

Is Preoperative Sarcopenia a Risk Factor for Loss of Cervical Lordosis Following Laminoplasty?

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INTRODUCTION: Laminoplasty is a spine surgical technique performed for multilevel degenerative cervical spine disease. Post-laminoplasty kyphosis is a recognized complication that can lead to poor outcomes, but its risk factors are not fully understood. Cervical sarcopenia, or muscle degeneration, has been proposed as a potential contributor to sagittal malalignment. This study aimed to assess the impact of sternocleidomastoid (SCM) muscle sarcopenia on preoperative and postoperative cervical alignment in patients undergoing laminoplasty.

METHODS: After approval of an Institutional Review Board, we retrospectively identified patients who underwent elective primary cervical laminoplasty for myelopathy (2014-2022). Sarcopenia was quantified on preoperative MRI (at the C5-C6 level) by measuring the SCM cross-sectional area (CSA) adjusted for BMI. The Goutallier grade (GG) for fatty infiltration was recorded at the same level. Patients were stratified into high or low SCM groups based on the 50th percentile for BMI-adjusted SCM CSA and by zero versus non-zero SCM GG. Pre- and postoperative cervical alignment (C2-C7 Cobb angle, C2-C7 sagittal vertical axis [SVA], C2 tilt, C2 slope) and patient-reported outcomes were compared between groups. Bivariate analyses were employed as appropriate for continuous and discrete data.

RESULTS: A total of 56 patients were included. When stratified by BMI-adjusted SCM CSA, there were no significant differences in postoperative sagittal alignment, surgical outcomes, or PROMs. High CSA patients were younger (59.7 vs. 66.0 years, $p=0.029$), predominantly male (82.1% vs. 42.9%, $p=0.006$), and had lower CCI (2.54 vs. 3.75; $p=0.002$). When stratified by GG, there were similarly no differences in postoperative alignment or surgical outcomes. However, patients with higher fatty infiltration (non-zero GG) reported significantly worse Neck Disability Index (NDI) scores at all timepoints: preoperative (36.6 vs. 14.3, $p=0.018$), 3-month postoperative (37.1 vs. 11.8, $p=0.011$), and 1-year postoperative (32.7 vs. 13.0, $p=0.041$).

DISCUSSION: Neither SCM muscle size nor fatty infiltration was associated with changes in postoperative sagittal alignment or surgical outcomes following laminoplasty. However, patients undergoing laminoplasty with higher Goutallier fatty infiltration scores had worse preoperative and postoperative NDI scores. This suggests that muscle quality, rather than muscle bulk or its effect on alignment, may be a more important determinant of functional outcomes. However, these findings were observed in a limited range of GGs in the current work with an overall mild severity. Thus, this topic still needs exploration amongst patients with more severe sarcopenia.

CLINICAL RELEVANCE: This study demonstrates that MRI measures of cervical muscle quality, specifically fatty infiltration, may be linked to worse functional outcomes after laminoplasty, even when sagittal alignment is preserved. Though further work is needed, these preliminary findings suggest that sarcopenia assessment might be able to be used to counsel patients on expected functional recovery, and to identify candidates preoperatively for physical therapy.