Neck pain after cervical laminoplasty

Axial neck pain remains the most important problem of cervical laminoplasty. Hosono et al. [1]), reviewed a series of 72 laminoplasties conducted to treat cervical spondylotic myelopathy, and found a 60% incidence of axial pain. Kawaguchi et al. [2]), reported significant axial neck pain in 44% of their patiensts. Other authors have reported incidence of axial neck pain after laminoplasty of about 30% [3], [4] [5]. The possible causes of axial neck pain after cervical laminoplasty are ischemia of the shoulder muscles, atrophy of nuchal muscles, and delayed union in the facet joints [6]).

Axial pain after cervical laminoplasty has been reported to be due to neck muscle disruption, especially because of detachments of muscle insertions to the C2 or C7 spinous processes, or deep extensor muscles [7] [8] [9]

A study demonstrated that C7 spinous process preserving laminoplasty decreases the incidence of aggravated axial neck pain after cervical laminoplasty [10].

The presence of anterolisthesis was associated not only with the highest odds ratio of persistent neck pain but also with significantly poorer functional outcomes. Indications for cervical laminoplasty should be carefully determined in patients with cervical anterolisthesis [11].

The use of a rigid collar after laminoplasty leads to less axial neck pain in the first 2 wk after surgery. However, there is no additional benefit with regards to range of motion, quality of life, and complication risk [12].

The preoperative CSA of the Semispinalis cervicis muscle (SC) has been reported to correlate with loss of lordosis (LL) after laminoplasty, with a CSA <154.5 mm2 associated with a 10 degrees LL.

Laminoplasty patients at the University of California San Francisco between 2009 and 2018 by 2 spine surgeons were retrospectively studied. Patients with previous cervical spine surgery or nondegenerative diagnoses were excluded. Measurements included the C2-C7 angle, T1 slope, and cervical sagittal vertical axis. Preoperative DEM CSA was measured on magnetic resonance imaging. Variables associated with lordosis were analyzed with univariate analysis and multivariate logistic regression, and association between postoperative Cervical spine alignment and the musculature was evaluated.

Seventy-six patients with a mean age of 64 years were included. The average follow-up was 22.53 months. The overall average CSA of the DEM was 2274.55 mm2 and that of the SC was 275.64 mm2. Means of both CSAs were higher in men (P<0.001). Linear regression showed no correlation between LL with CSA of the DEM or the SC (r=0.005, P=0.119; r=0.001, P=0.095). Univariate and multivariate regression showed no differences in the CSA of the DEM and SC between groups with and without LL (P=0.092, 0.117 and 0.163, 0.292). There was no correlation in LL with sex or body mass index (P>0.05).

Preoperative CSA of the deep neck extensors may not predict lordosis after cervical laminoplasty. The correlation between the preoperative SC CSA and postoperative Cervical spine alignment may not be as strong as previously reported [13].

Axial neck pain after C3-6 laminoplasty has been reported to be significantly lesser than that after C3-7 laminoplasty because of the preservation of the C-7 spinous process and the attachment of nuchal muscles such as the trapezius and rhomboideus minor, which are connected to the scapula. The C-6 spinous process is the second longest spinous process after that of C-7, and it serves as an attachment point for these muscles. The effect of preserving the C-6 spinous process and its muscular attachment, in addition to preservation of the C-7 spinous process, on the prevention of axial neck pain is not well understood. The purpose of the current study was to clarify whether preservation of the paraspinal muscles of the C-6 spinous process reduces postoperative axial neck pain compared to that after using nonpreservation techniques.

Montano et al. studied 60 patients who underwent C3-6 double-door laminoplasty for the treatment of cervical spondylotic myelopathy or cervical ossification of the posterior longitudinal ligament; the minimum follow-up period was 1 year. Twenty-five patients underwent a C-6 paraspinal muscle preservation technique, and 35 underwent a C-6 nonpreservation technique. A visual analog scale (VAS) and VAS grading (Grades I-IV) were used to assess axial neck pain 1-3 months after surgery and at the final follow-up examination. Axial neck pain was classified as being 1 of 5 types, and its location was divided into 5 areas. The potential correlation between the C-6/C-7 spinous process length ratio

and axial neck pain was examined.

The mean VAS scores (± SD) for axial neck pain were comparable between the C6-preservation group and the C6-nonpreservation group in both the early and late postoperative stages (4.1 ± 3.1 vs 4.0 ± 3.2 and 3.8 ± 2.9 vs 3.6 ± 3.0, respectively). The distribution of VAS grades was comparable in the 2 groups in both postoperative stages. Stiffness was the most prevalent complaint in both groups (64.0% and 54.5%, respectively), and the suprascapular region was the most common site in both groups (60.0% and 57.1%, respectively). The types and locations of axial neck pain were also similar between the groups. The C-6/C-7 spinous process length ratios were similar in the groups, and they did not correlate with axial neck pain. The reductions of range of motion and changes in sagittal alignment after surgery were also similar.

The C-6 paraspinal muscle preservation technique was not superior to the C6-nonpreservation technique for preventing postoperative axial neck pain [14].

[1], [6]
Hosono N, Yonenobu K, Ono K. Neck and shoulder pain after laminoplasty. A noticeable complication. Spine (Phila Pa 1976). 1996 Sep 1;21(17):1969-73. doi: 10.1097/00007632-199609010-00005. PMID: 8883196.

[2]
Kawaguchi Y, Kanamori M, Ishiara H, Nobukiyo M, Seki S, Kimura T. Preventive measures for axial symptoms following cervical laminoplasty. J Spinal Disord Tech. 2003 Dec;16(6):497-501. doi: 10.1097/00024720-200312000-00002. PMID: 14657744.

[3]
Hidai Y, Ebara S, Kamimura M, Tateiwa Y, Itoh H, Kinoshita T, Takaoka K, Ohtsuka K. Treatment of cervical compressive myelopathy with a new dorsolateral decompressive procedure. J Neurosurg. 1999 Apr;90(2 Suppl):178-85. doi: 10.3171/spi.1999.90.2.0178. PMID: 10199246.

[4]
Satomi K, Nishu Y, Kohno T, Hirabayashi K. Long-term follow-up studies of open-door expansive laminoplasty for cervical stenotic myelopathy. Spine (Phila Pa 1976). 1994 Mar 1;19(5):507-10. doi: 10.1097/00007632-199403000-00003. PMID: 8184342.

[5]
Wada E, Suzuki S, Kanazawa A, Matsuoka T, Miyamoto S, Yonenobu K. Subtotal corpectomy versus laminoplasty for multilevel cervical spondylotic myelopathy: a long-term follow-up study over 10 years. Spine (Phila Pa 1976). 2001 Jul 1;26(13):1443-7; discussion 1448. doi: 10.1097/00007632-200107010-00011. PMID: 11458148.

[7]
Iizuka H, Shimizu T, Tateno K, Toda N, Edakuni H, Shimada H, Takagishi K. Extensor musculature of the cervical spine after laminoplasty: morphologic evaluation by coronal view of the magnetic resonance image. Spine (Phila Pa 1976). 2001 Oct 15;26(20):2220-6. doi: 10.1097/00007632-200110150-00013. PMID: 11598512.

[8]
Shiraishi T, Fukuda K, Yato Y, Nakamura M, Ikegami T. Results of skip laminectomy-minimum 2-year follow-up study compared with open-door laminoplasty. Spine (Phila Pa 1976). 2003 Dec 15;28(24):2667-72. doi: 10.1097/01.BRS.0000103340.78418.B2. PMID: 14673367.

[9]
Takeshita K, Seichi A, Akune T, Kawamura N, Kawaguchi H, Nakamura K. Can laminoplasty maintain the Cervical spine alignment even when the C2 lamina is contained? Spine (Phila Pa 1976). 2005 Jun 1;30(11):1294-8. doi: 10.1097/01.brs.0000163881.32008.13. PMID: 15928555.

[10]
Cho CB, Chough CK, Oh JY, Park HK, Lee KJ, Rha HK. Axial neck pain after cervical laminoplasty. J Korean Neurosurg Soc. 2010 Feb;47(2):107-11. doi: 10.3340/jkns.2010.47.2.107. Epub 2010 Feb 28. PMID: 20224708; PMCID: PMC2836444.

11)
Kimura A, Shiraishi Y, Inoue H, Endo T, Takeshita K. Predictors of Persistent Axial Neck Pain After Cervical Laminoplasty. Spine (Phila Pa 1976). 2018 Jan 1;43(1):10-15. doi: 10.1097/BRS.0000000000002267. PMID: 28591073.
12)
Cheung JPY, Cheung PWH, Law K, Borse V, Lau YM, Mak LF, Cheng A, Samartzis D, Cheung KMC. Postoperative Rigid Cervical Collar Leads to Less Axial Neck Pain in the Early Stage After Open-Door Laminoplasty-A Single-Blinded Randomized Controlled Trial. Neurosurgery. 2019 Sep 1;85(3):325-334. doi: 10.1093/neuros/nyy359. PMID: 30113664.
13)
Liu J, Xie R, Ruan H, Rivera J, Li B, Mahmood B, Lee J, Guizar R 3rd, Mahmoudieh Y, Mummaneni PV, Chou D. The Preoperative Cross-sectional Area of the Deep Cervical Extensor Muscles Does Not Predict Loss of Lordosis After Cervical Laminoplasty. Clin Spine Surg. 2021 May 24. doi: 10.1097/BSD.0000000000001199. Epub ahead of print. PMID: 34029263.
14)
Mori E, Ueta T, Maeda T, Yugué I, Kawano O, Shiba K. Effect of preservation of the C-6 spinous process and its paraspinal muscular attachment on the prevention of postoperative axial neck pain in C3-6 laminoplasty. J Neurosurg Spine. 2015 Mar;22(3):221-9. doi: 10.3171/2014.11.SPINE131153. Epub 2014 Dec 19. PubMed PMID: 25525962.