

CASE REPORT

Katherine Heineman DO, FAAO

The Use of Osteopathic Manipulative Treatment for a Case of Cervical Radiculopathy

Abstract

Cervical radiculopathy is a clinical condition related to dysfunction of the cervical spinal nerve roots. Signs and symptoms include unilateral neck, shoulder, or arm pain; paresthesias of the arm, forearm or hand; diminished muscle tendon reflexes, sensory disturbances; and/or muscle weakness. Cervical radiculopathy is primarily a clinical diagnosis with patients reporting a varying degree of pain and/or neurologic dysfunction along a nerve root distribution. In addition to a thorough history, a detailed physical exam including muscle strength testing, deep tendon reflex testing and sensory testing should be performed to determine the nerve root involved and to further help determine a course of action for the patient. The current case report demonstrates the impact of a somatic dysfunction component on underlying pathology of cervical spondylosis, likely driving the symptomatic component of cervical radiculopathy. By eliminating the somatic dysfunction components with the use of osteopathic manipulative treatment, the patient's system was able to function maximally within existing structural limitations and the symptoms resolved.

Introduction

Cervical radiculopathy is a clinical condition related to dysfunction of the cervical spinal nerve roots. It is primarily a clinical diagnosis with patients reporting a varying degree of pain and/or neurologic dysfunction along a nerve root distribution.^{1,2,3} Signs and symptoms include unilateral neck, shoulder, or arm pain; paresthesias of the arm, forearm or hand; diminished muscle tendon reflexes, sensory disturbances and/or muscle weakness.^{1,2,3}

The major cause of cervical radiculopathy is from degenerative changes of the spine. Narrowing of the foraminal space from cervical spondylosis or disc herniation are the most common causes of nerve root compression. The pathophysiology of spondylosis, or nonspecific, degenerative changes of the spine, is not fully understood; however, the process of aging is an important contributor. Degenerative changes seen with spondylosis appear to begin with desiccation of the vertebral disc, leading to increased stress at the zygapophyseal (facet) joints, the uncovertebral joints and the vertebral end plates, further driving ligamentous hypertrophy and osteophyte formation.^{1,4} These structural changes narrow the foraminal space and can impede normal nerve root motion, manifesting as the signs and symptoms seen with cervical radiculopathy.

Corresponding Author

Katherine Heineman, DO, FAAO

Email:

katherine@yourosteopathiccare.com

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Radhakrishnan et al conducted one of the largest-to-date epidemiologic studies of cervical radiculopathy with a retrospective population-based review of 561 patients seen with cervical radiculopathy in Rochester, Minnesota from 1976-1990.³ Several observations were found. The mean age at diagnosis for cervical radiculopathy was 47.9 years. The annual age-adjusted rates of cervical radiculopathy per 100,000 persons was 83.2, with 107.3 for males and 63.5 for females. Age-specific incidence rates reached a peak of 202.9 per 100,000 persons for the age group of 50-54 years, which declined steeply after age 60. A history of trauma or physical exertion immediately preceding the onset of symptoms occurred in 14.8% of cases. Plain radiographs revealed an abnormality of the cervical spine in 86.6% of patients. Involvement of the C7 nerve root was found to be the most frequently affected nerve root, found in approximately 70 percent of cases with cervical radiculopathy, followed by C6 in 20 percent of cases.^{3,4}

The current case report demonstrates the impact of a somatic dysfunction component on underlying pathology of cervical spondylosis, likely driving the symptomatic component of cervical radiculopathy. By eliminating the somatic dysfunction components with the use of osteopathic manipulative treatment, the patient's system was able to function maximally within existing structural limitations and the symptoms resolved.

Case Report

History of Present Illness

A 48-year-old, right-hand dominant male presented for evaluation of constant right sided neck pain with accompanying right upper extremity paresthesias of 2 months duration. He stated the symptoms started with right parascapular pain, then the pain moved into his right sided neck. He states he saw a chiropractor around the onset of his symptoms who "pressed on his cervical spinous processes" while supine. About a week later, the patient experienced an increase in his neck pain. Symptoms were reported as a stabbing, pressure-like pain down the right shoulder, right arm, and right forearm with occasional tingling in the right digits 3-5. The patient stated he would awake from pain while sleeping, the pain was worse at night, and his neck felt stiff in the morning, which improved a bit with motion. He went to a different chiropractor for treatment for the neck and arm pain and was given exercises for his neck, which also increased

his symptoms. He had not done physical therapy.

He reports a particularly bad flare of symptoms 5 weeks prior, which was so significant that he presented to a local emergency department. There he was given Naproxen, a 7-day oral steroid dose pack, and 1 view cervical spine was obtained, which showed possible foraminal stenosis and disc space narrowing at C5/C6 and C6/C7. He reported that the Naproxen provided no relief, but the steroid dose pack provided moderate relief.

The neck pain was now also giving him headaches and he would wake with a headache most mornings. He also reported a sharp pain in the right buttock region, especially noticeable when he would swing his right leg off the bed to get up in morning. The neck and arm pain were aggravated with sitting, especially sitting with pressure on the left buttock. They were alleviated by lying down, resting, standing, heat, and leaning to right side with more weight on right buttock. He was taking ibuprofen and aspirin in the morning, but unsure if either was helping. Symptoms at initial visit were at a 4/10.

Surgical History: Carpal tunnel release of the right wrist 6 years prior. Pyloromyotomy to address pyloric stenosis at birth.

Trauma History: History of motor vehicle and whiplash injury twice ten years prior. Fracture of right clavicle 35 years ago when he fell off a bicycle as a child.

Other Past Medical History: Asthma, sleep apnea, history of depression, hypertension, seasonal allergies.

Family History: Paternal grandmother and brother with history of cancer; father with diabetes mellitus; mother, paternal grandfather and maternal grandfather with history of myocardial infarction; father with congestive heart failure.

Social History: Divorced. Current every day smoker, 1 PPD. Moderate caffeine intake. Occasional alcohol use. Works a desk job, alternates with use of a sit-to-stand desk option.

Allergies: No known drug allergies.

Medications: Aspirin 325mg 1-2 tabs daily as needed, ibuprofen 200mg 1-2 tabs daily as needed, lisinopril 20mg daily.

Review of Systems

Patient reported sleep apnea but no cough, no wheezing,

Table 1. Physical Exam.

Vital Signs	Height 5ft 7in, Weight 234 lbs, BMI 35.9, BP 164/111, Pulse 76
Constitutional	Healthy-appearing, although overweight. Level of Distress: NAD. Ambulation: ambulating normally.
Psychiatric	Mental Status: normal mood and affect and active and alert.
Head	Normocephalic and atraumatic.
ENMT	Ears: no lesions on external ear. Nose: no lesions on external nose. Oropharynx: moist mucous membranes.
Lungs	Respiratory effort of respiration rhythm and depth was normal.
Cardiovascular	No lower extremity edema on inspection or palpation of right or left.
Musculoskeletal	Motor Strength and Tone: normal tone. Right Upper Extremity: normal bulk. Left Upper Extremity: normal bulk. Right Shoulder Strength: abduction 5/5. Left Shoulder Strength: abduction 5/5. Right Elbow Strength: flexion 5/5. Left Elbow Strength: flexion 5/5. Right Wrist: extension 5/5. Left Wrist: extension 5/5. Left Hand: 3 rd finger DIP flexors 5/5, 5 th finger abduction 5/5. Right Hand: 3 rd finger DIP flexors 5/5, 5 th finger abduction 5/5.
Neurologic	Normal gait. Cranial Nerves: grossly intact. Sensation: C5 normal sensation, C6 normal sensation, C7 normal sensation, C8 normal sensation, and T1 normal sensation bilateral.
Deep Tendon Reflexes	Right: biceps 2/4, triceps 2/4, and brachioradialis 2/4; Positive Spurling's test right, pain improved with distraction. Left: biceps 2/4, triceps 2/4, and brachioradialis 2/4; negative Spurling's test left. Hoffman's negative bilaterally.
C-Spine/Neck	Active Range of Motion: flexion normal, rotation decreased bilaterally, lateral flexion decreased left; pain elicited with active ROM in the R neck and upper back. Resisted ROM elicits pain in right neck and upper back with flexion, rotation right and left, sidebending left and right. No pain with resisted extension.

no shortness of breath, and no hemoptysis. He reported muscle aches and arthralgias/joint pain (neck pain, right shoulder, right arm and hand) but no muscle weakness and no swelling in the extremities; morning stiffness, pain worse at night. He reported no fever, no night sweats, no significant weight gain or weight loss, and no exercise intolerance. He reported no vision change. He reported no difficulty hearing. He reported no chest pain, no shortness of breath when walking, no shortness of breath when lying down, no palpitations, and no known heart murmur. He reported no abdominal pain, no vomiting, normal appetite, no diarrhea, no dyspepsia, and no GERD. He reported no incontinence, no difficulty urinating, no hematuria, and no increased urinary frequency. He reported feeling safe in a relationship, no alcohol abuse, no anxiety, no hallucinations, and no suicidal thoughts. He reported no swollen glands, no bruising, and no excessive bleeding.

Osteopathic Structural Examination

L on R backward sacral torsion; bilateral pes anserine tenderpoint (TP); L4 ERSr, L5 ERSr; cervico-thoracic junction compression; C5 ant TP R, C6 ant TP R, C7 ant TP R; C5 FRSr; C6 FRSr, C7 FRSr, R levator scapulae TP; R scalene hypertonicity; R posterior 2nd rib.

Assessment

1. Neck pain, acute - R sided
2. Paresthesia of upper limb - R 3rd, 4th and 5th digits
3. Thoracic back pain - R sided and central
4. Pain in buttock - R sided
5. Tobacco dependence syndrome
6. Hypertension
7. Segmental and somatic dysfunction of cervical region, thoracic region, lumbar region, sacral region, lower extremity, upper extremity, and rib cage

Treatment

Based on the physical examination findings, OMT was offered to address the somatic dysfunction findings (see procedure note below). C-spine x-rays were ordered with flexion and extension views to rule out any potential liss-thesis (not done with ED 1 view). The patient was told to continue ibuprofen 200mg 1-2 tabs daily as needed. His lisinopril dose did not appear to adequately address his hypertension. The patient had a blood pressure cuff at home and was encouraged to begin monitoring his BP and to contact his primary care provider for a medication adjustment if blood pressure readings remained elevated. He was also encouraged to decrease tobacco use and was scheduled to return for further evaluation in 1 week.

After careful consideration of history and physical findings, osteopathic manipulation was offered to the patient as a modality to potentially improve the above areas of somatic dysfunction. The somatic dysfunctions present were found to be related to the patient's symptoms/condition. Following appropriate verbal consent, the patient was treated with gentle osteopathic manipulation to the above-mentioned areas of somatic dysfunction. Treatment techniques included: counterstrain (CS) to lower extremity (LE), upper extremity (UE), cervical region (C); muscle energy (ME) to sacrum (S); balanced ligamentous tension (BLT) to lumbar region (L), C, thoracic region (T), UE, rib cage (R), myofascial release (MFR) to UE. The patient tolerated the treatment well without complication. Somatic dysfunctions were notably improved as evidenced by an increased range of motion. The patient was advised on possible post-treatment flare (usually experienced as increased soreness/achiness) and encouraged to increase hydration and rest next 24-48 hrs. He was told to return to his usual activity following this time.

Course of Treatment

The patient returned after 1 week after the initial visit for further evaluation, review of cervical spine x-rays and coordination of care. He stated he had relief from pain at least once a day for "a period of time," which he noted was a significant improvement from having constant pain previously. He experienced some tingling down the right arm one night before the second visit after mal positioning with sleep, but overall, the tingling in the right upper extremity was notably improved. He reported sleeping more comfortably, including sleeping prone more easily. Pain in right buttock was completely resolved. He reported his mood was notably improved as well. Symptoms were at a 2/10 down from a 4/10.

C spine X-ray flexion/extension 5 views showed straightening of the normal cervical lordosis. Degenerative changes and disc space narrowing were present, greatest at C5/C6, C6/C7. No loss of height of the vertebral bodies was appreciated. There did not appear to be abnormal translational motion identified on flexion-extension images. There was slight scoliosis of the cervical spine, convex to the right.

Osteopathic Structural Exam findings at the second visit revealed a R on R forward sacral torsion (FST); right levator scapulae TP; C5 ERSr, C6 ERSr; T1 FRrSr; 1st

rib elevated L. Somatic dysfunctions were treated to resolution using CS to UE; MFR to T and R; and BLT to C. Tai Chi range of motion exercises were provided for the patient to begin as a home exercise.

The patient again returned for a third visit, 2 weeks after the initial evaluation. He had done very well through the week. He reported an episode over the weekend while taking care of his grandkids where his 6-year-old grandson was hanging on his neck which exacerbated his neck and scapular pain, including a return of tingling in the R upper extremity; however, the symptoms improved after 1 or 2 days. At that visit, he complained mainly of anterior right sided clavicle discomfort and pectoralis pain that were new complaints. He was doing the Tai Chi range of motion exercises and found them to be helpful. Aggravating factors included sleeping wrong and rough activity with grandkids, alleviating factors were rest. Symptoms present at a 1/10 that visit.

Osteopathic Structural Exam findings at the third visit revealed a L on L FST; dural restriction of thoracic spine at T2-4 NRrSl; R hemidiaphragm restriction; R pec major TP; C6 ERSr (improved from prior visit and resolved quickly). Somatic dysfunctions were again treated to resolution using CS to UE; BLT to abdomen (A), C, S; MFR to T.

The patient returned for a fourth and final visit, 3 and a half weeks following the initial evaluation and treatment. He had just returned from a trip via airplane to surprise his brother for a 50th birthday. He was doing very well with no further episodes of radicular symptoms and nearly no pain.

Osteopathic Structural Exam findings at the final visit revealed no dural pull from upper thoracics; slight L on L FST: slight AA RrSr; T1 RrSr; 1st rib elevated L; slight L hemi-diaphragm superior. Somatic dysfunctions were treated using BLT to S, C; MFR to T, R, A.

Discussion

Because cervical radiculopathy is a clinical diagnosis, a detailed physical exam including muscle strength testing, deep tendon reflex testing and sensory testing should be performed to determine the nerve root involved, although myotomes and dermatomes are innervated by multiple roots and denervation may not be seen for several weeks.^{2,3} Upper motor neuron signs, such as

Hoffman's, clonus and Babinski's signs should be evaluated to rule out myelopathy or other neurologic disorders. Provocative tests, such as Spurlings test, can reproduce or worsen symptoms of radiculopathy. Spurlings test is a foraminal compression test of the cervical spine and is performed by fully extending and rotating the neck toward the affected side. When positive, it can help to differentiate cervical radiculopathy from other potential causes of upper extremity paresthesias such as peripheral nerve entrapment.^{1,2} When applying this test, recall that cervical nerve roots exit at the level above their cervical vertebrae, e.g. C7 nerve root exits between C6 and C7.^{2,3}

The clinical diagnosis of cervical radiculopathy can be further confirmed with imaging. Plain radiographs can reveal degenerative changes such as decreased disc height and osteophytes. Flexion and extension views help to determine if there is a listhesis present and, if so, accompanying spinal instability. MRI is the imaging test of choice to best identify disc herniations, as well as spinal cord stenosis, myelopathy, and neuroforaminal stenosis. MRI is often helpful in determining whether nerve root compression is due to disc versus bony pathology, although both x-ray and MRI studies can yield degenerative changes unrelated to clinical signs and symptoms.^{1,2}

Cervical radiculopathy is thought to have a self-limited clinical course for most patients. One study of 51 patients with radiculopathy found at long-term follow up (2-19 years) that only 25% had a persistence or a worsening of symptoms.² For this reason, conservative management is the initial treatment of choice for most patients. However, for such a frequently encountered condition as degenerative cervical radiculopathy, it is surprising to find there is a current lack of controlled trials to compare various nonsurgical approaches, including manipulation, medication, physical therapy, traction, immobilization, and/or no treatment at all.^{1,2} An epidemiological survey of patients with cervical radiculopathy found 146 of 561 (26%) of patients underwent surgery for their persisting symptoms, which commonly included an anterior cervical discectomy and fusion (ACDF) or posterior lamino-foraminotomy.³

The patient in this case report presented with classical clinical features of cervical nerve root pathology, including unilateral neck pain and arm pain that radiated ipsilaterally into the distribution of an affected nerve root (primarily C7). His neurologic exam was found to be within normal limits, although he did have a positive

Spurlings test on the right. The Spurlings test was a helpful determinate in the above case, as the patient had a history of carpal tunnel syndrome and symptoms of right 3rd digit numbness. The positive Spurlings further ruled in cervical radiculopathy. He fit well into the common cervical radiculopathy epidemiologic findings as a 48-year-old male with cervical spondylosis shown on plain radiographs and a remote history of trauma. The patient was also known to be a current tobacco user and several studies have shown smoking to be a risk factor for radiculopathy, likely due to decreased oxygen and nutrition going to the disc from the vertebral blood supply.^{5,6}

Following discussion of osteopathic manipulative treatment, the patient elected to begin with a trial of OMT. Initial findings suggested that there was abnormal dural pull from a mal position of the sacrum (found as a backward sacral torsion) maintaining or at least contributing to dysfunction in the cervical spine. OMT was initiated at the sacrum, using a direct muscle energy technique. The bilateral pes anserine tenderpoints were treated to address dysfunction at the pelvis, as the pes anserine is the common insertion point of 3 separate muscles that originate at the pelvis: sartorius with its origin at the anterior superior iliac spine, gracilis with origin at the pubic symphysis and the inferior pubic ramus, and semitendinosus with origin at the ischial tuberosity and the sacrotuberous ligament.

The patient's right scalene muscles were notably tense with flexion, sidebending and rotation to the right of C5, C6, and C7 and corresponding anterior tenderpoints of C5, C6 and C7 were found. The posterior scalene has its origin at the posterior tubercles of the transverse processes of the vertebrae C4-C6, inserts on the lateral surface of the 2nd rib and acts to elevate the upper ribs. The patient's 2nd right rib was found in a posterior position. In addition, the patient's right levator scapulae was tense and strained with a notable tenderpoint. The levator scapulae has its origin at the transverse processes of the C1-C4 vertebrae.⁷ The levator scapulae strain may have maintained or contributed to strain at the scalenes, thus further contributing to the dysfunction of the cervical spine. The scalenes, levator scapulae and cervical spine were treated with counterstrain and the remaining myofascial dysfunction was treated with balanced ligamentous tension and myofascial release.

At the following visit, the backward sacral torsion had resolved, likely in part by improving the relationship

between the pelvis via the pes anserine and the lower lumbar. By addressing the sacral dysfunction, the dural strain upward to C2 and C3 was also likely improved, which may have helped relieve tension and strain of the anterior, middle, and posterior scalene muscles, as well as the levator scapulae. By removing these somatic dysfunction components, the cervical spine was found to be notably improved at the second and subsequent visits and much more easily treated.

Conclusion

The goal of any osteopathic treatment is to look for a more efficient and effective way to bring about health in the patient. The current case describes the impact that the somatic dysfunctional component can have when layered on underlying pathology, such as cervical spondylosis, likely driving the symptomatic component of cervical radiculopathy. By eliminating the somatic dysfunctional components with the related effect on neural, lymphatic and vascular elements, the patient's system could function maximally within existing structural limitations and the symptoms resolved.

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