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Original Article

Laminectomy versus open-door laminoplasty for cervical spondylotic myelopathy: A clinical outcome analysis

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ABSTRACT

Background: Cervical spondylotic myelopathy (CSM) is one of the most common diseases in the geriatric population. Decompressive laminectomy or laminoplasty is the predominant surgical procedure of choice, but there remains debate as to which procedure is optimal for managing CSM.

Methods: Here, we retrospectively analyzed 64 patients with CSM undergoing laminectomy (39 patients) versus laminoplasty (25 patients). The data were collected included respective Japanese orthopedic association (JOA) scores, Nurick grades, and Visual analog scale (VAS) values preoperatively versus 12 months postoperatively.

Results: The JOA score after 1 month improved in both groups utilizing laminectomy or laminoplasty. However, at 12 postoperative months, the JOA scores and Nurick grades showed greater improvement following laminoplasty, despite no differences in postoperative pain and complication rates.

Conclusion: Patients with cervical spondylotic myelopathy undergoing laminoplasty (25 patients) showed better 12-month postoperative outcomes (JOA scores and Nurick grades) versus those having laminectomies (39 patients).

Keywords: Cervical laminectomy, Cervical myelopathy, Cervical spondylotic myelopathy, Laminoplasty, Open-door technique, Spinal cord decompression

INTRODUCTION

Cervical spondylotic myelopathy (CSM) is the most common cause of nontraumatic spinal cord lesions in adults and geriatric patients.[6,18] Here, we compared the 12-month postoperative outcomes following open-door laminoplasty (25 patients) versus laminectomy without fusion (39 patients) for patients with multilevel CSM.

MATERIALS AND METHODS

We retrospectively reviewed the postoperative outcomes (Japanese orthopedic association [JOA] scores, Nurick grades, and Visual analog scale [VAS] scales) for 64 patients with

CSM from 2015 to 2018 and MR/CT-documented cord compression. Patients averaged 74.8 years of age (range 57–87 years old) [Table 1]. Those with JOA scores of <12 presenting with 6 months of rapidly progressive neurological deficits underwent three-level laminectomies (39 patients; without fusion) or open-door laminoplasty (25 patients).

Clinical data

For these patients with CSM, 39 (60.9%) underwent cervical laminectomy without fusion, and 25 (39.1%) had open-door laminoplasty. The mean age of the study cohort was 76.4 and 47 (73.4%) of the patients were male [Table 1].

Surgical techniques

Open-door laminoplasty versus laminectomy

Twenty-five patients underwent the classic Hirabayashi open-door laminoplasty.[8] This included a unicortical cut of the laminae along one side and bicortical cut on the other side. Once the bicortical side was elevated, the freed laminae were fixed "open" utilizing titanium miniplates and screws [Figure 1]. Alternatively, 39 multilevel laminectomies without fusion were performed (e.g. laminae removed medial to the facet joints) [Figure 2].

Statistics

Values are presented as mean ± SD or median. Univariate comparisons were made through the Student's *t*-test, Wilcoxon rank-sum test, or Chi-squared test. Changes in the scores obtained at 12 months after surgery were estimated using linear regression analysis. Data analysis was performed using STATA/IC 13.1 statistical package (StataCorp LP, Texas, USA).

RESULTS

Twelve-month postoperative scores JOA scores and Nurick grades were significantly improved for the 25 having open-door laminoplasty and 39 undergoing cervical laminectomy without fusion [Table 2]. Utilizing a regression analysis, however, the open-door laminoplasty group experienced significantly greater improvement [Table 3].

Complications

Postoperative complications occurred in 10 (15.6%) patients; five wound infections three new neurological deficits, one pulmonary embolism, and one case of pneumonia. There were no significant differences in the rates of other complications in the cervical laminectomy versus open-door laminoplasty groups (e.g., 18.0% versus 12%, respectively, $P = 0.523$).

Table 1: Baseline characteristics of patients.

	Laminectomy (*n*=39)	Laminoplasty (*n*=25)	*P* value*
Age	77.6 (10.2)	74.8 (10.7)	0.314
Male sex	29 (74.4)	18 (72.0)	0.835
VAS	3 (1-4)	3 (1-4)	0.768
Nurick	2 (2-3)	3 (2-3)	0.091
JOA	11 (9-13)	10 (9-13)	0.561

JOA: Japanese orthopedic association; VAS: Visual analog scale

Table 2: Clinical scores before and after surgery.

	Before surgery	After surgery	*P* value*
VAS	3 (1-4)	3 (1-4)	0.822
Nurick	3 (2-3)	2 (2-3)	0.001
JOA	11 (9-13)	12 (10-14)	<0.001

*Wilcoxon matched-pairs signed ranks test. JOA: Japanese orthopedic association; VAS: Visual analog scale

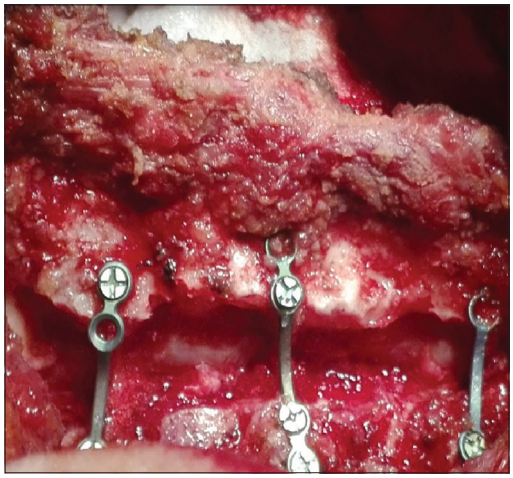

Figure 1: Open door laminoplasty technique.

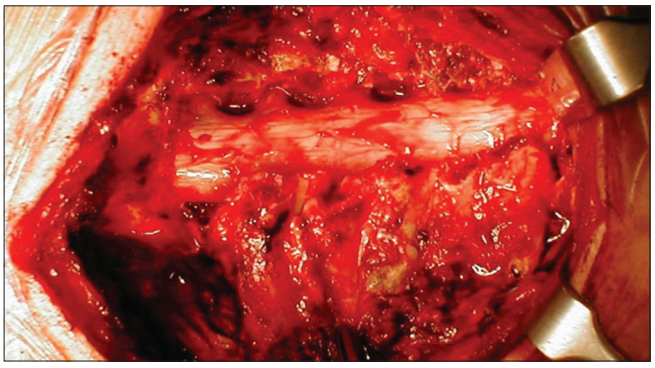

Figure 2: Laminectomy technique.

Table 3: Linear regression model predicting the change in clinical score during follow-up.

Dependent variable	Unadjusted		Adjusted*	
	β coefficient (95% CI)	*P* value	*β* coefficient (95% CI)	*P* value
VAS change	−0.06 (−1.22 to 1.09)	0.911	0.27 (−0.66 to 1.20)	0.559
Nurick change	−0.71 (−1.19 to −0.22)	0.005	−0.55 (−1.04 to −0.70)	0.027
JOA change	2.00 (0.73 to 3.27)	0.003	1.42 (0.19 to 2.66)	0.025

β coefficients with their 95% CIs and corresponding *P* values from linear regression models are shown with type of intervention (laminectomy versus laminoplasty) as independent variable. *Adjusted for age, sex, and baseline clinical score values. JOA: Japanese orthopedic association; VAS: Visual analog scale

DISCUSSION

Postoperative kyphosis and segmental instability after laminectomy are reported in from 6 to 47% of adults but in 100% of children.[1,7,9,14] To preserve vertebral stability, Hirabayashi *et al*., in 1981, described the "open-door" laminoplasty to treat patients with ossification of the posterior longitudinal ligament (OPLL). This provided decompression of the spinal cord while preserving the posterior elements and cervical segmental motion.[2,8,12] Alternatively, laminectomy poses a higher risk of postoperative kyphosis. In this study, we demonstrated in a small number of patients that both techniques (e.g. laminectomy or laminoplasty) resulted in patients' clinical improvement, but additionally found that those undergoing laminoplasty did better overall.[11,17]

Literature

The literature demonstrates different pros and cons for laminoplasty versus laminectomy. The prospective AOSpine CSM – North America study involving 757 patients with CSM showed no difference in 1-year clinical outcomes between laminectomy with fusion versus laminoplasty (JOA scores of 2.45 and 2.51, respectively).[5] Heller *et al.* found significantly fewer complications and better functional improvement utilizing laminoplasty to treat multilevel CSM.[6] Alternatively, Nurboja *et al.* reported significant improvement in axial pain in the laminectomy group when the decompression extended over more than three levels, while no differences were noted between laminectomy versus laminoplasty for one or two levels of decompression.[13,16] Lau *et al.* showed no differences in the overall readmission rate of 3.4% for both surgical groups, but at long-term follow-up, patients who underwent laminectomy with fusion showed higher complication rates (11.6% vs. 2.2%).[10]

The better clinical improvement seen in our series of 25 patients undergoing laminoplasty was based on the JOA score (not the Nurick grades), but there were no significant differences in the rates of pain improvement or complication.[3,4,15]

CONCLUSION

Our 25 patients with multilevel CSM undergoing laminoplasty showed better 12-month postoperative neurological outcomes based on significant improvement in JOA scores versus the 39 patients undergoing laminectomy without fusion.

Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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