Skip Laminectomy Compared with Laminoplasty for Cervical Compressive Myelopathy: A Systematic Review and Meta-Analysis

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Key words
- Cervical compressive myelopathy
- Cervical laminoplasty
- Meta-analysis
- Review
- Skip laminectomy

Abbreviations and Acronyms
CI: Confidence interval
GRADE: Grading of Recommendations Assessment, Development and Evaluation
JOA: Japanese Orthopaedic Association
OR: Odds ratio
ROM: Range of motion
VAS: Visual analogue scale
WMD: Weighted mean difference

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OBJECTIVE: **This meta-analysis evaluated the clinical outcomes of skip laminectomy relative to laminoplasty for the treatment of cervical compressive myelopathy.**

METHODS: **The Cochrane library, PubMed MEDLINE, EMBASE, and Web of Science databases were comprehensively searched to identify relevant articles published up to March 18, 2018. All values of weighted mean difference (WMD) or odds ratio are expressed as skip laminectomy relative to laminoplasty.**

RESULTS: **Four studies comprising 241 patients were included. Skip laminectomy and laminoplasty were comparable in terms of cervical lordotic curvature (weighted mean difference [WMD] −2.37°; 95% confidence interval [CI] −6.18 to 1.43; $P = 0.22$) and range of motion (WMD −2.65°; 95% CI −6.02 to 0.72; $P = 0.12$). The pooled data revealed that the mean visual analogue scale score for pain of the skip laminectomy group was significantly lower than that of the laminoplasty group (WMD −0.97; 95% CI −1.90 to −0.05; $P = 0.04$), and the rate of axial pain was also significantly lower (WMD 0.26; 95% CI 0.07−0.93; $P = 0.04$). The atrophy rates of the deep extensor muscles in the skip laminectomy group (14%) were significantly lower than that of the laminoplasty group (60%).**

CONCLUSIONS: **This meta-analysis determined that skip laminectomy was superior to laminoplasty in terms of visual analogue scale score and rates of axial pain and muscle atrophy. These results warrant further confirmation in future research.**

INTRODUCTION

The geriatric population is increasing worldwide and concomitantly the number of patients with spinal degenerative disease, including compressive myelopathy. In North America, the prevalence of myelopathy due to spinal degeneration is estimated at ≥605 people per million population.[1]

Laminoplasty is a common therapeutic modality to relieve pressure from the spinal cord in the neck affected by myelopathy. Moreover, studies have reported the satisfactory clinical efficacy of laminoplasty.[2-5] However, laminoplasty is associated with postoperative complications, including restricted neck movement, axial pain, and loss of lordotic curvature.[4,6-8] To avoid these postoperative problems, Shiraishi et al.[9] developed the less-invasive skip laminectomy, which is now widely used for selective decompression, with limited damage to posterior structures.

However, the question remains controversial as to which approach achieves better clinical results, laminoplasty or skip laminectomy. Otani et al.[10] reported that skip laminectomy had good outcomes, specifically the maintenance of the cervical lordotic curvature and range of motion (ROM) and low axial pain. Yukawa et al.[2] reported that there was no significant difference in operative invasiveness or axial neck pain between laminoplasty and skip laminectomy. The present systematic review and meta-analysis compared the effectiveness of laminoplasty and skip laminectomy for treating cervical compressive myelopathy.

METHODS

Literature Search

Two authors independently searched the Cochrane library, PubMed MEDLINE, EMBASE, and Web of Science databases for relevant articles published from the inception of these databases to March 18, 2018. The following key words were entered in the search: (laminoplasty OR cervical laminoplasty) AND (skip laminectomy OR selective laminectomy OR segmental partial laminectomy). The reference lists of the retrieved articles were manually scanned to identify relevant studies, using the aforementioned search terms.

Criteria for Selected Trials

We comprehensively searched all the studies that were retrieved from the literature search. To meet the criteria for inclusion in this meta-analysis, the design of each study compared laminoplasty and skip laminectomy, and all the participants were aged >18 years and had received a diagnosis of cervical spondylotic

Table 1. Additional Outcome Indexes According to First Author

	Yukawa et al., 2007[2]	Otani et al., 2009[11]	Shiraishi et al., 2003[9]	Chang et al., 2017[12]
Blood loss, mL				
Laminoplasty	43.8 ± 40.2	NR	249	98
Skip laminectomy	43.0 ± 56.1	NR	18	63
Operative time, minutes				
Laminoplasty	62.9 ± 18.6	NR	114	78
Skip laminectomy	77.3 ± 35.8	NR	133	57
JOA score				
Laminoplasty	14.4	12.8 ± 3.1	NR	NR
Skip laminectomy	13.6	14.2 ± 1.7	NR	NR
JOA recovery rate				
Laminoplasty	60.6%	42%	60%	NR
Skip laminectomy	57.5%	55%	59%	NR
Neck Disability Index				
Laminoplasty	NR	NR	NR	14.8
Skip laminectomy	NR	NR	NR	13.8
Muscle atrophy rate, %				
Laminoplasty	NR	NR	60	NR
Skip laminectomy	NR	NR	14	NR

NR, not reported; JOA, Japanese Orthopaedic Association.

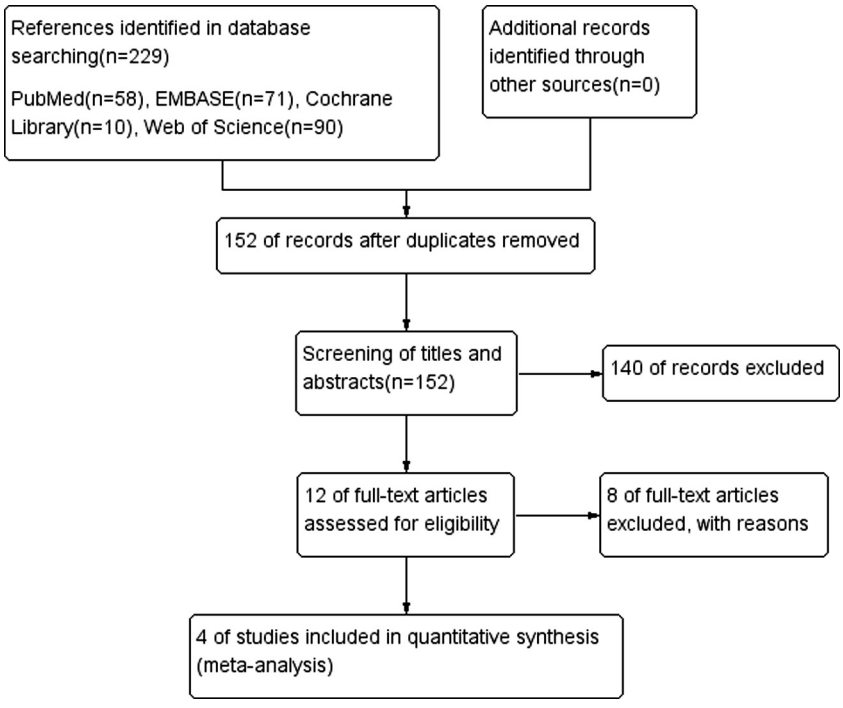

Figure 1. Flow chart showing the process of article selection.

myelopathy. In addition, included in each report were the rates of one or more clinical outcome indicators, with continuous variables expressed as mean and standard deviation, and dichotomous variables as number or rate/frequency of occurrence.

Studies were excluded for any of the following: the study was a case report, case series, review, or noncomparative; the outcomes were descriptive or graphic with no numerical values; if it included patients with previous cervical spine surgery; or if patients had cervical myelopathy caused by tumor or trauma. If a study met all of the aforementioned criteria for inclusion but also included patients with previous cervical spine surgery, tumors, or trauma, those individuals were excluded from the present analysis. Finally, all the included studies were independently extracted by 2 investigators. Inconsistencies between the investigators were rectified by discussion and consensus.

Data Extraction

Two independent investigators extracted data from the eligible studies. Any discrepancy was discussed, or a third reviewer was consulted when necessary, until a consensus was reached for all items. The indispensable data extracted from the eligible studies included study design, country of origin, sample size, publication year, intervention details, duration of follow-up, number of patients lost to follow-up, and clinical outcomes. The outcome parameters pooled in this analysis included cervical lordotic curvature, ROM, visual analogue scale (VAS) score for pain, and axial pain rate. Other outcome index data were not sufficient to construct a forest plot for this meta-analysis. Therefore, these are summarized in Table 1.[2,9,11,12]

Quality Assessment

We judged the level of evidence based on the guidelines of GRADE (Grading of Recommendations Assessment, Development, and Evaluation),[13] which was established for assessing the quality of scientific evidence in systematic reviews. Each of the following items was categorized as very low, low, moderate, or high: design of study, risk of bias, inconsistency, indirectness, and imprecision. At least 2 reviewers independently assessed the risk of bias, with disagreements resolved through discussion.