

Laminectomy with or Without Fusion to Manage Degenerative Cervical Myelopathy

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KEYWORDS

- Cervical laminectomy • Cervical myelopathy • Cervical spondylosis • Decompression
- Laminectomy • Kyphosis

KEY POINTS

- Posterior decompression is generally recommended in patients with multilevel cervical stenosis with preserved cervical lordosis.
- Successful treatment of multilevel degenerative cervical myelopathy (DCM) requires adequate decompression, restoration of the normal curvature, and reconstruction of the cervical stability.
- Fixed cervical kyphosis is a contraindication for a posterior-only approach.
- Laminectomy alone may put DCM patients at higher risk of postlaminectomy kyphosis and axial neck pain.

Degenerative cervical myelopathy (DCM) is among the most common causes of cervical spinal cord dysfunction in the elderly.¹ It results from spondylotic changes and ossification of the spinal ligaments, leading to compression of neural structures and subsequent spinal cord dysfunction. As the population ages, the demand for these surgeries will keep rising. A thorough knowledge of the advantages and limitations of the different surgical treatments is essential for decision-making.²

Cervical laminectomy was the first procedure described for the management of degenerative cervical spine disease. It provided validation to the hypothesis that alleviating neural compression

will result in clinical improvement in these patients. The procedure has since been found to have a high incidence of postoperative instability that necessitated the modifications to this procedure and the development of alternatives, including fusion.³

HISTORICAL OVERVIEW

Spine surgery for cervical degenerative disc disease has been described since the earlier half of the twentieth century. The initial fear of inducing significant postoperative instability status postdecompression alone was not realized and the procedure gained increased popularity. Many investigators reported

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the clinical success of laminectomy for DCM⁴⁻²² (Table 1). In the early twentieth century, many of these investigators did not pay any attention to the radiological failure in the form of postlaminectomy kyphosis.^{4-6,8,10,11} The initial impression that this procedure was well tolerated changed as long-term follow-up of these patients was obtained. It became clear that this procedure was marred by an unacceptably high rate of kyphosis, approaching 20%, and subsequent pain and neurologic deterioration as the spinal cord draped and compressed against the kyphosing spine.^{15,17,23}

Improved understanding of spinal biomechanics, along with the continued innovation in surgical access and reconstruction provided, a growing list of operative strategies to decompress the cervical spine while maintaining its alignment. The earliest was provided by the description of the anterior cervical approach. This allowed spine surgeons to address cervical compressive myelopathy and radiculopathy without disrupting the posterior tension band.³

Modifications to the posterior approach were also developed to compensate for the destabilizing effect of posterior element resection. Laminoplasty was 1 such modification to preserve the posterior elements popularized in East Asia in the 1970s.²⁴ This procedure retains the posterior bony elements with their attached ligaments and musculature in the hopes of maintaining segmental mechanical integrity.²⁵ Another strategy is the instrumentation of the destabilized segment, currently performed most commonly with polysegmental lateral mass screws. This results in a rigid construct that resists the kyphotic forces and allows for maintenance of sagittal alignment with long-term follow-up.¹⁷ Stand-alone laminectomies have, therefore, been generally abandoned in contemporary spine practice.²

DEFINITIONS

Laminectomy, as currently practiced, is the removal of the spinous processes with interposed interspinous and supraspinous ligaments; the laminae; and, in varying extent, the facet joints and capsules. This is followed by resection of the ligamentum flavum, until decompression and exposure of the thecal sac is obtained.

Posterior access to the spinal column is through a median approach bisecting the ligamentum nuchae, which exploits an avascular plane between the posterior paraspinal muscles. Exposure of the bony structures is done by stripping the musculature Sharpey fibers from their bony attachments via electrocautery in a subperiosteal fashion.²⁶ Laminectomies can then be supplemented with

posterior instrumentation. This frequently consists of lateral mass screws that span the destabilized segments.^{2,17}

In contrast, laminoplasty preserves the laminae and ligaments, but instead obtains expansion of the spinal canal by remodeling the lamina. This procedure posteriorly displaces the laminae, increasing spinal canal size, and fixes them in the new position while preserving the integrity of spinal ligaments and muscle attachments. Motion is, therefore, preserved in the operated motion segments. This procedure was developed to reduce the risk of postoperative kyphosis by maintaining the osteoligamentous tension band. Remodeling of the lamina is obtained via several techniques that include the initially described Z-plasty, the open door, and the French door, among other modifications.²⁷

ANTERIOR VERSUS POSTERIOR APPROACHES TO THE CERVICAL SPINE

It is critical to optimize a surgery that is best suited for a patient's pathologic findings. The objectives of surgery should include an adequate neural decompression, while respecting the normal spinal alignment, all while minimizing complications and disruption to local anatomy.

Deciding on the optimal approach for the myelopathic patient requires taking multiple factors into consideration. Large retrospective and prospective studies did not reveal any approach to be clearly superior when compared with others.^{2,28-30} In addition, the very large number of variations in procedures and differing compressive etiologic factors across populations creates a very heterogeneous mix of patients who are difficult to pool.²

The anterior spinal approach allows direct access to anterior compressive pathologic findings, as well as allows for correction of any significant kyphotic deformity. It also seems to be the surgical corridor that carries the lower risk for surgical site infection and that results in less postoperative pain compared with a posterior approach.²⁸ The drawbacks are the need to dissect between important neurovascular and aerodigestive structures with occasional access-related complications, such as hoarseness and dysphagia,²⁸ particularly in the elderly. Also, there is the high risk of dural tear with CSF leak after surgery for ossified posterior longitudinal ligament (OPLL).²⁸

The risk of complications with anterior approaches increases with the number of operated levels.^{2,31} This led to the general preference for posterior surgery when encountering pathologic findings extending for 3 or more segments.² Posterior approaches offer quick access that can be readily extended should the need arise, but they

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