Cervical Myelopathy (spondylotic, stenosis, ossification)

Overview

Cervical myelopathy is compression of the spinal cord in your neck. It can feel like stiffness in the neck, numbness or pain in the arms or legs, loss of dexterity in the hands, balance issues, and trouble walking. It can happen subtly and slowly as we age, making it difficult to diagnose. Physical therapy and spinal injections can help relieve mild symptoms. Moderate to severe myelopathy requires surgery to prevent further damage of the spinal cord.

Anatomy of the neck

Your neck is made of seven moveable bones called vertebrae. The cervical spine supports the weight of your head (~ 10 pounds) and allows you to bend your head forward and backward, from side to side, and rotate 180 degrees. The bones are separated by discs, which act as shock absorbers preventing the vertebrae from rubbing together. Down the middle of each vertebra is a hollow space called the spinal canal that contains the spinal cord, spinal nerves, ligaments, fat, and blood vessels. Nerves exit the spinal canal through the intervertebral foramen to branch out to your body. Both the spinal and nerve root canals are surrounded by bone and ligaments. Bony changes can narrow the canals and restrict the spinal cord.

What is cervical myelopathy?

Myelopathy is compression of the spinal cord that over time reduces the blood supply and inhibits the flow of messages between the brain and the body. Because the cord compression is up in the neck, symptoms affect the whole body, not just the arms and hands.

The most common type is cervical spondylotic myelopathy (CSM). The term "spondylotic" refers to degeneration of the spine that happens as we age. This includes the growth of bone spurs, herniated discs, and narrowing of the spinal canal (Fig. 1).

Cervical myelopathy can also be caused by "ossification," or hardening of the ligaments surrounding the spinal cord, such as the posterior longitudinal ligament or the ligamentum flavum.

Motion aggravates CSM injury. When you flex and extend your neck, the spinal cord is stretched and rubbed over the spurs and buckled ligaments.

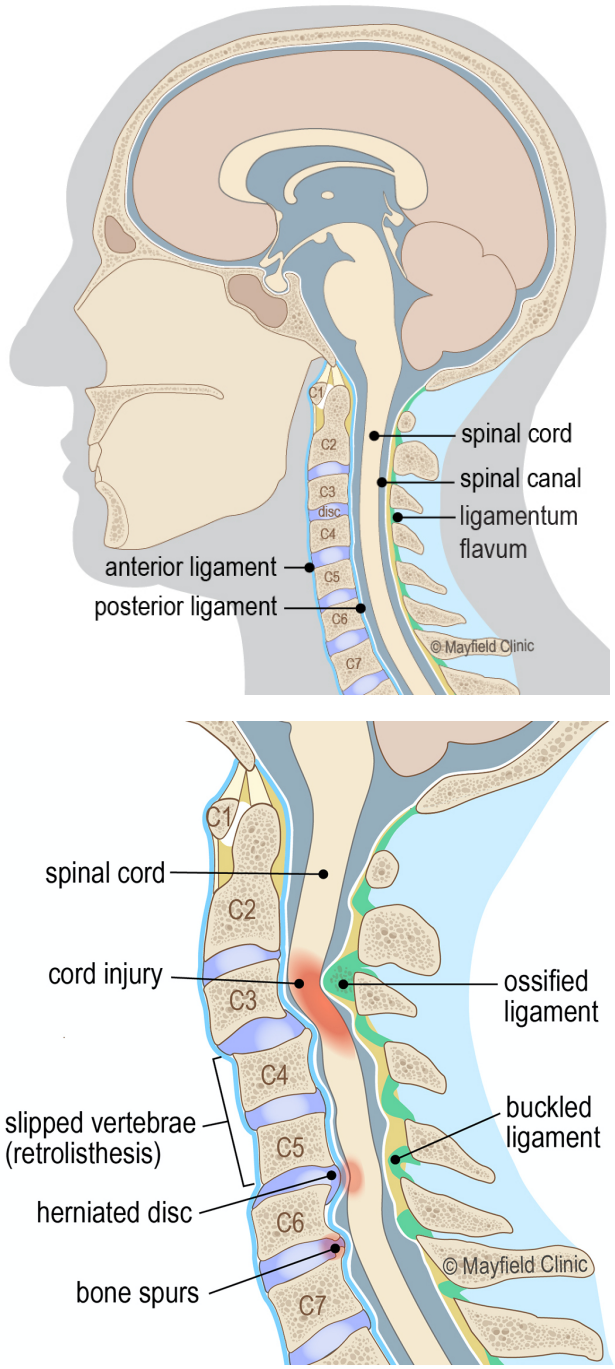

Figure 1. A normal spinal canal (top) in comparison to one with degenerative stenosis and myelopathy (bottom). The space for the spinal cord is compressed by the bulging discs, bone spurs, and thickened ligaments.

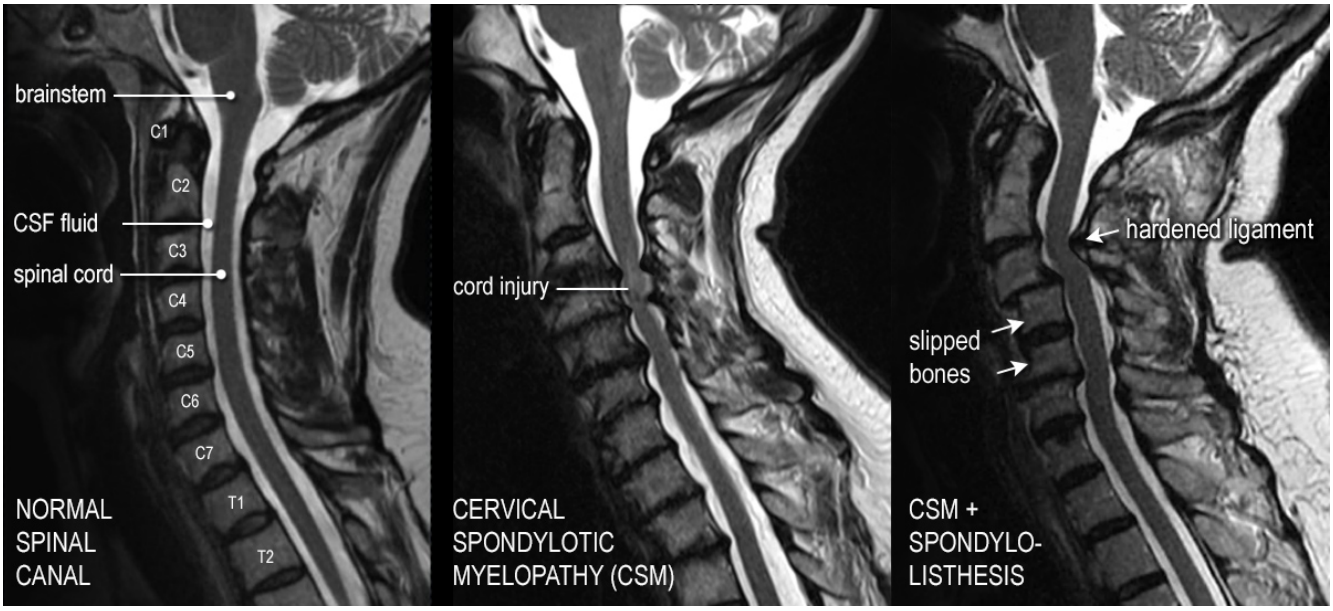

Figure 2. Side view of neck MRI. **(Left)** Normal spinal cord cushioned by CSF fluid in the spinal canal. **(Center)** MRI of stenosis pinching the spinal cord, causing myelopathy. **(Right)** MRI of CSM with bones slipping out of alignment.

CSM can be progressive, meaning symptoms may worsen over time and vary from person to person.

- Neck stiffness
- Numbness or tingling (pins and needles) of the hands, arms, or legs on one or both sides
- Weakness of the hands with loss of fine motor skills, like buttoning a shirt or writing
- Coordination problems, difficulty walking or maintaining balance, leading to falls
- Bladder or bowel problems like urgency, incontinence, or urinary retention
- Neck or arm pain may occur, but are not chief complaints

Because loss of hand dexterity can be part of normal aging, diagnosis is often delayed. CSM can be misdiagnosed as carpal tunnel, ALS or multiple sclerosis. CSM is a far more common cause of balance issues, falls, and poor hand dexterity.

What are the causes?

The most common cause of cervical myelopathy is the wear and tear of the spine as we age (Fig. 1):

- **Spondylosis**: The formation of bone spurs (osteophytes) and thickening of ligaments.
- **Herniated discs:** As we age, discs dry out and flatten. The gel-like center of the discs can bulge or rupture, pressing on the spinal cord.
- **Stenosis**: Narrowing of the spinal canal due to overgrowth of facet joints or ligaments can result in spinal cord compression.
- **Spondylolisthesis:** When one vertebra bone slips forward on another out of alignment.
- **Ossification of PLL:** Calcium deposits in the posterior longitudinal ligament (PLL) make it stiffer and thicker. Occurs more often in men and Asian people.

Other causes include trauma injury (whiplash), rheumatoid arthritis, infections, and spinal tumors.

Who is affected?

CSM is more common in adults older than 50, as the degenerative changes in the spine accumulate over time. Some people are born with a narrow spinal canal and may have myelopathy symptoms sooner.

How is a diagnosis made?

Your doctor will take a complete medical history to understand your symptoms, any prior injuries, or conditions. Next, a physical exam is performed to test your muscle reflexes, muscle strength, stiffness, and sensory feeling in your arms and legs. Signs include hyper reflexes, spasticity, and clonus.

Your doctor may order one or more scans / tests:

- **Magnetic Resonance Imaging (MRI)** scans can detect any nerve or cord compression, tumors, or thickened ligaments. Cord injury (myelomalacia) appears white on MRI (Fig. 2).
- **Myelogram** is a specialized X-ray where dye is injected into the spinal canal. The dye shows up white on the fluoroscope X-ray, allowing the physician to view the spinal cord and spinal canal in detail. A CT scan follows this test.
- **Computed Tomography (CT)** scans are useful for viewing bony changes and ossification of the ligaments.
- **Electromyography (EMG) & Nerve Conduction Studies (NCS)** measure the electrical activity of your nerves and muscles. Small needles, or electrodes, are placed in your muscles, and the results are recorded. The tests detect nerve damage and muscle weakness.

> 2

What treatments are available?

Treatment options depend on the severity of the myelopathy. The rate of progression may also change over time. Symptoms may progress rapidly and then stabilize. Conservative care may relieve symptoms, but will not fix the compression, which is why surgery is often necessary.

Time is spine. Left untreated, CSM can worsen and cause permanent spinal cord injury and paralysis.

Nonsurgical treatments

Self-care: Proper posture and alignment can prevent injury to your spinal cord and nerves. You may need to make adjustments to your daily standing, sitting, and sleeping habits. Avoid "tech neck" and looking down at your cell phone.

Physical therapy: The goal of PT is to help you reduce pain, numbness, and stiffness. Physical therapists can instruct you on neck posture, lifting, and walking techniques, and they'll suggest ways to redesign an ergonomic workspace. Exercise and strengthening are key elements to your treatment and should become part of your life-long fitness.

Bracing: Wearing a neck brace may help reduce symptoms by limiting movement, stretch, and shear of the spinal cord. But it also will allow the muscles supporting the head to weaken.

Medication: Your doctor may prescribe pain relievers, nonsteroidal anti-inflammatory medications (NSAIDs), or steroids. Sometimes muscle relaxants are prescribed for muscle spasms.

Steroid injections: The procedure involves an injection of corticosteroids and a numbing agent into the epidural space of the spine. The medicine is delivered next to the painful area to reduce the swelling and inflammation of the nerves. Some patients will have relief after an ESI, although the results tend to be temporary. If injections are helpful, they can be repeated.

Chiropractic: Patients with cervical myelopathy should **NOT** get high-velocity spinal adjustments or traction. This can further injure the spinal cord.

Surgical treatments

Surgery for cervical myelopathy involves removal of the overgrown bone and ligaments to open the canal and decompress the spinal cord.

The surgery can be performed from the front (anterior) or from the back (posterior) of the neck. In some cases, the surgeon will use both and customize a 360° approach to your unique anatomy based on the number of spine levels affected.

Anterior cervical discectomy & fusion (ACDF): An incision is made in the front of the neck. The muscles, vessels, and trachea are moved aside to expose the bony vertebra. The damaged disc(s), thickened ligaments, and bone spurs are removed. The empty disc space is filled with a bone graft or cage to create a fusion (Fig. 3). Fusion is the process of joining together two or more bones. Over time, the graft will fuse to the vertebrae above and below to make one solid piece of bone. Metal plates and screws provide stability during fusion.

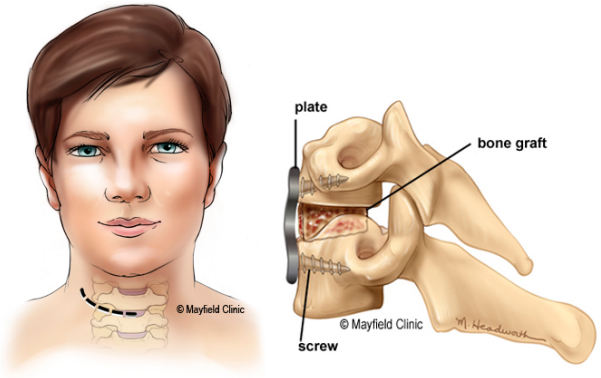

Figure 3. Anterior cervical discectomy & fusion.

Anterior corpectomy & fusion: This surgery is similar to ACDF, but includes removing the vertebra body along with the discs. A large titanium cage, or strut graft, is placed to span the gap and is secured with metal plates and screws. Corpectomy is done if there are multiple vertebrae with bone spurs.

Posterior cervical laminectomy & fusion: An incision is made in the back of your neck. The spinal muscles are moved aside to expose the bony lamina. The bony arch is removed to open the spinal canal and reach the spinal cord (Fig. 4). The overgrown ligaments and herniated disc material that is compressing the spinal cord is removed. Screws are placed in the left and right sides of each bone, called the lateral mass. Next, a fusion bed is created to hold bone graft. The screws are then connected to rods, one on each side.

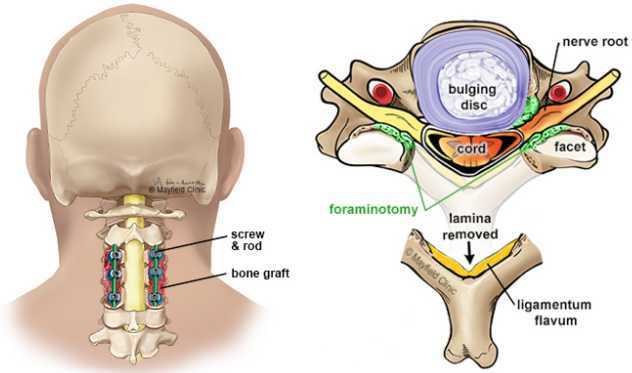

Figure 4. Posterior cervical laminectomy & fusion.

Cervical laminoplasty: This surgery is an alternative to laminectomy and fusion. It opens the space within the spinal canal by creating a hinge on the lamina and opening a door to the canal (Fig. 5). A metal plate bridges the gap in the opened section.

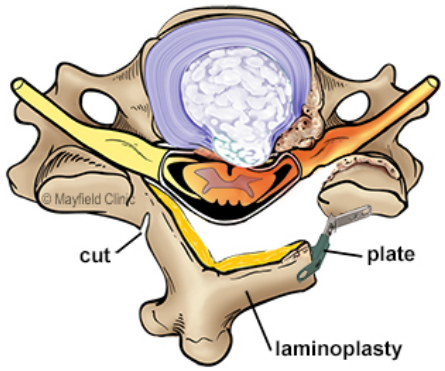

Figure 5. Cervical laminoplasty.

Clinical trials

Clinical trials are research studies in which new treatments—drugs, diagnostics, procedures, and other therapies—are tested in people to see if they are safe and effective. Research is always being conducted to improve the standard of medical care. Information about current clinical trials, including eligibility, protocol, and locations, are found on the Web. Studies can be sponsored by the National Institutes of Health (see clinicaltrials.gov) as well as private industry and pharmaceutical companies (see centerwatch.com).

Recovery

The main goal of surgery is to stop the worsening of spinal cord injury and prevent permanent disability. Recovery from myelopathy depends on the severity of symptoms and how long the cord was compressed before surgery was performed. You may regain modest improvement in hand function and walking, although numbness may persist. Residual problems after surgery may take several months to resolve. Rehabilitation methods such as gait and balance re-training may be required.

People who suffer permanent injury will face adjustments in their daily lives. Physical therapists can help them learn important self-care skills, including self-catheterization, stress management and relaxation techniques, or return to some kind of modified (light or restricted) duty. Your physician can give prescriptions for such activity for limited periods of time.

Sources & links

If you have more questions, please contact Mayfield Brain & Spine at 800-325-7787 or 513-221-1100.

https://www.spine-health.com
https://myelopathy.org

Glossary

clonus: rhythmic muscle contractions and relaxations pointing to upper motor neuron damage in the spinal cord.
discectomy: a type of surgery in which herniated disc material is removed so that it no longer irritates and compresses the nerve root.
fusion: to join two separate bones into one to provide stability.
kyphosis: abnormal forward bend of the spine.
myelopathy: compression injury to the spinal cord causing numbness, weakness, or paralysis.
myelomalacia: a "white spot" or signal intensity change in the spinal cord seen on MRI.
ossification of the posterior longitudinal ligament (OPLL): a stiffening and thickening of the main ligament in the spinal canal.
radiculopathy: compression of a spinal nerve root causing numbness or pain that radiates along the nerve path down the arm or leg.
spasticity: muscle stiffness or contraction that cause difficulty walking, placing your feet, or dropping objects.

updated > 1.2024
reviewed by > Juan Mejia Munne, MD, Zachary Tempel, MD, Mayfield Clinic, Cincinnati, Ohio