

Cauda Equina Syndrome Secondary to a Gun Shot Wound

submitted by

Joseph D'Angiolillo, D.C.

Private practice Somerset, NJ

November 26, 2022

Chiropractors see a multitude of patients with various neurologic problems, most commonly related to pain or numbness, to a lesser extent relating to altered function of a visceral organ. This case study outlines the care and outcome from a patient who suffers the chronic sequelae of spinal cord/cauda equina trauma related to a gunshot wound.

The most common causes of myelopathy seen in general chiropractic practice are associated with spinal stenosis due to degenerative spinal conditions, disc herniation, autoimmune disorders such as rheumatoid arthritis, spinal tumors, inflammatory conditions and radiation therapy. To a lesser extent a chiropractic physician may see a patient who has suffered a spinal trauma, secondary to a gunshot wound.

According to the National Spinal Cord Injury Statistical Center the vast majority of spinal cord injuries are related to vehicular accidents (37.7%) and falls (31.4%), with acts of violence, the majority being that of gunshot wounds, causing 15.3%.¹ The frequency of spinal cord injury in the general population varies from country to country, seemingly associated with the level of affluence, with the countries having lower incomes having a lower incidence and higher income countries having a high incidence.²

CASE REPORT

A 59 year old, well nourished, female was referred to the office by the Veterans Administration for lower back pain and bilateral sciatica. The patient relates that she was the victim of a gunshot wound 38 years prior. The bullet entered the anterior left side of her chest, collapsing her left lung, passing through her pancreas and stomach terminating in her spine. She had several surgeries to stabilize the bleeding, to re-inflate her lung, to decompress the spinal cord and debride the spine and adjacent tissues of shrapnel. Bilateral laminectomies were performed at L1 and L2.

The patient was “paralyzed from the waist down for several months” and after intensive physical therapy she was able to regain some function of her lower extremities. She is currently able to bear weight on both legs but walks with a limp. She has had constant pain, numbness and tingling in her entire left leg to the foot which she rates at an 8/10 on a numeric pain scale, along with weakness of the left leg muscles, which affects her gait and balance. She notes that if she goes into a pool she needs to put an ankle weight around the left ankle otherwise her left leg will float up and she is unable to keep the leg down. She has greater control of the right leg but has pain down the back of the leg which she rates at a 6/10. She has lower back pain, more to the right side than the left, which she rates at a 6/10 with the pain level being worse if she is sitting too long or has to walk for a long distance. She denies any changes on bowel or bladder function.

She has been under the care of a primary care physician, an orthopedic surgeon, a neurologist, a physical therapist and a pain management doctor at the local Veteran’s Hospital. She takes oral medications to control diabetes (Metformin), hypothyroidism (Levothyroxine), high cholesterol (Atorvastatin), antispasmodic (Methocarbamol, Baclofen), pain medication (Hydrocodone/acetaminophen tab, Lidocaine patch, Pregabalin), neuropathy (Duloxetine) and insomnia (Zolpidem, melatonin).

Examination revealed very limited dorso-lumbar ranges of motion which also produces lumbar spine pain. Gait reveals a limp with partial left foot drop. Seated Dorso-lumbar Circumduction bilaterally elicited right sided

lumbar spine pain. The right Bechterew's test produced pain at the right buttocks. Ely's Test produced left sided lumbar spine pain. The deep tendon reflexes of the left Patella and Achilles were 0, the Right patella was +2 and the right Achilles was +1. The dermatomal sensation of the lower extremities revealed hypoesthesia of the left L3, L4, L5, S1, S2 using a pin prick.

A Computed Tomography (CT) scan was performed by the Veterans Administration on May 19, 2022, which revealed bilateral laminectomies at L1 and L2. Radiopacities are noted at the inferior endplate of L1 and superior endplate of L2 on the left, along with scattered radiopacities from L1 through L3 within the spinal canal, most representative of shrapnel from the gunshot. Spondylosis is noted ranging from L1 to L3 with anterior, posterior and lateral traction spur formations. Posterior joint arthrosis is noted at the L2-L3 joint level accompanied by a thin disc space and a retolisthesis of L2 on L3. There is a broad-based disc bulge at L1-L2.

IMAGING



FIGURE 1: Red arrows point to shrapnel within the thecal sac, ranging from the inferior margin of L1 to the superior margin of L3. The blue arrow points to the retolisthesis at L2.

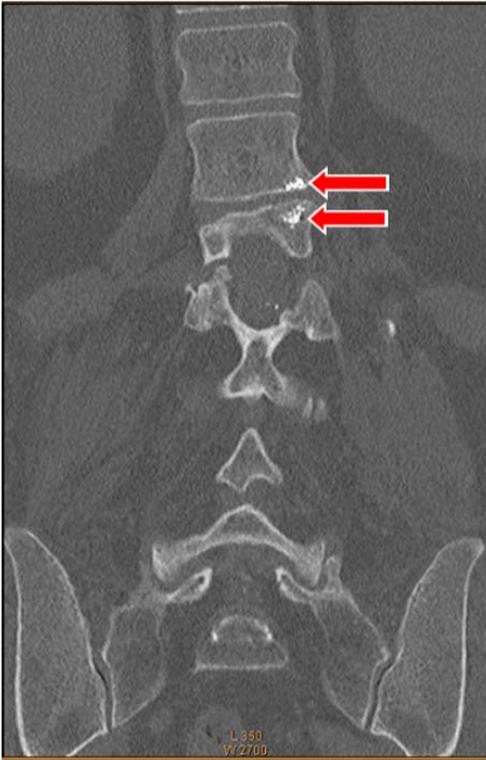


FIGURE 2: Red arrows point to shrapnel at the left inferior lateral aspect of the L1 inferior endplate and at the left superior lateral endplate of L2.

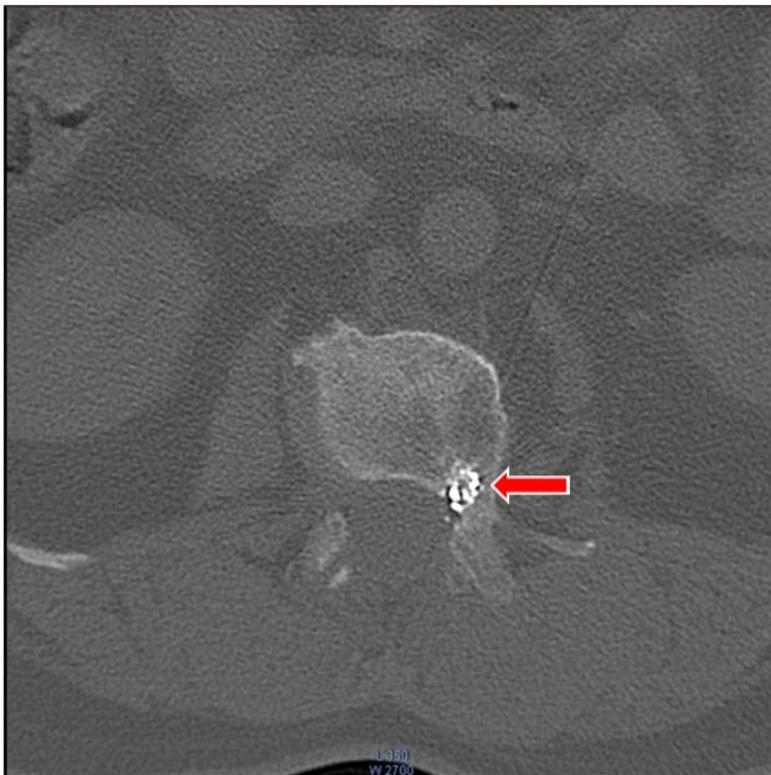


FIGURE 3: Red arrow points to Shrapnel imbedded in L2 at the junction of the pedicle.



FIGURE 4: Red arrows point to shrapnel located within the thecal sac.



FIGURE 5:

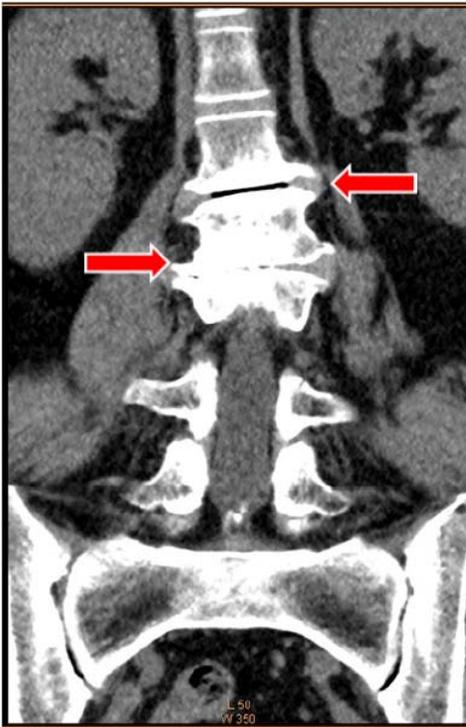


Figure 6:

Figures 5 & 6: The arrows point to the reactive sclerosis and degenerative changes.

DIAGNOSIS

Cauda Equina Syndrome resulting in lumbalgia, bilateral sciatic neuralgia, hypoesthesia, ataxia, associated with spondylosis, and a retrolisthesis of L2.

TREATMENT

I reviewed with the patient her history, the chronicity of her condition, the examination, and the CT scan findings. We discussed her care options, noting her medical and physical therapy care to this point. I discussed with her the possible complications to chiropractic spinal manipulation given the retention of shrapnel within her spinal canal, her prior laminectomies, the retrolisthesis and spinal degenerative changes. I discussed the use of a Cox® Flexion Distraction Spinal Decompression Adjustment (CTFDD) to the lumbar spine, that I would need her feedback as I test her tolerance to the procedure. I discussed what reactions she may experience from the procedure. She understood the communication and elected to undergo a course of chiropractic care. I recommended a treatment frequency of two times per week for five weeks with a re-evaluation to be performed at the conclusion of this trial of care to assess the patient's progress and need for future care. My goal was to see a 30% improvement in the patient's pain scale and function over the course of the five weeks given the chronicity of her complaints.

Tolerance testing, prior to the patient's first adjustment, revealed that she was only able to tolerate Protocol 2 CTFDD of the lumbar spine with circumduction to the right. On the second visit she was able to tolerate Protocol 2 of the lumbar spine bilaterally. Tolerance Testing involves contacting the spinous processes of the individual lumbar spine, applying gentle cephalad pressure, and placing the vertebral motor unit through its full range of motion bilaterally with a circumduction motion one side at a time. Spinous process contact was made from L3 to L5. Since bilateral laminectomies were performed at L1 and L2 an alternative contact was made at

these motor units. At the L1-L2 and L2-L3 levels contact was made with the pisiform and hypothenar eminence of my left hand on the facet joints on the left side of the motor unit and with the thenar eminence of my left hand on the right side of the motor unit. Should tolerance testing produce the lateralization of pain, then treatment does not advance beyond the point at which the patient can tolerate the application of force and movement. In this case the patient could not tolerate the flexion and left sided circumduction movement on her first adjustment so only the right side had the application of the CTFDD. Preparatory to the spinal manipulation interferential electrical stimulation along with hydrocollator therapy was applied to the lumbar paraspinal musculature.

DISCUSSION

The patient has had an extensive amount of care, first relating to life saving surgeries, subacute rehabilitation, and supportive care for the chronic sequelae of the traumatic insult. She has been under the care of the Veteran's Administration for the past 38 years receiving orthopedic care, medical care, repeated courses of physical therapy, and pain management.

Typically the spinal cord terminates at the L1 level becoming the cauda equina, the exact level where the bullet impacted the left side of this patient's spine, the L1-L2 motor unit. The insult permanently altered the function of the cauda equina, from direct trauma as well as the shock wave of the kinetic energy released from the bullet impacting the spine.

Spinal cord injury after a gunshot wound usually occurs due to direct trauma resulting in transection, contusion, vascular injury and ischemia associated with bone and soft tissue injuries. High velocity gunshot wounds produce the distribution of a large amount of energy that can have an indirect negative effect on the vascular supply of the spinal cord. In such cases, kinetic energy is dissipated into the surrounding tissues disrupting tissues distant from the direct track of the bullet. This results in microvascular injury leading to contusion.³

Symptoms of spinal cord injury most often seen encompass pain in the neck, lower back, arm or leg. As the severity of the nerve dysfunction progresses tingling, numbness or weakness in one or more of the extremities, lack of coordination, difficulty walking, altered balance or loss of fine motor skills and in some instances altered bowel or bladder function. In the most severe case, where there has been a disruption of spinal cord function, paraplegia or quadriplegia.

Aside from the direct trauma to the nervous system, there has been trauma to the spinal motor unit. The lumbar spine, most notably T12 through L3, has altered function. The impact of the bullet caused a direct insult to the vertebral bodies, the associated connective tissues, the intervertebral disc, as well as altering alignment of L1-L2. Over time, due to altered spinal biomechanics and a chronic inflammatory reaction, the L1 through L3 joint complexes have undergone a progressive degeneration. The breakdown of the L2-L3 joint complex has led to a retrolisthesis. Dr. J.A Buckwalter, Department of Orthopedic Surgery, University of Iowa stated several decades ago: "Normal use of abnormal joints, in particular joints with incongruous articular surfaces, malalignment, instability, or disturbances of joint or muscle innervation may also increase the risk of degenerative joint disease."⁴ This patient's condition checks several of these risk factors which lead to spinal degenerative changes.

The patient's lower extremity muscle weakness, numbness and altered proprioception leads to an altered gait which also impacts the biomechanics of the lumbar spine, complicating the progress of care directed at improving her spinal biomechanics, which ultimately affects her symptom complex.

Having a realistic expectation of how a patient with such an injury with multiple, chronic complications may progress is important for the clinician as well as patient to understand. This is why my expectation of 30% improvement versus the usual 50% improvement that one would like to achieve with a typical CTFDD trial of care was modified.

After the initial 5 week course of care the patient achieved relief from pain in her right leg, she had intermittent right buttocks pain, a reduction in the intensity of the left leg pain and a reduction in the intensity of her lower back pain.

Since the patient made positive gains with CTFDD after the initial trial, I recommended an additional course of care of 1 time per week for 4 weeks with her treatment frequency being reduced to 1 time per month.

Over the course of six months, the patient had 19 visits. On the 19th visit she filled out an Interim Report outlining her current complaints and her estimation of how she felt she progressed. She no longer experienced right leg pain or lower back pain. The left leg pain has been reduced to a 5/10, with her commenting on how much better she is able to walk due to having a lowered pain level. She states she has reached 60% improvement.

While care has certainly improved her symptomatically and objectively, this patient has a permanent disability. She will require some level of supportive care the rest of her life to afford her the best opportunity to better manage her pain level and lead a more functional life.

References:

1. National Spinal Cord Injury Statistical Center, “Spinal Cord Injury Facts and Figures at a Glance,” 2022 SCI Data Sheet.
<https://msktc.org/sites/default/files/SCI-Facts-Figs-2022-Eng-508.pdf>
2. Barbiellini Amidei, Claudio, et al, “Epidemiology of traumatic spinal cord injury: a large population-based study,” Spinal Cord volume 60, 2022, pages 812–819.
[Epidemiology of traumatic spinal cord injury: a large population-based study | Spinal Cord \(nature.com\)](https://www.nature.com/articles/s41591-022-1711-1)
3. Khuram Khan, et. Al, “Paraplegia Following Spinal Cord Contusion from an Indirect Gunshot Injury,” Korean Journal of Neurotrauma, Volume14(1), 2018, pages 32-34.
<https://www.kjnt.org/Synapse/Data/PDFData/0203KJN/kjn-14-32.pdf>
4. Buckwalter, J.A., “Osteoarthritis and articular cartilage use, disuse and abuse: experimental studies,” Journal of Rheumatology, 1995, Feb;43:13-5.
<https://pubmed.ncbi.nlm.nih.gov/7752117/>