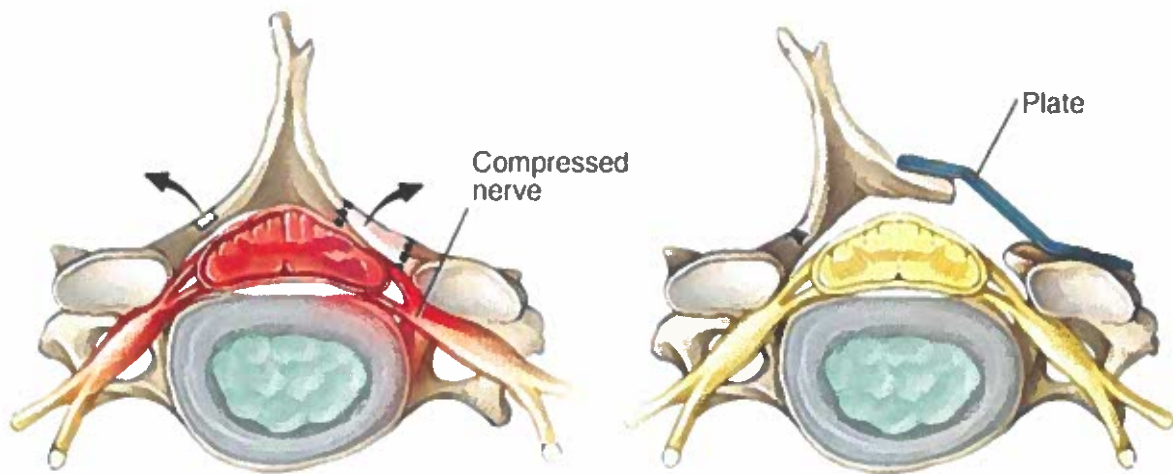




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Surgical Treatment of Cervical Spinal Stenosis via Laminoplasty



Understanding the Spine

The spine is made up of vertebrae, which are bones that are stacked on top of each other in a column. Between these bones are discs that act as cushions. The discs have a tough outer ring called the annulus fibrosus. This outer layer covers the inner gel-like center of the disc, called the nucleus pulposus. The vertebrae meet at bony junctions called facet joints connected by ligaments called ligamentum flavum. The spinal cord and nerves are contained in the spinal canal, which runs through the column made by the vertebrae. Nerves exit the spinal canal on each side through the foramina, which are openings between the vertebrae.

Common Cervical Spine Issues

Spinal Canal Stenosis (Narrowing)

- ☒ Usually develop slowly over years
- ☒ Maybe caused by disc breakdown, disc herniation, osteoarthritis, bone spurs and thickening of the ligaments (ligamentum flavum)
- ☒ Narrowing of the spinal canal may cause pressure on the nerves, which can cause neck pain, leg symptoms, balance problems and abnormal reflexes with possible arm pain, numbness or weakness

Foraminal Stenosis

- ☒ Narrowing of the openings between vertebrae where the spinal nerves exit the spinal column
- ☒ May be caused by bone spurs (outgrowth of bone), herniated or bulging discs
- ☒ Foraminal narrowing may lead to trapping or constriction of the nerves which can cause neck pain, arm pain, numbness, weakness or cramping.

Disc Herniation

- ☒ As the body ages, disc height can become reduced, which can lead to "rupture" or "herniation" of the inner gel-like disc (nucleus pulposus).
- ☒ Disc herniation may bulge into the spinal canal, causing pressure on the nerve, which may cause sudden neck pain, numbness/tingling in the shoulders, arms, and fingers. (See above in foraminal stenosis and spinal canal stenosis.)

Ossification of the posterior Longitudinal Ligament

- ☒ The posterior longitudinal ligament (PLL) is a flexible structure that runs behind the vertebrae. It connects the vertebrae and stabilizes the spine
- ☒ During aging the PLL becomes thicker and less flexible. This condition is described a "ossification" of the PLL.
- ☒ An ossified PLL narrows the spinal canal and can cause symptoms of spinal canal narrowing and foraminal stenosis (see above).

Treatment Options:

Non-operative treatment Options

All of these cervical spine issues may first be treated with non-operative management. This may include rest, medication, physical therapy, and/or steroid injection.

Surgical Treatment Options

Surgery is usually saved as the last treatment option for those who have not had improvement of symptoms with non-operative treatments.

Cervical spine surgery can be done via anterior or posterior approach. General anterior spine techniques are anterior cervical discectomy and fusion (ACDF) and disc arthroplasty. Posterior cervical spine approach may involve direct decompression, where the pressure is removed from the nerve, which may include foraminotomy, laminoplasty and/or laminectomy. Implants can be used to prevent the instability of spine.

How Is Laminoplasty better?

Laminoplasty is a surgical procedure to expand the volume of the spinal canal. It is used to treat conditions where the narrowing of the spinal canal puts pressure on the spinal nerves or the spinal cord. Conditions where a laminoplasty can be especially useful, are narrowing of the spinal canal with ossification of the posterior longitudinal ligament or narrowing due to a cervical spondylosis.

Compared to the alternative procedures it offers several advantages:

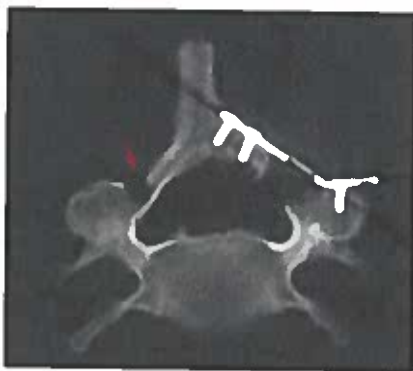
- ☒ Preservation of the posterior bone structures
- ☒ Reduced risk of developing posterior instability
- ☒ It aids in the maintenance of spinal balance
- ☒ Intact posterior structure form a protective layer against scar tissue

Indications/contraindications

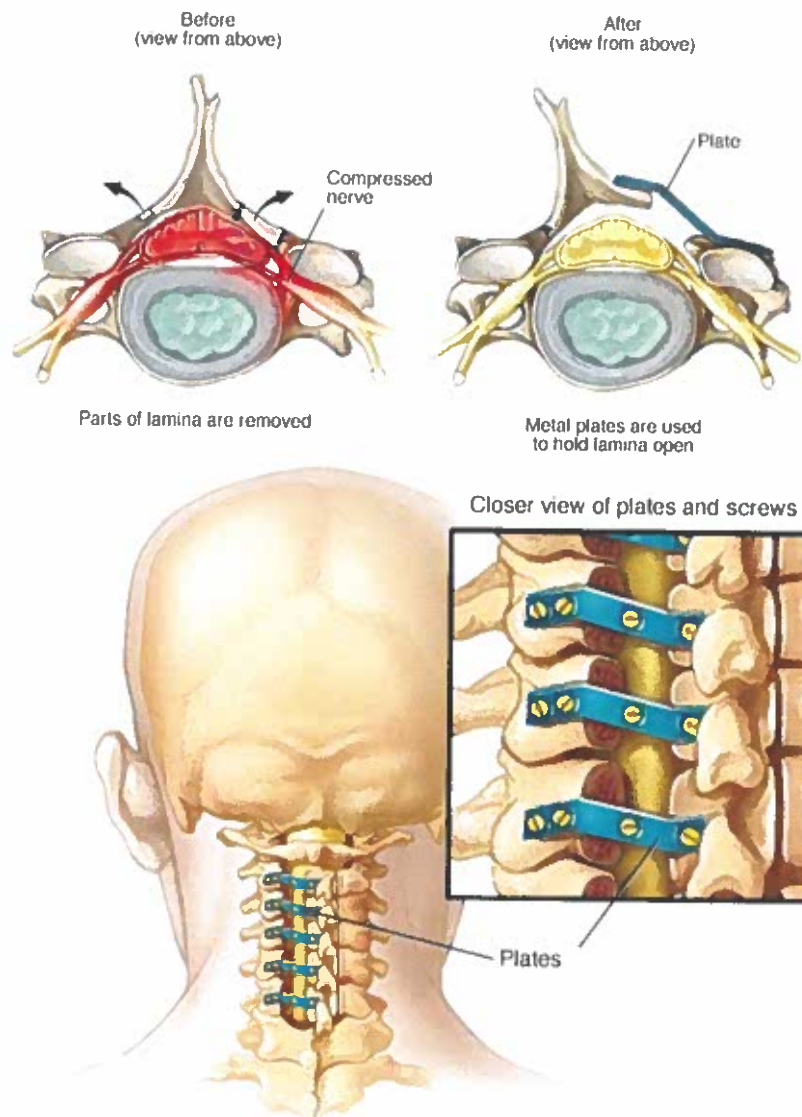
- ☒ Cervical laminoplasty is only indicated in patients with symptomatic spinal stenosis that failed non-operative treatment
- ☒ A stable cervical spine with adequate alignment is mandatory
- ☒ CLP is not indicated in patients with severe mechanical backpain

The Procedure

The spinal canal is limited by a posterior border, the so called "lamina". In the "open door laminoplasty" procedure a small part of the lamina is removed on one side. Additionally, on the other side of the lamina, the bone receives a small incision to allow for mobility. The next step is to lift the lamina up like the opening of a door to increase the volume of the spinal canal. In the new position the lamina is fixed with a small plate and screws.



Stages of cervical laminectomy procedure



The Results and Scientific Evidence

- ☒ The laminoplasty is a common and well evaluated procedure. In the last years over 100 studies with almost 9000 included patients were performed about laminoplasty.¹
- ☒ Patients with cervical laminoplasty show less postoperative deformity than patients with laminectomy.¹
- ☒ Cervical laminoplasty shows excellent clinical outcomes for many indications.²
- ☒ Laminoplasty causes less pain than a fusion of the spinal segments

References:

1. Duetzmann, S., Cole, T., & Rattiff, J. K. (2015). Cervical laminoplasty developments and trends, 2003–2013: a systematic review. *Journal of Neurosurgery: Spine* SPI, 23(1), 24–34. Retrieved Mar 18, 2021
2. Hale, James J., Konrad I Gruson, and Jeffrey M Spivak. "Laminoplasty: a review of its role in compressive cervical myelopathy." *The Spine Journal* 6.6 (2006): S289–S298.