

Postoperative C4 Radiculopathy May Result in Axial Pain after Cervical Laminoplasty

Kaho Yasuda, Yoshitada Usami, Sachio Hayama, Yoshiharu Nakaya, Takashi Fujishiro and Masashi Neo

Department of Orthopedic Surgery, Osaka Medical and Pharmaceutical University, Osaka, Japan

Keywords:

cervical laminoplasty, axial pain, C5 palsy, C4 radiculopathy, neck pain

Spine Surg Relat Res 2023; 7(5): 461-463
dx.doi.org/10.22603/ssrr.2023-0018

Cervical laminoplasty (CLP) is an established procedure; however, postoperative concerns such as axial pain, C5 palsy, restriction of neck motion, and loss of lordotic curvature are commonly noted¹⁾. Moreover, axial pain after laminoplasty is common. However, the cause of this complication has not been fully elucidated. Several studies have

suggested the origins of these complications as cervical muscles¹⁾, and the preservation of paravertebral muscles and early activation of the range of motion have been recommended^{2,3)}. Although these countermeasures improved the rate and severity of axial pain, some unexplained axial pain after CLP persists. Specifically, it is difficult to explain the laterality of the severity of the postoperative axial pain because double-door laminoplasty is a completely symmetrical procedure.

This case study suggests that the C4 nerve root may contribute to postoperative axial pain.

A 48-year-old woman presented with numbness in her



Figure 1. Preoperative T2-weighted MRI images revealed cervical canal stenosis in the C5–C6 and C6–C7 levels.



Figure 2. Neck photograph on the second postoperative day. The blue circle indicates the hypoesthesia and painful area.

Corresponding author: Yoshitada Usami, yoshitada.usami@ompu.ac.jp

Received: January 27, 2023, Accepted: March 9, 2023, Advance Publication: April 21, 2023

Copyright © 2023 The Japanese Society for Spine Surgery and Related Research

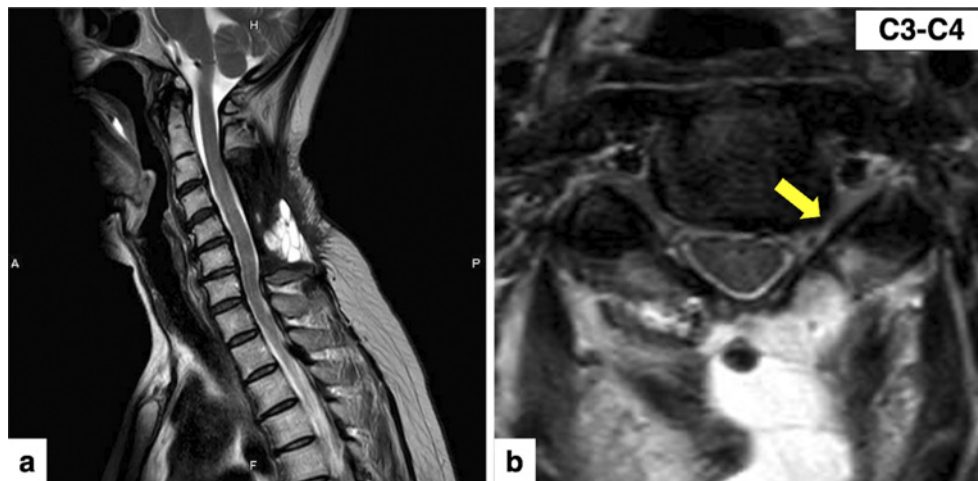


Figure 3. Postoperative T2-weighted MRI images showed the posterior shift of the cord (a) and the slight left C3–C4 foraminal stenosis at the yellow arrow (b).



Figure 4. A left C4 nerve root block was performed with the fluoroscopy.

right upper extremity and hand clumsiness, but she did not complain of cervical pain. Radiographic examination revealed a spontaneous fusion between C2 and C3. Magnetic resonance imaging (MRI) revealed cervical canal stenosis in C5–C6 and C6–C7 (Fig. 1). Furthermore, computed tomography revealed segmental ossification of the posterior longitudinal ligament (OPLL) at C3–Th1. Thus, the patient was diagnosed with cervical myelopathy with OPLL, and underwent C4–C6 double-door laminoplasty with laminotomy of the caudal C3 and cranial C7, and decompressing from C3–C4 to C6–C7. Immediately after the surgery, the patient's preoperative upper extremity symptoms improved.

On the second postoperative day, hypoesthesia on the left side of the wound and neck pain, predominantly on the left side, were observed (Fig. 2). However, paralysis of the upper extremities was absent. The pain severity on the left and right sides were seven and two, respectively, on the 11-point

numerical rating scale (NRS).

Postoperative MRI revealed posterior shift of the cord (Fig. 3a) and slight left C3–C4 foraminal stenosis (Fig. 3b). We suspected C4 nerve root involvement as the pain site and hypoesthesia was localized to the left C4 dermatome region. Subsequently, a left C4 nerve root block was performed using 1.0 mL of 1% mepivacaine hydrochloride on the eighth postoperative day (Fig. 4). The neck pain on the left side improved from seven to two on the NRS immediately after the root block and did not worsen thereafter.

Usami et al. studied nerve root anatomy to elucidate the cause of C5 palsy, which is another unresolved complication after CLP⁴. They demonstrated that the C3, C4, and C5 nerve roots are likely vulnerable to traction when the spinal cord shifts posteriorly after CLP, compared with the C6, C7, and C8 nerve roots. This is because cranial cervical nerve roots are anchored closer to the dural sac than caudal ones. They concluded that these anatomical characteristics could be why C5 palsy is more common than C6, C7, and C8 palsy. Furthermore, they suggested that the C4 root may be paralyzed after CLP, resulting in neck pain. However, the symptoms are indistinguishable from postoperative wound pain because C4 radiculopathy presents with pain in the axial cervical and interscapular regions without muscle weakness^{5,6}. Majority of the postoperative axial pain subsides gradually within one year⁷, similar to that of C5 palsy⁸, which supports the hypothesis that the tethering effect of the C4 nerve root is involved in axial pain after CLP.

Therefore, if the postoperative axial pain exhibits laterality or late-onset, there may be C4 radiculopathy caused by tethering of the nerve root with posterior shift of the spinal cord. In such cases, we suggest that a C4 nerve root block may be effective. This study provides a new perspective on axial pain after CLP.

Disclaimer: Masashi Neo is one of the Editors of Spine Surgery and Related Research and on the journal's Editorial Committee. He was not involved in the editorial evaluation

or decision to accept this article for publication at all.

Conflicts of Interest: The authors declare that there are no relevant conflicts of interest.

Sources of Funding: None

Author Contributions: Y.U., S.H., Y.N., T.F., and M.N. supervised the experiments; K.Y. wrote the manuscript.

Ethical Approval: Ethical approval was unnecessary due to a case correspondence.

Informed Consent: Informed consent for publication was obtained by all participants in this study.

References

1. Wang SJ, Jiang SD, Jiang LS, et al. Axial pain after posterior cervical spine surgery: a systematic review. *Eur Spine J.* 2011;20(2):185-94.
2. Kato M, Nakamura H, Konishi S, et al. Effect of preserving

paraspinal muscles on postoperative axial pain in the selective cervical laminoplasty. *Spine.* 2008;33(14):E455-9.

3. Kawaguchi Y, Kanamori M, Ishiara H, et al. Preventive measures for axial symptoms following cervical laminoplasty. *J Spinal Disord Tech.* 2003;16(6):497-501.
4. Usami Y, Yokota A, Kondo Y, et al. Morphology of cervical periradicular fibrous sheath and nerve roots in relation to postoperative C5 palsy. *Spine J.* 2022;22(4):690-6.
5. Ross DA, Ross MN. Diagnosis and treatment of C4 radiculopathy. *Spine.* 2016;41(23):1790-4.
6. Shifflett GD, Iyer S, Derman PB, et al. Upper cervical radiculopathy: the hidden pathology of the spine. *Spine Surg Relat Res.* 2018;2(2):93-7.
7. Hosono N, Yonenobu K, Ono K. Neck and shoulder pain after laminoplasty. A noticeable complication. *Spine.* 1996;21(17):1969-73.
8. Pennington Z, Lubelski D, Westbrook EM, et al. Time to recovery predicted by the severity of postoperative C5 palsy. *J Neurosurg Spine.* 2019;32(2):191-9.

Spine Surgery and Related Research is an Open Access journal distributed under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. To view the details of this license, please visit (<https://creativecommons.org/licenses/by-nc-nd/4.0/>).