Hybrid Posterior Decompression in Cervical Myelopathy: Laminoplasty-Laminectomy Technique

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OVERVIEW OF CERVICAL SPINE DECOMPRESSION PROCEDURES

Posterior cervical decompression procedures are commonly performed to relieve pressure on the spinal cord caused by conditions such as cervical spinal stenosis and cervical spondylotic myelopathy. These conditions occur when degenerative changes narrow the spinal canal, compressing the spinal cord and nerve roots. Patients may experience symptoms such as neck pain, numbness, weakness in the upper extremities, loss of coordination, or difficulty walking. When conservative treatments fail, surgical decompression may be required to prevent further neurological decline.

Two commonly performed posterior decompression procedures are laminectomy and laminoplasty. Although both techniques aim to relieve pressure on the spinal cord, they differ in how the lamina is managed and how spinal stability is preserved. A laminectomy involves the surgical removal of the lamina, the posterior portion of the vertebra that forms the roof of the spinal canal. By removing the lamina, the surgeon creates additional space for the spinal cord and nerve roots, relieving compression.

Laminectomy has historically been considered a reliable method of decompression because it allows for wide exposure of the spinal canal. However, removal of the posterior bony structures can compromise the stability of the cervical spine. In many cases, this requires spinal fusion to maintain alignment and prevent postoperative deformity. Fusion can limit motion and increase surgical time and recovery.

Laminoplasty was developed as an alternative to laminectomy to preserve spinal stability and maintain motion. The expansive open-door lami-

LEARNING OBJECTIVES

- Differentiate between laminectomy, laminoplasty, and hybrid cervical decompression techniques used to treat cervical spinal cord compression
- Explain the purpose of hybrid cervical laminoplasty in decompressing the spinal cord while preserving cervical spine stability and motion
- Identify key instrumentation, implants, and supplies used during hybrid cervical laminoplasty, including the Canopy Laminoplasty System
- Describe the role of the CST during hybrid posterior cervical decompression
- Recognize postoperative considerations and potential complications associated with cervical decompression procedures

noplasty technique was originally described by Hirabayashi and Satomi.[1] Instead of removing the lamina entirely, the surgeon reshapes and repositions it to expand the spinal canal. The lamina is typically opened on one side, like a door, allowing more room for the spinal cord while keeping the bone intact.

Modern laminoplasty procedures often utilize plates or spacers to hold the lamina in the expanded position. Instrumentation systems such as the Canopy Laminoplasty System from Globus Medical allow surgeons to secure the lamina with small plates and screws, maintaining the new canal diameter while promoting stability.[2] Laminoplasty preserves motion and avoids the need for fusion in many patients. However, it may not fully address all sources of compression, particularly when thickened ligament tissue is present within the spinal canal.

HYBRID DECOMPRESSION

To address the limitations of each technique, some surgeons have adopted a hybrid decompression approach that combines laminoplasty with selective laminectomy. This allows the surgeon to remove structures that are directly compressing the spinal cord while still preserving the stabilizing structures of the spine.

Ding et al examined the effectiveness of a hybrid decompression technique that combines laminoplasty with selective laminectomy in patients with cervical spinal cord compression associated with hypertrophic ligamentum flavum. [3] In this approach, selective laminectomy is used to remove compressive ligament tissue while laminoplasty is performed at adjacent levels to expand the spinal canal thus preserving the posterior spinal elements.

The study demonstrated that hybrid decompression provided significant enlargement of the spinal canal while maintaining structural stability of the cervical spine. Postoperative imaging confirmed adequate decompression of the spinal cord and reconstruction of a stable laminar arch. Patients in the study also demonstrated neurological improvement following the procedure. These findings suggest that combining laminoplasty with selective laminectomy can effectively address multiple sources of spinal cord compression while preserving important anatomical structures.

Additional research comparing laminoplasty techniques with traditional laminectomy and fusion procedures has supported the use of motion-preserving approaches when appropriate. In a comparative study evaluating modified laminoplasty versus laminectomy with fusion, investigators found that laminoplasty produced similar neurological recovery while offering advantages such as shorter operative times, reduced blood loss, and improved preservation of the cervical range of motion.[4]

> "Hybrid cervical laminoplasty combining laminoplasty with selective laminectomy provides an effective surgical approach for decompressing the spinal cord while preserving stability of the cervical spine."

These findings highlight the growing interest in hybrid and motion-preserving posterior cervical decompression techniques. By selectively removing compressive structures while maintaining spinal stability, surgeons may be able to achieve effective decompression while minimizing some of the limitations associated with traditional procedures.

For the Certified Surgical Technologist (CST®), understanding the differences between these procedures is essential. Hybrid decompression requires familiarity with both laminectomy and laminoplasty techniques, as well as the specialized instrumentation used during the procedure.

ROLE OF THE CST DURING HYBRID CERVICAL LAMINOPLASTY

The role the CST plays in a hybrid cervical laminoplasty is crucial. Knowledge of instrumentation and surgical setup, along with a clear understanding of the procedural steps, helps ensure that the surgical team maintains efficiency and patient safety throughout the procedure. Proper preparation and anticipation of the surgeon's needs allow the procedure to progress smoothly and minimize delays in the operating room.

Preparation for this procedure begins before the patient enters the operating room. The CST is responsible for ensuring that all necessary instrumentation, implants, and supplies are available and properly organized on the

sterile field. For hybrid cervical decompression procedures, this typically includes standard spine instruments, high-speed drills and burrs, Kerrison rongeurs, curettes, and the laminoplasty instrumentation system. When using the Canopy Laminoplasty System, the CST must verify that the appropriate plates, spacers, and screws are available and that the implant system is open and ready for use. Hemostatic agents such as Floseal and small surgical patties should be available, along with bone wax to control bleeding from bone surfaces. Irrigation should be prepared in a 20 mL syringe with an angiocath attached, which allows for controlled irrigation while drilling. Continuous irrigation is important because high-speed drills can generate significant heat, and irrigation helps cool the drill tip and surrounding bone during the procedure.

OPERATING ROOM SETUP AND PATIENT POSITIONING

Proper operating room setup is essential for maintaining efficiency and patient safety during posterior cervical spine procedures. For hybrid cervical laminoplasty, the patient is typically positioned prone on a radiolucent spine table, such as a Jackson table, which allows for proper spinal alignment and unobstructed imaging during the procedure. The patient's head is secured in a Mayfield head holder to maintain stability and prevent movement while the surgeon is working near the spinal cord. Careful positioning of the head and neck helps maintain neutral cervical alignment and allows optimal surgical exposure of the posterior cervical spine.

Fluoroscopy using the C-arm is used to confirm the correct spinal level prior to the incision. The CST should ensure that the C-arm can be brought into position easily without contaminating the sterile field and that there is adequate space in the operating room for imaging equipment and the surgical team.

Many surgeons utilize an operating microscope during posterior cervical decompression procedures to improve visualization of the spinal cord and surrounding structures. The microscope should be draped prior to the start of the procedure so that it can be moved into position when needed without interrupting surgical flow.

Intraoperative neuromonitoring is commonly used during cervical spine procedures to monitor the function of the spinal cord and nerve pathways throughout the surgery. Neuromonitoring equipment is set up in the operating room prior to the start of the procedure, and baseline signals are typically obtained before surgical decompression begins. This monitoring helps the surgical team detect any potential changes in neurological function during the procedure.

Careful attention to the operating room setup, patient positioning, and equipment placement allows the surgical team to work efficiently and safely throughout the procedure. Draping both the operating microscope and the C-arm is performed by the CST with the assistance of the circulating nurse using sterile technique. Proper draping is critical to maintaining the sterile field while allowing the equipment to be safely maneuvered during the procedure. If the equipment is not draped correctly, contamination of the sterile field can occur, potentially increasing the risk of surgical site infection. For this reason, careful attention must be given to proper sterile handling and placement of these drapes to ensure patient safety and maintain the integrity of the sterile environment.

HYBRID LAMINOPLASTY–LAMINECTOMY SURGICAL TECHNIQUE

Once the patient has been properly positioned, the surgical site is prepped according to the surgeon's preference using an appropriate antiseptic solution. The required dry time for the prep solution is observed to ensure effectiveness and reduce the risk of surgical site infection. The surgical field is then

draped using sterile towels followed by placement of a universal spine drape to establish and maintain a sterile operative field.

A midline incision is made over the affected cervical levels. The surgeon begins the dissection through the subcutaneous tissue and muscle layers to expose the posterior elements of the cervical spine. Electrocautery is commonly used during this portion of the procedure to control bleeding and aid in tissue dissection.

Once the posterior cervical spine is reached, the paraspinal muscles are carefully elevated from the lamina using periosteal elevators. Self-retaining retractors are placed to maintain exposure and allow clear visualization of the surgical field. At this stage, the lamina and spinous processes of the affected vertebral levels are exposed.

After adequate exposure has been achieved, fluoroscopy using the C-arm may again be used to confirm the correct spinal level before decompression begins. A spinal needle is often placed into the surgical field and visualized under fluoroscopy to accurately identify the appropriate vertebral level. Accurate level confirmation is essential in spine surgery to ensure the correct anatomical site is treated and to prevent wrong-level surgery.

The hybrid decompression technique involves a combination of selective laminectomy and laminoplasty. During the laminectomy portion of the procedure, Kerrison rongeurs, curettes, and high-speed drills are used to remove portions of the lamina and other compressive structures that are contributing to spinal cord compression. Careful removal of these structures helps create additional space within the spinal canal.

Following decompression at the necessary levels, the laminoplasty portion of the procedure is performed. Using a high-speed drill, the surgeon creates a hinge on one side of the lamina while opening the opposite side to expand the spinal canal. Continuous irrigation is used during drilling to prevent excessive heat generation, that can occur when high-speed drills are used on bone.

> "By selectively removing compressive structures while maintaining spinal stability, surgeons may be able to achieve effective decompression while minimizing some of the limitations associated with traditional procedures."

Once the lamina has been opened to the desired position, laminoplasty plates and spacers from the Canopy Laminoplasty System are placed to secure the lamina in the expanded position. Screws are inserted to stabilize the plates and maintain the newly enlarged spinal canal. During this stage of the procedure, the CST plays an important role in implant management. The CST should organize the Mayo stand with the various plate sizes and screws that are required, allowing the surgeon to easily select the appropriate implant. The CST must also verify the correct screw length prior to passing it to the surgeon to ensure proper fixation and prevent complications associated with implanting the incorrect size of screw.

After instrumentation is secured and adequate decompression has been confirmed, the surgical site is irrigated and hemostasis is achieved. The retractors are removed, and the wound is closed in layers according to the surgeon's preference.

POSTOPERATIVE CONSIDERATIONS AND POTENTIAL COMPLICATIONS

Once the surgical procedure is completed, dressings are applied and the patient begins the process of emerging from anesthesia. The surgical technologist must continue to maintain the sterile field and ensure that sterile technique is preserved until the patient leaves the operating room. Maintaining sterility throughout the entire procedure helps reduce the risk of surgical site infection.

As the patient begins to awaken from anesthesia, the surgeon may perform a brief neurological assessment. The patient may be asked to move or wiggle their feet and squeeze the surgeon's hands to help confirm that motor function remains intact following the decompression procedure. These early neurological checks provide reassurance that the spinal cord and nerve structures are functioning appropriately.

Following hybrid cervical laminoplasty, patients are closely monitored for neurological status, pain control, and signs of complications. Frequent neurological assessments are performed to evaluate motor strength, sensation, and overall spinal cord function. Early detection of neurological changes is important to ensure prompt intervention if complications arise.

Although hybrid decompression procedures are generally safe, potential complications can occur. These include postoperative bleeding, infection, cerebrospinal fluid leak, nerve root injury, or C5 nerve palsy. Kaptain et al identified C5 nerve palsy has been identified as a recognized com-

plication following posterior cervical decompression procedures.[5] Careful surgical technique, proper instrumentation handling, and adherence to sterile technique by the surgical team help reduce the risk of these complications.

CONCLUSION

Hybrid cervical laminoplasty combining laminoplasty with selective laminectomy provides an effective surgical approach for decompressing the spinal cord while preserving stability of the cervical spine. By addressing multiple sources of spinal cord compression and maintaining important anatomical structures, this technique offers an alternative to more extensive procedures that can limit spinal motion.

Advancements in spinal instrumentation, such as the Canopy Laminoplasty System, have improved the ability to secure the lamina in an expanded position and maintain adequate decompression of the spinal canal. These technological developments have contributed to increased efficiency and improved surgical outcomes in posterior cervical spine procedures.

The CST plays a vital role throughout the procedure, from initial operating room setup to assisting with instrumentation and maintaining the sterile field. Knowledge of surgical anatomy, instrumentation, implant management, and sterile technique allows the CST to anticipate the needs of the surgical team and contribute to the overall success of the operation.

ABOUT THE AUTHOR

Christy Smith, BAS, CST, CSFA, is a Certified Surgical First Assistant with extensive experience in multiple surgical specialties including orthopedic, spine, and robotic procedures. She has worked in the operating room for more than two decades and currently practices as a surgical assistant supporting complex surgical cases. Smith is passionate about surgical education and advancing the role of the Certified Surgical Technologist in the operating room. She is dedicated to promoting patient safety, teamwork, and excellence in perioperative care.

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1. **The primary purpose of hybrid cervical laminoplasty is to:**
   - **a.** Fuse the cervical vertebrae together.
   - **b.** Decompress the spinal cord while preserving spinal stability.
   - **c.** Remove the spinal cord.
   - **d.** Replace damaged vertebrae.

2. **Which of the following best describes the difference between laminectomy and laminoplasty?**
   - **a.** Laminectomy reshapes the lamina while laminoplasty removes it.
   - **b.** Laminectomy removes the lamina while laminoplasty expands and preserves it.
   - **c.** Laminoplasty fuses the vertebrae while laminectomy replaces bone.
   - **d.** Laminoplasty removes nerve roots.

3. **Why is fluoroscopy used with a spinal needle before decompression begins during posterior cervical laminoplasty?**
   - **a.** Measure spinal cord pressure
   - **b.** Confirm the correct vertebral level prior to surgery
   - **c.** Monitor blood flow to the spinal cord
   - **d.** Guide screw insertion

4. **Why is irrigation used during drilling of bone in cervical spine surgery?**
   - **a.** Improve bone healing
   - **b.** Cool the drill and surrounding bone to prevent thermal injury
   - **c.** Increase visibility of the lamina
   - **d.** Sterilize the bone surface

5. **What device is commonly used to stabilize the patient's head during posterior cervical spine procedures?**
   - **a.** Halo brace
   - **b.** Mayfield head holder
   - **c.** Gel head ring
   - **d.** Cervical collar

6. **Which piece of equipment may be used intraoperatively to monitor spinal cord function during cervical spine surgery?**
   - **a.** Cardiac monitor
   - **b.** Ultrasound
   - **c.** Intraoperative neuromonitoring
   - **d.** Endoscopy

7. **What responsibility does the CST have regarding implants during laminoplasty instrumentation?**
   - **a.** Determining surgical indications
   - **b.** Organizing plate sizes and verifying screw length before passing
   - **c.** Inserting the screws
   - **d.** Selecting the surgical approach

8. **What is one advantage of laminoplasty compared with traditional laminectomy with fusion**?
   - **a.** Increased removal of vertebral bone
   - **b.** Preservation of spinal motion
   - **c.** Shorter incision length
   - **d.** Elimination of decompression

9. **Which of the following helps maintain a sterile environment during procedures involving a microscope or C-arm?**
   - **a.** Covering equipment with sterile towels only
   - **b.** Draping the equipment using sterile technique by the CST
   - **c.** Limiting movement of equipment
   - **d.** Avoiding use of imaging devices

10. **The neurological assessment that may be performed as the patient awakens from anesthesia following cervical decompression is asking the patient to:**
    - **a.** Cough
    - **b.** Wiggle feet and squeeze hands
    - **c.** To sit upright
    - **d.** Turn their head

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