

# Clinical Outcomes in Patients with Cervical Spondylotic Myelopathy Treated with French door Laminoplasty

Bishnu Babu Thapa, Rajesh Pratap Shah, Dipendra Maharjan

Associate Professors, Department of Orthopedics, Shree Birendra Hospital, Chhauni, Kathmandu, Nepal

## Corresponding Author

Bishnu Babu Thapa,  
Associate Professor,  
Department of Orthopedics,  
Shree Birendra Hospital,  
Chhauni, Kathmandu  
Email: drbishnubthapa@gmail.com

## Keywords

lordosis, Laminoplasty, myelopathy, stenosis

## Online Access



DOI: 10.3126/mjsbh.v22i1.51078

Date of submission - 2023 Jan 04

Date of acceptance - 2023 Sep 16

© The Author(s) 2023. This work is licensed under a Creative Commons Attribution 4.0 International License. (CC BY-NC)



## Abstract

**Introduction:** Cervical spondylotic myelopathy (CSM) is a condition that results from cervical stenosis. The clinical manifestation of CSM are paresthesia of extremities, loss of motor functions, difficulty in walking and in severe cases bowel and bladder dysfunction. Mostly CSM is treated with surgical methods. In case of single level involvement, anterior surgery is commonly done and preferred posterior surgery for multilevel involvement. Among all posterior techniques, laminoplasty is one of the most popular ones. The study aims to assess the clinical outcomes of French door Laminoplasty in CSM.

**Methods:** We retrospectively analysed the patients hospital record and radiographs who were operated with French door laminoplasty for cervical spondylotic myelopathy. We analysed pre and post operative mJOA score, axial neck pain and cervical lordosis. The data were analysed with SPSS version 20.

**Results:** A total of 30 patients were evaluated. Majority of patients were males (27). All the patients pre and postop cervical lordosis measured and there is maintained cervical lordosis postoperatively. The mJOA score improved from  $9.83 \pm 1.82$  to  $14.27 \pm 1.28$  postoperatively at one year. Mean axial pain improved from  $4.1 \pm 1.19$  to  $1.7 \pm 0.651$  postoperatively.

**Conclusions:** There is improved clinical outcome of cervical spondylotic myelopathy patients after French door laminoplasty surgery.

## INTRODUCTION

Cervical spondylotic myelopathy (CSM) is a clinical condition manifested with symptoms caused by spinal cord compression due to disc herniation, ligament hypertrophy or presence of osteophytes.<sup>1</sup> The manifestation of CSM are paresthesia in the extremities, loss of fine motor skills, balance problems and bowel and bladder dysfunction in advanced disease.<sup>2</sup>

There are anterior and posterior surgery for the treatment of CSM. Laminoplasty is one surgical treatment option done posteriorly. There are many techniques of laminoplasty. In open door laminoplasty we lift the lamina from one side and opening is maintained by different techniques. In French door laminoplasty we split the lamina from the spinous process and sutured on muscle, without the use of any implant.<sup>1,2</sup>

French door laminoplasty is a technique used recently for CSM with encouraging results.<sup>3,4</sup> There are several studies on the effectiveness of the French door laminoplasty for CSM, including multilevel involvement, from abroad. However, very few data are available from Nepal. The aim of the study is to assess the clinical outcome of cervical spondylotic myelopathy treated with French door Laminoplasty.

## METHODS

This is a retrospective study performed in Shree Birendra Hospital, Chhauni, Kathmandu, Nepal. This is a 750 bedded tertiary care level multi - specialty hospital. This tertiary care centre caters to the Nepalese Army personnel and their dependents. This study was approved by Institutional Review Committee of Nepalese Army Institute of Health

Sciences (NAIHS), Swoyambhu, Kathmandu. This is a retrospective study where we analysed a total of 30 patients who were operated from June 2017 to January 2020. These patients were enrolled in this study on the basis of the following inclusion and exclusion criteria (Table 1).

**Table 1:**

Inclusion Criteria	Exclusion Criteria
1. Patients with myelopathic feature	1. Cervical lordotic patients
2. Patients with myelopathic Hand	2. Unstable cervical spine
	3. Previous posterior cervical spine surgery

The patient’s demographic data were noted down. Clinical features like bladder functions, motor as well as sensory functions of upper and lower limbs were retracted from the patients record file and entered into the data sheet. Preoperative cervical spine x ray and MRI were analysed to know the status of cervical lordosis and level of diseases. We recorded JOA score of the myelopathy patients after the assessment of all clinical feature preoperative, postoperative and 12 months. Axial neck pain VAS scores were also recorded. Data were analysed in SPSS version 20.

**RESULTS**

This study included 30 patients. The patients baseline demographic data are presented in Table 2.

**Table 2:** Demographic data of the study population

No of patients	30	
Sex	Male	27
	Female	3
Age (Year)	36 - 78	59.8 ± 10.72
Symptoms before surgery (Months)	1 - 60	28.07 ± 16.30
Level of myelopathy	Single	8
	Two	11
	Three	11

There was a significant difference in the mean mJOA score in the patients when recorded preoperative and then again at the end of one year post-operative (Table 2). In one patient, mJOA scores did not improve during the follow-up period.

**Table 2:** Modified Japanese Orthopaedic Association (mJOA) score

	Preop	Postop at the end of one year	P value
mJOA score	9.83 ± 1.82	14.27 ± 1.28	< 0.000

We also assessed the clinical outcome regarding pain relief as measured by the axial pain visual analog score (VAS) pre and post operatively. There was a significant improvement in the symptoms (Table 3).

**Table 3:** Axial pain visual analogue score (VAS)

	preop	postop	P value
Axial pain	4.1 ± 1.19	1.7 ± 0.651	< 0.000

All patients with preoperative cervical lordosis did not change to kyphosis after surgery. Preoperative cervical lordosis was maintained or increased after surgery. The mean change in Cobb angle between preoperative and post-operative for all patients was 1.83 ± 1.66, which was significant (P < 0.000).

All the patients who had preoperative cervical lordosis did not change to kyphosis after surgery. Preoperative cervical lordosis was maintained or increased after surgery. The mean change in cobb angle between preoperative and post operative for all patients was 1.83 ± 1.66. This change in cobb angle is also statistically significant (P < 0.000).

**DISCUSSION**

CSM is a condition resulting from cervical canal stenosis. Pathophysiologically, myelopathy results from static compression and spinal malalignment. These conditions result in altered cord tension and vascular supply, which leads to dynamic injury with the resultant CSM.<sup>5</sup> One important surgical option for the remedy of this condition is laminoplasty. Laminoplasty is posterior decompression of cervical spinal cord. In open door laminoplasty we lift the lamina from one side and opening is maintained by different techniques. In French door laminoplasty we split the lamina from the spinous process and sutured on muscle, without the use of any implant.<sup>12</sup> Hence, French door laminoplasty would be more useful in resource limited set ups. This study was conceptualized to study the clinical outcomes in French door laminoplasty method.

Our study showed significant improvement in the mJOA scores following French door laminoplasty surgery in cervical spondylotic myelopathy patients. In a study conducted by Guoliang Chen et al on the surgical outcomes of French door laminoplasty for cervical spondylotic

myelopathy (CSM), it was demonstrated that this surgical approach is efficacious in the management of multilevel CSM. However, patients with prolonged preoperative symptoms, a high intramedullary signal on T2 MRI, and a canal narrowing ratio exceeding 50% exhibited less favorable neurological recovery.<sup>3</sup>

In a separate publication authored by Okada M et al,<sup>4</sup> a comparison was made between laminoplasty techniques, revealing that French door laminoplasty may offer more significant advantages compared to open door laminoplasty. However, it should be noted that both groups exhibited similar JOA scores and recovery rates. Similar findings were observed in the studies done by Takashi F et al and Chiba K et al.<sup>6,7</sup> The mean mJOA score improved significantly until three years after surgery and remained at an acceptable level with slight deterioration after five years in the study by Chiba K et al.<sup>7</sup> In our study; there was only a one-year follow-up period; hence, we could not demonstrate the effectiveness of surgery beyond one year. They also found no significant difference in pre and post operative mJOA score and recovery rate between open-door and French door laminoplasty groups ( $P > 0.0005$ ).<sup>8-10</sup>

In this study, the preop axial pain score improved significantly after the surgery. Similar results were found in the study done by Okada M et al.<sup>4</sup> The open door type of cervical en bloc laminoplasty was performed with modification and found the incidence of axial symptoms was much lower compared with the control group.<sup>11</sup>

The cervical lordosis was maintained after surgery in our study. Several studies have shown that French door laminoplasty tends to preserve post-operative cervical alignment better than open door laminoplasty.<sup>12</sup> The cervical lordotic angle was significantly decreased in patients with post-operative axial symptoms after expansive open door laminoplasty, but there was no statistically significant difference in patients with post-operative nonaxial symptoms.<sup>13</sup> During the follow-up period, there was one patient whose mJOA scores did not exhibit improvement. This lack of improvement in the overall score can be attributed to lumbar canal stenosis. However, it's worth noting that the patient did experience an improvement in upper limb scores.

The most frequent post-operative complications observed were motor weakness (C5 palsy), CSF leakage, and lower limb weakness. In all cases, these complications resolved without any long-term effects.<sup>14</sup> However, it is important to note that in our study, we did not encounter these

complications. This discrepancy may be attributed to the smaller number of cases in our series. In a study focused on recovery rates, it was established that most patients (94.8%) exhibited improvement when treated with modified double door laminoplasty. Consequently, this procedure is considered a secure, dependable, and efficient option for individuals with cervical spondylotic myelopathy.<sup>15</sup>

## CONCLUSIONS

The French door laminoplasty could be one of the optimal surgical treatment options in cervical spondylotic myelopathy with comparable results between French door laminoplasty and open door laminoplasty.

## REFERENCES

1. Takeshima Y, Matsuoka R, Nakagawa I, Nishimura F, Nakase H. Surgical Outcome of Laminoplasty for Cervical Spondylotic Myelopathy in an Elderly Population - Potentiality for Effective Early Surgical Intervention: A Meta-analysis. *Neurologia medico-chirurgica*. 2016;57(7):366-73. DOI: [10.2176/nmc.ra.2016-0302](https://doi.org/10.2176/nmc.ra.2016-0302) PMID:28529246 PMCID:PMC5566709
2. Protopsaltis TS, Choi CE, Kaplan DJ. Double-Door or "French-Door" Cervical Laminoplasty. *J Spinal Disord Tech*. 2015 Nov;28(9):319-23. DOI: [10.1097/BSD.0000000000000323](https://doi.org/10.1097/BSD.0000000000000323) PMID:26422693
3. Chen G, Liu X, Chen N, Chen B, Zou X, Wei F, et al. Ten-Year Surgical Outcomes and Prognostic Factors for French-Door Laminoplasty in the Treatment of Multilevel Cervical Spondylotic Myelopathy. *Biomed Res Int*. May 6;2020:3627071. DOI: [10.1155/2020/3627071](https://doi.org/10.1155/2020/3627071) PMID:32461980 PMCID:PMC7229559
4. Okada M, Minamide A, Endo T, Yoshida M, Kawakami M, Ando M, et al. A Prospective Randomized Study of Clinical Outcomes in Patients With Cervical Compressive Myelopathy Treated With Open-Door or French-Door Laminoplasty. *Spine*. 2009 May;34(11):1119-26. DOI:[10.1097/BRS.0b013e31819c3b61](https://doi.org/10.1097/BRS.0b013e31819c3b61) PMID:19444058
5. Nouri A, Tetreault L, Singh A, Karadimas SK, Fehlings MG. Degenerative Cervical Myelopathy. *Spine*. 2015 Jun;40(12):E675-93. DOI: [10.1097/BRS.0000000000000913](https://doi.org/10.1097/BRS.0000000000000913) PMID:25839387
6. Fujishiro T, Nakano A, Baba I, Fukumoto S, Nakaya Y, Neo M. Double-door cervical laminoplasty with suture anchors: evaluation of the clinical performance of the constructs. *Eur Spine J*. 2016 Jun 21;26(4):1121-8. DOI: [10.1007/s00586-016-4666-2](https://doi.org/10.1007/s00586-016-4666-2) PMID:27329617

7. Chiba K, Ogawa Y, Ishii K, Takaishi H, Nakamura M, Maruiwa H, et al. Long-term Results of Expansive Open-Door Laminoplasty for Cervical Myelopathy—Average 14-Year Follow-up Study. *Spine*. 2006.Dec;31(26):2998-3005.  
DOI: [10.1097/01.brs.0000250307.78987.6b](https://doi.org/10.1097/01.brs.0000250307.78987.6b)  
PMID:17172996
8. Chen G, Liu X, Zhao E, Chen N, Wei F, Liu S. Comparative Five-Year Surgical Outcomes of Open-Door versus French-Door Laminoplasty in Multilevel Cervical Spondylotic Myelopathy. *Biomed Res Int*. 2020 Dec 10;2020:1-7.  
DOI: [10.1155/2020/8853733](https://doi.org/10.1155/2020/8853733)  
PMID:33376747 PMCID:PMC7746444
9. Nakashima H, Kato F, Yukawa Y, Imagama S, Ito K, Machino M, et al. Comparative Effectiveness of Open-Door Laminoplasty Versus French-Door Laminoplasty in Cervical Compressive Myelopathy. *Spine*. 2014 Apr;39(8):642-7.  
DOI: [10.1097/BRS.0000000000000252](https://doi.org/10.1097/BRS.0000000000000252)  
PMID:24503689
10. Park JH, Roh SW, Rhim SC, Jeon SR. Long-term Outcomes of 2 Cervical Laminoplasty Methods. *J Spinal Disord Tech*. 2012 Dec;25(8):E224-9.  
DOI: [10.1097/BSD.0b013e31825dda6b](https://doi.org/10.1097/BSD.0b013e31825dda6b)  
PMID:23160272
11. Kawaguchi Y, Kanamori M, Ishiara H, Nobukiyo M, Seki S, Kimura T. Preventive Measures for Axial Symptoms Following Cervical Laminoplasty. *J Spinal Disord Tech*. 2003 Dec;16(6):497-501.  
DOI: [10.1097/00024720-200312000-00002](https://doi.org/10.1097/00024720-200312000-00002)  
PMID:14657744
12. Nakashima H, Kato F, Yukawa Y, Imagama S, Ito K, Machino M, et al. Comparative Effectiveness of Open-Door Laminoplasty Versus French-Door Laminoplasty in Cervical Compressive Myelopathy. *Spine*. 2014 Apr;39(8):642-7.  
DOI: [10.1097/BRS.0000000000000252](https://doi.org/10.1097/BRS.0000000000000252)  
PMID:24503689
13. Zhang H, Zhu R, Yang H, Zhu X, Zhou F. Multifactor Analysis on the Outcomes of Cervical Spondylotic Myelopathy with Expansive Open-Door Laminoplasty. *J Int Med Res*. 2012 Aug;40(4):1608-16.  
DOI: [10.1177/147323001204000441](https://doi.org/10.1177/147323001204000441)  
PMID:22971514
14. Kimura A, Seichi A, Inoue H, Hoshino Y. Long-term results of double-door laminoplasty using hydroxyapatite spacers in patients with compressive cervical myelopathy. *Eur Spine J*. 2011 Feb 19;20(9):1560-6.  
DOI: [10.1007/s00586-011-1724-7](https://doi.org/10.1007/s00586-011-1724-7)  
PMID:21336508 PMCID:PMC3175910
15. Machino M, Yukawa Y, Hida T, Ito K, Nakashima H, Kanbara S, et al. Modified Double-Door Laminoplasty in Managing Multilevel Cervical Spondylotic Myelopathy. *J Spinal Disord Tech*. 2013 May;26(3):135-40.  
DOI: [10.1097/BSD.0b013e31823d848b](https://doi.org/10.1097/BSD.0b013e31823d848b)  
PMID:22105107