

# What is Cervical Radiculopathy?

## PATIENT RESOURCES

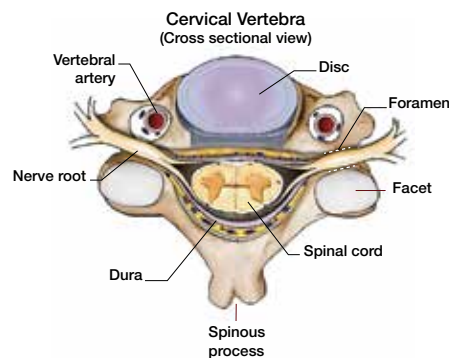
The cervical spine supports the head, allows neck movement, and protects the spinal cord and nerves. The spinal cord occupies the central spinal canal of the cervical spine. Between each of the seven bones (vertebrae) in the cervical spine, nerve roots branch off of the spinal cord in the central canal and pass through a small hole (foramen) (Figure 1). In the cervical spine, these nerve roots carry motor impulses to the muscles of the arm and hand, and carry sensation (pain, temperature, and light touch) from the arm and hand up to the brain.

Radiculopathy can result from compression of the nerve root in this foramen. This can cause weakness in the muscles innervated by that nerve root (myotome), as well as sensory changes in the pattern of skin innervated by that nerve root (dermatome). Sensory changes of radiculopathy can include pain, typically radiating down from the neck towards the hand, numbness, or abnormal sensations (dysethesias) such as pins and needles. Compression of the nerve root causing radiculopathy can present with any combination of weakness, numbness, pain, or dysthesias. As the symptoms of radiculopathy affect specific muscles and dermatomes in the arm, the spine specialist can sometimes predict which nerve is affected before reviewing an MRI scan through a detailed history and neurological examination.

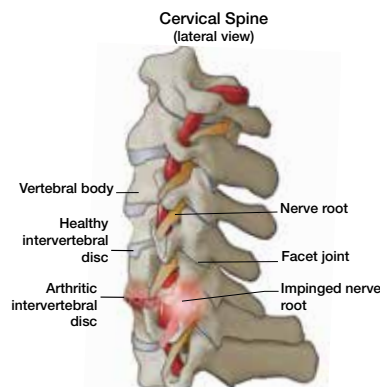
Radiculopathy (compression of the nerves) is distinct from myelopathy (compression of the spinal cord) in several ways. Radiculopathy typically involves only the pattern of skin and muscles innervated by that single nerve root, while myelopathy can involve the entire arm and hand. Radiculopathy is often unilateral, affecting only one arm, while myelopathy more commonly affects both arms (and can affect the legs as well). Myelopathy less

commonly causes arm pain, while radiculopathy most commonly starts with arm pain. Lastly, myelopathy can cause clumsiness of the hands such as changes in handwriting and clumsiness of walking, while radiculopathy usually does not.

Other disorders can mimic radiculopathy. Shoulder impingement may present similar to C5 radiculopathy, as both of these problems may result in pain around the shoulder and weakness of the shoulder (deltoid) muscle. Peripheral nerve compression of the ulnar nerve at the elbow or median nerve at the wrist can present similarly to a cervical radiculopathy.



**Figure 1.** The normal relationship between cord, central canal, foramen, nerve root, and disc.



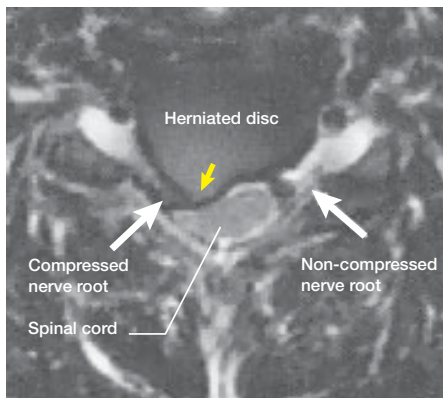
**Figure 2.** Demonstrates an arthritic, degenerative disc that can impinge upon the exiting nerve root as it leaves the spine, potentially causing symptomatic radiculopathy

### What are the causes of cervical radiculopathy?

The foramen through which the nerve root travels is a three dimensional structure, with the boundaries including the disc and facet joints. Disorders of any of these structures can cause compression of the nerve (Figure 2).

Most commonly, the nerve root is compressed by a disorder of the intervertebral disc, which normally acts as a cushion between the cervical vertebrae. The disc can be damaged from long term wear and tear, or acutely from trauma such as car accidents, falls, and sports injuries. The center of the disc (nucleus) can start to bulge through outer layers (annulus), or can actually rupture (herniate) through the annulus (Figure 3). Both bulges and herniations can compress the nerve root and cause radiculopathy.

Chronic degeneration of the disc can lead to bone spurs forming at the edges (marginal osteophytes) and these spurs can slowly narrow the foramen. Once the foramen is narrowed, direct impingement and/or secondary inflammation of the involved nerve root can cause symptoms of radiculopathy.



**Figure 3.** Axial (or transverse) MRI through the cervical disc, showing the exiting nerve roots (white arrows) and a herniated disc (yellow arrow) with compression of the nerve root on the left side of the image ("Compressed nerve root"). In this image, the herniated disc compresses both the nerve root in the foramen as well as mildly indenting the spinal cord.

## What are the treatments for cervical radiculopathy?

### Conservative Treatments

Fortunately, many patients with cervical radiculopathy will heal without needing surgery. For most patients, the acute or severe pain lasts 3-6 weeks and the episode lasts 3-6 months.

Initial care is normally initiated by the patient's primary care physician, and often involves one or more of the following:

- Rest
- Avoiding trauma and re-injury
- Cervical immobilization with a cervical brace or collar
- Medications:
  - Non-steroidal anti-inflammatories such as ibuprofen
  - Muscle relaxers
  - Oral steroids
- Physical therapy, sometimes including cervical traction
- Spinal injections for pain relief
  - Nerve blocks
  - Epidural steroid injection

### Indications for surgery

As radiculopathy will resolve in most people without surgery, nonoperative ("conservative") care is the initial treatment of choice for the majority of patients. In addition, many insurance carriers require documentation of conservative treatments prior to their approval of surgery.

However, severe weakness related to radiculopathy that is not improving, or is progressive, may prompt surgery even in the absence of conservative treatments. Patients with weakness should see a cervical spine surgeon early in the course of their treatment.

### Surgical Treatments

The spine surgeon has several options for treatment, and will normally recommend one of the following, based on the patient's specific anatomy and pathology.

Anterior cervical discectomy with fusion (ACDF) is a surgery from the front of the neck. The entire disc is removed from the affected level, along with any associated bone spurs, to decompress the spinal cord and nerve roots. The level is then fused with a spacer made up of either bone or a synthetic material and often an anterior cervical plate (Figure 4).

Anterior arthroplasty (artificial disc). Similar to the ACDF surgery, this is an approach from the front of the neck to remove the disc and associated bone spurs. However, rather than fusing the spine, a mechanical artificial disc is placed to preserve motion at this level (Figure 4).

Posterior foraminotomy (opening of the nerve foramen from the back of the neck). This is a surgery from the back of the neck, and can be done in an open or minimally-invasive fashion. The surgeon removes a portion of bone from the back of the spine to decompress the nerve in the foramen. The surgeon may also remove a portion of the disc, if herniated, through this approach.

The exact surgical treatment will depend on a number of factors specific to your condition, and often times there is more than one way to treat the specific problem. Multiple factors need to be considered when determining the best surgical treatment option for any given patient. It is important to recognize that one operation is not necessarily superior to the others in every case.



**Figure 4.** Illustration of anterior cervical discectomies and fusion (ACDF) at three levels in the cervical spine. The intervertebral discs have been removed to decompress the spinal cord and nerves. The neck has then been fused with spacers and an anterior cervical plate.



**Figure 5.** Lateral cervical radiograph showing anterior cervical discectomy and arthroplasty at two levels, with placement of mechanical disc devices.

## About CSRS

*The Cervical Spine Research Society is a multidisciplinary organization of individuals interested in clinical and research problems of the cervical spine. Its purpose is to provide a forum for the exchange and development of ideas and philosophy regarding the diagnosis and treatment of cervical spine injury and disease. The organization values collegial interaction and strong scientific principles. Founded in 1973, the CSRS is the internationally recognized authority focused on the research and education of cervical spine disorders.*

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