



American
Association of
Neurological
Surgeons

CERVICAL SPINE

PATIENT INFORMATION

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

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The neck is part of a long flexible column, known as the **spinal column** or backbone, which extends through most of the body. The **cervical spine** (neck region) consists of seven bones (**C1-C7 vertebrae**), which are separated from one another by intervertebral discs. These discs allow the spine to move freely and act as shock absorbers during activity.

Attached to the back of each vertebral body is an arch of bone that forms a continuous hollow longitudinal space, which runs the whole length of the back. This space, called the **spinal canal**, is the area through which the spinal cord and nerve bundles pass. The spinal cord is bathed in **cerebrospinal fluid** (CSF) and surrounded by three protective layers called the **meninges** (**dura, arachnoid, and pia mater**).

At each vertebral level, a pair of spinal nerves exit through small openings called **foraminae** (one to the left and one to the right). These nerves serve the muscles, skin and tissues of the body and thus provide sensation and movement to all parts of the body. The delicate spinal cord and nerves are further supported by strong muscles and ligaments that are attached to the vertebrae.

Cervical Disc Disease

Patients may be referred to a neurosurgeon because of problems in their neck, shoulders, arms and/or hands. They may have experienced pain, numbness, tingling and/or weakness in any or all of these locations.

Neck pain may be caused by disc degeneration, narrowing of the spinal canal, **arthritis**, and, in rare cases, cancer or **meningitis**. For serious neck problems, a primary care physician and often a specialist, such as a neurosurgeon, should be consulted to make an accurate diagnosis and prescribe treatment.

You should consult a neurosurgeon for neck pain if

- It occurs after an injury or blow to the head
- Fever or headache accompanies the neck pain
- Stiff neck prevents touching chin to chest
- Pain shoots down one arm
- There is tingling, numbness or weakness in arms or hands
- Neck symptoms associated with leg weakness or loss of coordination in arms or legs
- Neck and/or shoulder pain do not improve after four weeks, or sooner if weakness develops

Age, injury, poor posture or diseases such as arthritis can lead to degeneration of the bones or joints of the cervical spine, causing **disc herniation** or **bone spurs** to form. Sudden severe injury to the neck may also contribute to disc herniation, **whiplash**, blood vessel destruction, vertebral bone or ligament injury and, in extreme cases, permanent paralysis. Herniated discs or bone spurs may cause a narrowing of the spinal canal or the small openings through which spinal nerve roots exit.

Pressure on the spinal cord in the cervical region can be a very serious problem because virtually all of the nerves to the rest of the body have to pass through the neck to reach their final destination (arms, chest, abdomen, legs). This can potentially compromise the function of many important organs.

Cervical stenosis

Cervical stenosis occurs when the spinal canal narrows and compresses the spinal cord, and is most frequently caused by aging. The discs in the spine that separate and cushion vertebrae may dry out. As a result, the space between the vertebrae shrinks, and the discs lose their ability to act as shock absorbers. At the same time, the bones and ligaments that make up the spine become less pliable and thicken. These changes result in a narrowing of the spinal canal. In addition, the degenerative changes associated with cervical stenosis can affect the vertebrae by contributing to the growth of bone spurs that compress the nerve roots. Mild stenosis can be treated conservatively for extended periods of time as long as the symptoms are restricted to neck pain. Severe stenosis requires referral to a neurosurgeon.

Symptoms

- Neck or arm pain
- Numbness and weakness in both hands
- Unsteady gait when walking
- Muscle spasms in the legs
- Loss of coordination

Diagnosis

Diagnosis is made by a neurosurgeon based on history, symptoms, a physical examination and results of tests, including the following:

- **Computed tomography scan (CT or CAT scan):** A diagnostic image created after a computer reads and combines a multitude of thin-cut X-rays; can show the shape and size of the spinal canal, its contents and the structures around it, especially bones.
- **Electromyogram and Nerve Conduction Studies (EMG/NCS):** These tests measure the electrical impulse along nerve roots, peripheral nerves and muscle tissue. This will indicate whether there is ongoing nerve damage, if the nerves are in a state of healing from a past injury or whether there is another site of nerve compression.
- **Magnetic resonance imaging (MRI):** A diagnostic test that produces images of body structures using powerful magnets and computer technology; can show the spinal cord, nerve roots and surrounding areas, as well as enlargement, degeneration and tumors.

- **Myelogram** : An X-ray of the spinal canal following injection of a contrast material into the surrounding cerebrospinal fluid spaces; can show pressure on the spinal cord or nerves due to herniated discs, bone spurs or tumors.
- **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.

Treatment

Nonsurgical treatment is the first approach in patients with common neck pain not involving trauma. For example, many patients with cervical disc herniations improve with conservative treatment and time and do not require surgery. Conservative treatment includes time, medication, brief bed rest, reduction of physical activity and physical therapy. A doctor may prescribe medications to reduce the pain or inflammation and muscle relaxants to allow time for healing to occur. An injection of **corticosteroids** may be used to temporarily relieve pain.

Surgery

The patient may be a candidate for surgery if

- Conservative therapy is not helping
- Progressive neurological symptoms involving arms and/or legs
- Difficulty with balance or walking
- In otherwise good health

There are several different surgical procedures that can be utilized, the choice of which is influenced by the severity of the case. In a small percentage of patients, spinal instability may require that spinal fusion be performed, a decision that is generally determined prior to surgery. Spinal fusion is an operation that creates a solid union between two or more vertebrae. Various devices (like screws or plates) may be used to enhance fusion and support unstable areas of the cervical spine. This procedure may assist in strengthening and stabilizing the spine and may thereby help to alleviate severe and chronic neck pain.

Anterior Cervical Discectomy

This **operation** is performed on the neck to relieve pressure on one or more nerve roots or on the spinal cord. The cervical spine is reached through a small incision in the anterior (front) of the neck. If only one disc is to be removed, it will typically be a small horizontal incision in the crease of the skin. If the operation is more extensive, it may require a slanted or longer incision. After the soft tissues of the neck are separated, the intervertebral disc and bone spurs are removed. The space left between the vertebrae may be left open or filled with a small piece of bone or device through spinal fusion. In time, the vertebrae may fuse or join together.

Anterior Cervical Corpectomy

This operation is performed in conjunction with the anterior cervical discectomy. The **corpectomy** is often done for multi-level cervical stenosis with spinal cord compression caused by bone spur formations. In this procedure, the neurosurgeon removes a part of the vertebral body to relieve pressure on the spinal cord. One or more vertebral bodies may be removed including the adjoining discs. The incision is generally larger. The space between the vertebrae is filled using a small piece of bone or device through spinal fusion. Because more bone is removed, the recovery process for the fusion to heal and the neck to become stable is generally longer than with anterior cervical discectomy. The surgeon may select to use a metal plate that is screwed into the front of the vertebra to help the healing process.

Posterior Microdiscectomy

This **procedure** is performed through a vertical incision in the posterior (back) of your neck, generally in the middle. This approach may be considered for a large soft disc herniation that is located on the side of the spinal cord. A high speed burr is used to remove some of the facet joint, and the nerve root is identified under the facet joint. The nerve root needs to be gently moved aside to free up and remove the disc herniation.

Posterior Cervical Laminectomy

This **procedure** requires a small incision in the middle of the neck to remove the **lamina** (the back bony part of the vertebrae). Removal of the section(s) of bone is done to allow for of thickened ligament, bone spur formation or disc material that may be pushing on the spinal cord and/or nerve roots. The **foramen**, the passageway in the vertebrae through which the spinal nerve roots travel, may also be enlarged, to allow the nerves to pass through.

Risks and Outcome

Although complications are fairly rare, as with any surgery, the following **risks** may be associated with cervical spine surgery:

- Infection
- Excessive bleeding, which may require blood transfusion
- An adverse reaction to anesthesia
- Chronic neck or arm pain
- Inadequate symptom relief
- Damage to the nerves and nerve roots
- Damage to the spinal cord (about 1 in 10,000), resulting in paralysis
- Spinal instability
- Damage to the esophagus, trachea or vocal cords
- Injury to the carotid or vertebral arteries, which could result in stroke

- Fusion that does not
- Instrumentation breakage and/or failure
- Persistent swallowing or speech disturbance
- Leakage of cerebral spinal fluid

The benefits of surgery should always be weighed carefully against its risks. Although a large percentage of cervical spine patients report significant pain relief after surgery, there is no guarantee that surgery will help every individual.

Post-surgery

The doctor will give specific instructions **postsurgery** and usually prescribe pain medication. The doctor will help determine when the patient can resume normal activities such as returning to work, driving and exercising. Some patients may benefit from supervised rehabilitation or physical therapy after surgery. Discomfort is expected while the patient gradually returns to normal activity, but pain is a warning signal that he or she might need to slow down.

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.