upon awaking he had a headache but no other symptoms. There was no sideline medical team available at the time of this injury. If sideline management was present, he would have most likely been back-boarded and emergency services called for transport to the emergency department (ED). Approximately 10-15 minutes following the injury, he felt pain, numbness and tingling bilaterally through his arms and into his hands. He had visited the emergency department 1 day following the injury but was sent home after a CT exam found no abnormalities.

Upon physical exam by the Doctor of Chiropractic 3 days after the initial injury, he had bilateral hand swelling and extreme hypersensitivity to touch, air, and cold water he felt was worse in his right hand, which was his dominant hand. He could not recall how long after the injury these symptoms started. The cause of the swelling in his hands was unknown, as he stated he was sparing and was not striking his opponent. He also complained of extreme hand weakness, and seemed to feel better with his hands and arms in a contracted state on his chest. He rated his pain a 10/10 and stated that

nothing made the pain better or worse, but he was also afraid to move his hands away from his body. A thorough physical exam could not be completed as the patient was in too much pain and refused to even move his arms away from his body in the spastic state he was in upon initial presentation, he was exhibiting fear avoidance.
Sensation was tested with pinprick and he was hyper-sensitive to touch and stated it caused extreme pain, with this the patient refused any further testing such as reflexes or muscle strength, which is the standard of care, as a cord injury was suspected a lower extremity exam was performed, including sensation, strength, and reflexes, all of which were within normal limits. His gait was also normal. Due to the mechanism of injury it was suspected that the patient had suffered a concussion, which most likely had impact on his reporting of the actual injury and the timeline of such.

A working diagnosis of cord contusion was made but differential diagnoses include cord neuropraxia, central canal stenosis, myelomalacia, “spear-tacklers spine,” cervical spine instability, and subdural hematoma. He was adamant that he be adjusted as it previously helped with this type of injury. His previous medical records were requested but were unavailable.

A cervical radiographic series of anterior/posterior, anterior/posterior open mouth, and lateral were taken in house. Cervical imaging revealed degenerative disc disease at C4-C5, and to a lesser extent C3-C4 and C5-C6 with bilateral C5-C6 degenerative uncinated joint disease, and increased kyphosis (Figure 1). The radiologist suggested non-contrast MRI, which was ordered at the time of the initial visit. The patient was sent home with no treatment rendered and was told to follow-up with the ED if symptoms progressed or worsened. The ED records did not show any relative exam findings or history pertinent to the case other than imaging.

The CT scan once received after the initial triage of the patient, did show central disc protrusion at C4-5 and C5-6 levels with moderate narrowing of the thecal sac. These findings are associated with some osteophyte formation suggesting at least some of this is chronic. His initial MRI revealed a diffuse area of increased signal intensity noted on T2 imaging within the spinal cord predominantly at the C5-C6 intervertebral disc level, consistent with contusion. This finding was not noted in the diagnostic imaging report from the imaging facility, but was discovered on review of the images by the chiropractic radiologist in our clinic. In addition, the MRI showed C2-C3 stenosis, C3-4 diffuse disc bulge with right sided stenosis, C4-C5 loss of disc height, disc bulge, and moderate stenosis, C5-C6 loss of disc height with bulge and moderate central and right-sided stenosis with cord deformity, and C6-C7 loss of disc height with annular tear in combination with right-sided disc herniation producing stenosis. (Figure 2).

The patient was then referred to a neurosurgeon for a second opinion. He reported back following his initial consultation with the neurosurgeon, stating that he would be going for a second MRI using a 3T magnet, but would probably be a candidate for cervical surgery. No electromyography or nerve conduction studies were ordered.

Figure 1. Lateral cervical spine radiograph obtained 3 days after injury. Degenerative disc disease is noted C4-C5, and to a lesser extent C3-C4 and C5-C6, with mild degenerative posterior subluxation of C4. There is mild kyphosis.

Figure 2. Sagittal T1 and T2 weighted cervical spine MRI through the midline of the spinal cord obtained 6 days after injury. A diffuse area of increased signal intensity noted on T2 imaging within the spinal cord predominantly at the C5-C6 intervertebral disc level, consistent with contusion. Degenerative disc disease is noted C3-C4, C4-C5 and C5-C6 with diffuse circumferential disc bulges. There are disc protrusions noted at C4-C5 and C5-C6 that efface the spinal cord and narrow the spinal canal.

The neurosurgeon did not provide any treatment other than the recommendation of a second MRI and telling the patient not to participate in sport at this time. A second MRI taken approximately 3 weeks post trauma showed resolution of edema within the spinal cord, as well as degenerative disc disease, multi-level, most prominent at C4-C5, C5-C6 with posterior osteophyte complexes which encroach upon the thecal sac and abut the cord slightly (Figure 3).

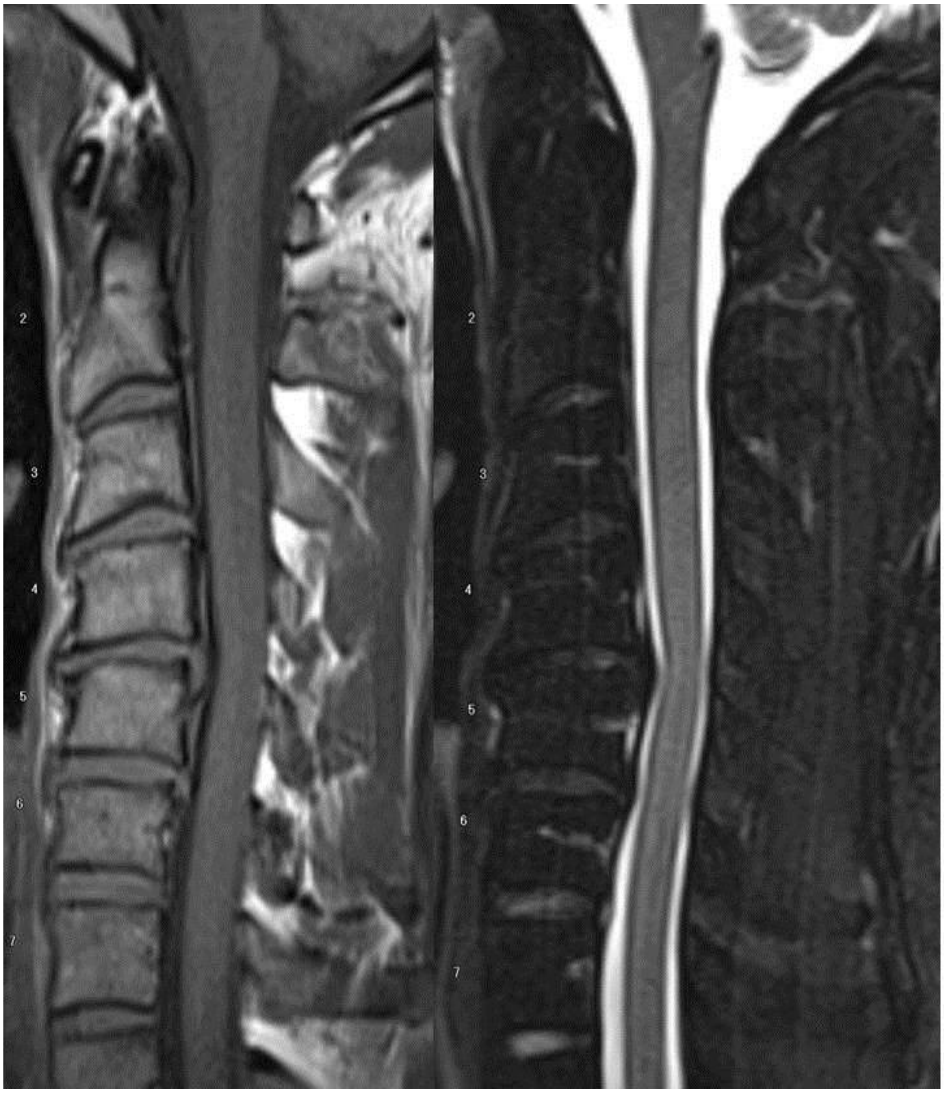

Figure 3. Sagittal T1 and T2 weighted cervical spine MRI obtained 17 days after initial MRI examination. Spinal cord signal intensity has returned to normal.

The patient is still considering surgical intervention because of his active lifestyle. The patient was not interested in oral medications due to the intensity of his job as a firefighter and the need for an epidural steroid injection was discussed but he was not interested. Before any treatment was rendered an exam following the second MRI was performed which revealed normal sensation to dull and pinprick, all upper extremity

strength testing was +5 and upper extremity reflexes were +2. Currently his treatment consists of y-axis cervical traction, cold laser therapy to the cervical spine 2 times a week and nutritional supplements to aid in decreasing inflammation and healing. He was most likely a candidate for neuromusculoskeletal rehab but his care had not progressed to that point before he dropped out of care. He has not returned to his activities of MMA fighting as he has not met the return to play standard following such injury and concussion.

DISCUSSION

The importance of the correct initial working diagnosis is vital in the appropriate triage of a patient that you believe may have a spinal cord injury. Doctors that treat combat and high impact sport as well as high level athletes must be aware of the different possibilities of injuries and their differential diagnosis. Due to the patients initial presentation cord contusion in a concussed person was the primary working diagnosis due to the time of the symptoms and mechanism of injury involving impact. Cervical cord neuropraxia CCN) could not be ruled out as it is uncommon in the general population but in combat sports is more prevalent, presenting as a temporary loss or impairment of sensory or motor deficits.

The diagnosis of concussion was made using history of impact and a description of brain fog following the incident with continued slow reaction times. Cervical stenosis and degeneration was also a differential diagnosis with the patients history as a Marine and current occupation of firefighter. Stenosis of the cervical spine may increase chances of CCN due hyperextension and axial loading, which in this case was the mechanism of injury. Treatment of this particular patient involved no chiropractic care initially; however, the doctor of chiropractic was the primary care provider who made appropriate recommendations. The presentation of the patient strongly suggested that imaging would be needed prior to any treatment.

Following evidence-informed practices, a thorough history was taken, a complete exam could not be performed due to the patient's pain level, fear avoidance behavior and refusal to complete upper extremity reflexes or muscle strength as he was hypersensitive to touch. Using the most recent research, the experience of the doctor of chiropractic and the patient's preference, radiographic imaging was ordered to evaluate for cervical fracture and possible canal compromise from osseous structures to triage the patient as access to the CT from the ER was unavailable at initial presentation. Radiographic imaging was to ensure relative safety to proceed with traveling to MRI and neurological consult. Imaging revealed no fracture but multilevel degenerative disc disease, and after correlation of the x-ray results to the clinical presentation, an MRI was ordered. MRI examination is sensitive to assessing general morphology of, and edema within, the spinal cord demonstrating areas of edema as high signal intensity on T2 imaging. In cases of mild edema within the cord following acute injury, the increased signal intensity on fluid sensitive imaging typically resolves within a 3-week period (9).

This is consistent with the variation in signal intensity observed within the spinal cord of this patient on initial and follow-up MRI.

The MRI findings were coupled with patient history, presentation, and examination findings in order to establish the best treatment plan for the patient. The treatment plan included a referral to a neurosurgeon who recommended an anterior cervical discectomy and fusion after stating “that this is indeed a potentially serious situation.” The patient returned for a follow-up visit to our facility to discuss treatment and alternatives.

The patient refused surgical intervention and medical treatment. With the patient refusing medical/surgical intervention, a treatment plan was established utilizing chiropractic flexion distraction techniques, passive modalities, and nutritional intervention. (10-14) Early intervention in the rehabilitation and treatment of spinal cord injuries involving spasticity consistent with an upper motor neuron lesion is integral in successful treatment of the patient. (15) The importance of integrating early active rehabilitation is to prevent joint contracture, loss of muscles strength, conservation of bone density, and to ensure normal functioning of the respiratory and digestive system. (15) Injuries involving the C5 and C6 levels active rehabilitation should be performed to prevent elbow flexion and supination contractures. (16) The most common contractures associated with cervical spinal cord injuries include the elbow 33% of the time, forearm and wrist 41% of the time within 1 year following the incident (16).

The patient’s treatment plan included electric stimulation as an important modality in suppression of pain following the incident. Transcutaneous electric nerve stimulation has demonstrated beneficial effects as a simple non-invasive analgesic for patient with spinal cord injury patients.(4,17) Considering the severity of the injury, cervical manipulations were contraindicated and not performed. The use of y-axis cervical traction has provided the patient with relief. The use of this technique was considered safe as the injury was deemed as an incomplete injury. An incomplete injury is defined as partial preservation of sensory and motor functions below the neurological level. (16) This type of injury is caused by flexion, compression, hyperextension, or flexion-rotation mechanisms. Injuries resulting from one of the prior mentioned mechanisms is called primary damage. (16) The patient was placed on an anti-inflammatory diet as excessive inflammation at the site of injury prolongs and exacerbates the symptoms. The diet was supplemented with known anti-inflammatory agents such as Omega 3, curcumin, Vitamin D, and proteolytic enzymes. Omega-3 fatty acids, such as α-linolenic acid, eicosapentaenoic acid, and docosahexaenoic acid that have long been associated with anti-inflammatory activities and general benefit toward human health. (18) The patient’s blood sugar was monitored with routine blood work and recommending patient monitor at home with glucometer. Following a spinal cord injury blood pressure, heart rate and blood glucose rise, due to an immediate activation of the adrenal medulla and sympathetic nervous system. (19)

In this particular case, the patient's success was directly related to the early detection of the injury, achieving the proper diagnosis and a multi-faceted treatment plan that included passive modalities, decompression, and nutritional intervention.
The prognosis of this patient at the time of this case was fair, only due to the patient's current activity levels; he continues to be an active firefighter which may cause injury dependent on calls. He has stopped participating in sports but continues to state that he wants to return to his regular sporting activities that includes mixed martial arts and rugby.

At the time of writing the patient had not returned to play (RTP) and has since dropped out of care. Considering the type of injury he suffered RTP guidelines for him would most likely be, a relative contraindication to absolute contraindication to play as this was a cord contusion or more likely CCN and not the first time he has had some degree of these types of symptoms. (20)

Limitations

This case study has several limitations. The initial history following such injury most likely was not as thorough as it should have been due to the patient's probable concussion, lack of all the facts and a poor time line given to the clinician. The fact that an initial exam was not performed due to the patients stated pain level and no initial outcome assessment was performed due to patients stated pain level. Initial cervical radiographs may have been avoided if CT results could have been obtained sooner. The patient has left care prior to starting any RTP protocols.

CONCLUSION

Following the initial presentation of an apparent spinal cord injury, the appropriate images were taken before any type of chiropractic manipulation was performed. The patient was referred to the appropriate provider and following approximately 8 weeks of conservative care with no manipulation the initial symptoms resolved. The patient has currently returned to work and all activities of daily living are unremarkable. He continues treatment; now using cervical flexion distraction protocol.

REFERENCES

1. National Spinal Cord Injury Statistical Center. Spinal cord injury: facts and figures. 2014. Available at https://www.nscisc.uab.edu/Public/Facts%202015.pdf. Accessed August 2015.
2. Forgione N, Karadimas S, Foltz W, Satkunendrarajah K, Lip A, Fehlings M. Bilateral contusion-compression model of incomplete traumatic cervical spinal cord injury. J Neurotrauma 2014 31:1776-1788
3. Hagen E. Acute complications of spinal cord injuries. World J Orthop 2015;6(1):17-23
4. Xu D, Guo X, Yang C, Zhang L. Assessment of hyperactive reflexes in patients with spinal cord injury. BioMed Research International 2015:149875: doi: 10.1155/2015/149875

5. Lance J. Symposium synopsis. Spasticity: Disorder motor control. 1980:485-500
6. ODwyer N, Ada L, Neilson P. Spasticity and muscle contracture following stroke. Brain 1996;119:1737-1749
7. Gupta R, Mittal P, Sandhu P, Saggar K, Gupta K. Correlation of qualitative and quantitave MRI parameters with neurological status: a prospective study on patients with spinal trauma. J Clin Diagn Res 2014: Nov;8(11):RC13-7. doi: 10.7860/JCDR/**2014**/9471.5181.
8. Bozzo A, Marcoux J, Radhakrishna M, Pelletier J, Goulet B. The role of magnetic resonance imaging in the management of acute spinal cord injury. J Neurotrauma 2011;28:1401-1411
9. Shimada K, Tokioka T. Sequential MR studies of the cervical cord injury: correlation with neurological damage and clinical outcome. Spinal Cord 1999;37:410-415
10. Sezer N. Chronic complications of spinal cord injury. World J Orthop 2015;6(1):24-24
11. Hagen E. Acute complications of spinal cord injuries. World J Orthop 2015; 6(1):17-27
12. Rekand, T. Clinical assessment and management of spasticity: A review. Acta Neurologica Scand 2010;(190):62-6. doi: 10.1111/j.1600-0404.2010.01378.x
13. Manison A. Chiropractic management using Cox cervical flexion-distraction technique for a disk herniation with left foraminal narrowing in a 64-year-old male. J Chiropr Med 2011;10:316-321
14. Wong J, Shearer H, Mior S et al. Are manual therapies, passive physical modalities, or acupuncture effective for the management of patients with whiplash associated disorders or neck pain and associated disorders? An update of the bone and joint decade task force on neck pain and its associated disorders by the optima collaboration. Spine J 2015, http://dx.doi.org/doi: 10.1016/j.spinee.2015.08.024
15. Detloff M, Quiros-Molina D, Javia A et al. Delayed exercise is ineffective at reversing aberrant nociceptive afferent plasticity or neuropathic pain after spinal cord injury in rats. Neurorehabil Neural Repair 2015: 545968315619698. [Epub ahead of print
16. Nas K.. Rehabilitation of spinal cord injuries. World J Orthop 2015;6(1):8-18
17. Bi X, Lv H, Chen B, Li, Wang X. Effects of transcutaneous electrical nerve stimulation on pain in patients with spinal cord injury: A randomized controlled trial. J Phys Ther Sci 2014;27:23-25
18. Cheshmehkani A, Senatorov I, Kandi et al. Fish oil and flax seed oil supplemented diets increase FFAR4 expression in the rat colon. Inflamm Res 2015;64:809-815
19. Sala F, Menna G, Bricolo A, Young W. Role of Glycemia in acute spinal cord injury: data from a rat experimental model and clinical experience. Annals NY Acad Sci 133-154
20. Paulus S, Kennedy D. Return to play considerations for cervical spine injuries in athletes. Phys Med Rehabil Clin N Am 2015;25:723-733