

Factors Influencing Outcome After Surgery in Cervical Spondylotic Myelopathy-A Cross Sectional Study

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Abstract

Introduction: Cervical Spondylotic Myelopathy is caused by the reduction in the sagittal diameter of the cervical spinal canal as a result of congenital and degenerative changes. Often due to degeneration of the intervertebral disc producing a focal stenosis due to a “cervical bar,” which is usually a combination of osteophytic spurs and/or protrusion of disc material. Most common type of spinal cord dysfunction in patients over the age of 55 years. Cord injury likely occurs as the result of several interrelated factors: direct compression of the cord, microtrauma associated with neck flexion and extension, and vascular injury. Risk factors include cigarette smoking, frequent lifting, and diving. Signs and symptoms may overlap with those of amyotrophic lateral sclerosis (motor neuron disease). More severe myelopathy should be treated with surgical

decompression with surgical approaches such as Laminectomy. This study deals with posterior approach.[1].

Objectives of the Study: To evaluate the impact of various prognostic factors affecting its outcome after laminectomy in patients with CSM.

Methodology: Study design: A Single centre, cross sectional study. Source of Study: Patients with CSM, having definitive clinical and MRI features presenting in the Department of Neurosurgery, Tirunelveli Medical College Hospital, Tirunelveli. Duration of study: 24 months. Sample size: 39 patients, sample size calculated from 4pq/d2. The study was conducted in the Department of Neurosurgery, Tirunelveli Medical College and Hospital, Tirunelveli. A total number of 50 patients with CSM, having definitive clinical and MRI features will be included. The follow up duration is from minimum of 2

months to maximum 6 months. Patients age, duration of symptoms, preoperative neurological disability, effective canal diameter, number of levels of compression will be evaluated. Posterior approach will be used in patients with pathological compression by thickened ligamentum flavum. The technique used for posterior decompression is cervical laminectomy from C3 to C6.

Conclusion: Decompression surgeries of CSM have got significant function outcome, although there are certain factors that are correlated especially age, duration of disease and co- morbidity. Elderly age group was observed to be insignificant for functional outcome. Still surgery provides neurological improvement. Higher Nurick grade of 1-3 had better functional outcome following surgery than the lower grades. The cervical level of compression, age and gender had no significant association with functional outcome.

Keywords: Nuricks Grading, Level of Compression, CSM, effective canal diameter.

Introduction

Cervical Spondylotic Myelopathy is caused by the reduction in the sagittal diameter of the cervical spinal canal as a result of congenital and degenerative changes. Often due to degeneration of the intervertebral disc producing a focal stenosis due to a “cervical bar,” which is usually a combination of osteophytic spurs and/or protrusion of disc material. Most common type of spinal cord dysfunction in patients over the age of 55 years. Cord injury likely occurs as the result of several interrelated factors: direct compression of the cord, microtrauma associated with neck flexion and extension, and vascular injury. Risk factors include cigarette smoking, frequent lifting, and diving. Signs and symptoms may overlap with those of amyotrophic lateral sclerosis (motor neuron disease). More severe myelopathy should be treated with surgical decompression with

surgical approaches such as Laminectomy. This study deals with posterior approach.[1]

Objectives of the Study

To evaluate the impact of various prognostic factors affecting its outcome after laminectomy in patients with CSM.

Inclusion Criteria

Patients of age group of 30 to 60 years irrespective of sex undergoing decompressive cervical laminectomy for Cervical spondylotic myelopathy (CSM), Patients belonging to ASA I and ASA II grade

Exclusion Criteria

Patients less than 30 yrs and more than 60 years of age irrespective of sex.

All cases with loss of cervical lordosis will be excluded patient managed conservatively.

Materials And Methodology

Study design: A Single centre, cross sectional study. Source of Study: Patients with CSM, having definitive clinical and MRI features presenting in the Department of Neurosurgery, Tirunelveli Medical College Hospital, Tirunelveli. Duration of study: 24 months. Sample size: 39 patients, sample size calculated from 4pq/d2. The study was conducted in the Department of Neurosurgery, Tirunelveli Medical College and Hospital, Tirunelveli. A total number of 50 patients with CSM, having definitive clinical and MRI features will be included. The follow up duration is from minimum of 2 months to maximum 6 months. Patients age, duration of symptoms, preoperative neurological disability, effective canal diameter, number of levels of compression will be evaluated. Posterior approach will be used in patients with pathological compression by thickened ligamentum flavum. The technique used for posterior decompression is cervical laminectomy from C3 to C6.

Results

Age And Gender: Most of the patients in our study belonged to the age group of 40-60 years and the majority of them were males(82.05%) compared with females

Gender	No of cases (N) (%)
Male	33 (82.5%)
Female	7 (17.5%)
Grand Total	40 (100%)

Chief Complaints

Almost all the patients in our study had the complaints of neck pain, weakness and sensory disturbance while bowel and bladder disturbance was present in only 5 patients (12.82%)

Symptoms	Present	Absent
Chief complaints	40 (100%)	0
Neck pain	40 (100%)	0
weakness	40 (100%)	0
sensory disturbances	40 (100%)	0
bowel disturbances	6 (15%)	34 (85%)
bladder disturbances	6 (15%)	34 (85%)

Duration of Symptoms

Majority of the patients had duration of symptoms less than 4 months(94.87%) while only two patients (5.13%) had duration of symptoms more than 4 months

Duration of symptoms (months)	No of cases (N) (%)
<4	38 (95%)
>4	2 (5%)
Grand Total	40 (100%)

Nuricks Grading

Nurick grading of 0-2 and 4-5 was seen among 9 patients (23.08%), whereas most of the patients were under grade of 3 with 21 patients (53.85%)

Nuricks grade	No of cases (N) (%)
0-2	10 (25%)
3	21 (52.5%)
4-5	9 (22.5%)
Grand Total	40 (100%)

Levels of Compression

levels of compression	No of cases (N) (%)
C3-C4 C4-C5	2(5%)
C3-C4 C4-C5 C5-C6	11(27.5%)
C4-C5 C5-C6	14(35%)
C4-C5 C5-C6 C6-C7	13(32.5%)
Grand Total	40 (100%)

In this study, C3-C4 & C4/5 level disease was the least observed level of compression in 2 patients (5%) and most was 14 patients (35%) seen at C4/5 and C5-C6 levels. C4-C5, C5-C6 C6-C7 levels had 13 patients (33.33%). And no significant difference in functional outcome was observed among the different level of disease. (p=0.19)

Outcome

Improvement was seen among 31 patients (79.49%) while others were deteriorated or remained stationary.

Outcome	No of cases (N) (%)
Deteriorated	3 (7.5%)
Stationary	6 (15%)

Improved	31 (79.5%)
Grand Total	40 (100%)

Cord signal changes

Cord signal changes	No of cases (N) (%)
Present	4 (10%)
Absent	36 (90%)
Grand Total	40 (100%)

Gender vs outcome

Gender	outcome		
	Improved	Stationary	Deteriorated
Male	27	5	1
Female	5	1	1
Grand Total	32	6	2
p= 0.4621			

Duration of symptoms (months) vs outcome

Duration of symptoms (months)	outcome		
	Improved	Stationary	Deteriorated
<4	32	6	0
>4	0	0	2
Grand Total	32	6	2
p<0.001			

Nuriks grade vs outcome

Nuriks grade	Outcome		
	Improved	Stationary	Deteriorated
0-2	10	0	0
3	21	0	0

4-5	1	6	2
Grand Total	32	6	2
p<0.001			

Variable	outcome		
	Improved (Mean ± SD)	Stationary (Mean ± SD)	Deteriorated (Mean ± SD)
Effective Canal diameter	14.58 ± 0.80	14.33 ± 0.78	12.5 ± 0.81
N	32	6	2
Anova (F = 27.9542)	p<0.001		

From the above table, Effective canal diameter values among Improved, Stationary and Deteriorated patients were statistically significant with p <0.001.

Discussion

CSM is the commonest spinal cord disorder among elderly population and is seen in people above 40 years. In our study, the results of 39 cases of CSM who underwent surgical decompression were analysed and there were more cases in the age group between 40 and 60 years. The cause of increased number of CSM in middle aged group may be due to lifestyle changes. Zhang et al also showed similar findings with more prevalence of CSM in age group 40-60 years [2]. The natural history of CSM had not documented well in literatures with substantial evidence. But in general, CSM have a tendency to progress to severe disability. Hirai et al states that, the surgical approaches can prevent the

progression of disease[3]. This study showed 5.13% improvement in their neurological status with a decrease in mean Nurick score of 0.78.

According to Morio et al above 70% of patients showed neurological improvement while in Curick et al 85% patients showed neurological improvement.[9,10] Wilberg et al studied 99 cases of CSM and after surgery they got 80% neurological improvement and could arrest the progression of myelopathy by 95%.[10] Hirai et al studied 139 cases of CSM and there was a significant improvement in mean Nurick scale scores after decompression surgeries[8].

Functional outcome of CSM decompression surgeries is dependent on several predictors like age of the patient, gender, duration of symptom, patient factors, techniques, cervical spinal levels of diseases etc. in which age is considered an important independent predictor. Many articles had studied the relation of age and functional outcome after CSM surgeries. Sixteen studies showed negative correlation while 27 articles reported no significant relationship. Nagashima et al [4], Furlan et al[4] and Ogawa et al[5] states, age as a negative predictor. Koyanagi et al [6] studied OPLL cases and also observed age as a predictive factor for outcome after CSM surgeries.

Hiroki et al[7] observed 479 patients of CSM, 119 patients were above 60 years. After 24 months of surgery, younger patients achieved lower Nurick score than elderly patients whereas in our study, there was no significant relationship between age and the outcome. In this study, grading of 0-2 and 4-5 was seen among 9 patients (23.08%), whereas most of the patients were under grade of 3 with 21 patients (53.85%). Higher Nurick grades of 1-2 had better recovery than that of with lower grades.($p < 0.001$)

In this study, there observed statistically significant (p value < 0.001) values of duration of symptoms were found with symptoms more than 4 months had better recovery in as many as 2 patients who were reported. As duration of symptom advances the improvement in functional recovery is more, still the neurological improvement is present. Hence surgery is recommended after watchful waiting for the symptoms.

In Zhang et al[2] 459 cases were studied, in that 84% were C5/6 level spondylosis, while 55% were C4/5 level. Thirty two percent cases showed only one level disease. The study observed no significant difference in level of disease and functional outcome of surgery.

In this study, C5/6 level disease was the least observed in 4 patients (10.26%) and most was 22 patients (56.41%) seen at C4/5 levels. C3, C4 levels had 13 patients (33.33%). And no significant difference in functional outcome was observed among the different level of disease. ($p = 0.19$)

Conclusion

Decompression surgeries of CSM have got significant function outcome, although there are certain factors that are correlated especially age, duration of disease and comorbidity. Elderly age group was observed to be insignificant for functional outcome. Still surgery provides neurological improvement. Higher Nurick grade of 1-3 had better functional outcome following surgery than the lower grades. The cervical level of compression, age and gender had no significant association with functional outcome.

Reference

1. Baaj and P. V. Mummaneni, Handbook of Spine Surgery. Thieme, 2011. [Online]. Available: <https://books.google.co.in/books?id=-RYK8l40SYC>
2. R. Zhang et al., "Clinical features and surgical outcomes of cervical spondylotic myelopathy in

- patients of different ages: A retrospective study,” *Spinal Cord*, vol. 56, Aug. 2017, doi: 10.1038/sc.2017.91.
3. O. Hirai, A. Kondo, I. Aoyama, and K. Nin, “[Anterior decompression surgery of aged patients with cervical myelopathy].,” *No Shinkei Geka.*, vol. 19 11, pp. 1017–23, 1991.
 4. J. Furlan, S. Kalsi-Ryan, A. Kailaya-Vasan, E. Massicotte, and M. Fehlings, “Functional and clinical outcomes following surgical treatment in patients with cervical spondylotic myelopathy: A prospective study of 81 cases,” *J. Neurosurg. Spine*, vol. 14, pp. 348–55, Mar. 2011, doi: 10.3171/2010.10.SPINE091029.
 5. K. Chiba et al., “Long-term Results of Expansive Open-Door Laminoplasty for Cervical Myelopathy—Average 14-Year Follow-up Study.,” *Spine*, vol. 31, no. 26, pp. 2998–3005, Dec. 2006, doi: 10.1097/01.brs.0000250307.78987.6b.
 6. T. Koyanagi, K. Hirabayashi, K. Satomi, Y. Toyama, and Y. Fujimura, “Predictability of Operative Results of Cervical Compression Myelopathy Based on Preoperative Computed Tomographic Myelography,” *Spine*, vol. 18, pp. 1958–1963, 1993.
 7. Y. Masaki et al., “An Analysis of Factors Causing Poor Surgical Outcome in Patients With Cervical Myelopathy Due to Ossification of the Posterior Longitudinal Ligament: Anterior Decompression With Spinal Fusion Versus Laminoplasty,” *J. Spinal Disord. Tech.*, vol. 20, pp. 7–13, 2006.
 8. Ebersold MJ, Pare MC, Quast LM. Surgical treatment for cervical spondylitic myelopathy. *J Neurosurg.* 1995;82(5):745-51.
 9. Morio Y, Teshima R, Nagashima H, Nawata K, Yamasaki D, Nanjo Y. Correlation between operative outcomes of cervical compression myelopathy and MRI of the spinal cord. *Spine (Phila Pa 1976).* 2001;26(11):1238-45.
 10. Cusick JF. Pathophysiology and treatment of cervical spondylotic myelopathy. *Clin Neurosurg.* 1991;37:661-81.