



Recognition of prodromal cervical spondylotic myelopathy presenting in a U.S. Veteran referred to chiropractic for acute thoracic pain: A case report



Morgan Price ^{a, *}, Ali Ravanpay ^{b, c}, Clinton Daniels ^a

^a Rehabilitation Care Services, VA Puget Sound Health Care System, Tacoma, WA, USA

^b Department of Neurosurgery, VA Puget Sound Health Care System, Seattle, WA, USA

^c Neurological Surgery, Department of Neurological Surgery, University of Washington, Seattle, WA, USA

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ABSTRACT

Objective: To highlight a patient who was referred to a VA chiropractic clinic for thoracic pain and upon physical exam was found to be myelopathic, subsequently requiring surgery.

Clinical features: A 58-year-old male attended a telephone interview with the VA chiropractic clinic for thoracic pain of 4 months duration; he denied neck pain, upper extremity symptoms or clumsiness of the feet or hands. At his in-person visit, he acknowledged frequently dropping items. The physical examination revealed signs of myelopathy including positive Hoffman's bilaterally, 3+ brisk patellar reflexes, and 5+ beats of ankle clonus bilaterally. He also had difficulty walking heel/toe.

Intervention and outcome: Cervical and thoracic radiographs were ordered and a referral was placed to the Physical Medicine and Rehabilitation (PM&R) Clinic for evaluation of the abnormal neurologic exam and suspicion of cervical spondylotic myelopathy (CSM). He was treated for 2 visits in the chiropractic clinic for his thoracic pain, with resolution of thoracic symptoms. No treatment was rendered to the cervical spine.

The PM&R physician ordered a cervical MRI which demonstrated severe central canal stenosis and increased T2 signal within the cord at C5–C6, representing myelopathic changes. The PM&R specialist referred him to Neurosurgery which resulted in a C5-6, C6-7 anterior cervical discectomy and fusion.

Conclusion: The importance of physical examination competency and routine thoroughness cannot be overstated. Swift identification of pathologic signs by the treating chiropractor resulted in timely imaging and surgical intervention.

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1. Introduction

Cervical spondylotic myelopathy (CSM) is a degenerative condition that is the most common mechanism of spinal cord injury in adults (Iyer et al., 2016). It has been estimated that as many as ten percent of people 55 years and older demonstrate clinical CSM, although comparatively, fifty percent of all people 55 and older demonstrate imaging findings of cervical spondylosis (Klineberg 2010). The pathophysiology of this non-traumatic cord injury occurs when osteoarthritis affecting the intervertebral discs and surrounding structures progress to encroach the spinal cord, causing compression (Iyer et al., 2016). Typically CSM affects the

spinocerebellar and corticospinal tracts first (Baron and Young 2007), presenting as neck pain with or without radiculopathy, lower motor neuron signs at the affected level (i.e. diminished deep tendon reflex, myotome weakness), and upper motor neuron signs (i.e. hyperreflexia) below the level of lesion. This is only diagnostically useful if the CSM occurs at a level clinically observable, innervating the upper extremity (C5–C8) (Iyer et al., 2016). Ataxic gait or fine motor hand deficits may be apparent as well as pathological reflexes such as Hoffman's, Babinski (extensor toe sign), and clonus (Iyer et al., 2016).

This study was approved by the Privacy Officer at the treating facility, the patient provided consent for publication, and we followed the CARE guidelines of reporting for case reports (Riley et al., 2017). The objective of this case report is to highlight a case referred to the chiropractic clinic by his primary care provider for acute

* Corresponding author.

E-mail address: Morgan.Price@va.gov (M. Price).

thoracic pain and upon physical exam was discovered to have early myelopathic signs, which lead to subsequent referral and surgical intervention.

2. Case presentation

2.1. Patient information

A 58-year-old white male presented for a telephone patient interview with the Veterans Affairs (VA) Puget Sound Health Care System chiropractic clinic following a referral from his VA primary care provider for episodic middle back pain of 4 months duration without a specific mechanism of injury. His history included greater than 20 years of constant low back pain, but he denied any neck complaints. His chief complaint pain was located axially to the thoracic spine between the scapulae and he denied any peripheral symptoms into the upper extremities. Pain quality was described as uncomfortable to take deep breaths at times and flares of pain with unknown triggers. His pain ranged from 0 to 7/10 numerical pain rating scale (NPRS).

Past medical history was relevant for diabetes mellitus, essential hypertension, and an episode of chest pain and shortness of breath 1 month prior, which was evaluated by a non-VA Emergency Department. He denied recent fever/chills, abdominal pains, bowel/bladder dysfunction, new severe headache, clumsiness of the feet or hands, dizziness, history of stroke, recent unexplained weight loss, and history of cancer. Prior imaging with lumbar MRI from a year earlier showed significant degenerative changes including L3-L4 disc protrusion displacing the right L3 nerve root, significant canal stenosis and bilateral foraminal narrowing, and L4-L5 disc extrusion extending 7 mm superior and displacing the right L5 nerve root. There was no prior reported treatment or imaging of the thoracic or cervical spine.

He presented to the clinic 2 weeks later for a physical examination. He stated that his chief complaint had improved to 3/10 NPRS because he had been “taking it easy.” He continued to note constant chronic low back pain and denied neck complaints. He denied any provocation of his thoracic pain with neck movements; he noted throwing with his left arm while playing fetch with his dog was the most provocative activity for his middle back pain.

2.2. Clinical findings

Physical examination revealed marked reduction of lumbar flexion, minimal in extension, and no restriction in side-glide movements bilaterally, where all but extension were provocative to the patient’s chronic low back pain only. There was 5/5 myotome strength and normal sensation in the upper and lower extremities. Deep tendon reflexes were 2+ bilaterally and symmetrically in the upper extremities; L4 was 3+ and brisk bilaterally and 2+ at S1. Upon observation, gait was unremarkable, but during the neurological exam, the patient had significant difficulty in performing a heel/toe walk. Hoffman’s sign was present bilaterally; Romberg’s was unremarkable, and ankle jerk elicited 5+ beats of clonus bilaterally. When questioned again, the patient admitted subjectively that he had been having more frequent reports of dropping things, although had attributed this to normal aging. Thoracolumbar orthopedic special testing was unable to provoke thoracic complaint. There was joint restriction throughout the mid-thoracic region surrounding the chief complaint.

2.3. Diagnostic assessment

The treating chiropractor ordered 6 view cervical and 3 view thoracic radiographs revealing mild to moderate degenerative

changes of the cervical and thoracic spine (Fig. 1). A referral was placed to the Physical Medicine and Rehabilitation (PM&R) Spine Clinic for evaluation due to suspicion of cervical spondylotic myelopathy with recommendation for a cervical MRI. The patient was treated in the chiropractic clinic for his thoracic complaint with spinal manipulation, seated thoracic extension and rotation mobilizations, and prone diaphragmatic breathing. No treatment was rendered to the cervical spine.

The evaluating PM&R physician ordered a cervical MRI without contrast and ordered neurosurgical consultation. MRI demonstrated severe spinal stenosis at C5–C6 level caused by a combination of disc osteophyte complex and facet arthropathy with increased T2 signal within the spinal cord at this level, likely representing myelopathic changes. There was additionally moderate-to-severe left and severe right neuroforaminal narrowing at C5–C6 (Figs. 2–5).

Three days later the patient presented to the chiropractic clinic for follow-up. He described transient thoracic soreness following his initial treatment which resolved within a few days without further adverse response. Overall, he described his thoracic complaint as greatly improved, once soreness resolved, with intermittent dull ache quality and he expressed compliance with his home exercise program.

The patient met with neurosurgery 2.5 weeks following the MRI. By this time his symptoms had progressed to include myotome weakness 4/5 of the left triceps, left wrist extension, and bilateral abductor digiti minimi; with normal lower extremity myotome strength. There was diminished sensation to light touch in the C8 distribution on the left. Bilateral Hoffman’s reflex and hyperreflexia was reproduced in this session.

Neurosurgery confirmed his symptomatology as consistent with cervical myelopathy secondary to severe cervical stenosis from the disc osteophyte complex at C5–C6 and neural foraminal narrowing at C6–C7 on the left. Additionally, there was suspicion for symptomatic neural foraminal narrowing at the lower level due to the left triceps weakness. Electrodiagnostic studies to evaluate the triceps weakness and suspicion of a C7 radiculopathy were ordered and were unremarkable for cervical motor radiculopathy, ulnar, and median neuropathy (Table 1).

2.4. Follow-up and outcomes

One month following the patient’s consultation with neurosurgery, he presented for a C5-6, C6-7 Anterior Cervical Discectomy

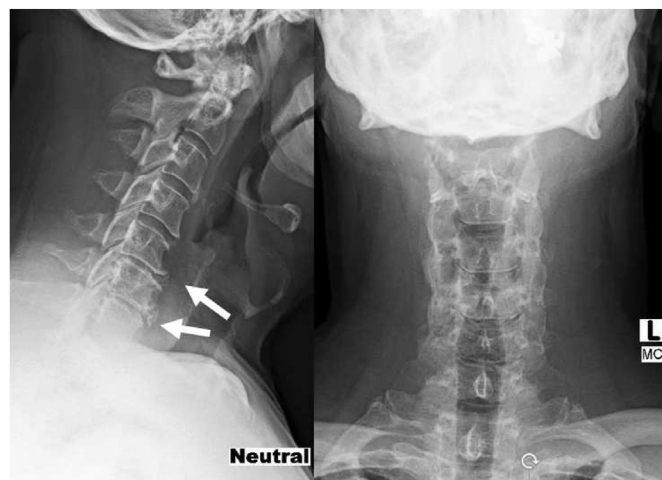


Fig. 1. Lateral and AP cervical radiographs demonstrating mild to moderate degenerative changes at C5-6 and C6-7.



Fig. 2. Sagittal cervical MRI demonstrating severe spinal stenosis at C5-6 caused by disc osteophyte complex and facet arthropathy (white arrow).



Fig. 3. Sagittal cervical MRI demonstrating increased T2 signal within the spinal cord at C5-6 (white arrow).



Fig. 4. Axial cervical MRI demonstrating severe spinal stenosis at C5-6 (white arrow).

and Fusion (ACDF) (Fig. 6). Post-operatively, his strength had immediately improved from 4/5 to 5/5 in the left triceps and 4/5 to 4+/5 in the left wrist extensors; he additionally had improved sensation in the left upper extremity. At the 3 month follow-up he had full strength and was symptom free with full return to activities.

3. Discussion

This case demonstrates the importance of performing neurological examination by manual therapy providers on all patients independent of initial recounted history by the patient. In our case, subtle and insidious early signs of CSM were identified through neurological examination in a patient, who was referred for acute thoracic pain without neck complaint. After triaging the patient through telephone consultation and specifically inquiring about red flags such as clumsiness of the feet or hands, which the patient denied at that time, there was no indication for CSM to be part of this patient’s differential diagnosis. CSM is considered an absolute contraindication for high-velocity, low-amplitude (HVLA) cervical spinal manipulation (Whalen et al., 2019; Hawk et al., 2020). Depending on severity and clinical presentation, surgical management may be indicated. Although it has been demonstrated that HVLA may not be contraindicated in patients with cord encroachment in the absence of myelopathy (Murphy et al., 2006). Conservative care in the form of non-manipulative manual therapies and therapeutic exercise may be acceptable management strategies in the event that the patient is referred and deemed not a surgical candidate (Almeida et al., 2013; Browder et al., 2004; Murphy and Beres 2008a,b). Thorough physical examination for an accurate diagnosis for appropriate management is crucial.

Several case reports have attempted to assign blame to cervical manipulation as a potential cause of cervical myelopathy (Kewalramani et al., 1982; Malone et al., 2002; Padua et al., 1996; Fattahi and Taheri 2017; Tseng et al., 2002a,b; Oppenheim et al., 2005; Schmidley and Koch 1984; Rinsky et al., 1976; Davis 1985; Destee et al., 1989; Lipper et al., 1998; Tseng et al. 2002a,b). However, this case report highlights a “near miss” situation for the possibility of an adverse event if HVLA manipulation or other neck manual therapies were performed. A recent population-based epidemiological investigation of 100 million person-years found a strong positive association of acute lumbar disc herniation with early surgery following chiropractic care and primary care provider visits (Hincapie et al., 2018). This data indicated the risk for acute lumbar disc herniation with early surgery following chiropractic care is no higher than it is for primary care provider visits. This suggest that patients with prodromal back pain symptoms from a developing herniation will seek healthcare from both chiropractors

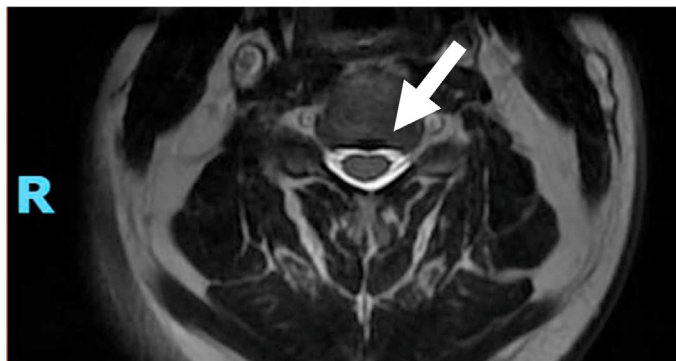


Fig. 5. Axial cervical MRI demonstrating normal spinal cord diameter at C4-5 (white arrow).

and primary providers before full clinical expression of the condition. While no such studies have been published for cervical disc herniations or myelopathy, we believe findings would likely be similar and consistent with our case. Another case report described a near miss situation where a patient was referred by neurosurgery to the chiropractor for a cervical complaint deemed nonsurgical, and in the time between initial evaluation and scheduled first treatment, the patient's condition rapidly deteriorated with signs suggestive of myelopathy with need for surgical intervention (Murphy and Beres 2008a,b). Whether a prodromal manifestation of his CSM (Tseng et al., 2002a,b) or incidental, our patient's acute thoracic pain was evaluated and determined appropriate for management with chiropractic care, subsequently reaching full resolution with minimal intervention.

This case additionally demonstrated collaboration of an integrative care environment. Upon presentation to the chiropractic clinic and discovery of the myelopathic symptoms, the patient was immediately referred for radiographs and a consultation with a PM&R physician. Based on the chiropractic physical exam and subjective presentation of the patient, the PM&R physician ordered a cervical MRI that revealed the severe cervical spinal stenosis as the likely source of myelopathic signs. The patient was then referred to the VA neurosurgery department where he was evaluated and scheduled for surgical intervention. This case highlights not only efficient interdisciplinary management and referral patterns for the CSM, but also the successful co-management and resolution of the patient's acute thoracic pain for which he was referred for chiropractic care initially. Interprofessional education opportunities in hospital-based systems may lead to increased provider exposure to complex patients and better prepare providers for clinical practice collaboration (Ly et al., 2020; Green and Johnson 2015).

There are some limitations to our report, as the findings are representative of a single case and may not be generalizable to

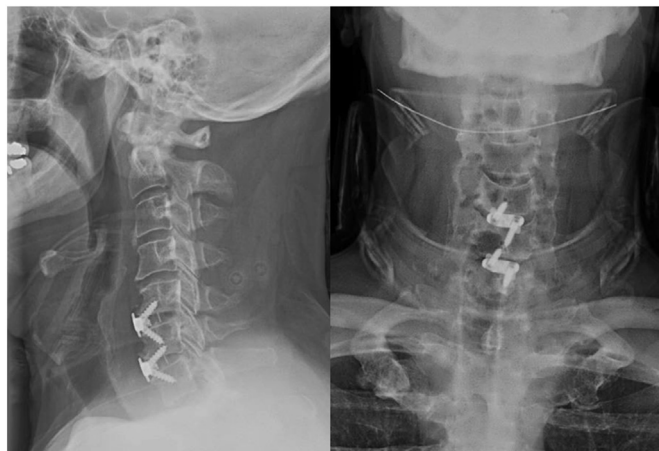


Fig. 6. Lateral and AP cervical radiographs demonstrating post-surgical changes from a C5-6, C6-7 Anterior Cervical Discectomy and Fusion.

every patient with CSM. Secondary to COVID-19 restrictions, and efforts to minimize patient encounter time, patient reported outcome measures were not completed. Cervical orthopedic and provocative tests were not performed due suspicion of CSM early in the physical assessment.

4. Conclusions

The importance of provider physical exam competency and routine thoroughness cannot be overstated enough. Swift identification of pathologic neuropathic signs by the chiropractor were able to effectively avoid the potential of adverse event and lead to appropriate referral of the patient for imaging and surgical intervention. With the patient attributing his myelopathic symptoms to normal aging, it is uncertain how long he would have been at risk before he sought help or another provider recognized his neurological decline.

CRedit authorship contribution statement

Morgan Price: Conceptualization, Writing – original draft, Investigation, Visualization. **Ali Ravanpay:** Writing – review & editing, Validation. **Clinton Daniels:** Supervision, Writing – review & editing, Project administration.

Declaration of competing interest

The authors have no relevant disclosures to report.

Table 1
Timeline of case management.

| Visit (Weeks) | Event |
|--|---|
| 0 (0) | Onset of thoracic pain complaint |
| 1 (14) | Primary care provider evaluates and refers to chiropractic clinic |
| 2 (17) | Telephone appointment with chiropractic clinic |
| 3 (18) | Chiropractic evaluation and referral to PM&R |
| 4 (23) | PM&R Ordered MRI |
| 4b (25) | MRI Results, referral to Neurosurgery |
| 5 (28) | Neurosurgery evaluation, ordered CT, x-rays, NCS/EMG |
| 6 (32) | Surgical discectomy and fusion |
| *Weeks and visits are estimates and would need to be counted and confirmed | |

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