Using Suture Anchors for Cervical Laminoplasty: A Reliable, Safe, and Simple Technique

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Abstract

Cervical spondylomyelopathy from spinal stenosis is a debilitating disease that often progresses with neurologic deficits in the upper and lower extremities. Spinal stenosis may be treated operatively with expansive open-door laminoplasty. We describe the technique of laminoplasty using suture anchors. Suture anchors may be used to perform laminoplasty in a safe, time-efficient, and reliable manner.

Cervical spondylotic myelopathy, or spinal stenosis, usually has an insidious onset with progressive narrowing of the spinal canal.[1] Unremitting in its course, cervical stenosis can result in myelopathy causing difficulty ambulating, clumsiness, paresthesias of the hands and fingers, and bladder dysfunction. Patients often complain of upper extremity fine-motor dysfunction. Outcomes for patients with cervical spine myelopathy are better with surgical treatment than with medical therapy.[2]

For myelopathy, the surgical goals are to halt progression by decompressing the spinal cord and to provide relief from symptomatology. The Japanese Orthopaedic Association (JOA) developed a standardized scoring system to measure patient deficits for use in the clinical setting.[3,4] Postoperative assessment can also be done through analysis of both radiographs and magnetic resonance imaging scans.[5-7]

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Surgical options include single-level or multilevel anterior cervical discectomy with fusion, single-level or multilevel anterior corpectomy with fusion, laminectomy with or without fusion, and laminoplasty.[1] Location of pathology, risks and benefits of each procedure, and geometry of the spinal canal all dictate operative approach. Compared with laminoplasty, laminectomy can result in increased risk for instability and postoperative kyphosis.[1,8-12] A variety of laminoplasty techniques has thus been described, but the gold standard has not yet been agreed on.[6,13-16]

Kawaguchi and colleagues[17] studied long-term (>10 years) clinical outcomes after laminoplasty in 126 patients with cervical spondylomyelopathy. JOA score improved a mean of almost 4 points within 1 year, but 61% of patients had some reduction in range of motion at last follow-up. Heller and colleagues[18] compared the clinical and radiographic outcomes of 2 matched cohorts: 13 patients who underwent laminectomy with fusion and 13 patients who underwent laminoplasty. The number of patients who reported objective improvement (functional scores) and subjective improvement (strength, dexterity, sensation, pain, gait) tended to be higher in the laminoplasty cohort, but the findings were not statistically significant. In addition, the laminoplasty cohort had no complications, whereas 9 patients in the laminectomy-with-fusion cohort had 14 complications, including progression of myelopathy, nonunion, instrumentation failure, development of significant kyphotic alignment, persistent bone graft harvest site pain, adjacent segment degeneration requiring reoperation, and deep wound infection.

Technique

We detail our technique in using suture anchors for expansive cervical laminoplasty. We believe that fixation with suture anchors is easier and does not risk collapse of bone graft into the canal. Bone grafting or fixation of the lamina directly to the lateral mass is not necessary with this technique, which minimizes procedure time and provides adequate fixation at all levels involved.

Procedure

After general endotracheal anesthesia, the patient is placed in the prone position with head secured by Mayfield tongs without traction. Intraoperative

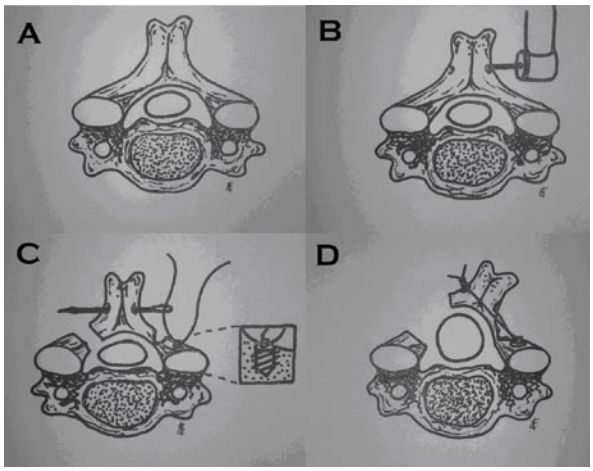

Figure 1. (A) Cervical vertebrae with narrowed canal viewed on end. (B) A dental drill is used to burr a hole in the spinous process and the laminae is cut before (C) a Keith needle is used to pass the suture from the anchor through the hole. (D) The suture is tied under tension to maintain the open-door laminoplasty and expand the spinal canal diameter.

Figure 2. Anteroposterior and lateral radiographs of selected case show preoperative state (left) and postoperative laminoplasty state (right).

somatosensory evoked potential monitoring is advised. A standard vertical midline incision is made along the ligamentum nuchae to the spinous processes. A Bovie cauterizer and a Cobb elevator are used to dissect out the posterior cervical spine, and the spinous processes and lateral masses of each vertebra preoperatively determined to undergo laminoplasty are exposed. Care is taken to avoid violating the facets and to maintain hemostasis with either monopolar or bipolar electrocautery at all times (Figure 1A).

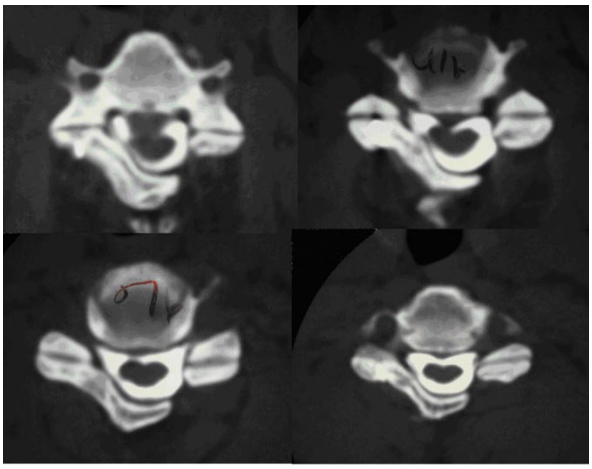

Figure 3. Computed tomography of Figure 2 case at multiple levels shows increase in anteroposterior diameter after suture anchor laminoplasty.

A cutting burr is used to thin the left and right sides of the laminae near the junction with the lateral masses. The through-and-through cut is made on the most symptomatic side, and the completing cut of that lamina is made with a shaving burr and Kerrison rongeur. The laminae and the interspinous ligaments are freed superiorly and inferiorly at the end levels. To maintain the laminae in the open position, suture anchors (Statak Suture Anchors, Zimmer, Warsaw, IN) are placed into the lateral masses of the hinged side. A right-angle dental drill with 2-mm burr tip is used to make a hole in the base of the spinous processes (Figure 1B).

The laminae are hinged up, with the thinned but still complete lamina acting as the hinge. The nonabsorbable suture of the suture anchor is brought through the drill hole in the spinous process with the help of a Keith needle (Figure 1C).

A slip knot is used to obtain optimal tension on the suture, and square knots are tied to maintain the tension indefinitely, thereby providing a restraint to prevent closure of the laminoplasty (Figure 1D).

Foraminotomies may then be performed on the open side of at least the C4–C5 and C5–C6 levels using an operating microscope. After copious irrigation of the wound, closure is performed in a standard fashion, with figure-of-8 interrupted No. 0 Vicryl knots followed by a running No. 0 Vicryl knot to close the fascia. A drain is placed over the fascial layer, the subcutaneous tissue is approximated with No. 2-0 Vicryl interrupted knots, and the skin is closed with a running No. 3-0 subcuticular suture. With this technique, mean time per level is about 30 minutes, representing an almost 30% decrease in total operating room time over that involved in posterior fusion with instrumentation. Postoperative radiographs and computed tomography scan reveal expansion of the cervical canal (Figures 2 and 3).

Authors' Disclosure Statement

The authors report no actual or potential conflict of interest in relation to this article.

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This paper will be judged for the Resident Writer's Award.