



American  
Association of  
Neurological  
Surgeons

# CENTRAL CORD SYNDROME

## PATIENT INFORMATION

This resource, developed by neurosurgeons, provides patients and their families trustworthy information on neurosurgical conditions and treatments.

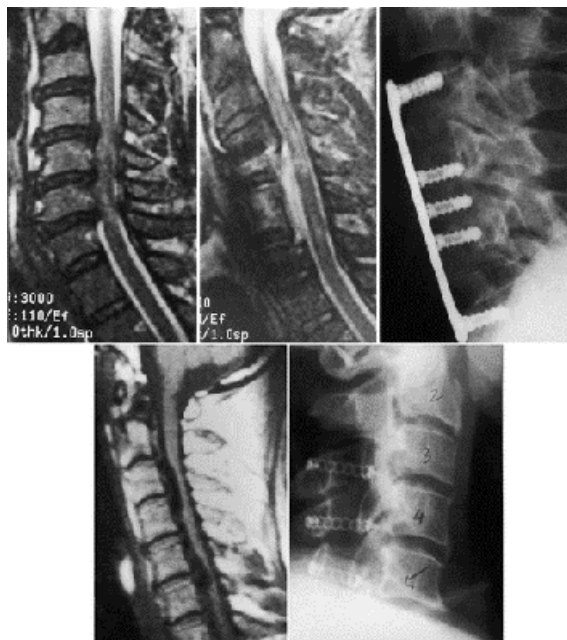
For more patient resources from the American Association of Neurological Surgeons (AANS), visit [www.aans.org/Patients](http://www.aans.org/Patients).

Central cord syndrome (CCS) is an incomplete traumatic injury to the cervical spine resulting in more extensive motor weakness in the upper extremities than the lower extremities. The mechanism of injury occurs from a forceful hyperextension neck injury with prior existence of degenerative ligamentous and osteophytic spinal column disease. There is usually no obvious associated spinal column fracture or evidence of spinal instability.

## Mechanism and Causes of Injury

CCS typically occurs in patients with hyperextension injuries where the spinal cord is squeezed or pinched between pre-existing anterior cervical spondylotic bone spurs and a thickened posterior intraspinal canal ligament, the ligamentum flavum. The ligamentum flavum is a strong ligament that connects the laminae of the vertebrae.

It serves to protect the neural elements and the spinal cord and stabilize the spine so that excessive motion between the vertebral bodies does not occur. Pictured left is a sagittal, or lateral cervical MRI, showing bone spurs (degenerative spondylotic bone spurs) narrowing the cervical spinal canal and compressing the cervical spinal cord in a CCS patient.



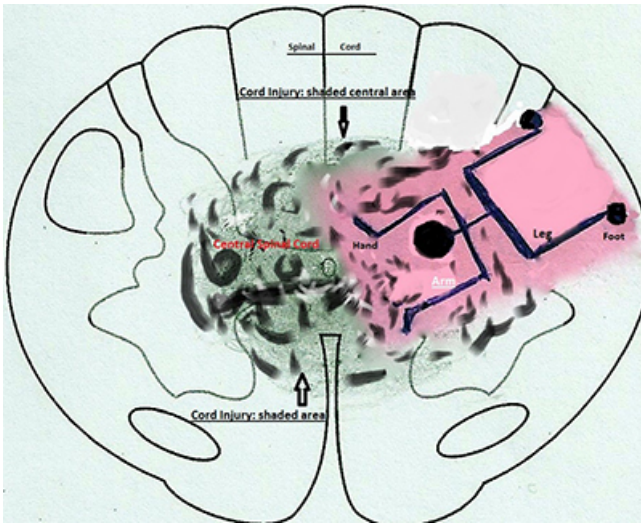
The injury occurs as a result of anterior and posterior compression of the spinal cord, leading to edema, hemorrhage or ischemia to the central portion of the spinal cord. The site of most injuries is in the mid-to-lower cervical cord.

Due to the anatomical lamination of the corticospinal tract with the arm fibers medially and the leg fibers laterally, the arms are affected more so than the legs, resulting in a disproportionate motor impairment (see the illustration below). Typical patients with CCS regain use of their legs and can often walk, but cannot effectively use their arms and hands.

## Symptoms and Incidence

Patients are typically left with more profound motor weakness of the upper extremities and less severe weakness of the lower extremities. A varying degree of sensory loss below the level of the lesion and bladder symptoms (urinary retention) may also occur.

This syndrome more commonly affects patients age 50 and older who have sustained a cervical hyperextension injury. CCS affects males more frequently than females.



It is anticipated that the incidence and prevalence of CCS will increase proportionately with an aging population that tends to remain physically exertive much later in life than in past generations.

CCS may occur in patients of any age and is seen in athletes who present with not only hyperextension injuries to their neck but associated ruptured disc(s) with anterior cord compression.

## Diagnosis

Evaluation of the patient includes a complete history, thorough general and neurological examinations, cervical magnetic resonance imaging (MRI), computed tomography scan (CT) and plain cervical spine X-rays including supervised flexion and extension views.

- **MRI:** A diagnostic test that produces three-dimensional images of body structures using powerful magnets and computer technology; can show direct evidence of spinal cord impingement from bone, disc or hematoma. MRI can also show ligamentous and soft tissue injuries that might be missed by other imaging tests.
- **CT or CAT scan:** A computer enhanced X-ray imaging device that shows bony detail superior to any other imaging device. It also shows shape and size of the spinal canal, its contents and the structures around it. It is usually performed prior to MRI scanning. Combined with MRI scans it provides a more comprehensive diagnostic data set for treatment decision making.
- **X-ray:** Application of radiation to produce a film or picture of a part of the body can show the structure of the vertebrae and the outline of the joints. X-rays of the spine delineate fractures and dislocations, as well as the degree and extent of spondylitic changes. Flexion/extension views assist in evaluation of ligamentous stability. Both the MRI and CAT scan images are static images. Flexion / extension plain X-rays can provide a simple means of determining dynamic stability or instability of the spinal column. These views can help determine whether or not a cervical collar or stabilizing cervical spine surgery is necessary or not.

## Surgical Treatment

Acute surgical intervention is not usually necessary unless there is significant cord compression. Prior to the CT/MRI era, surgical intervention was thought to be more harmful because of the risk of injuring a swollen cervical cord and worsening the deficit.

However, with advanced imaging technology, patients with compression of the spinal cord secondary to traumatic herniated discs and other structurally compressive lesions can be quickly diagnosed and surgically decompressed. In cases with anterior bony ridges and spinal canal narrowing secondary to ligamentous thickening and or stenosis, acute surgery is usually not performed until the patient has made significant recovery that has stabilized clinically.

Reassessment at that time may lead to surgery depending on the underlying cause. If there is a surgically treatable lesion with significant residual motor weakness after a period of recovery, or if there is new neurological deterioration is observed, then surgical intervention may be considered. Additional pre-surgical re-evaluation with pre-surgical CAT scan and/or MRI scan will usually be necessary beforehand.

## Nonsurgical Treatment

Observed neurological improvement is the most compelling reason not to proceed with surgical treatment in favor of non-surgical management of CCS. Nonsurgical treatment consists of immobilization of the neck with a rigid cervical collar, steroids unless contraindicated and rehabilitation with physical and occupational therapy.

## Outcomes

Many patients with CCS make spontaneous recovery of motor function while others experience considerable recovery in the first six weeks post injury.

If the underlying cause is edema, recovery may occur relatively soon after an initial phase of motor paralysis or paresis. Leg function usually returns first, followed by bladder control and then arm function. Hand movement and finger dexterity improves last. If the central lesion is caused by hemorrhage or ischemia, then recovery is less likely and the prognosis is more devastating.

The prognosis for CCS in younger patients is more favorable than older patients. Within a short time, a majority of younger patients recover and regain the ability to ambulate and perform daily living activities. However, in elderly patients the prognosis is not as favorable, with or without surgical intervention.

## References

*Journal of Neurosurgery: Spine*

July 2002 / Vol. 97 / No. 1 / Pages 25-32

Traumatic central cord syndrome: results of surgical management

*Illustration Credit:* Bernard Robinson, MD, FAANS

*The AANS does not endorse any treatments, procedures, products or physicians referenced in these patient fact sheets. This information is provided as an educational service and is not intended to serve as medical advice. Anyone seeking specific neurosurgical advice or assistance should consult his or her neurosurgeon, or locate one in your area through the AANS' Find a Board-certified Neurosurgeon"online tool.*