

CERVICAL RADICULOPATHY

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Neck and arm pain secondary to cervical radiculopathy is a common clinical entity in the general neurology clinic. It is curious to note that the first descriptions of arm pain secondary to cervical root compression by herniated intervertebral disc material were written surprisingly recently—in the 1940s.¹ Previously, most instances of arm pain were believed to be related to compression at the thoracic outlet. As discussed previously, the topics of neck pain and cervical radiculopathy are not synonymous. However, when discussing the presentation of neck pain combined with arm pain, cervical radiculopathy is a leading diagnostic consideration. In this talk, we will discuss the relevant anatomy, differential diagnosis, evaluation, and management pertaining to cervical radiculopathy. What follows is a brief overview.

Relevant Anatomy

There are 31 pairs of nerve roots: 8 cervical, 12 thoracic, 5 lumbar, 5 sacral, and one coccygeal. The diameters of the cervical and lumbar nerve roots are larger than the thoracic nerve roots. The dorsal root ganglia are located in the intervertebral foramina, which are bordered superiorly and inferiorly by pedicles and inferiorly by intervertebral discs and vertebral bodies. The five lower cervical vertebral bodies are joined by zygapophyseal (facet) joints located at the posterior portion of the vertebral body. These joints are true synovial joints. The vertebral body also has a vertical projection called the uncinete process; it makes contact with the disc and vertebral body superiorly. These junctions are the uncovertebral joints, or joints of Luschka. Uncovertebral joints are located anteriorly to the exiting nerve roots. They are not synovial joints. These joints are frequent sites of bone spur formation. The upper cervical anatomy is responsible for rotational movements of the head. The lower cervical spine is suited for flexion and extension. Spondylotic disease preferentially affects the lower cervical spine.

Ventral and dorsal nerve roots combine to form the spinal nerves that emerge through the intervertebral foramina. After a short distance, each spinal nerve divides into two rami. The ventral ramus contributes to the plexuses and nerves that innervate the extremities. The dorsal ramus innervates the paraspinal muscles, skin of the neck, periosteum, ligaments, and zygapophyseal joints. The root blood supply is derived from radicular arteries. It is important to remember that cervical nerve roots exit through neural foramina above the bony vertebral level of the same number.

Differential Diagnosis

Usually cervical roots are damaged by compression. Weight loss, fevers, chills, immunosuppression, history of cancer, or intravenous drug use should increase the suspicion that infection or tumor is responsible for the nerve damage. Infectious agents that can damage the roots include herpes zoster, Lyme disease, and, in severely immunosuppressed patients, CMV. Trauma can lead to avulsion of the nerve roots. Infiltration by tumor or granulomatous material is also possible. Infectious and infiltrating processes often damage the dorsal root ganglion, leading to reduced amplitudes for the sensory nerve action potentials. Idiopathic neuritis (neuralgic amyotrophy) affecting the upper limb can mimic compressive cervical radiculopathy. In fact, the neuritic attack can directly involve the cervical roots, either singly or multiply. In my opinion, neuralgic amyotrophy explains many cases of imaging-negative cervical radiculopathy.

Lower extremity symptoms including difficulty walking as well as Lhermitte's symptom are clues suggestive of myelopathy. New onset bladder or bowel dysfunction also point to spinal cord injury. Cervical myelopathy will be discussed in a separate lecture.

Compressive Cervical Radiculopathy

Most cervical radiculopathies are caused by compression and/or stretch. Cervical spondylosis and disc herniation are the two main mechanisms for nerve root damage. The former tends to be seen in older individuals and the latter in younger patients. Cervical spondylosis is a general term for degenerative joint disease in the cervical spine region. Aging is the main risk factor for spondylosis. Bone spur formation at the zygapophyseal and uncovertebral joints will narrow the neural foramina. In addition, degenerative changes at the edges of the vertebral bodies and the posterior longitudinal ligament may squeeze the exiting nerve root. Disc herniation usually occurs when there is age-related weakening of the annulus of the nerve disc. If the pressure of the nucleus pulposus elevates too highly, material can prolapse through the annulus. As a consequence of the local anatomy, most disc herniations are posterior-lateral. Herniation of the nucleus pulposus is usually associated with acute nerve pain whereas radiculopathy from spondylosis may be associated with insidiously progressive discomfort.

In a large series, the mean age of diagnosis of compressive cervical radiculopathy was 48 years. Lower cervical roots, particularly C7, are the most frequently affected.²

Evaluation

Taking a detailed history is essential for discovering one of the red flags suggestive of a dangerous cause of radiculopathy. The neck pain review of systems (Table 1 from the Initial Evaluation and Management of Neck Pain summary) is useful for screening for those red flags. Unless there are warning signs to suggest an infectious or infiltrative process, laboratory (blood and/or CSF) testing is usually not needed in the work-up of cervical radiculopathy.

Table 1 outlines the key symptoms and findings associated with cervical radiculopathy at various levels.

In regards to imaging, MRI imaging of the cervical spine is the recommended study for evaluation of cervical radiculopathy. It allows for excellent imaging of neural elements as well as the discs and other soft tissues. It is useful in the evaluation of tumors and infections. CT imaging of the spine is superior to MRI for visualizing the bony anatomy. If combined with myelography, CT imaging provides excellent information regarding the status of the nerve roots in the neural foramina. Bone scans and SPECT may be helpful for further evaluation of trauma, infections, ischemia or malignancy.

Electrodiagnostic studies are helpful in evaluation of radiculopathy. These studies can confirm whether or not the radiculopathy is leading to muscle denervation. Because of the poly-root innervation of muscles, minimum F-wave latencies may be normal even a clear-cut cases of cervical radiculopathy. Needle EMG is most important single electro-physiologic test for radiculopathy.

Management

As is the case for isolated neck pain, the most important aspect of management is probably telling patients that they will get better no matter what is prescribed.³ Most patients recover completely within 6 weeks. Nonsteroidal anti-inflammatory drugs are appropriate for pain relief. Agents for neuropathic pain relief may also be prescribed. Muscle relaxant and Botox therapy may help pain relief in certain patients. Despite little evidence of efficacy, many practitioners try a short course of oral steroids to reduce pain.

For persistent pain, epidural injections of steroids with local anesthetics may help reduce pain, though the evidence for efficacy is weak.⁴ It is important to note that occasionally patients with such injections have very serious complications including longitudinally extensive cervical myelopathy and stroke. The mechanism of injury in these instances is debated.

Surgery is clearly indicated when neurological deficits are progressive, or if the patients develop intractable pain or myelopathy signs.⁵ The decision regarding surgical intervention is more difficult in instances in which none of those criteria apply. Reviewing of the surgical literature for nonemergent cervical radiculopathy leads to three major conclusions:

- 1) Surgical interventions may lead to rapid improvement in pain level.
- 2) Long-term outcomes with surgery are similar to nonoperative care.
- 3) Poor standardization of nonoperative management is a problem across many studies.

Table 1. Symptoms and Findings in Cervical Radiculopathy

Disc level	Nerve root	Symptoms and Findings
C4-C5	C5	Pain: Neck, tip of shoulder, anterior arm Sensory change: Deltoid area Motor deficit: Deltoid, biceps Reflex change: Biceps
C5-C6	C6	Pain: Neck, shoulder, medial border of scapula, lateral arm, dorsal forearm Sensory change: Thumb and index finger Motor deficit: Biceps Reflex change: Biceps
C6-C7	C7	Pain: Neck, shoulder, medial border of scapula, lateral arm, dorsal forearm Sensory change: Index and middle fingers Motor deficit: Triceps Reflex change: Triceps
C7-T1	C8	Pain: Neck, medial border of scapula, medial aspect of arm and forearm Sensory change: Ring and little fingers Motor deficit: Intrinsic muscles of the hand Reflex change: Finger flexors

⁶Modified from Boden SD, Wiesel SW, Laws ER. The Aging Spine: Essentials of Pathophysiology, Diagnosis, and Treatment. Philadelphia: WB Saunders Co, 1991, p 46.

Select References:

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