

## Posterior Cervical Surgery

### DISCECTOMY | FORAMINOTOMY | LAMINECTOMY | FUSION

#### Overview

Posterior cervical surgery occurs in the back of the neck to relieve pressure on the nerves or spinal cord. The surgeon opens the spinal canal to remove a herniated disc, a tumor, a bone spur, or to relieve spinal stenosis. Surgery may be an option if physical therapy or medications fail to relieve your symptoms.

#### What is posterior cervical surgery?

*Posterior* means the surgeon reaches the spine by splitting the muscles at the back of the neck to expose bone. This is an alternative to anterior cervical surgery, through the front throat area.

Surgery from the back of the neck is more accessible to the spinal canal and spinal cord. Surgery from the front (anterior) of the neck is more accessible to the disc.

Pressure on the cervical nerve roots can cause *radiculopathy* symptoms. This includes pain, tingling, or numbness that radiates from the neck, down the shoulders, and into the arms and hands.

Pressure on the cervical spinal cord can cause *myelopathy* symptoms. This includes pain, numbness, weakness, abnormal reflexes, and spasticity — not only in the arms, but also in the legs. Spasticity is abnormal muscle tightness that makes it difficult to walk, hold an object, or keep your balance. It can also cause bladder issues.

Types of posterior cervical surgeries include:

- **Discectomy:** removal of a herniated disc to relieve pressure on the nerve root (Fig. 1).
- **Foraminotomy:** removal of bone to enlarge the neural foramen — the canal where the nerve root exits the spine.
- **Laminectomy:** removal of the lamina bone to open the spinal canal and decompress the cord and nerves (Fig. 2).
- **Laminoplasty:** expansion of the spinal canal by cutting the lamina bone on one side and propping it open like a door (Fig. 3).
- **Posterior fusion:** joining together of two or more vertebrae to stop unstable motion. Metal screws and rods align the bones and graft material. After surgery, the body begins its healing process and new bone grows around the graft. In 6 to 12 months the bone graft should form one solid piece of bone (Fig. 4).

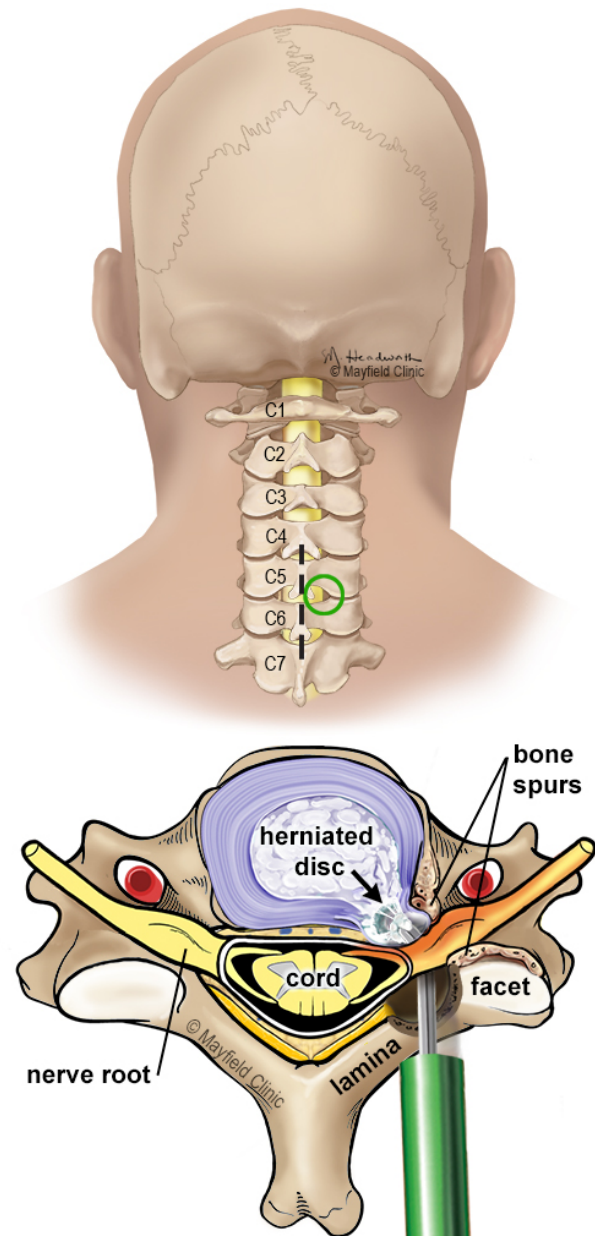


Figure 1. Posterior cervical discectomy involves a small incision (dashed line) in the neck. Bone of the lamina is removed (green circle) to open the nerve canal. The disc material pinching the nerve root is removed. Any bone spurs are removed and the nerve canal is enlarged (foraminotomy).

You may be a candidate for posterior cervical surgery if you have:

- significant pain, numbness, or weakness in your hand or arm
- symptoms that have not improved with physical therapy or medication
- difficulty walking or spasticity in your legs
- diagnostic tests (MRI, CT, myelogram) that show you have stenosis or disc herniation

Posterior surgery may be helpful in treating:

- **Cervical disc disease:** As discs naturally wear out, they become dry, shrink, and lose flexibility. The disc spaces get thinner. This leads to disc bulging and herniation.
- **Cervical stenosis / myelopathy:** Narrowing of the bony canals through which the spinal cord and nerves pass. Stenosis is often caused by age-related changes: enlarged facet joints, bulging discs, bone spurs, and thickened ligaments that all narrow the canals.
- **Cervical kyphosis:** An abnormal forward curve of the neck. The weight of the head can cause imbalance or pain and make it difficult to look straight ahead. Surgery can help support and straighten the spine.

### The surgical decision

If you are a candidate for surgery, the surgeon will explain your options. Consider all the risks and benefits as you make your decision.

Your surgeon will also explain the various types of bone graft to create a fusion. These materials act as a kind of mortar between the bones as your body heals. Each type has advantages and disadvantages.

- Autograft is your living bone. The marrow contains bone-growing proteins. It can be collected from drillings during the surgery or taken from the hip as an iliac crest bone graft.
- Allograft (cadaver bone-bank) is more commonly used and is effective as well.
- Bone-growing proteins and cadaver bone matrix may be added to the graft.

### Who performs the procedure?

A neurosurgeon or an orthopedic spine surgeon can perform spine surgery. Many spine surgeons have specialized training in minimally invasive or complex spine surgery. Ask your surgeon about their training and experience, especially if your problem is complex or you've had more than one spinal surgery.

### What happens before surgery?

In the office, you will sign consent forms and provide your medical history (allergies,

medicines/vitamins, bleeding history, anesthesia reactions, previous surgeries). Inform your health care provider about all the medications (over-the-counter, prescription, herbal supplements) that you are taking, especially if you take blood thinners or steroids. Presurgical tests (blood test, electrocardiogram) may need to be done several days before surgery. Consult your primary care physician about stopping certain medications and ensure you are cleared for surgery.

Continue taking the medications your surgeon recommends. Stop taking all non-steroidal anti-inflammatory medicines (ibuprofen, Advil, etc.) and blood thinners (Coumadin, aspirin, Plavix, etc.) 7 days before surgery.

You may be asked to wash your skin with Hibiclens (CHG) or Dial soap before surgery. It kills bacteria and reduces surgical site infections. (Avoid getting CHG in eyes, ears, nose, or genital areas.)

### Stop smoking

The most important thing you can do to ensure a successful surgery is quit using nicotine products. This includes cigarettes, vaping, cigars, pipes, chew, and snuff/dip. Nicotine prevents bone growth and decreases successful fusion. Smoking risk is serious: fusion fails in 40% of smokers compared with 8% of non-smokers [1]. Smoking also decreases blood circulation, resulting in slower wound healing and an increased risk of infection. Talk with your primary care doctor about ways to help you quit: nicotine replacements, medications (Chantix or Zyban), and counseling programs.

Don't drink alcohol 1 week before and 2 weeks after surgery to avoid bleeding problems.

### Morning of surgery

- Don't eat or drink after midnight before surgery (unless the hospital tells you otherwise). You may take permitted medicines with a small sip of water.
- Shower using antibacterial soap. Dress in freshly washed, loose-fitting clothing.
- Wear flat-heeled shoes with closed backs.
- Remove make-up, hairpins, contacts, body piercings, nail polish, etc.
- Leave all valuables and jewelry at home.
- Bring a list of medications with dosages and the times of day usually taken.
- Bring a list of allergies to medication or foods.

Arrive at the hospital two hours before (outpatient center one hour before) your scheduled surgery time to complete paperwork and pre-procedure work-ups. An anesthesiologist will talk with you and explain the effects of anesthesia and its risks.

## What happens during surgery?

The surgery takes 1-3 hours, depending on how many spine levels are treated.

### Step 1: prepare the patient

You will lie on the operating table and be given anesthesia. Once asleep, you will be rolled onto your stomach with your chest and sides supported by pillows. Your neck is cleansed and prepped.

### Step 2: make an incision

A skin incision is made over the appropriate vertebrae. The neck muscles are moved aside to expose the bone. An X-ray is taken to verify the correct vertebra.

### Step 3: expose the nerve

In a minimally invasive discectomy, a series of tube dilators are passed, one around the other, to gradually separate the muscles and create a tunnel to the bony vertebra. A small bone window is made on one side of the lamina to expose the nerve. Disc material pinching the nerve is removed (Fig. 1).

### Step 4: enlarge the nerve canals

The facet joints, which are directly over the nerve roots, may be undercut (trimmed). The foramen, through which the spinal nerve exits, is enlarged with a drill. This is called a foraminotomy and gives your nerves room to move freely.

### Step 5: decompress the cord

If stenosis is squeezing the spinal cord, the entire bony lamina and thickened ligament are removed to open the spinal canal. This is repeated for each affected vertebrae level (Fig. 2). The surgeon gently retracts the protective sac of the spinal cord to remove bone spurs and any disc material.

### Step 6: expand the spinal canal (optional)

Laminoplasty is an alternative to laminectomy and fusion. It opens up the space within the spinal canal by creating a hinge on the lamina and opening a door to the canal (Fig. 3). A metal plate bridges the gap in the opened section.

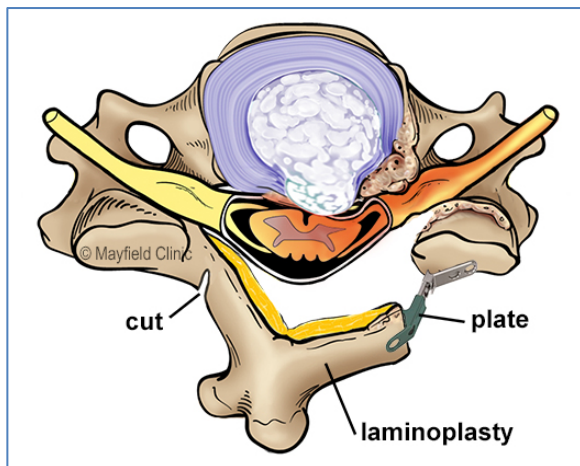


Figure 3. Laminoplasty is an alternative to laminectomy. It creates a door hinge to open and widen the spinal canal, giving more room for the spinal cord.

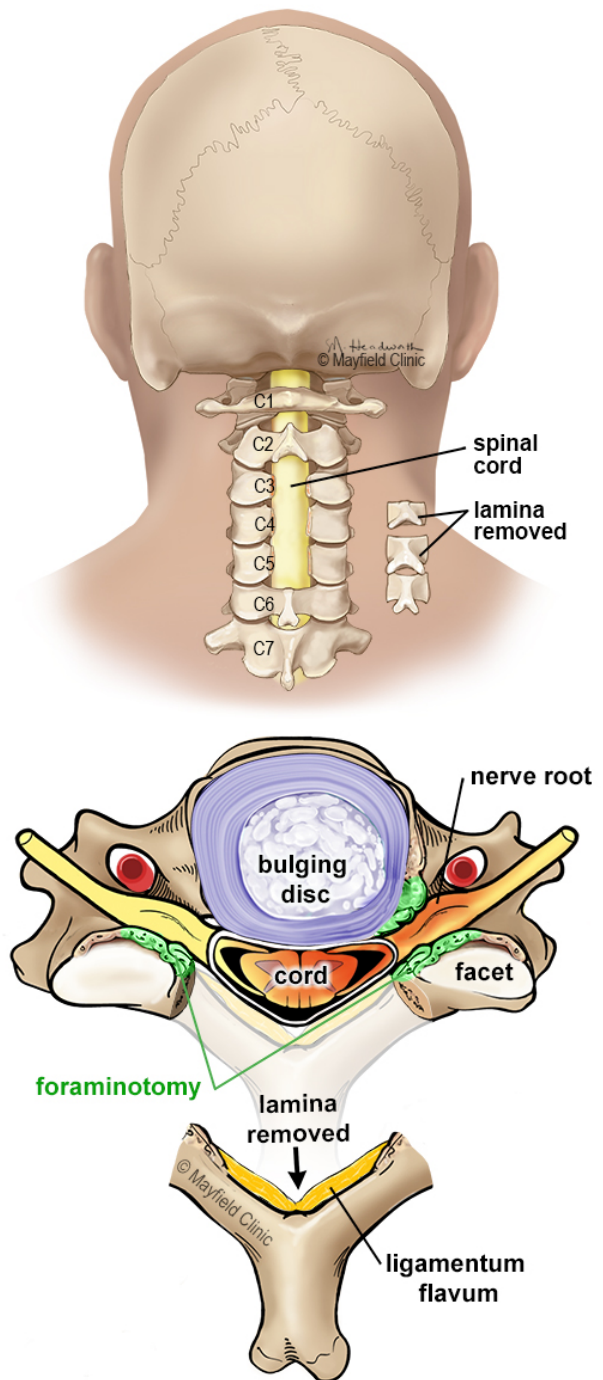


Figure 2. Posterior cervical decompression involves removing one or more bony lamina and ligament to open the spinal canal and relieve pressure on the cord. Bone spurs are drilled to open the nerve canals (green areas), a procedure called a foraminotomy.



### Step 7: create a bone fusion (optional)

If a fusion is planned, titanium screws will be placed in the left and right sides of each bone, called the lateral mass. The screws angle away from the spinal canal and vertebral artery (Fig. 4).

The outer layer of bone over the facet joints is drilled to expose the blood-rich bone inside. This "fusion bed" will hold the bone graft material. The screws are then connected to rods, one on each side. An x-ray is taken to verify the position of the graft, rod, and screws.

### Step 8. close the incision

The muscle and skin incisions are sutured together. Steri-Strips or biologic glue is placed across the incision.

### What happens after surgery?

You will awaken in the post-op recovery area. Blood pressure, heart rate, and respiration will be monitored. Any pain will be addressed. Once awake, you can increase your activity (sitting in a chair, walking).

Patients having a 1 or 2-level foraminotomy often go home the same day. If you have had a fusion, you may stay in the hospital overnight and go home in 1-2 days. Be sure to have someone at home with you the first 24-48 hours to help.

Follow the surgeon's home care instructions for **2 weeks** after surgery or until your follow-up appointment. In general, you can expect:

#### Restrictions

- Avoid bending or twisting your neck.
- Don't lift anything heavier than 5 pounds.
- No strenuous activity including yard work, housework, or sex.
- **DON'T SMOKE** or use nicotine products: vape, dip, chew. It prevents new bone growth and may cause your fusion to fail.
- Don't drive until after your follow-up visit.
- Don't drink alcohol. It thins the blood and increases the risk of bleeding. Also, don't mix alcohol with pain medicines.

#### Incision Care

- If Dermabond skin glue covers your incision, you may shower the day after surgery. Gently wash the area with soap and water every day. Don't rub or pick at the glue. Pat dry.
- If you have staples, Steri-strips, or stitches, you may shower 2 days after surgery. Gently wash the area with soap and water every day. Pat dry.
- If there is drainage, cover the incision with a dry gauze dressing. If drainage soaks through two or more dressings in a day, call the office.
- Don't soak the incision in a bath or pool.
- Don't apply lotion/ointment on the incision.

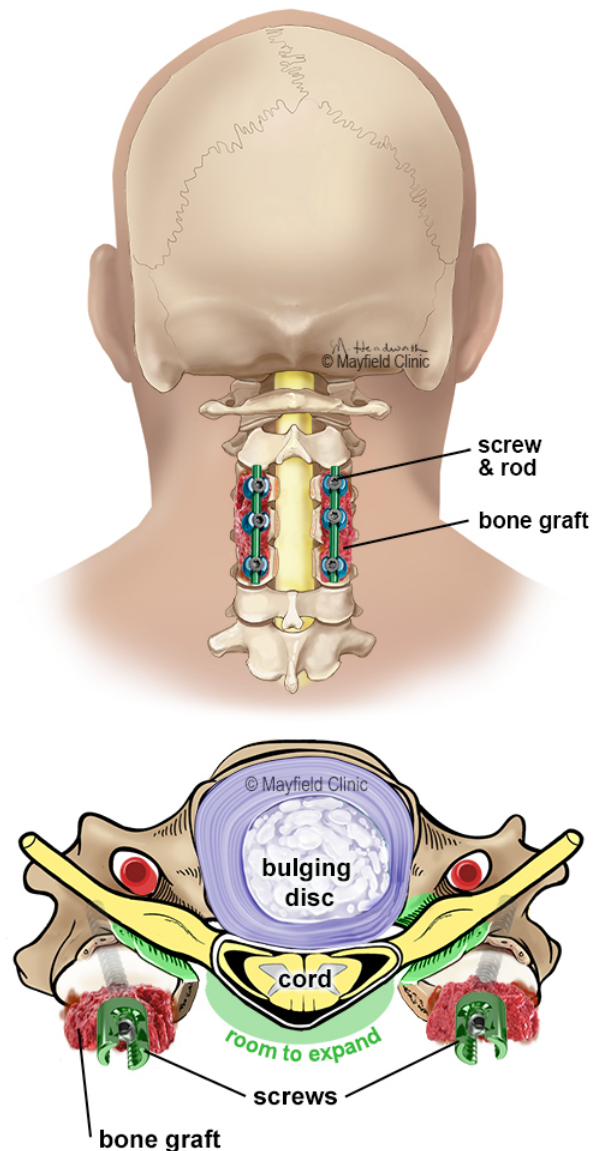


Figure 4. Posterior cervical fusion involves placing screws in each of the vertebra and then connecting them with a rod. Chips of your own bone (or donor's bone) are placed along the exposed bones and around the hardware to help promote new bone growth. Over time, the vertebrae fuse (grow and join) together.

- Dress in clean clothes after each shower. Sleep with clean bed linens. No pets in the bed until your incision heals.
- Some clear, pinkish drainage from the incision is normal. Watch for spreading redness, colored drainage, and separation.
- Staples, Steri-strips, and stitches are removed at your follow-up appointment.

### Medications

- Take pain medicines as directed. Reduce the amount and frequency as your pain subsides. If you don't need the pain medicine, don't take it.
- Narcotics can cause constipation. Drink lots of water, and eat high-fiber foods. Stool softeners and laxatives can help move the bowels. Colace, Senokot, Dulcolax, and Miralax are over-the-counter options.
- If painful constipation does not get better, call the doctor to discuss other medicine.
- Don't take anti-inflammatory pain relievers (Advil, Aleve) without your surgeon's approval. They prevent new bone growth and may cause your fusion to fail.
- You may take acetaminophen (Tylenol).

### Activity

- If you were given a brace, wear it at all times except when sleeping, showering, or icing.
- Ice your incision 3-4 times per day for 15-20 minutes to reduce pain and swelling.
- Get up and walk 5-10 minutes every 3-4 hours. Gradually increase walking, as you are able.

### When to Call Your Doctor

- Fever over 101.5° (unrelieved by Tylenol)
- Unrelieved nausea or vomiting
- Severe unrelieved pain
- Signs of incision infection
- Rash or itching at the incision (allergy to Dermabond skin glue)
- Swelling and tenderness in the calf of one leg
- New onset of tingling, numbness, or weakness in the arms or legs
- Dizziness, confusion, nausea, or excessive sleepiness

### Recovery and prevention

Schedule a follow-up appointment with your surgeon for 2 weeks after surgery. Recovery time generally lasts 4-6 weeks for foraminotomy or discectomy and 3-6 months for fusion surgery. The surgeon will decide when to release you back to work at your follow-up visit. Most patients can return to desk work in 2-4 weeks, light duty work in 4-6 weeks, and full-duty work in 3-6 months, depending on how strenuous.

If you had a fusion, healing will continue for 3 to 6 months while bony fusion takes place. X-rays may be taken periodically to verify that fusion is occurring.

A cervical collar or brace is sometimes worn during recovery to provide support and limit motion while your neck heals or fuses (see Neck Braces). Your doctor may prescribe neck stretches and exercises or physical therapy once your neck has healed.

If you had a bone graft taken from your hip, you may experience pain, soreness, and stiffness at the incision. Get up frequently (every 20 minutes) and move around or walk. Don't sit or lie down for long periods of time.

Recurrences of neck pain are common. The key to avoiding recurrence is prevention:

- Proper lifting techniques
- Good posture during sitting, standing, moving, and sleeping
- Appropriate exercise program
- An ergonomic work area
- Healthy weight and lean body mass
- A positive attitude and relaxation techniques
- No smoking

### What are the results?

Each patient's result and recovery differ based on his or her health and lifestyle. Keep a positive attitude and perform your physical therapy as instructed.

With posterior cervical fusion, you may notice some range of motion loss, but this varies according to neck mobility before surgery and the number of levels fused. Most patients do not notice a big loss of motion or limits turning their head.

Achieving a spinal fusion varies depending on the technique used, your general health, and whether you smoke. You should stop smoking before surgery, or this could hinder fusion. Also, anti-inflammatories like ibuprofen and naproxyn can affect fusion and need to be avoided for 3-6 months after surgery.

### What are the risks?

No surgery is without risks. General complications of any surgery include bleeding, infection, blood clots (deep vein thrombosis), and reactions to anesthesia.

Specific complications related to posterior cervical surgery may include:

**C5 nerve palsy.** In some cases, temporary weakness of the deltoid or biceps muscle can occur. Patients have pain and difficulty elevating the arm at the shoulder. The C5 nerve, which has the shortest length, can be stretched during surgery. It may take several months for the nerve to recover. In rare cases, deltoid paralysis may persist and need further therapy.

**Post-laminectomy kyphosis.** An abnormal forward curvature of the neck can occur after surgery due to disruption of the lamina and ligaments. This forward tension can stretch the spinal cord and reduce its blood supply.

**Vertebrae failing to fuse.** There are many reasons why bones do not fuse together. Common ones include smoking, osteoporosis, obesity, and malnutrition. Smoking is by far the greatest factor that can prevent fusion. Nicotine is a toxin that inhibits bone-growing cells. If you continue to smoke after surgery, you could undermine the fusion process.

**Hardware fracture.** Metal screws and plates used to stabilize the spine are called "hardware." The hardware may move or break before the bones are completely fused. If this occurs, a second surgery may be needed to fix or replace the hardware.

**Adjacent segment disease.** Fusion of a spine segment causes extra stress and load to be transferred to the discs and bones above or below the fusion. The added wear and tear can eventually degenerate the adjacent level and cause pain.

**Nerve damage or persistent pain.** Any spine surgery comes with the risk of damaging the nerves or spinal cord. Damage can cause numbness or even paralysis. However, the most common cause of persistent pain is nerve damage from the disc herniation itself. Some disc herniations may permanently damage a nerve, making it unresponsive to surgery. Like furniture on the carpet, the compressed nerve doesn't spring back. In these cases, spinal cord stimulation or other treatments may provide relief.

## Sources & links

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

## Sources

1. Emami A, et al. Comparing Mid-Term Outcomes Between ACDF and Minimally Invasive Posterior Cervical Foraminotomy in the Treatment of Cervical Radiculopathy. *Spine* 47(4):324-330, 2022
2. Skovrlj B, et al. Complications, outcomes, and need for fusion after minimally invasive posterior cervical foraminotomy and microdiscectomy. *Spine J* 14(10):2405-11, 2014

## Links

<http://www.spine-health.com>  
<http://www.spineuniverse.com>  
<http://www.knowyourback.org>

## Glossary

**allograft:** a portion of living tissue taken from one person (the donor) and implanted in another (the recipient) for the purpose of fusing two tissues together.

**autograft (autologous):** a portion of living tissue taken from a part of one's own body and transferred to another for the purpose of fusing two tissues together.

**bone graft:** bone harvested from oneself (autograft) or from another (allograft) for the purpose of fusing or repairing a defect.

**discectomy:** a type of surgery in which herniated disc material is removed so that it no longer irritates and compresses the nerve root.

**foraminotomy:** surgical enlargement of the intervertebral foramen through which the spinal nerves pass from the spinal cord to the body.

**fusion:** to join together two separate bones into one to provide stability.

**ossification of the posterior longitudinal ligament (OPLL):** a stiffening and thickening of the main ligament in the spinal canal.



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