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TREATMENT OF A 41 YEAR OLD MALE STATUS/POST MVA WITH RADICULAR SYMPTOMS IN THE LEFT ARM AND SCAPULA: A CASE REPORT

By

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B.A., Governors State University, 2010

CAPSTONE PROJECT

Submitted in partial fulfillment of the requirements

For the Degree of Doctor of Physical Therapy

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University Park, IL 60484

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Abstract

Background and Purpose: Motor vehicle accidents with a whiplash mechanism of injury are one of the most common causes of neck injuries, with an incidence of perhaps 1 million per year in the United States. The purpose of this case report was to examine the progress of a patient with symptoms of cervical radiculopathy through a conservative treatment approach. Case Description: The patient was a 41 year old (y.o.) male status/post (s/p) a rear end collision 1 month prior and was experiencing neck pain and radicular left arm and scapular numbness and tingling. Interventions occurred in an outpatient physical therapy clinic for 1 hour sessions 3 times per week. Outcomes: Over the course of a 5 week treatment program, the patient improved significantly through intervention. Interventions included cervical retractions, isometric exercises, cervical traction, soft tissue mobilizations, and TENS therapy. The most significant improvements included abolishment of symptoms in the left arm and an NDI score of 13/100 (45/100 at initial evaluation). Discussion: A conservative treatment program for a patient with cervical radiculopathy may be an effective option in reducing symptoms of pain and parasthesia (numbness and tingling) and improving cervical active range-of-motion (AROM) and postural stability.
INTRODUCTION

Motor vehicle accidents with a whiplash mechanism of injury are one of the most common causes of neck injuries, with an incidence of perhaps 1 million per year in the United States. As a result of sustaining a whiplash injury, many people experience symptoms associated with cervical radiculopathy. Cervical radiculopathy is a disease process marked by nerve compression from herniated disc material or arthritic bone spurs. This impingement typically produces neck and radiating arm pain or numbness, sensory deficits, or motor dysfunction in the neck and upper extremities. Patients usually present with complaints of pain, numbness, tingling, and weakness in the upper extremity, which often result in significant functional limitations and disability. Intervertebral discs are structures found in between the spinal vertebral bodies from the neck to the sacrum. The discs absorb stress applied to the spine and allow six degrees of freedom where the largest motion present is in the sagittal plane (flexion/extension). It has been argued that despite the lack of definitive diagnosis, once red flag signs for conditions such as tumor, infection and fracture have been ruled-out, a course of conservative treatment focused on restoring overall function is indicated. Outcomes such as better pain reduction, better patient satisfaction, improved function, increased range of motion and increased strength in people with neck pain have been reported in patients who received manual therapy alone or in combination with other modalities.
Surgical intervention is also a viable option for patients experiencing neck pain with radicular symptoms. One study reported that 26% of those who undergo surgery continue to experience high levels of pain at a 1-year follow-up. Research suggests patients treated conservatively experience superior outcomes to patients treated surgically. The purpose of this case report was to examine the progress of a patient with symptoms of cervical radiculopathy through a conservative treatment approach.

**CASE DESCRIPTION**

**Patient History**

The patient was a 41 y.o. Caucasian male who was involved in a rear end collision 30 days prior to the onset of physical therapy. Preceding treatment, the patient reported taking steroids and muscle relaxants prescribed by his physician. The patient reported no change in his symptomology while on the medications prescribed during that time period. The patient’s chief complaints included: generalized neck pain, numbness and tingling down the left upper extremity, and a constant dull pain along the inferior border of the left scapula. He continued to work full time as a painter following the motor vehicle accident (MVA), which exacerbated his symptoms. His reported primary functional limitations included turning his head while driving and extending his head back to look up while painting.
His goal for seeking physical therapy was to abolish his symptoms of pain and paresthesia and return to his role as a husband, father, and painter.

**Examination**

Upon initial examination, the patient demonstrated poor posture characterized by a forward head and rounded shoulders. The patient presented with a pain level of 4/10 on the visual analog scale for pain (VAS) in his neck. In a study done by Boonstra et al, it was found that the reliability of the VAS for patients with pain was good (0.60-0.77, \( P \) value 0.03).\(^8\) However, the validity of the VAS was not confirmed because of a weak-to-moderate correlation with a concurrent validity measure and a strong correlation with pain intensity.\(^8\) He was unable to turn his head to the left or look up without an increase in pain. His chief complaints included numbness and tingling traveling down his left arm and a dull ache near the inferior border of his left scapula. The patient denied any other prior episodes or exacerbations related to his complaints.

**Systems Review**

A neuromuscular screening of the cervical spine was performed and included a positive Spurling’s compression and distraction test, peripheralization of symptoms with cervical flexion, and centralization of
symptoms with cervical retraction. Spurling’s compression and distraction test was performed according to Wainner et al.\textsuperscript{9} Spurling’s test is highly specific for a diagnosis of cervical radiculopathy (specificity=0.86), with lower sensitivity (0.50).\textsuperscript{9} The reliability of Spurling’s test is moderate ($K=0.60$).\textsuperscript{9} Furthermore, the examination revealed an absent left biceps tendon reflex test, a positive median nerve tension test accompanied by impaired sensation to light touch, and decreased strength at the C5, C6, and C7 myotomes. A screening of the musculoskeletal system found decreases in cervical AROM when compared to normal values\textsuperscript{10} and limited mobility and tenderness of the upper thoracic vertebrae. The Neck Disability Index (NDI) is a questionnaire designed to give the physical therapist information as to how the patient’s neck pain is affecting their ability to manage in everyday life. The NDI contains 10 items, seven related to activities of daily living, two related to pain, and one related to concentration. Each item is scored from 0 to 5 and the total score is expressed as a percentage, with higher scores corresponding to greater disability.\textsuperscript{11} The NDI has been found to have positive test/retest reliability ($r=0.90$) and is a useful predictor of measuring disability in patients with cervical radiculopathy.\textsuperscript{12} The NDI was administered during the initial evaluation and the patient scored a 45 out of a possible 100. This indicated that moderate activity caused significant pain. In addition, the cardiopulmonary and integumentary systems were examined and found to be unimpaired.
Clinical Impression

Based on the location and description of the symptoms reported by the patient, the numbness and tingling sensation in the arm and pain in the upper back were believed to have originated from nerve roots in the cervical spine. This led to the screening of the neuromuscular system that confirmed the involvement of at least one cervical nerve root. The nature of the injury also offered foresight into what the key contributor to the patient’s symptoms may be. This patient had characteristics typical of someone with cervical nerve root compression and was considered to be a good candidate to receive conservative intervention.

TESTS AND MEASURES

Active Range-of-Motion

Cervical AROM was measured using an inclinometer. Inclinometers are fluid-filled goniometric instruments that depend on gravity. Cervical flexion and extension were both measured with the inclinometer placed longitudinally and held at the apex of the skull. Left and right side-bending were also measured with an inclinometer but in a horizontal orientation. Rotation to either side was measured with the patient lying on his back and the inclinometer placed on his forehead. The patient rotated his head to either side for the measurement to be taken. Research suggests that single
inclinometry provides good reliability when measuring active motion, but clinical validity has not been adequately determined because there is no true gold standard.13 Reliability coefficients for cervical spine ROM parameters range from 0.81 to 0.84.9 The measurements taken were used to determine the patient’s progress during the course of therapy. The measurements are documented in Table 1.

**Neurovascular Integrity**

Biceps tendon reflex integrity was assessed using a Babinski reflex hammer with the patient in a seated position and his arm supported by the examiner. The examiner’s thumb was placed directly over the patient’s biceps tendon applying a firm amount of pressure while tapping the reflex hammer on his thumb to illicit a response. The test yielded no response and was graded 0. The biceps tendon reflex is associated with the C5-C6 spinal level. Sensation was impaired and was described as “needles” throughout his arm by the patient, which is a clear sign of nerve irritation. Specific dermatomes were not tested. The median nerve tension test was performed with the patient in the supine position. With the examiner at the patient’s side, maximal length of the median nerve was achieved with shoulder depression, 90 degrees of shoulder abduction, elbow flexion, forearm supination, ulnar deviation, and full wrist and finger extension. From this
position the examiner passively extended the patient’s elbow until the patient reported a tingling sensation in the arm. At that point the examiner measured the degree of elbow extension with a goniometer. Further evaluation of nerve root compression was performed with the patient supine and the examiner providing a manual traction force at the occipital-atlantal (OA) junction. This was followed by a response of symptom relief by the patient. The results of these tests and measures can be found in Table 1. The reliability coefficients for the items of clinical examination and their associated 95% confidence intervals (CIs) are listed in Table 2.9

**Strength**

The ability for a muscle or group of muscles to properly perform is directly related to the nerve(s) that innervate the muscle(s). If the source or root of a nerve is compressed, then all of the tissues related to that nerve will be affected. Since the patient did not have any diagnostic imaging done, the best way to specify the level of the spine at which the nerve root was compressed was by examining the strength of individual muscles, or myotomes. Manual muscle testing (MMT) was performed by using the “break test” to compare the strength of one side of the body against the other to identify abnormalities. The patient was instructed to maximally contract the respective isolated muscle during the test. There was a
noticeable decrease in strength on the left side as compared to the right in the supraspinatus, infraspinatus, deltoid, biceps, and wrist extensor muscles. The weakness in these muscles is directly associated with the C5 and C6 nerve roots.

**Table 1**

<table>
<thead>
<tr>
<th>Date</th>
<th>AROM (degrees)</th>
<th>Reflex Integrity (Bicep C5,6)</th>
<th>ULTT (median nerve)</th>
<th>NDI Score</th>
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<td>Ext</td>
<td>LRot</td>
<td>RRot</td>
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<td>Normal ROM Values</td>
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**Table 2**

<table>
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<tr>
<th>Examination Test</th>
<th>Sn 95 CI</th>
<th>Sp 95 CI</th>
<th>LR- 95 CI</th>
<th>LR+ 95 CI</th>
</tr>
</thead>
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<tr>
<td>Dermatome Testing</td>
<td>0.29 (0.08-0.51)</td>
<td>0.86 (0.77-0.94)</td>
<td>0.82 (0.60-1.1)</td>
<td>2.1 (0.79-5.3)</td>
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<td>Manual Muscle Testing</td>
<td>0.24 (0.03-0.44)</td>
<td>0.94 (0.88-1.0)</td>
<td>0.82 (0.62-1.1)</td>
<td>3.7 (1.0-13.3)</td>
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<tr>
<td>Biceps Brachii Reflex Test</td>
<td>0.24 (0.3-0.44)</td>
<td>0.95 (0.90-1.0)</td>
<td>0.80 (0.61-1.1)</td>
<td>4.9 (1.2-20.0)</td>
</tr>
<tr>
<td>Spurling’s Test</td>
<td>0.50 (0.27-0.73)</td>
<td>0.74 (0.63-0.85)</td>
<td>0.67 (0.42-1.1)</td>
<td>1.9 (1.0-3.6)</td>
</tr>
<tr>
<td>Upper Limb Tension Test A</td>
<td>0.97 (0.90-1.0)</td>
<td>0.22 (0.12-0.33)</td>
<td>0.12 (0.01-1.9)</td>
<td>1.3 (1.1-1.5)</td>
</tr>
</tbody>
</table>

Sensitivity = Sn; specificity = Sp; negative likelihood ratios = LR-; positive likelihood ratios = LR+; 95 CI = 95% confidence intervals.
EVALUATION

Based on the additional information gained from the tests and measures portion of the examination, the consensus was that there was a disc herniation causing nerve root compression at the C5-C6 level. Pain radiation can vary depending on the involved nerve root, although some distributional overlap may exist. Intervention procedures were guided by patient responses to treatment. The goal of the interventions was to regain mobility of the spine, improve overall mobility, and increase stability of the supporting musculature of the cervical spine.

Diagnosis

The diagnosis for this patient was cervical radiculopathy with a disc herniation at the C5-C6 spinal levels. The patient’s neck pain and associated radiating symptoms into the left upper extremity and scapula were adversely affecting his everyday life. The most relevant limitations included the ability to turn his head while driving and extending his head to look up while painting. These functional limitations significantly impacted the patient’s ability to continue to work full time and drive safely.
Prognosis

Given that this patient was middle-aged and presented with no other significant health related issues, the prognosis for returning to his prior level of function is excellent. Most patients with cervical radiculopathy have a favorable prognosis. A large epidemiologic study demonstrated that over a five year follow-up period, 31.7 percent of patients with symptomatic cervical radiculopathy had symptom recurrence and 26 percent needed surgical intervention for intractable pain, sensory deficit, or objective weakness. Based on the tests and measures that yielded positive results for cervical nerve root compression during the examination, the patient was likely to have a positive response to a conservative approach to intervention.

INTERVENTION

The intervention procedure was created to address the symptoms of parasthesia as well as promote stability in the cervical and thoracic spine by strengthening the associated musculature. Table 3 describes the sequence of which the interventions were given to the patient. The patient was treated for 1 hour sessions 3 times per week for 5 weeks. During the initial evaluation, cervical neck retraction and postural education were the only interventions given to the patient to control variables during treatment. Neck retractions were instructed by having the patient touch his fingers to
his chin and bring his head directly backwards. By having his fingers on his chin he was less likely to flex or extend his head during the exercise. The patient’s postural abnormalities were first addressed. The patient’s head and spine were manually placed in proper postural alignment, using a mirror for biofeedback purposes. The patient was educated on the importance of correct posture during activities of daily living, as well as sleeping postures. After the initial treatment session, the patient reported having less pain (5/10) in the neck and a decrease in symptoms in the left arm. During the second week, the physical therapist decided to include soft tissue mobilization and moist heat to the cervical and thoracic spine as additional interventions. Soft tissue mobilization was performed after 15 minutes of moist heat on the posterior neck musculature, which was believed to be contributing to the patient’s symptoms. Moist heat was applied to increase extensibility by warming up the muscle tissue. Next, the therapist addressed the neural mechanosensitivity exhibited by the positive median nerve tension test. This was addressed with manual cervical traction in addition to soft tissue mobilization to the left upper quarter musculature. The patient responded well to these interventions and reported abolishment of all radicular symptoms during manual cervical traction. Mechanical cervical traction was added as an intervention because it has been shown to decrease pain and perceived disability in patients with cervical radiculopathy; however, no standard parameters have been reported. In
theory, traction distracts the neural foramen and decompresses the affected nerve root. The patient received cervical traction for 15 minutes set at an incline of 10 degrees of flexion with 20 pounds of applied force. As treatment progressed, interventions were added based on if there was a positive response from the patient. Isometric exercises of the neck were administered by placing a theraband around the patient’s head while the therapist applied a fair amount of resistance to the theraband for a 5 second period in a given direction. The patient was instructed to maintain the position of his head throughout the exercise. The patient performed a total of 2 sets of 10 repetitions in all 4 directions. To address the patient’s hypomobility of the thoracic spine, the therapist added stretching of the paraspinal muscles by having the patient flex his upper body and trunk over a Swiss Ball while seated at the edge of a chair. The next phase of treatment concentrated on improving the strength of the postural muscles and deep neck flexor muscles. The strengthening of the patient’s postural muscles was achieved by having the patient perform repeated scapular retraction exercises with a theraband. The patient would perform these exercises by standing with his feet staggered. He pulled the theraband attached to the wall towards his body while retracting his shoulders and scapulae. Neck retraction during scapular retraction was introduced once the patient demonstrated the proper technique of the exercise. The patient was given a home exercise program (HEP) including neck and scapular
retractions. Deconditioning of cervical deep neck flexors was also addressed through exercise.\textsuperscript{13} Deep neck flexor exercises were performed with the patient in supine while he attempted to bring his chin to his chest without activating the sternocleidomastoid (SCM) muscles. Stretching of the upper trapezius muscles was performed by the patient using a towel to depress the left shoulder while side bending his head to the right. This was done 5 times on both sides in 30 second intervals. To improve upper cervical extension, a towel was used to stabilize the lower cervical vertebrae while the patient actively extended his head. The provided stabilization stopped the onset of pain during extension. The final phase of treatment included the addition of transcutaneous electrical nerve stimulation (TENS) to the upper trapezius muscle. TENS was administered for 15 minutes with a cold pack applied to the neck. This was performed during the patient’s last recorded therapy session to decrease neck pain further than reported. In a study done for patients with myofascial neck pain, TENS seemed to relieve pain better than placebo.\textsuperscript{14}
### Table 3

<table>
<thead>
<tr>
<th>Week #</th>
<th>Interventions</th>
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<tr>
<td>1</td>
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<tr>
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</tr>
<tr>
<td>5</td>
<td>5 6 8 9 10 11 12**</td>
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</table>

1) Postural education 7) Mechanical cervical traction
2) Neck retractions 8) Scapular retractions
3) Soft tissue massage 9) Thoracic spine stretches
4) Upper trap stretch (active) 10) Deep neck flexion
5) Moist Heat 11) Grade I & II mobilizations
6) Isometric strength exercise 12) Electrical stimulation

### Outcomes

The patient responded favorably to all interventions that were administered during the course of physical therapy treatment. After the first week of treatment, the patient reported a significant decrease in symptoms of the left arm and neck. During the second week, the patient had a complete abolishment of symptoms in the left arm as well as a noticeable improvement in posture. Follow-up measurements were taken throughout the patient’s course of treatment, which are located in Table 1. The patient’s bicep tendon reflex, sensation, strength, and cervical AROM significantly improved after 3 weeks. Flexion improved from 25 degrees to 35 degrees, but it was still 15 degrees below the normal range. Extension
increased from 35 degrees to normal functional limits. Rotation to the left improved from 45 degrees to 80 degrees. Side bending toward the left increased 17 degrees. However, the patient still lacked the final 10 degrees to be considered normal. Following the third week of treatment, the patient plateaued as far as radicular symptoms were concerned. The dull ache near the patient’s left inferior border of the scapula ceased to improve with added interventions. On the other hand, the patient’s tolerance to exercise continued to improve. It is unknown whether these symptoms decreased after the addition of electrical stimulation to the area, as that was the last recorded treatment session for the patient. The patient completed the NDI during the final week and scored significantly lower (13/100), indicating he was able to perform his daily activities with symptoms.15

Discussion

The purpose of this case report was to examine the outcomes of a patient with cervical radiculopathy through a conservative approach with interventions. The patient responded quite favorably in this case to the interventions administered. There were noticeable and significant changes in all aspects of the patient’s original complaints prior to treatment. However, this may or may not have been a direct cause of the interventions used. The patient could have improved with general movement and the natural healing process as well. All of the tests and measures chosen for the
patient were well researched and established as reliable and valid sources of objective information. The outcome assessment, NDI, is also a widely used index for patients experiencing pain and symptoms associated with neck related disorders. A treatment program for a patient with cervical radiculopathy may be an effective option in reducing symptoms of pain and parasthesia and improving cervical AROM and postural stability.
References


