

REVIEW OF THE FUNDAMENTAL HISTORY, PHYSICAL EXAMINATION AND DIAGNOSTIC PROCEDURES IN THE ASSESSMENT OF CERVICAL RADICULOPATHY

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ABSTRACT

Objective: Cervical radiculopathy is a form of neck pain whose misdiagnosis may result in disability. Although hallmarks of the condition have been identified they are not always consistent, making diagnosis difficult. This paper reviews the history, physical examination and diagnostic procedures recommended for the assessment of cervical radiculopathy.

Method: PubMed, Medline and Google Scholar were searched to identify relevant papers published between 1980- 2020. Search terms included individual use of or a combination of cervical radiculopathy, cervical spondylosis, cervical disc herniation, cervical assessment, cervical imaging, cervical diagnosis, neck pain and neck conditions.

Results: The search identified 24 papers. Although authors generally agreed that a thorough evaluation- including an in-depth history, physical examination and use of diagnostic procedures- are recommended for the workup of cervical radiculopathy, there can be variability. This was present in the selection of provocative tests meant to identify cervical radiculopathy. A novel solution to this variability involving cluster testing has been proposed. This increases the probability of correctly diagnosing cervical radiculopathy.

Conclusion: The results of this review indicate that cervical radiculopathy warrants a thorough assessment to ensure the highest likelihood of correct diagnosis. (*J Contemporary Chiropr* 2020;3:101-105)

Key Indexing Terms: Cervical Radiculopathy; Cervical Spondylosis; Disc Herniation; Cervical Assessment; Cervical Imaging; Neck Pain

INTRODUCTION

30-50% of the American population complains of neck pain in a given year. (1) Neck pain can take many forms one of which is cervical radiculopathy (CR). Although the majority of cases of CR have positive outcomes with conservative care, some may result in a debilitating condition with lasting impact. This paper reviews the diagnostic procedures used with cervical radiculopathy so practitioners may better serve their patient's needs.

DISCUSSION

Cervical radiculopathy can be defined as pain in a radicular pattern in 1 or both upper extremities due to compression and/or irritation of 1 or more cervical nerve roots. Signs and symptoms include sensory, motor and reflex changes as well as dysesthesias and paresthesias related to nerve root(s) without evidence of spinal dysfunction. (2) However, this may vary and may not be consistent. (3) Common hallmarks are pain, sensory loss and motor weakness in the distribution of the nerve root. Neck pain may be evident with radiation into the ipsilateral arm in a dermatomal distribution. However, an absence of arm pain does not exclude the presence of cervical radiculopathy. In addition to radiation into the upper extremity, patients may complain of sensory loss in the same dermatome and weakness along the corresponding myotome. (4)

A study of 846 patients with cervical radiculopathy found the prevalence of signs and symptoms was: 99.4% arm pain; 85.2% sensory deficits; 79.7% neck pain; 71.2% reflex deficits; 68.0% motor deficits; and 52.5% scapular pain. This was followed in descending order by anterior chest pain, headache, anterior chest and arm pain, and left-sided chest and arm pain. All of these were reported in a low percent of cases. (5)

The incidence of cervical radiculopathy has been estimated at 83.2 per 100,000, with a higher frequency in

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Table 1. Table Root Patterns (24)

Root	Level	Pain Distribution	Motor Abnormality	Sensory Abnormality	Reflex Abnormality
C4	C3-C4	Lower neck, Trapezius	Usually none, Deltoid	Upper shoulder	N/A
C5	C4-C5	Neck, shoulder, lateral arm	Supra-infraspinatus	Lateral arm	Biceps
C6	C5-C6	Neck, radial arm, thumb	Biceps, wrist extension	Lateral forearm, thumb	Brachioradialis
C7	C6-C7	Neck, lateral forearm, middle finger	Triceps, wrist flexion, finger extension	Dorsal mid-forearm, 3 rd digit	Triceps
C8	C7-C8	neck, medial forearm, ulnar digits	Finger flexion	4 th , 5 th digits, medial hand, forearm	N/A
T1	C8-T1	Ulnar forearm	Intrinsics	Proximal ulnar forearm	N/A

men (107.3 per 100,000) than women (63.4 per 100,000). (6) Causes of cervical radiculopathy vary by age. Cervical radiculopathy experienced by patients under 40 has been linked to disc herniation and direct pressure on a corresponding nerve, while those over 55 appear to be most related to spondylosis or degenerative change. (7)

Overall spondylosis is reported to account for approximately 70% of cervical radiculopathy cases, while disc herniation comprise 20%. (6) The remaining 10% of cases are related to tumors, trauma or instability. (8) As previously noted, signs and symptoms commonly follow the distribution of the nerve root involved. The roots most often involved include C5-C8, with C7 nerve root most common. (4) (TABLE 1.)

History

Evaluation of cervical radiculopathy begins with a detailed history following the OPQRST format [O (onset), P (pain provocation), Q (quality of pain), R (radiation or referral), S (severity), T (time frame)]. This widely accepted process is essential when assessing cervical radiculopathy. Additional information to be collected includes prior episodes of symptoms, past medical and surgical history, previous tests and treatments if performed, medication use, family history and social history (including use of tobacco, alcohol and exercise) and sleep habits.

Cervical radiculopathy has an insidious onset, with radiating pain into the upper extremity or scapular region, altered sensation along a dermatome pathway, relief of symptoms with hand placed on top of head, and provocation with head extended, rotated and/or laterally flexed to the side of involvement.

Antecedent events and risk factors include physical exertion or heavy lifting, previous cervical or lumbar radiculopathy, smoking, driving equipment that vibrates and playing golf. (4) The incidence of trauma, however, is low since 30% of patients have a benign onset related to sitting, standing or walking. (4)

Classically, patients with cervical radiculopathy have discomfort or pain that may or may not have a triggering episode, as well as altered sensation and pain in the corresponding dermatome. This may vary and is not always consistent.

Physical Examination

Evaluation of cervical radiculopathy requires a thorough physical examination followed by provocative tests and diagnostic procedures. The examination begins with observation. Individuals with CR may hold a rigid neck posture with their head tilted away from the side of involvement. Loss of lordosis of the cervical spine may also be present in older individuals, potentially reflecting underlying degenerative change contributing to their condition. (9)

Palpation may find tenderness along the cervical musculature, more pronounced on the side of involvement, potentially extending into the scapular region, upper brachium and lower arm. Bony structures of the cervical spine should be palpated for tenderness and pain, especially if an acute onset has been reported. Active range of motion may cause pain with cervical extension, rotation and lateral flexion toward the side of complaint. Cervical extension is thought to be the most provocative (10) although each movement may be irritating.

Muscle Strength Testing

An essential element of the physical exam is the neurological evaluation including testing of strength, muscle stretch reflexes and sensation. Collecting information

about the status of a patient's myotomes, dermatomes and reflexes is critical in assessing CR. Diminished stretch reflexes, motor weakness and sensory loss have been found to correlate with surgical findings 82%, 77% and 65% of the time. (11)

Motor Deficits

Motor deficits follow the myotomal pattern of the nerve root involved. (Table 1). For example, a patient with involvement of the 7th cervical nerve root would have strength loss of the triceps, wrist flexors and finger extensors.

Deep Tendon Reflexes

Yost (11) found diminished reflexes in 82% of cases of CR when correlated to surgery. Although absent, diminished and hyper-reactive reflexes need to be carefully evaluated. Asymmetry of reflexes can be equally significant. In particular, asymmetry of C5, C6 and C7 deep tendon reflexes suggests presence of CR. (12) (See Table 1)

Sensory Assessment

Sensory Assessment should include light touch and pin prick along the dermatome pattern to assess for anesthesia or hypesthesia. Pinprick sensation has been found to be more reliable than light touch in people with mild CR. (13)

Provocative Tests

Several provocative tests indicate the presence of CR. The most commonly used is Spurling's Test, where combinations of cervical extension, rotation, lateral flexion and axial compression may reproduce the patient's symptoms. Studies assessing Spurling's Test's ability to identify CR have demonstrated sensitivity ranging from 30-100% and specificity 75-100%. Other commonly used tests and maneuvers used to examine for CR and their level of efficacy are presented in Table 2.

The variability of results raises the question of which provocative tests to use when diagnosing CR. The answer may lie in a concept referred to as "cluster testing." Wainner (14) found that a "cluster" of positive tests consisting of the Upper Limb Tension Test, Cervical Distraction, Spurling's and provocation with rotation to the side of involvement strongly suggested CR. When 3 of these tests were positive, the likelihood of CR was 65% and if all 4 were present the likelihood of CR increased to 90%.

The ability of this cluster to pinpoint CR is also apparent when the positive likelihood ratio (LR positive) is

examined. When all 4 tests are positive the LR+ is 30. A LR+ more than 10 is felt to be large, making the impairment in question likely. If 3 of 4 tests are positive, the LR decreases to 6 but the probability of the impairment existing is still moderately high. (15) Independent of "cluster testing," Wainner found the most accurate test for identifying CR was the Upper Limb Tension Test (ULTT). ULTT has been lauded by others (16) who found its effectiveness and reliability similar to the Straight Leg Raise, the gold standard for lumbar radiculopathy.

Diagnostic Procedures

X-Ray

Imaging can be valuable in assessing a patient with CR. Practitioners should be aware of subjecting patients to unnecessary procedures that provide limited information. (17) Plain film radiography is frequently used in the assessment of CR. However, plain film studies have limitations since cervical plain films have been shown to have low sensitivity and specificity for identifying nerve root lesions. (17) Additionally, x-ray only identified 57% of osteophytes and 32% of joint abnormalities. (18)

Many degenerative changes seen on radiographs of patients with CR are also seen on radiographs of asymptomatic patients, making the predictive value of routine plain films even more questionable. The main purpose of performing x-rays for CR is to rule out fracture, dislocations, instability, spondylosis, spondylolisthesis or disease processes that warrant immediate referral. X-rays are also justified if there is a recent history of trauma, or if care has been rendered and the patient is not responding as expected.

MRI

Although MRI is not a prerequisite for diagnosing CR it is the imaging of choice for its assessment. The reliability of MRI for identifying CR has been found to be variable. (19) Nardin found just 57% of patients who had CR had a positive MRI. Askhan (20) found the sensitivity of MRI for CR to be 93%. Several other studies have correlated MRI findings with post-op outcomes, particularly with T2 hyper-intensity and T1 hypo-intensity. Like other imaging studies, MRI also has a history of abnormal neurological findings in asymptomatic individuals. (21)

Table 2. Provocative Tests

Test/Maneuver	Sensitivity	Specificity
Cervical Distraction	44%	90-97%
Valsalva Maneuver	22%	94%
Shoulder Abduction Test	17-78%	75-92%
Upper Limb Tension Test	72-83%	11-33%

MRI is clearly warranted if there's suspicion of an abscess, malignancy, myelopathy, persistent or progressive neurological symptoms. MRI is not necessary to diagnosis CR. If used, it should be carefully correlated with the history and physical exam findings to ensure diagnostic accuracy.

Computed Tomography

Computed Tomography (CT) is particularly useful for visualizing bony processes; however, it's limited ability to detect soft tissue lesions and radiation exposure has caused CT to be supplanted by MRI for identifying CR. CT may be used as an alternative for patients who have a contraindication to MRI (4), or to clarify the existence of nerve root impingement in patients with equivocal MRI findings (22)

Electrodiagnostics

Electrodiagnostic tests such as needle EMG and nerve conduction studies may assist in identifying CR and differentiating it from other causes. On its own, EMG has a relatively poor predictive capacity to identify nerve root compression. In 1 study, less than half of patients with a positive EMG had nerve root compression at the time of surgery while 93% of those with a positive MRI did. (10) Electrodiagnostic studies should be carefully correlated with the history and physical exam findings and providers should keep in mind a normal study does not rule out CR. (22) Electrodiagnostic studies may act as an important adjunct assisting in the investigation of CR when the physical examination is inconclusive or patients have vague symptoms. (10) The timing of EMG testing warrants consideration as positive sharp waves and fibrillation potentials- hallmarks of neurological distress- typically don't appear until 18-21 days after the onset of the condition. In instances where there's a recent onset practitioners may want to use this as a guide with their orders.

CONCLUSION

Cervical radiculopathy (CR) is a common condition of the cervical spine marked by variability, making it's identification challenging. With a better understanding of history, examination and imaging procedures known to assist in identifying cervical radiculopathy, providers will be better able to identify this condition and help patients avoid the disability that may ensue.

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