Cervical spinous process reconstruction

Case report

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Posterior neck deformity with an unsightly crater-like defect may result after cervicothoracic laminectomies. The authors present a new technique, spinous process reconstruction, to address this problem. A 64-year-old man presented with progressive quadriparesis secondary to cervical spondylotic myelopathy. Previously he had undergone multiple neck surgeries including cervicothoracic decompressive laminectomy. Postoperatively, he developed severe craniocervical spinal deformity and a large painful concave surgical defect in the neck. The authors performed craniocervical decompression and craniocervicothoracic instrumented stabilization. At the same time, cervicothoracic spinous process reconstruction was performed using titanium mesh to address the defect. Cervicothoracic decompressive laminectomy results in varying degrees of neck defect with resulting unsightly and an often painful surgical wound defect despite an appropriate multilayer closure. The presented spinous process reconstruction is a simple technique to address this problem with good clinical outcome.

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Key Words • cervical spondylotic myelopathy • cervical laminectomy • spinous process reconstruction • titanium mesh • cosmesis

Cervical spondylotic myelopathy is considered one of the most common progressive diseases in the aging cervical spine.1 A variety of methods for the treatment of cervical spondylotic myelopathy exist, and numerous factors influence the course of action chosen by the surgeon.9,10 Posterior approaches are readily chosen because of their relatively simple operations and minimal complications. Multilevel cervical laminectomy with instrumented stabilization is frequently performed for multilevel spondylosis with loss of physiological lordosis.4 As a consequence of such treatment, posterior musculature and ligamentous and bony structures are disrupted. In addition, resection of spinous processes creates a potential space that may result in a concave, crater-like cosmetic deformity despite careful layered closure. To reduce this possibility, posterior paraspinous muscles should be secured to remaining cephalad and caudad spinous processes with the fascia closure brought to midline. The overlying soft tissues should be closed in multiple layers to ensure that the dead space is minimized.1 This report presents a simple technique to repair the cosmetic defect resulting from such a procedure.

Case Report

History and Examination. This 64-year-old man presented with a 5-year history of chronic neck pain, bilateral shoulder and arm pain, suboccipital headaches, and progressive weakness. He had severe neck pain extending from the suboccipital to the upper thoracic region, scored by the patient as 10 of 10 on the visual analog scale. The patient’s condition had deteriorated to such an extent that he was no longer ambulatory. He had previously undergone 2 cervical spine decompressive surgeries and experienced postoperative infection after the second surgery. Until the last few years, he was ambulatory, but his condition gradually deteriorated and he became wheelchair bound and had developed bladder incontinence.

On observation, the patient had a severe craniocervical spinal deformity with his chin almost touching his chest. There was a significant crater-like defect along the previous surgical scar at the posterior neck (Fig. 1). Left deltoid, biceps, triceps, wrist flexion and extension, and intrinsic hand muscle strength were all 3/5, and the left hip adductor muscles were 4+/5. All other tested muscle group strength in the upper and lower extremities was 0/5. The patient had hyperreflexia in all extremities.

Cervical radiographs, CT scans, and MR images were available for review (Fig. 2). These studies demonstrated a kyphotic deformity with chronic fracture of the dens, C4–6 anterior fusion, and a C6–T1 laminectomy.
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defect. There was severe spinal cord compression from C-1 to C-3, resulting in cord signal changes. Sagittal and axial T1-weighted MR images of the cervical spine revealed significant atrophy and lateral displacement of the paraspinal muscles (Fig. 3) resulting in the observed concave crater-like defect.

Operation. A midline posterior cervical approach through the crater-like defect was performed. Decompressive C1–4 laminectomy and occiput to T-3 instrumented arthrodesis were performed. A 10 × 10–cm titanium mesh, commonly used for cranial procedures, was contoured and cut to reproduce the normal posterior spinous process line (Fig. 4). The titanium mesh was positioned spanning the spinolaminar defect and was secured to the C-5 and T-3 spinous processes with 6-mm self-drilling screws (Fig. 5). A subfascial drain was placed, and a multilayer closure was performed using synthetic absorbable 0 sutures followed by 2-0 sutures. Posterior paraspinal muscles and fascia were not secured to the mesh implant. Necessary dissection to expose the lateral masses provided enough soft-tissue mobilization for closure with synthetic absorbable 0 sutures.

Postoperative Course. Immediate resolution of the preoperative crater-like defect was noted, which persisted at the most recent follow-up visit 1 year later (Fig. 6). The subfascial drain was removed once the output was less than 30 ml in 12 hours. A postoperative cervical CT scan confirmed the reconstructed posterior spinous process line (titanium mesh contour), with anatomical positioning of the posterior paraspinal musculature (Fig. 7). At the 1-year follow-up, the patient continues to experience significant improvement in his neck pain and he is able to walk with the aid of a front-wheel walker. The posterior cervical incision healed well, with no residual cosmetic deformity (Fig. 6C).
Spinal spondylosis is a common cause of cervical myelopathy, and decompressive laminectomy with or without posterior instrumented fusion is an effective surgical option. However, in a subset of these patients with multilevel cervical laminectomy, especially involving C-7 or when improper layered closure of the paraspinal muscles is performed, a disfiguring concave crater-like defect may result. A novel technique of spinous process reconstruction using titanium mesh may be an effective option to prevent this cosmetic defect.

In our case, we attribute the concave crater-like defect to decompressive laminectomy with resection of the C-7 spinous process. Poor wound closure technique and postoperative wound infection, although superficial, may also have played a role. Securing the posterior paraspinous muscles to the remaining cephalad and caudal spinous processes and bringing the fascia closure to midline may also help to reduce this complication. However, paraspinous muscular atrophy due to mechanical injury, disuse secondary to immobilization or bracing, ischemia, and/or denervation may also be a contributing factor. At the 1-year follow-up, the surgical wound was aesthetically pleasing, and the patient’s quality of life was significantly improved with minimal neck pain.

Transposition and malalignment of paraspinal muscles may also be a source of postoperative pain in patients who have undergone posterior cervical decompressive surgery. Abnormal positioning and orientation of the paraspinal musculature may also promote muscle atrophy and increase the risk of cervical kyphotic deformity often seen after laminectomy. Spinous process reconstruction using a titanium mesh cage may prevent the consequences of paraspinal muscle malpositioning and also provide the added benefit of creating a mechanical barrier that reduces the risk of cervical peridural fibrosis.

This is a non–FDA approved application for titanium mesh. Also, this technique is only appropriate if an instrumented fusion is to be performed and must not extend beyond the fusion levels. If the implant extends to the levels not intended for fusion, repetitive motion may cause the implant to migrate and/or fail. The implant may also interfere with normal motion segments, resulting in accelerated degeneration at adjacent segments. Although the overlying paraspinal muscles may be secured to the mesh implant, we chose not to do so. We thought that...
preventing the overlying soft tissue from sliding freely over the mesh may lead to a possible kink in the skin and increase postsurgical neck pain.

In conclusion, spinous process reconstruction using titanium mesh is a novel and simple technique that may be performed with preexisting implant equipment and has the potential of significantly improving cosmetic and clinical outcomes.

Disclosure

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Author contributions to the study and manuscript preparation include the following. Conception and design: all authors. Acquisition of data: all authors. Analysis and interpretation of data: all authors. Drafting the article: all authors. Critically revising the article: all authors. Reviewed submitted version of manuscript: all authors. Approved the final version of the manuscript on behalf of all authors: Kim. Study supervision: Kim.

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