Comparative Risk of Spinal Epidural Hematoma Following Laminoplasty and Laminectomy With Fusion in Patients With Degenerative Cervical Myelopathy

Daniel Rusu[1], Aidan Lindgren[1], Henry Avetisian[1], Marco Napolitano[1], William J. Karakash[1], Mirbahador Athari[1], Marc A. Abdou[1], Chimere O. Ezuma[1], Dil V. Patel[1], Jeffrey C. Wang[1], Raymond J. Hah[1], Ram K. Alluri[1]
[1]Keck School of Medicine of University of Southern California, Los Angeles, CA, Department of Orthopaedic Surgery
drusu@usc.edu

Disclosures: Daniel Rusu (N), Aidan Lindgren (N), Henry Avetisian (N), Marco Napolitono (N), William J. Karakash (N), Mirbahador Athari (N), Marc A. Abdou (ATEC Spine), Chimere O. Ezuma (N), Dil V. Patel (N), Jeffrey C. Wang (Biomet, Novapproach, Seaspine, Synthes, GS Medical, DepuySynthes, Bioretec, Bone Biologics, Electrocore, PearlDiver, Surgitech, Illuminant), Raymond J. Hah (ATEC, NuVasive, Medtronic, Globus, Orthofix, SI-Bone, Cerapedics, Evolution Spine), Ram K. Alluri (Orthofix, eCential Robotics, Globus, Medtronic, HIA technologies, NeoOnc, ATEC, Max BioPharma)

INTRODUCTION: Degenerative cervical myelopathy (DCM) is the leading cause of spinal cord dysfunction in adults, typically due to cervical spondylosis or ossified posterior longitudinal ligament (OPLL). Surgical decompression is indicated for patients with mild to severe DCM, with laminoplasty (LP) and laminectomy with fusion (LF) being two commonly employed posterior approaches. Although symptomatic epidural hematoma (EDH) is rare, it remains a potentially catastrophic complication that can result in paralysis or death. This study aims to compare the incidence, risk, and timing of EDH within 7 days following LP vs LF in patients with DCM.

METHODS: The PearlDiver national database was queried to identify patients with DCM who underwent LP or LF from 2010 to 2023. Patients with concomitant anterior cervical surgery were excluded. EDH occurring within 7 days postoperatively was identified using ICD coding. Secondary outcomes included hospital readmission, time to EDH presentation, and time from symptom onset to reoperation. Chi-squared testing was used to compare incidence between groups, and multivariable logistic regression was used to assess risk, adjusting for age, gender, Elixhauser Comorbidity Index (ECI), and presence of OPLL.

RESULTS SECTION: Among 104,170 included patients, 6,477 (6.2%) underwent LP and 97,693 (93.8%) underwent LF. The LP cohort was slightly older (61.81 vs 61.35, $p<0.001$), had a lower mean ECI (7.03 vs 7.69, $p<0.001$), lower proportion of females (37.33% vs 42.36%, $p<0.001$), and a higher prevalence of OPLL (3.57% vs 2.15%, $p<0.001$). The incidence of EDH was significantly lower in the LP group (0.29% vs 0.73%, $p<0.001$), and multivariate regression confirmed a reduced risk of EDH with LP (aOR: 0.41, $p<0.001$) (Figure 1; Table 1). Among patients who developed EDH, most cases occurred after discharge and required hospital readmission—68.4% in the LP group vs 81.3% in the LF group. The mean time to EDH presentation was 4.63±2.03 days for LP and 3.91±2.07 days for LF. The time from symptom onset to reoperation was 3.40±2.22 days for LP and 3.13±2.47 days for LF (Table 2).

DISCUSSION: Laminoplasty is associated with a significantly lower incidence and risk of postoperative epidural hematoma compared to laminectomy with fusion in patients with DCM. Given that most hematomas presented after discharge, strategies such as extended inpatient monitoring and perioperative risk mitigation—including delayed anticoagulation and use of surgical drains—should be considered for high-risk patients to minimize delays in diagnosis and optimize outcomes. While there was a significant difference in relative rates of EDH between treatment modalities, absolute risk only decreased by 0.44% in the LP group, owing to the relatively rare nature of this complication.

SIGNIFICANCE/CLINICAL RELEVANCE: (1-2 sentences): In patients who may be deemed equipoise for LP or LF, laminoplasty may be favorable in those patients at higher risk for epidural hematoma including patients with underlying coagulopathy or patients who may require early postoperative anticoagulation due to cardiac comorbidities or venous thromboembolism risk factors.

Figure 1: Incidence of Epidural Hematoma following LP vs. LF

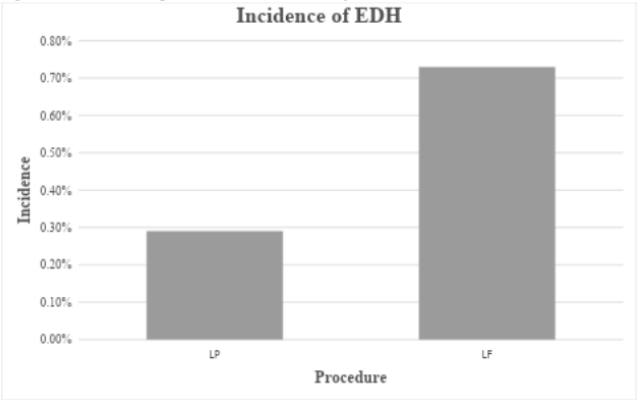

Table 1: Regression Analyses of Risk of Epidural Hematoma

	Univariate			Multivariable		
	Odds Ratio	**95% CI**	**p-value**	**aOR**	**95% CI**	**p-value**
Epidural Hematoma	0.40	0.24-0.61	**p<0.001**	0.41	0.25-0.63	**0.00013**

p<0.05 is considered statistically significant

Table 2: Timing, Readmission, and Reoperation Rates of Patients with EDH

	LP (n=19)	**LF (n=716)**
Readmission	13 (68.42%)	528 (81.28%)
Time to Presentation (Days)	4.63±2.03	3.91±2.07
Reoperation	*	492 (68.72%)
Time to Reoperation (Days)	3.40±2.22	3.13±2.47

*= <11 patients