Cox® Distraction Manipulation Successfully Treats Cervical Discogenic Pain with Motor Weakness During a Global Pandemic

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Introduction

This case report examines the benefit of implementing the Cox instrument for a cervical radiculopathy with neurological deficits present during the time of a global pandemic.

History

The patient is a forty-two year-old female who presents to the office on April 6, 2020 with chief complaints of left-sided neck, upper back and upper extremity pain of one week duration after cleaning out her classroom. She denies palliative factors. Provocative factors include lying down, sitting, driving, coughing, sneezing, any movement of her neck or arm. She describes the pain as sharp and rates the pain as a 10/10 and constant. She states that she hasn't slept for 2 days as she is unable to find any position that gives her relief. She indicates the site of the pain as over the right C/T spine with radiating pain and paresthesias into the left C7 dermatomal distribution with weakness in her left upper extremities. She states that she is unable to hold anything in her left hand without supporting it with her right hand.

Physical Examination

Inspection revealed the patient in an antalgic position of the cervical spine of cervical flexion with right lateral flexion.

Palpation revealed pain over the left C5-T1 paraspinal region as well as pain over the left T3-4 costotransverse articulations. Pain with hypertonicity was present in the left upper trapezius, levator scapula, infraspinatus, teres, pectoral and suboccipital musculature.

Active range of motion testing (by visual estimate) of the cervical spine was significantly limited in all planes with moderate to severe pain present. Left rotation caused significant left-sided cervicothoracic pain with radiating pain into the left arm at ten degrees. Left lateral flexion caused moderate pain in the left cervicothoracic spine and left arm at fifteen degrees.

Orthopedic testing of the cervical spine revealed an increase in pain with cervical compression as well as maximum cervical compression bilaterally. Cervical distraction lessened the neck and left upper extremity pain.

Neurological testing of the upper extremities consisted of vibratory sensation testing with a C128 Hz tuning fork, light touch testing, deep tendon reflexes, muscle strength testing, and grip strength testing using a Jamar Hydraulic Hand Dynanometer.

Vibration sensation was intact as tested at the 5th distal interphalangeal joints of the upper extremities bilaterally.

Light touch was intact over the C5-T1 dermatomal distributions bilaterally.

Deep tendon reflexes revealed

Muscle (level)	Left	Right

Biceps (C5)	1/4	2/4
Brachioradialis (C6)	1/4	2/4
Triceps (C7)	1/4	2/4
Finger Flexors (C8)	2/4	2/4

Grade	
0	No Response
1	Sluggish or diminished
2	Active or Expected Response
3	More Brisk than expected, slightly hyperactive
4	Brisk, hyperactive, with intermittent or transient clonus

Mosby's Guide to Physical Examination, 4th edition p. 788

Muscle Strength Testing

Muscle	Left	Right
Deltoids (C5)	5	5
Biceps (C6)	3-4	5
Triceps (C7)	5	5
Wrist Extensors (C6)	3	5
Wrist Flexors (C7)	4	5
Finger Flexors (C8)	4-5	5
Finger Abductors (T1)	5	5
Finger Adductors (T1)	5	5

Muscle Function Level	Grade
No evidence of contractility	0
Slight contractility, no movement	1
Full range of motion, gravity eliminated	2
Full range of motiion against gravity	3
Full range of motion against gravity, some resistance	4
Full range of motion against gravity, full resistance	5

Mosby's Guide to Physical Examination, 4th edition p. 707

Dynanometer Testing Measured in Pounds Force (Patient is right-handed)
Testing performed with left forearm supported by right hand

Repetition	**Left**	**Right**
1	22	45
2	18	44
3	18	41
Average	19.33	43.33

Imaging

Plain film imaging studies of the cervical spine revealed no evidence of acute fracture, dislocation, or space occupying lesion with disc space heights unremarkable, as read by the radiologist.

Assessment

Findings are consistent with cervical discogenic pain with left-sided radiculopathy, likely at the C6 level. Considerable muscle strength weakness is present with hyporeflexia, a common sign of a lower motor neuron lesion.

Plan

The patient will be treated with Cox Distraction Manipulation to provide an increase in cervical foraminal area, decrease irritation of the left cervical nerve roots, increase intervertebral disc space height, return physiological range of motion, and decrease the intradiscal pressure (1). Cox distraction Protocol 1 will be used initially, which is 5 repetitions of 4-second distraction pumps repeated for 3 total sets. Protocol 1 will be used until there is a 50% decrease in pain or the radicular pain moves proximal to the elbow. Treatment will be at a frequency of a minimum of 3 visits per week until a 50% decrease in pain and/or increase in Activities of Daily Living are achieved with a goal of reaching these in a one- month period of time. The patient was instructed to use cryotherapy over the cervical spine. The patient contacted her primary care physician and was prescribed Dexamethasone. I instructed the patient to be diligent with her mask wearing and limit her time in stores/restaurants due to the immunosuppressant nature of Dexamethasone. The patient chose, along with her Primary Care Physician, to cease use of the Dexamethasone as she didn't wish to be immunosuppressed during the time of the Covid-19 pandemic. I discussed that a neurosurgical consult will be indicated if progressive muscle weakness occurs or if weakness is still present in four to six weeks.

Results

Results were derived using the patient's subjective reporting, palpatory findings, the Stanford Pain Scale with a 0-10 rating, follow up neurological testing and Dynanometer testing using the Jamar Hydraulic Hand Dynanometer. After two visits, the patient was able to sleep four hours at night time which was a great relief for her. After four visits the pain began to centralize and was occurring more in her left arm with paresthesias but not pain into the right C6 and C7 dermatomal distribution of her hand.

On the 8th visit (9 days after the initial visit), the patient reported a 50% decrease in pain with an increase in functional strength with her left hand. The patient's deep tendon reflexes were 2/4 for all muscles testing for the upper extremity with the exception of the right bicep testing at ¼. Light touch testing was within normal limits for C5-T1 bilaterally. Muscle strength testing at that time revealed:

Muscle	Left	Right
Deltoids (C5)	5	5
Biceps (C6)	4.5-5	5
Triceps (C7)	5	5
Wrist Extensors (C6)	5	5
Wrist Flexors (C7)	5	5
Finger Flexors (C8)	5	5
Finger Abductors (T1)	5	5
Finger Adductors (T1)	5	5

The only weakness was with the right biceps brachii which was close to returning to full strength.

Dynanometer testing measured in pounds force revealed a 100% improvement with her left hand and an 18% improvement on the asymptomatic right hand.

Testing performed with left forearm supported by right hand

Repetition	**Left**	**Right**
1	37	55
2	42	53
3	37	50
Average	38.66	52.67

At the 16th visit (23 days after initial visit), the patient no longer had an antalgic posture of the cervical spine. The patient's rating on the Stanford Pain Scale can be found below.

Stanford Pain Scale with a 0-10 rating

Week of Treatment	Visit Number	Pain Scale	Percent Improvement
Onset	1	10	
1	5	7	30%
2	9	5	50%
3	14	6	40%
4	17	5	50%
5	19	4	60%
6	22	1	90%

Long-term follow up

The patient was examined on 6/16/2020, ten weeks after the initial visit and eleven weeks after the onset of pain. Patient revealed a 1/10 on the Stanford Pain Scale. Light touch was intact over C5-T1 bilaterally. Deep tendon reflexes revealed:

Muscle (level)	Left	Right
Biceps (C5)	1/4	2/4
Brachioradialis (C6)	2/4	2/4
Triceps (C7)	2/4	2/4
Finger Flexors (C8)	2/4	2/4

Muscle strength testing revealed:

Muscle	Left	Right
Deltoids (C5)	5	5
Biceps (C6)	5	5
Triceps (C7)	5	5
Wrist Extensors (C6)	5	5
Wrist Flexors (C7)	5	5
Finger Flexors (C8)	5	5
Finger Abductors (T1)	5	5
Finger Adductors (T1)	5	5

Dynanometer testing revealed:

Repetition	Left	Right
1	55	46
2	66	46
3	63	56
Average	61.33	49.3

The patient was again evaluated 10 weeks following the initial visit with the following results:
Deep tendon reflexes were tested at 2/4 for all levels previously tested for the upper extremities bilaterally. Muscle strength testing was 5/5 for all levels previously tested for the upper extremities. Light touch testing was within normal limits for the C5-T1 dermatomal distribution bilaterally. The patient rated the pain as 0/10 on the Stanford Pain Scale.

Dynanometer testing revealed:

Repetition	Left	Right
1	60	55
2	60	60
3	53	55
Average	57.67	56.67

Discussion:
The patient had shown a considerable improvement after two weeks of treatment and had reached our goal of 50% improvement and had done so in 2 weeks as opposed to our 4-week goal. However, due to the patient having to work from home on a less than ideal work station, she had an exacerbation of her neck pain. The patient again responded favorably to treatment related to her exacerbation. In addition to the patient's pain levels improving significantly, her neurological deficits greatly improved with treatment. The patient showed a considerable improvement with upper extremity strength after 7 visits. Her dynamometer testing revealed notable improvement with a 100% increase in grip strength with her left upper extremity with an over 300% improvement with the long-term follow-up.
Next, we'll evaluate the historical significance of the time period within which the patient was treated. In February a disease caused by the novel coronavirus was classified by the International Committee on Taxonomy of Viruses as SARS-CoV-2 (Covid-19) (2). On March 7, 2020, the first known case of Covid-19 was diagnosed in the Commonwealth of Virginia. By March 31, 2020, 25 deaths were reported related to Covid-19. Just six days later, the day of the patient's first visit, the number of deaths related to Covid-19 in Virginia had climbed to 61 (3). A March 16 report by the Imperial College COVID-19 Response Team predicted with an unmitigated epidemic, that we would experience 2.2 million deaths in the United States alone. This number didn't account for the potential negative effects of an overwhelmed health system which could lead to higher mortality rates (4). Discussions began about "flattening the curve" to limit the spread of Covid-19. Much was unknown about the virus at the time. On March, 24, 2020, the governor of Virginia enacted Executive Order 53. The order called for the cessation of all-in person instruction for grades K-12 for all schools for the remainder of the 2019-2020 season. Additionally, many businesses were ordered to close for a one-month period including all indoor dining establishments as well as a closure of all public access to recreational and entertainment businesses (5). As of

March 31, 2020, the CDC website recommended that "the only people who need to wear a face mask are those who are sick or are caring for someone who is sick and unable to wear a mask". Other experts suggested that wearing a mask would be the most effective way to slow the spread of Covid-19. At the time there was a shortage of many Personal Protective Equipment (PPE). Panic buying occurred with everything from sanitizing devices to paper products at a shortage.

The patient was in a vulnerable position at an unprecedented time in our history. She was experiencing debilitating pain with the possibility of a need for cervical spine surgery. Initially, she injured her neck by carrying heavy loads of books and supplies out of her classroom to prepare for working at home. Exacerbations occurred due to a poor ergonomic work station at home as well as shopping due to the shortage and a need to purchase the supplies needed for her family.

From a healthcare perspective, health care providers were learning about Covid-19 as they went, as they continued to treat their patients. Surgical procedures were being triaged with many surgeries being cancelled. With this particular patient, a medication, Dexamethasone, was prescribed to reduce inflammation. Due to the immunosuppressive aspects of the medication, the patient chose not to receive the medication during the time of the pandemic. Referring patients to their primary care physicians and other physicians became challenging as many offices simply closed and others were in the process of implementing their protocols to be able to see patients. Additionally, patients were hesitant to go into any offices where there may have been at risk of exposure to Covid-19.

Due to the aforementioned and the patient's response to treatment, the patient had little co-management for her cervical discogenic pain with radiculopathy including motor weakness. Cox distraction proved to be vital for this patient as it eliminated the patient's pain, eliminated the patient's neurological deficits, and eliminated the need for surgery during the time of a global pandemic.

References

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