

Cervical Radiculopathy

Diagnosis and treatment

BY BAYARD C. CARLSON, MD

Cervical radiculopathy is a clinical diagnosis that involves pain, numbness or tingling that starts in a patient's neck and radiates down the arm. Pain is the most typical symptom encountered; however, patients can complain of sensory or motor deficits as well. The symptom pattern classically follows a dermatomal pattern in which the symptoms are isolated to the area of a specific cervical nerve root; however, atypical presentations are often encountered.

There are eight cervical nerve roots in the cervical spine, labelled C1 through C8. These nerve roots exit the spinal cord and then leave the cervical spinal canal through an anatomic structure called the neuroforamen. Once they leave the cervical spine, they converge in specific patterns to form the brachial plexus and subsequently enter the upper extremity as components of named peripheral nerves. Cervical radiculopathy arises when these nerve roots are compressed within the cervical spine. This compression results from a variety of causes. Acute disc herniations can lead to compression of nerve roots either within the neuroforamen or at the site where the nerve root exits the spinal cord. More chronic compression can result from loss of disc height, cervical facet joint hypertrophy or from chronic disc herniations. All of these pathologies ultimately create a situation in which the cervical nerve root lacks enough space as it is leaving the spinal canal; this compression leads to nerve root irritation and ultimately the symptoms of cervical radiculopathy.

Patient Presentations

Patients who present with cervical radiculopathy often complain of pain or neurologic symptoms such as numbness, tingling

or weakness affecting one arm. A majority of the time, pain is the predominant complaint patients describe; however, sensory changes, neck pain, motor deficits, scapular pain, chest pain and headaches can also be associated with cervical nerve root compression. Classically, each nerve root has a specific distribution and characteristic symptoms that present when the nerve root experiences pathologic compression. The C2 and C3 nerve roots tend to present with occipital headaches. The C4 nerve root, when irritated, classically presents with trapezial pain. The C5 nerve root presents with pain in the shoulder and lateral arm, but can also be associated with weakness of the deltoid. The C6 and C7 nerve roots are the most commonly affected nerve roots. The C6 nerve root tends to present with pain that radiates from the neck down into the radial forearm and into the thumb and index finger; it can be associated with weakness in the biceps and wrist extensor muscle groups. The C7 nerve root presents with pain that starts in the neck and travels down the back of the arm into the middle finger; it can be associated with weakness in the triceps and wrist flexors. Finally, the C8 nerve root leads to pain that travels down the arm into the ring and small finger and can be associated with weakness in the finger flexors. A detailed physical examination is a crucial part of the evaluation of a patient with potential cervical radiculopathy. The examination starts with an investigation of the patient's neck, shoulders, arms, and lower extremities. Clinicians must assess range of motion, strength, sensation and reflexes. As discussed above, specific nerve roots are associated with specific motor functions. Additionally, specific nerve roots are associated with specific reflexes: the biceps reflex associated with the C5 nerve root, the brachioradialis reflex associated with the C6 nerve root and the triceps reflex associated

with the C7 nerve root. Abnormalities in specific motor or sensory distributions or reflex abnormalities can help the clinician localize the level of neurologic impingement.

Physical Examinations

There are several physical examination maneuvers that are specific to cervical radiculopathy. One such test is the Spurling's maneuver in which the patient's neck is extended and rotated toward the side where the patient is experiencing symptoms. Physiologically, this maneuver narrows the neuroforamen and can lead to an exacerbation of the patient's symptoms due to increased compression on the nerve within the neuroforamen. Conversely, flexing the patient's neck or rotating the patient's neck towards the contralateral side may increase the space available within the neuroforamen and lead to a decrease in the patient's symptoms. Additionally, abducting the patient's arm away from their body may effectively decrease the stretch on a nerve root and lead to a decrease in symptoms. Ultimately, these exam findings, if positive, can point towards a radicular etiology of a patient's symptoms, as opposed to alternative pathology.

The differential diagnosis for cervical radiculopathy is wide and includes diagnoses such as carpal tunnel syndrome, cubital tunnel syndrome, rotator cuff pathology, lateral epicondylitis, brachial plexus injury, Parsonage-Turner syndrome and thoracic outlet syndrome, among others. As such, performing exam maneuvers specific to these clinical entities, such as a Tinel's test or examination of the rotator cuff, can help to distinguish radiculopathy from an alternative diagnosis.

Cervical radiculopathy can often be associated with cervical myelopathy in which there is pressure on the spinal cord. It is imperative to evaluate for this condition as it has more significant clinical consequences for patients and has a progressive natural history that can lead to debilitating neurologic deficits. Thus, an examination of someone's cervical spine must include an evaluation of a patient's gait and an assessment for pathologic reflexes such as a Hoffman's reflex, inverted brachioradialis reflex, clonus or a Babinski sign. Evidence of these findings on examination is suggestive of myelopathy and requires a more urgent clinical work up.

Finally, an investigation of a patient's vascular status, with assessment of pulses particularly with the arm in different positions, can help to diagnose other clinical entities, such as thoracic outlet syndrome which may mimic the symptoms of cervical radiculopathy.

The Use of Imaging Studies

The next step in investigating a patient for cervical radiculopathy involves imaging studies. Imaging begins with four views of the cervical spine, including posterior-anterior, lateral, flexion and extension films. These imaging studies allow for assessment of the overall alignment of a patient's cervical spine and also assess for loss of disc height, osteophyte formation or traumatic changes.

The flexion/extension films allow for the assessment of instability in the cervical spine, which can lead to dynamic compression of a patient's nerve roots. While useful, radiographs do not allow for the assessment of soft tissue or neurologic structures; MRI is the most useful study to assess for impingement of the neurologic structures in the cervical spine. However, it is important to recognize that even though an MRI can show evidence of neurologic compression, these imaging findings must be closely correlated with a patient's clinical symptoms, as studies have shown evidence of abnormalities on MRIs in asymptomatic patients.

Treatment Strategies

Many studies have shown that cervical radiculopathy has a favorable natural history in the sense that a majority of patients are able to manage successfully with nonoperative treatment. Generally, a majority of patients show improvement in their symptoms within six weeks. If patients present with evidence of cervical myelopathy, a significant motor deficit that has lasted over six weeks or a progressive neurologic deficit, one should entertain the idea of surgical intervention. However, in a majority of patients, nonoperative strategies provide an effective starting point for treatment.

Nonoperative treatment consists of pain medications, physical therapy, traction, manipulation and injections. The most common medications utilized are nonsteroidal anti-inflammatory drugs (NSAIDs) and oral corticosteroids. Inflammation is one

Each nerve root has a specific distribution and characteristic symptoms.

of the predominant mechanisms underlying the etiology of pain in cervical radiculopathy. Thus, these medications have shown efficacy in helping patients manage radicular pain. Additionally, neuroleptic agents such as gabapentin are also frequently utilized to help patients manage the pain associated with cervical radiculopathy. When prescribing these medications, it is important to note they do have potential side effects and interactions with other medications. Thus, it's imperative to monitor patients while they are taking these medications. While narcotics do provide a powerful method for pain control, it is often best to try to avoid these medications in the management of cervical radiculopathy due to their potential addictive qualities.

Physical therapy also plays an important role in the nonoperative management of cervical radiculopathy. Therapy focuses on strengthening and increasing range of motion and also employs pain control modalities such as heat, ice, electrical stimulation and massage. Therapists also often employ traction, which can often help patients find temporary relief of their symptoms. If patients find relief from traction, home traction devices can be prescribed and utilized by patients on a more consistent basis to help manage their pain.

Chiropractic care can also be effective for patients experiencing radicular pain. While effective, we often advise avoidance of manipulation in patients with myelopathy, anatomic abnormalities or traumatic causes of their symptoms. However, in most patients, chiropractic care can serve a very important role in the nonoperative treatment of cervical radiculopathy.

Cervical steroid injections serve an important role in nonoperative treatment. Based on the pattern of a patient's symptoms and the imaging results, providers are often able to target the specific site of neurologic compression that is likely causing the patient's symptoms. At this point, transforaminal cervical injections or selective nerve root blocks can often be used for both diagnostic and therapeutic benefits. While it is difficult to predict how long a patient may benefit from an injection, these interventions do often provide patients with relief for at least a short period of time. Moreover, if effective, they provide the treating provider with important diagnostic information regarding the underlying etiology of the patient's symptoms.

A majority of patients are able to manage successfully with nonoperative treatment.

While nonoperative treatment strategies often prove effective, surgical intervention can be considered in patients who have failed at least six weeks of nonoperative treatment or in patients with progressive symptoms or neurologic deficits. Surgical intervention is considered sooner if patient presents with concomitant myelopathy, severe neurologic deficits or progressive neurologic deficits. There are a variety of surgical treatment options available for cervical radiculopathy, and the details of what goes into the decision of choosing a specific intervention is beyond the scope of this text. Nonetheless, surgical intervention involves either an anterior or posterior approach to the spine. Anterior-based options include an anterior cervical discectomy and fusion or a cervical disc replacement. Both options have proven to be successful and durable solutions for patients with radiculopathy. Another option involves a posterior cervical laminoforaminotomy, in which the nerve root is decompressed from the back of the spine. Depending on the particular situation, all of these surgical options have shown clinical success. While successful, it is important to reserve these options as a last resort for patients, given the fact that a majority of patients are able to experience resolution of their symptoms with nonoperative treatment alone.

In conclusion, cervical radiculopathy is a clinical syndrome in which patients present with pain, numbness, tingling or weakness in a specific location due to compression of a nerve root in the cervical spine. The differential diagnosis is broad, thus obtaining a detailed history and physical examination is imperative in these patients. Imaging studies including radiographs and MRIs allow clinicians to localize the specific anatomic lesion causing the patient's symptoms. Cervical radiculopathy often resolves on its own; thus, nonoperative strategies are the treatment options for a majority of patients. If patients continue to have symptoms after at least six weeks of nonoperative treatment or present with progressive symptoms, surgical options have proven effective and can be utilized to provide patients with durable clinical relief.

BAYARD C. CARLSON, MD, is an orthopedic surgeon with Twin Cities Spine Center. 