Complications and Outcomes in Minimally Invasive vs. Open L4-L5 Decompression for Lumbar Stenosis

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INTRODUCTION:

Lumbar decompression procedures remain a cornerstone for the treatment of lumbar spinal stenosis (LSS). Efforts to refine minimally invasive (MIS) approaches are predicated on prospective improvements in clinical and patient-reported outcomes relative to conventional open techniques. L4-L5 is the most commonly involved level and the most frequent target of operative decompression. This study aims to compare MIS to open surgery for L4-L5 decompression in relation to perioperative and patient-reported outcomes.

METHODS:

Patients who underwent decompression involving L4-L5 for lumbar spinal stenosis (i.e laminectomy/laminotomy) between 2015 and 2023 were retrospectively identified. Patients age < 18 years, who underwent fusion, or with surgical indications for trauma, malignancy, or infection were excluded. Postoperative outcomes included estimated blood loss (EBL), pain Numerical Rating Scale (NRS), Oswestry Disability Index (ODI), operative time (OT), intraoperative and postoperative complications, length of stay (LOS), and reoperation rates. Cohorts were 1:1 propensity matched for age, sex, body mass index, American Society of Anesthesiologists (ASA) class, smoking status, diabetes, osteoporosis, and number of levels decompressed. Chi-squared analysis was performed to compare complication and reoperation rates and unpaired Student's t-test was performed to compare LOS, EBL, and postoperative ODI and NRS scores. RESULTS:

132 total patients were included, of which 66 underwent open (mean age= 65.86 ± 10.82 , 45.5% female) and 66 MIS (mean age= 62.24 ± 14.31 , 31.8% female) decompression . All demographic and baseline characteristics, including type and degree of stenosis were similar between the two groups (p>0.05) (Tables 1 and 2). The MIS group demonstrated lower EBL (23.95 cc vs. 168.26cc, p=0.0001), duration of surgery (140.50 vs. 219.08 min), immediate postoperative NRS (2.27 vs 5.23, p=0.0001), 2- week (23.98 vs. 36.32, p=0.0001), 3-month (9.79 vs. 22.91 p=0.0001), 6-month (8.92 vs. 22.02, p=0.0001), and 1-year (7.23 vs. 22.31, p=0.0002) postoperative ODI compared to the open group. There was no significant difference between the two groups with respect to LOS, complication rates, or reoperation rates (p>0.05) (Tables 3 and 4).

DISCUSSION AND CONCLUSION:

MIS decompression at L4/L5 is associated with significantly lower EBL, OT, and improved postoperative NRS and twoweek, 3-month, 6-month, and 1-year ODI scores relative to conventional open approaches. Although this lends precursory evidence to support short- and long-term safety and efficacy of MIS techniques, further exploration is necessary to better inform current understanding of MIS techniques in consideration of its technical limitations.







	ME8 (m= 66)	Open (a=66)	вм	85% CI	p-value
Prooperative CO1	33.09 ± 15.86	37.52±13.08	4.42	-0.38 to 9.43	0.8821
2-week ODI	23.98 ± 14.79	36.32±19.16	12.34	6.45 to 18.25	0.0001
2-week-5CDI	-9.11 ± 14.491	$+1.29 \pm 17.77$	7.61	2.83 to 13.19	0.8079
3-month OD1	\$.79±7.95	22.91 ± 12.79	13.12	9.45 to 15.79	0.0001
3-month ACOI	-23.29 ± 14.62	-34.99 ± 17.72	8.70	3.11 to 14.29	0.0024
6-month COI	8.92±8.55	22.02 ± 14.88	13.10	8.52 to 17.27	0.8081
6-month ACOI	-34.19±13.68	-15.51 ± 18.13	8.67	3.14 to 14.20	0.0024
1-pear COI	7.23 ± 6.58	22.81 ± 13.84	15.89	11.47 to 18.71	0.8083
1-seer 3001	-25.88±14.21	-15.29 ± 17.77	10.86	5.12 to 16.20	0.8083