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Cervical Radiculopathy: A Case Report

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CERVICAL RADICULOPATHY: A CASE REPORT

by

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This Scholarly Project, submitted by Kimberly Dobrovolny in partial fulfillment of the requirements for the Degree of Doctor of Physical Therapy from the University of North Dakota, has been read by the Advisor and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.

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ABSTRACT

There is currently little evidence to determine which conservative treatment approach is best for the management of patients with cervical radiculopathy; however, there is evidence these patients benefit from a multi-treatment approach. The purpose of this case is to describe the physical therapy management of a patient with cervical radiculopathy. Physical therapy diagnosis was based on the patient's physical signs and symptoms as well as meeting three of the four criteria of the clinical prediction rule which is used to identify patients with cervical radiculopathy. Results from the examination and evaluation were consistent with the magnetic resonance imaging findings. Physical therapy treatment included patient education, therapeutic exercise, manual traction, and manual therapy. Patient's pain improved from a 9/10 to 0/10 and Neck Disability Index score improved from 46% disability to 0% disability from initial examination to discharge. Following a multi-treatment approach that included patient education, therapeutic exercise, and manual therapy techniques, this patient with cervical radiculopathy experienced decreased pain, increased cervical mobility, improved posture, and was able to return to full-time work duties and prior level of function.

CHAPTER I

BACKGROUND AND PURPOSE

Cervical radiculopathy (CR) is the clinical description of pain and neurological symptoms resulting from irritation of a nerve in the cervical spine. Cervical nerves, C1-8, exit the spine at each level and then branch to supply muscles that allow the shoulders, arms, hands, and fingers to function. They also carry sensory fibers to the skin and muscles to provide sensation. If a nerve root in the cervical spine is irritated through compression or inflammation, the symptoms can radiate along that nerve's dermatomal distribution into the distal upper extremity. While this condition may result in neck pain, the primary symptoms are often upper extremity pain, numbness, and weakness, which result in significant functional limitations.[1,2,3]

Cervical radiculopathy is a common condition with a reported annual incidence of approximately 83 per 100 000 individuals, with a peak prevalence in the fourth and fifth decades of life (203 per 100 000).[4] Disc herniation and osteophytosis are the two most common causes of cervical radiculopathy.[5] In both cases, nerve root impingement and irritation can occur secondary to decreased space available. It is unclear whether there is a predominance based on gender. Some reports have shown CR is more predominant in men, while

others have shown it is more predominant in women. The most common levels affected are C6 and C7.[6]

The diagnostic criteria for CR are not well-defined and no universally accepted criteria for the diagnosis have been established. Imaging studies are most commonly used to diagnose CR. Magnetic resonance imaging (MRI) is considered the reference standard for diagnosing (94% specifity)[7] as it is a noninvasive test that is highly accurate although it can be costly and uncomfortable.[8] While imaging studies are effective in the identification of changes in the spine, these changes do not necessarily correlate with signs and symptoms.[9] Therefore, imaging is commonly used in combination with physical signs and symptoms to confirm diagnosis.

Waldrop[5] developed a clinical prediction rule (CPR) of four clinical tests that demonstrated reliability and accuracy in diagnosing CR. The four items included (1) Spurling Compression Test, (2) distraction test, (3) cervical spine rotation less than 60° to the ipsilateral side, and (4) upper limb tension test. The CPR had 99% specificity when all four items were positive and 94% specificity when three items were positive.[10] These findings suggest clinicians can incorporate a more cost-effective CPR into the examination to help diagnose CR and start appropriate treatment immediately.

The goal of treatment is to eliminate pressure on the nerve root. Conservative interventions are most often used for management of CR, with interventions including therapeutic exercise, postural education, and manual or mechanical cervical traction. Studies indicate some combination of these

interventions may lead to improved outcomes for patients with CR. A systematic review conducted by Boyles et al[11] concluded manual therapy in combination with therapeutic exercise is effective in improving function while decreasing pain and disability. A randomized control trial by Young et al[12] suggested the addition of mechanical cervical traction to a manual therapy and therapeutic exercise-based rehabilitation program yielded no significant additional benefit to function, pain, or disability in patients with CR. The purpose of this case is to describe the physical therapy management of a patient with CR.

CHAPTER II

CASE DESCRIPTION

A 35-year-old male tire mechanic was referred to physical therapy by his primary care physician with a diagnosis of cervical pain secondary to a herniated nucleus pulposus. The onset of pain began two days prior to physical therapy evaluation when he experienced an intense pinch in his neck after closing his car door. He went to the emergency room immediately following the incident due to severe pain. An MRI scan revealed a C5 disc herniation with C6 nerve root compression. He was prescribed Percocet and physical therapy for pain management. He had a history of prescription drug addiction and was hesitant to comply with prescribed medication because of fear of relapse. He reported he took one Percocet in the past 48 hours which resulted in moderate pain relief. He sustained a right brachial plexus injury during birth that resulted in right upper extremity range of motion and strength deficits. He had no concerns with these deficits as he could complete all functional tasks independently. His primary complaint was left-sided neck pain that radiated distally down his left arm to his thumb and index finger. He was left-hand dominant. He was placed on driving restrictions while taking medication, as well as work and 15-pound lifting restrictions. He stated his symptoms generally increased over the course of the day and he had difficulty getting to and staying asleep at night. The patient's

goals were to decrease pain, increase cervical mobility, decrease sleep disturbances, and return to full-time work duties.

The patient completed the Neck Disability Index (NDI), a self-report measure to assess his perceived level of disability and the impact on daily activities.[13] He scored 46% disability which was considered moderate disability. The test-retest reliability of the NDI has been reported to be moderate in patients with CR.[14] Pain was reported at 9/10 (0=no pain, 10=worst pain possible). The patient did not present with any red flags based on history so a physical examination followed.

Examination

The physical examination began with a postural assessment which revealed a forward head and elevated and protracted shoulders. A modified vertebral artery test was completed prior to the physical assessment. In a seated position, the patient extended and rotated his head maximally to the right for 10 seconds, returned to neutral for 10 seconds, and then extended and rotated his head to the left as tolerated for 10 seconds.[15] The patient did not experience any symptoms associated with vertebral artery occlusion. Cervical active range of motion (ROM) was measured over the course of treatment, using a bubble inclinometer as described by Norkin and White[16] (Table 1).

Table 1. Cervical active range of motion findings.				
	Initial Evaluation	**Week 2/Visit 4**	**Week 3/Visit 7**	**Week 4/ Visit 12 (Discharge)**
Flexion	50°, pain-free	54°, pain-free	53°, pain-free	54°, pain-free
Extension	13°, pain throughout	38°, pain at end range	49°, pain-free	50°, pain-free
Right Sidebend	47°, pain-free	48°, pain-free	50°, pain-free	49°, pain-free
Left Sidebend	22°, pain throughout	41°, pain at end range	49°, pain-free	48°, pain-free
Right Rotation	52°, pain-free	58°, pain-free	56°, pain-free	58°, pain-free
Left Rotation	26°, pain throughout	43°, pain at end range	53°, pain-free	55°, pain-free

Bilateral upper extremity active ROM was assessed in a supine position as described by Norkin and White.[16] Deficits were noted in right shoulder flexion and abduction while all other motions were within functional limits and pain free bilaterally. No formal measurements were taken. Bilateral upper extremity gross manual muscle testing was performed in a seated position as described by Berryman Reese.[17] Strength deficits were noted in right shoulder flexion and abduction as well as left elbow flexion and wrist extension. Right shoulder flexion and abduction were graded 3/5 (0=no muscle contraction, 5=able to hold against maximal resistance.) Left elbow flexion and wrist extension were graded 4-/5. Grip strength was assessed using a hand dynamometer and revealed strength within 15 pounds bilaterally. Cervical strength was not assessed due to patient intolerance.

Spurling compression test was performed with the patient in a seated position. The patient's neck was positioned in extension with his head rotated to the left while an axial load was placed on the spine by applying a downward pressure through the patient's head. Spurling compression test was positive as

the patient experienced a reproduction of radicular symptoms into his distal left upper extremity.[18] According to Tong et al,[19] the test is highly specific (93%) for a diagnosis of CR, with low sensitivity (30%). The distraction test was performed in a seated position. The clinician placed one hand under the patient's chin and the other around the occiput then slowly applied an upward force.[2] The distraction test was positive with the patient's radicular symptoms relieved. According to Wainner et al,[10] the test is highly specific for a diagnosis of CR (0.86), with lower sensitivity (0.50).

Neurological tests included deep tendon reflexes and myotomes. Bilateral upper extremity deep tendon reflexes (C5-7) were intact and equal except C6 (biceps) was diminished on the left. Bilateral cervical myotomes were tested in a seated position as described by Magee.[2] C1-T1 myotomes were all negative bilaterally except C6 (elbow flexion/wrist extension) on the left. Palpation of the left upper and middle trapezius, scalenes, levator scapulae, and rhomboid major and minor revealed tenderness and increased muscle guarding.

Evaluation

Based on the physical examination findings, physical therapy services were appropriate to reduce pain and inflammation, improve posture, increase cervical ROM and strength, and improve body mechanics and work ergonomics.

Diagnosis

The patient's medical diagnosis of cervical pain secondary to a herniated nucleus pulposus was confirmed by an MRI. The CPR was used to determine patient's physical therapy diagnosis of CR. The patient had three of the four

items present: positive Spurling compression test, positive distraction test, and cervical rotation less than 60 degrees to the ipsilateral side. The CPR had a 94% specificity when three of the four items were present.[12] The physical examination revealed the patient had signs and symptoms of CR with neurological deficits that were indicative of C6 nerve root compression. These physical findings were consistent with the MRI results. Physical impairments found during the examination included poor posture, limited ROM of the cervical spine, decreased strength of the elbow and wrist, positive Spurling compression test, positive distraction test, and increased tone and guarding of the cervical and scapular musculature.

Prognosis

According to the Guide to Physical Therapist Practice,[20] 80% of patients with CR should achieve expected outcomes within 8 to 24 visits over the course of 1 to 6 months. Cleland et al[4] established a 4-variable model to identify patients with CR who were most likely to achieve optimal recovery with physical therapy interventions. These variables included age of <54 years, dominant arm not affected, symptoms not exacerbated with downward gaze, and multimodal treatment approach including manual therapy, cervical traction, and deep neck flexor strengthening. The patient fit 3 of the 4 variables based on history and physical examination; therefore, his prognosis was very good.

CHAPTER III

INTERVENTION

The patient was seen for a total of 12 visits over a 4 week period. Treatment consisted of patient education, therapeutic exercise, and manual techniques to address impairments found during the examination as well as functional limitations. The goals of therapy were to decrease pain, improve mobility, and improve strength to increase tolerance of functional activities and return to full-time work duties.

Postural Education

During the initial treatment session, the patient was educated on the importance of correct postural alignment during sitting, standing, and activities of daily living. The patient was provided with verbal cues throughout subsequent treatment sessions when necessary.

Manual Therapy

Manual therapy techniques included soft tissue mobilization, cervical traction, and cervical passive ROM/stretching. Soft tissue mobilization was focused on the cervical and scapular musculature that was tender or restricted. The patient was supine with the cervical spine in neutral alignment. Non-painful manual pressure was applied to the soft tissues until the tissue restrictions were released.[21] Manual cervical traction was performed with the patient supine with

the cervical spine in neutral alignment. The therapist's hands were placed as described by Cameron.[22] A slow, gradual static distraction force was applied. Cervical traction was used to lengthen the vertically oriented soft tissues of the neck and decrease the pressure on the discs and nerve roots by causing a vacuum effect to widen the intervertebral disc spaces.[23] The patient reported immediate relief of radicular symptoms with traction. Passive ROM of the cervical spine in all six directions was performed with the patient supine until a mild stretch was felt. All manual techniques were performed to decrease pain and improve mobility.

Strengthening Exercises

Isometric strengthening of the cervical musculature was initiated when pain subsided. The patient was seated with the cervical spine in neutral alignment while the therapist applied resistance in all six directions. The patient progressed to strengthening of the deep cervical flexors and scapulothoracic musculature when able to perform ten repetitions times five second holds with isometric exercises. Chin tucks were performed to target the deep cervical flexors. The patient was supine with the cervical spine in neutral and instructed to flatten the curve of the neck by nodding his head. This position was held for ten seconds and repeated ten times. This was progressed by applying pressure to the chin. Scapulothoracic exercises included serratus anterior, middle and lower trapezius, and rhomboid major and minor strengthening. Scapular retraction was performed in standing while pulling a resistance band with both hands to target rhomboid major and minor. Middle and lower trapezius

strengthening exercises were performed in prone on a physioball using “y” and “t” movement patterns. The patient was instructed to slowly raise his arms as high as possible by squeezing his shoulder blades together then slowly lower his arms to the floor. Dumbbell incline shoulder raises were performed in sitting on an incline bench to target serratus anterior. The patient was instructed to position the weights above his shoulders with elbows extended while raising his shoulders toward the dumbbells as high as possible. Elbow flexion and wrist extension strengthening exercises were performed in standing using dumbbells. All scapulothoracic strengthening exercises were progressed through increasing resistive bands or dumbbells when ten repetitions times three sets were performed at the previous resistance.

Home Exercise Program

After the patient performed the strengthening exercises independently with proper form and no exacerbation of symptoms, he was provided with a home exercise program that included the strengthening exercises performed in therapy. The patient was instructed to perform the exercises twice daily within a pain-free range and discontinue if pain arose. Resistance and repetitions progressed with therapy intervention.

CHAPTER IV

OUTCOMES

After the first week of therapy, the patient demonstrated rapid improvements in pain and function. The patient made significant improvements in posture and regained full cervical mobility and strength. Upon discharge, the patient rated his pain at 0/10 with all activity and scored 0% disability on the NDI. The patient returned to his prior level of function and full-time work duties with no complaints of increased pain which were his goals for therapy.

CHAPTER V

DISCUSSION

This case report describes the physical therapy management of a patient with CR. Physical impairments included limited ROM, decreased strength, and decreased functional ability. Significant improvements were observed following the first week of intervention and were maintained throughout the remainder of therapy as indicated by decreased pain and an improved score on the NDI. Previous research has suggested patients who meet the diagnostic criteria for CR can benefit from a multi-treatment approach that includes a combination of cervical traction, manual therapy, and therapeutic exercise [5,24,25] while more recent research suggests the addition of cervical traction to a multi-treatment approach of manual therapy and therapeutic exercise results in no additional benefit to pain, function, or disability in patients with CR.[12] Cleland et al[4] reported patients with CR who received a multi-treatment approach had a more positive outcome when compared to those who received a single intervention. The patient in this case received an intervention program that included manual therapy techniques and therapeutic exercises that targeted the deep neck flexors and scapular stabilizers. Since the patient demonstrated a positive Spurling compression and distraction test, he received manual cervical traction as it was assumed to be beneficial in alleviating radicular symptoms.

The McKenzie protocol, which has been commonly utilized in low back conditions[26], may also be utilized in the treatment of cervical pain. The McKenzie method is based on the centralization of pain theory. This theory suggests pain is progressively eliminated in a distal to proximal direction until all symptoms are completely abolished.[27] This system been shown to be a good predictor of successful conservative treatment outcomes in low back pain.[28] While McKenzie exercises have been shown to be a beneficial for low back conditions, there is a need for further research to determine its benefits for cervical conditions.

Future research should investigate the likelihood of spontaneous resolution of radicular symptoms by including a control group. This would help determine if spontaneous recovery occurs and the length of time for recovery without intervention.

Reflective Practice

Based on current research, the incorporation of manual cervical traction was not necessary for this patient as several studies have concluded there is no additional benefit when cervical traction is combined with manual therapy and therapeutic exercise. The patient may have had similar outcomes with fewer therapy sessions and a more aggressive home exercise program. Research indicates the average treatment program for CR is two times per week for an average of 4.2 weeks[12] while this patient was seen twelve times of the course of four weeks. The patient could have benefited from McKenzie cervical spine exercises instead of cervical traction and manual therapy as the McKenzie

progression is more easily performed independently as a home exercise program, resulting in fewer in-clinic treatment sessions and decreased costs.

Conclusion

Patients with CR present with a variety of symptoms including neck and radiating arm pain that may be linked to several factors. Currently, there is little evidence to support the best conservative treatment approach for these individuals; however, there is research that supports a multi-treatment approach that includes manual therapy and therapeutic exercise. Although a cause-and-effect relationship cannot be inferred from a case study, in this case, a multi-treatment approach that included postural education, cervical traction, manual therapy, and therapeutic exercise was associated with a significant decrease in pain, improved cervical mobility, and increased functional ability for a patient with CR. Current research suggests the implementation of cervical traction in addition to therapeutic exercise and manual therapy yields no additional benefits or improved outcomes for patients with CR. Further research investigating the effects of cervical traction with varying forces is necessary.

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