Impact of Sarcopenia on Postoperative Outcomes Following Cervical Laminoplasty Versus Laminectomy and Fusion: A Single-Institution Retrospective Analysis

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Background: Sarcopenia, a degenerative loss of muscle mass, is increasingly recognized as a modifiable risk factor for poor postoperative outcomes in spine surgery. This study compares radiographic alignment outcomes after cervical laminoplasty (LP) and laminectomy with fusion (LF) in sarcopenic and non-sarcopenic patients.

Hypothesis: We hypothesize that patients with sarcopenia will result in postoperative increased cervical kyphosis in both the fusion and the laminoplasty group compared to nonsarcopenic patients. However, there would be a greater degree of kyphosis in the laminoplasty group as paraspinal muscle function plays a more critical role in maintaining upright sagittal alignment in non-fusion patients.

Methods: We conducted a retrospective study of 457 patients who underwent posterior cervical decompression between August 2017 and 2024 at a single academic center for cervical spondylotic myelopathy (CSM). Laminoplasty (n=173) and laminectomy with fusion (n=284) cohorts were compared. Patients who previously underwent prior cervical surgery or indications other than myelopathy were excluded. Sarcopenia was graded independently by three blinded raters using the modified Goutallier classification on preoperative MRI (Fig 1), with Grades 3 and 4 categorized as sarcopenic. Sagittal parameters, including C2–C7 lordosis and cervical sagittal vertical axis (cSVA), were measured on lateral cervical spine radiograph preoperatively and at the last followup visit (Fig 2). Demographics and baseline comorbidities were also recorded.

Results: There was no statistically significant difference in baseline demographics and comorbidities between LP and LF group. Average age at surgery was 66. 43% of surgical patients were female. Sarcopenia prevalence was 18% (n=82) in our studied cohort, 16% (n=28) in the laminoplasty group and 19% (n=54) in the laminectomy and fusion group (p = 0.45). In the laminoplasty group, sarcopenic patients had significantly greater loss of C2–C7 lordosis postoperatively (mean change −6.2° vs −1.8°, $p < 0.001$) and higher incidence of postoperative kyphosis (28% vs 9%, $p < 0.01$). In the laminectomy with fusion group, alignment was more stable regardless of sarcopenia status (mean change −1.3° vs −0.5°, $p = 0.08$). cSVA increased more in sarcopenic patients after laminoplasty (+12.3 mm vs +4.5 mm, $p < 0.01$), but not significantly after laminectomy/fusion ($p = 0.11$). Multivariate regression showed sarcopenia as an independent predictor of postoperative kyphosis (OR 3.4, 95% CI: 1.9–6.3, $p < 0.001$).

Conclusion:
Sarcopenia significantly impacts sagittal alignment after cervical laminoplasty, increasing risk for kyphotic deformity and loss of lordosis. Laminectomy with fusion appears more robust in

preserving alignment in sarcopenic patients. Preoperative evaluation of paraspinal muscle quality should inform surgical planning.
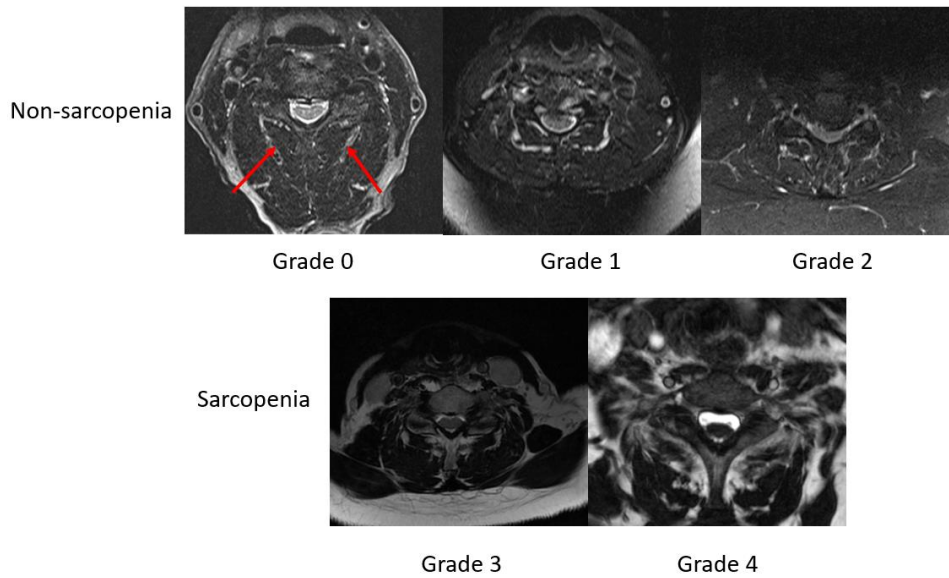

Figure 1. Axial T2-weighted cervical spine MRI images demonstrating modified Goutallier grades 0 to 4 for fatty infiltration of the cervical paraspinal musculature. Grade 0: No visible fat. Grade 1: Some fatty streaks. Grade 2: Less fat than muscle. Grade 3: Equal fat and muscle. Grade 4: More fat than muscle.
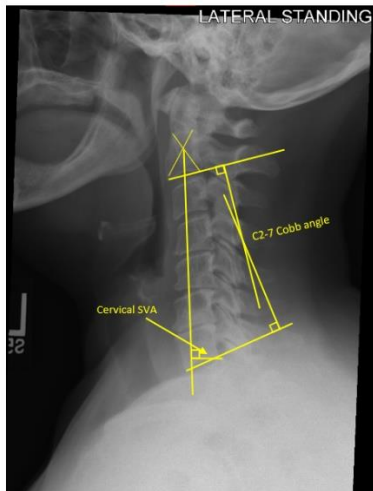

Figure 2. Measurement of cervical alignment. **C2–C7 lordosis** is the angle between lines along the Inferior endplates of C2 and C7 vertebral bodies. **Cervical sagittal vertical axis (cSVA)** is measured as the horizontal distance between a vertical line dropped from the centroid of C2 and the posterior superior corner of T1.