Impact of C3 Laminectomy versus C3 Laminoplasty on Cervical Alignment

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INTRODUCTION: Cervical laminoplasty is a motion-preserving procedure for decompressing the spinal cord in patients with symptomatic cervical stenosis. Some surgeons perform a laminectomy at C3, while others include it in the laminoplasty construct. The study evaluates the radiographic impact of C3 laminectomy vs. C3 laminoplasty, on postoperative cervical sagittal alignment (CSA) after open-door laminoplasty.

METHODS: We retrospectively reviewed patients at a single institution who underwent C3-C6 laminoplasty (LP) or C4-C6 laminoplasty with C3 laminectomy (LN). Patients were divided into two groups based on surgical approach, and cervical alignment was assessed using standard radiographic measures at preoperative, first erect, 6-month, and 1-year follow-up intervals. Unpaired t-tests and chi-squared tests were used for statistical analysis, with significance set at $p \leq 0.05$.

RESULTS: A total of 133 patients (46 females) were included: 66% in the LP and 34% in LN. Preoperative alignment parameters (C2-C7 Cobb angle, C2-C3 Cobb angle, C4-C7 Cobb angle, and cSVA) were similar between groups ($p > 0.05$). At 1-year follow-up, the LP group had significant C2-C7 (5.34°, $p = 0.0002$) and C4-C7 (7.13°, $p < 0.0001$) lordosis loss, while the LN group showed smaller, non-significant changes (C2-C7: 3.08°, $p = 0.1406$; C4-C7: 1.86°, $p = 0.3405$). The cSVA increased significantly in the LP group (-0.64 cm, $p = 0.0010$) but not in the LN group (-0.33 cm, $p = 0.1690$). Loss of lordosis (≥ -10° change) at the C4-C7 level occurred in 38% of LP patients compared to 15% of LN patients. Regarding the cervical sagittal vertical axis (cSVA), a ≥ 4 cm change was observed in 2% of patients in both groups.

DISCUSSION AND CONCLUSION: C3 laminectomy preserves cervical lordosis and sagittal alignment, and is non-inferior to laminoplasty alone.

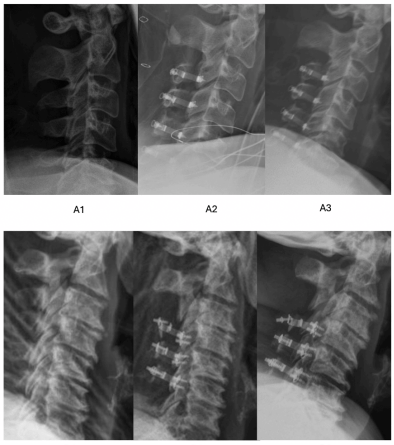

Figure 1: A – preoperative radiograph (A1), immediate postoperative radiograph (A2), and 1-year postoperative radiograph (A3) of a patient who underwent C3-C6 laminoplasty. B - preoperative (B1), immediate postoperative radiograph (B2), and 1-year postoperative radiograph (B3) of a patient who underwent C3 laminectomy with C4-C6 laminoplasty.

Table I: Baseline Demographics and Radiographic Parameters at Time Intervals

Comparison of baseline demographics and radiographic parameters between the laminoplasty (LP) and laminoplasty with laminectomy (LN) groups at various time intervals. No significant differences were observed in demographics, preoperative Cobb angles, or cervical sagittal vertical axis (cSVA) between groups.

Baseline and Radiographic Parameters	Laminoplasty (LP)	Laminoplasty + Laminectomy (LN)	p-value
Female (%)	35	27	0.170
Age (years)	66 ± 19	72 ± 28	0.1140
Pre-operative Cobb Angles			
C2–C7	10° ± 12°	9° ± 15°	0.5638
C2–C3	2° ± 5°	2° ± 6°	0.9378
C4–C7	6° ± 9°	6° ± 11°	0.7555
Cervical Sagittal Vertical Axis (cSVA)	3° ± 1°	4° ± 2°	0.5136
Immediate Postoperative Cobb Angles			
C2-C7	2° ± 11°	-1° ± 13°	0.1933
C2–C3	1° ± 5°	0° ± 5°	0.4031
C4–C7	-2° ± 10°	-2° ± 11°	0.9693
Cervical Sagittal Vertical Axis (cSVA)	4° ± 2°	3° ± 2°	0.2440
6-Month Follow-Up Cobb Angles			
C2-C7	5° ± 11°	4° ± 16°	0.6491
C2–C3	3° ± 6°	1° ± 6°	0.1134
C4–C7	-2° ± 9°	0° ± 10°	0.4033
Cervical Sagittal Vertical Axis (cSVA)	4° ± 2°	4° ± 2°	0.4416
1-Year Follow-Up Cobb Angles			
C2-C7	6° ± 12°	4° ± 15°	0.6841
C2–C3	2° ± 5°	2° ± 3°	0.7288
C4–C7	-1° ± 11°	2° ± 1°	0.3254
Cervical Sagittal Vertical Axis (cSVA)	4° ± 2°	4° ± 1°	0.7731

Table II: Cervical Alignment Outcomes at 1-Year

Cervical alignment changes at the 1-year follow-up comparing the laminoplasty (LP) and laminoplasty with laminectomy (LN) groups. A loss of lordosis was defined as a ≥ -10° change in Cobb angle (CA), while cSVA was defined as ≥ 4 cm, an indicator of sagittal imbalance.

Cervical Alignment Change at 1 year follow-up	Laminoplasty (LP) group	Laminoplasty + Laminectomy (LN) group	Total
C2-C7			
≥ -10° CA change	9 (19%)	4 (21%)	13 (20%)
< -10° CA change	38 (81%)	15 (79%)	53 (80%)
C2-C3			
≥ -10° CA change	2 (4%)	0	2 (4%)
< -10° CA change	44 (96%)	20 (100%)	64 (97%)
C4-C7			
≥ -10° CA change	17 (38%)	3 (15%)	20 (31%)
< -10° CA change	28 (62%)	17 (85%)	45 (69%)
Cervical Sagittal Vertical Axis (cSVA)			
≥ 4cm change	1 (2%)	1 (2%)	2 (3%)
< 4 cm change	43 (98%)	18 (98%)	61 (97%)