Comparative Outcomes of Open Versus Endoscopic Lumbar Discectomy: A Propensity-Matched Analysis

Intro: Lumbar disc herniation is a common cause of low back pain and radiculopathy, often co-occurring with disc degeneration. Non-operative management is the mainstay; however, in severe or refractory cases, open lumbar discectomy (OLD) via laminotomy has been the procedure of choice. Advancements in minimally invasive spine surgery have led to the increased adoption of endoscopic lumbar discectomy (ELD), which allows for similar decompression with decreased tissue disruption. Despite growing interest in ELD, comparative data evaluating its efficacy and safety relative to OLD remain mixed. This study aims to compare 3-month, 1-year, and 2-year postoperative outcomes between patients undergoing ELD versus OLD using a large national database

Methods: The TriNetX US Collaborative Network database was queried using ICD-10 and CPT codes to identify adult patients (≥ 18 years old) diagnosed with disc-related lumbar/sacral radiculopathy or myelopathy who underwent either endoscopic or open lumbar discectomy (laminotomy) within the past 20 years. Patients were stratified into cohorts based on surgical approach (endoscopic vs. open). After propensity score matching (1:1) was performed using demographic variables and relevant comorbidities to minimize baseline differences between groups, two groups of 1,432 were analyzed . Postoperative outcomes were evaluated at 3-month, 1-year, and 2-year intervals and included wound complications, revision surgery, medical complications, surgical site infection (SSI), and emergency department (ED) utilization. All statistical analyses were conducted using TriNetX's built-in analytics platform, with results reported as hazard ratios (HR) and p-values. A p-value < 0.05 was considered statistically significant.

Results: At 3 months, wound complications, revision, and SSI showed no statistically significant differences between groups. At 1 year, the OLD cohort had increased risk of wound complications (HR 2.00; $p = 0.011$), SSI (HR 2.23; $p = 0.013$) and DVT/PE (HR 2.07; $p = 0.017$) while revision was more common in the ELD cohort (HR 0.473; $p = 0.0011$). At 2 years, revision remained more frequent in the ELD cohort (HR 0.51; $p < .001$), and there were increased rates of new disc displacement (HR = 1.51, p = 0.027).

Discussion: Patients undergoing OLD experienced significantly higher complication rates in both the short- and long-term compared to those treated with ELD . Conversely, patients treated with ELD exhibited significantly higher revision rates at both 1 and 2 years. These differences likely reflect the inherent trade-offs between the two surgical approaches. The greater complication burden seen with a more invasive approach such as OLD is expected. Conversely, the higher revision rates observed with ELD may stem from limited visualization, decompression capabilities of the minimally invasive approach, or the novelty of the procedure, especially when including a large North American patient and physician population. This study highlights that while OLD may provide more robust decompression, it comes at the cost of higher perioperative morbidity, whereas ELD offers a less invasive alternative with reduced early complication rates but possibly greater long-term risk of reoperation.

Limitations: This retrospective database study is subject to selection bias, coding inaccuracies, and unmeasured confounders, with limited detail on surgical technique, fixation, timing, and postoperative care. Complications were identified using administrative codes, which are prone to misclassification and fail to capture clinical nuance or patient-reported outcomes.

SIGNIFICANCE/CLINICAL RELEVANCE: This study provides important insight into the evolving surgical landscape for lumbar disc herniation by comparing outcomes between endoscopic and open lumbar discectomy. As interest in minimally invasive spine surgery continues to grow, understanding the trade-offs between complication risk and revision burden is critical for evidence-based surgical decision-making. These findings may inform patient counseling, surgical planning, and postoperative surveillance strategies, especially in cases where minimizing perioperative morbidity is prioritized.

1-Year							2-Year					
Variable	Laminotomy	Endoscopic	HR	CI95	P		Variable	Laminotomy	Endoscopic	HR	CI95	P
Wound Complication (Hematoma, Infection, Dehiscence)	38	19	2	1.6, 3.45	0.011		Wound Complication (Hematoma, Infection, Dehiscence)	44	27	1.63	1.02, 2.62	0.041
SSI	29	13	2.23	1.16, 4.3	0.013		SSI	31	20	1.55	0.888, 2.71	0.12
Subsequent Fracture	22	16	1.38	0.73, 2.60	0.32		Subsequent Fracture	23	23	1	0.56, 1.77	1
Revision	26	55	0.473	0.3, 0.75	0.0011		Revision	34	67	0.51	0.34, 0.76	<.001
DVT/PE	31	15	2.07	1.12, 3.81	0.017		DVT/PE	38	25	1.5	0.92, 2.51	0.098
Renal Failure	38	25	1.52	0.922, 2.51	0.098		Renal Failure	55	38	1.45	0.96, 2.17	0.073
UTI	67	39	1.72	1.17, 2.5	0.0056		UTI	94	65	1.45	1.06, 1.97	0.018
ED Usage	183	181	1.01	0.83, 1.23	0.91		ED usage	275	265	1.04	0.89, 1.21	0.63
Opioid Prescription	904	637	1.49	1.34, 1.52	<.001		Opioid Prescription	964	717	1.34	1.26, 1.43	<.001
Post-op Lumbago	55	55	0.91	0.63, 1.31	0.61		Post-op Lumbago	83	90	0.84	0.63, 1.12	0.23
Post-op disc displacement	35	56	1.39	0.93, 2.08	0.11		Post-op disc displacement	44	65	1.51	1.05, 2.16	0.027