

# Cost-Utility Analysis Comparing Laminectomy with Fusion Versus Laminoplasty for Treatment of Cervical Spondylotic Myelopathy

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## INTRODUCTION:

Cervical spondylotic myelopathy (CSM) is the most common cause of spinal cord dysfunction in adults and significantly impacts quality of life. Although both laminectomy with fusion and laminoplasty are widely used posterior surgical approaches, laminoplasty has been associated with fewer complications, shorter hospital stays, and reduced costs. Despite these advantages, it is performed less frequently. With increasing healthcare costs and limited resources, cost-effectiveness data are essential to guide surgical decision-making. This study presents a cost-utility analysis comparing laminoplasty versus laminectomy with fusion for the treatment of CSM.

**METHODS:** A decision tree comparing a 55-year-old male with Grade 1 cervical spondylotic myelopathy (CSM) undergoing laminectomy with fusion versus laminoplasty was built for analysis. A literature review was performed to obtain event probabilities, costs and health utilities. Health utilities were utilized to calculate Quality-Adjusted Life Years (QALYs). A base-case analysis was carried out to obtain the incremental cost and effectiveness (QALYs) of laminectomy with fusion and laminoplasty. A probabilistic sensitivity analysis was performed using 1000 Monte Carlo simulations to evaluate the uncertainty in our model and obtain mean incremental costs, effectiveness, and net monetary benefits. One-way deterministic sensitivity analyses were also performed to identify the variables with most impact.

**RESULTS:** Laminoplasty was favored in 69.7% of the simulations resulting in both lower net costs and higher QALYs versus laminectomy and fusion in 53.5% of occasions. Mean difference in lifetime costs, with laminectomy and fusion as baseline, was  $-\$28,614$  (95% CI,  $-\$29,843 - \$28,286$ ) and the mean difference in lifetime QALYs was 0.11 (95% CI, 0.02 – 0.20). The mean cost for laminoplasty was  $\$30,684$  (Sd=3088), while the mean cost for laminectomy with fusion was  $\$59,298$  (SD= 4330). The median incremental net monetary benefit (INMB) for laminoplasty was found to be  $\$35,312$  (95% CI,  $\$29,552 - \$38,565$ ) at  $\$50,000/\text{QALY WTP}$ .

**DISCUSSION AND CONCLUSION:** Laminoplasty is a more cost-effective modality for the treatment of patients with CSM in comparison to laminectomy and fusion.

Table 1. Estimated Probabilities, Lifetime Costs, and Lifetime Quality-Adjusted Life-Years for Patients Undergoing Laminectomy with Fusion or Laminoplasty

Event	Probability (%)	Lifetime Cost (2021 USD)	Lifetime QALY (2021)
<b>Laminectomy with Fusion</b>			
Unoperated	1	42,494	13.6
Chronic neck pain	2.91	41,709	10.0
Neurologic complications	2.19	107,040	12.2
Medical complications	22.06	48,272	11.7
Hypotonia	2.65	16,207	11.7
Recovery	4.7	42,174	11.7
Death	4.23	42,048	0
<b>Laminoplasty</b>			
Unoperated	1	20,107	13.8
Chronic neck pain	1.36	49,108	10.0
Neurologic complications	2.88	94,406	12.2
Medical complications	14.68	18,848	11.7
Hypotonia	2.2	27,853	11.7
Recovery	2.2	49,700	11.7