Comparison of anterior and posterior surgical approaches in multi-level cervical spondylotic myelopathy

Paruvakkattil Kunjan Balakrishnan, Tinu R. Abraham*, Ajax John

Department of Neurosurgery, GMC, Kottayam, Kerala, India

Received: 16 May 2021
Revised: 27 June 2021
Accepted: 29 June 2021

*Correspondence:
Dr. Tinu R. Abraham,
E-mail: tinuraviab@gmail.com

ABSTRACT

Background: Cervical spondylotic myelopathy (CSM) is one of the most common dysfunctions of spinal cord which occurs due to degenerative changes in cervical spine disc and facet joints. The management of multilevel spondylotic myelopathy is always controversial. The posterior approaches are always preferable in multiple level spondylosis. But according to newer studies, anterior approaches have similar results. Aim of the study was to compare the efficacy of posterior and anterior approaches in multilevel cervical myelopathy.

Methods: This study includes all patients with multilevel cervical spondylotic myelopathy who have undergone decompression surgery with fusion. Detailed preoperative and post-operative assessment was done according to modified Japanese Orthopedic Association scoring system.

Results: Eighty eight patients of CSM surgical cases were selected for this study and 29 cases of multi-level CSM were observed. And they were randomly selected for anterior and posterior approaches. Sixteen cases anterior approach was done either ACDF or Corpectomy with fusion. Mean age of study was 51.63 years with 64 males and 24 females. The spinal cord level at which most surgeries did was C5/6, 62 cases. While at level C4/5, it was 49 and at level C3/4 and C6/7, it was 35 and 36 respectively.

Conclusions: Both anterior approach and posterior approaches were associated with betterment in postoperative neurological function for multilevel CSM. And there is no significant advantage in doing anterior approach in multilevel CSM.

Keywords: Cervical spondylotic myelopathy, ACDF, Corpectomy

INTRODUCTION

Cervical spondylotic myelopathy (CSM) is one of the most common dysfunctions of spinal cord occurs due to degenerative changes in cervical spine disc and facet joints. The management options of cervical myelopathy include either conservative treatment or operative. Operative management is indicated for most of is recommended for patients who have either substantial or progressive impairment of neurological function without sustained remission. Surgical procedures includes decompression procedures like laminectomy and laminoplasty and decompression with fusion procedures like anterior cervical discectomy and fusion (ACDF), Anterior cervical corpectomy with fusion and fusion and posterior cervical laminectomy with Lateral mass fixation.

Timely intervention by decompression surgeries may decrease the progression of disabilities and help in functional recovery. Management of multiple level cervical myelopathy management is always debatable. If patient have posterior compression, facet hypertrophy, posterior approach and patients having anterior compression with kyphosis anterior approach is recommended.
In case of anterior compression with 3 or more level spondylotic disease with maintained cervical lordosis, posterior laminectomy with lateral mass fixation is conventionally done.\(^5,6\)

**Objective**

The aim of this study is to compare the efficacy of posterior and anterior approaches for multilevel cervical myelopathy.

**METHODS**

This prospective cohort study was conducted in the Department of Neuro Surgery from December 2018 to January 2020 in Government Medical College, Kottayam. This study includes all patients with multilevel cervical spondylotic myelopathy who have undergone decompression surgery with fusion under general anaesthesia. Detailed preoperative and post-operative assessment was done according to modified Japanese Orthopedic Association (mJOA) scoring system.\(^7,8\) Post-operative assessment was done immediately after surgery, at 6 months and 1 year of follow up.

Inclusion criteria include all multi-level CSM patients above age of 18 years with cervical myelopathy undergoing decompression surgeries with fusion and fixation. And exclusion criteria include patients above 75 years and all traumatic spinal cord disease.

According to mJOA scoring system, patients were grouped into 3 groups: mild=15-17, moderate=12-14 and severe ≤12.\(^9,10\)

Sample size was calculated as convenient sampling. Data assessment was done using statistical package for the social sciences (SPSS) software and Microsoft excel. Descriptive statistics were ascertained for the included studies. Means standard deviations and proportions were calculated for all outcomes of interest.

**RESULTS**

Eighty eight patients with CSM were observed in this study including 29 cases of multilevel CSM. Mean age of study was 51.63 years with 64 males and 24 females. The spinal cord level at which most surgeries did was C5/6, 62 cases. While at level C4/5, it was 49 and at level C3/4 and C6/7, it was 35 and 36 respectively.

Out of 88 cases of CSM surgeries, ACDF were done in 47 cases, while corpectomy with fusion for 27 cases and laminectomy with lateral mass fixation done for 14 cases. Multi-level CSM was observed in 29 cases. And they were randomly selected for anterior and posterior approaches. Sixteen cases anterior approach was done either ACDF or corpectomy with fusion and the results are depicted in Table 1 and Table 2.

| Parameters                             | Anterior | Posterior |
|----------------------------------------|----------|-----------|
| Mean age                               | 50.5     | 60        |
| No. of cases                           | 16       | 13        |
| Mean m-JOA score                       | 13.9     | 13.5      |
| Mean Nurick score                      | 2.32     | 2.2       |
| Post op m-JOA after 1 year             | 15.9     | 15.25     |
| Post op Nurick score after 1 year      | 1.38     | 1.4       |

The difference in mean score of mJOA in anterior and posterior approaches for multilevel CSM was 2 and 1.75 respectively, while that of Nurick score is 0.94 and 0.8.

**DISCUSSION**

In this study out of 88 cases, 29 cases were three or more level cervical myelopathy anterior approach surgery done in 16, posterior approach done in 14. In the anterior group, an increase of 2 mJOA score observed after 1 year, while posterior group it was 1.75. Three complications were there in anterior group and two were there in posterior group.

In CSM patients irrespective of surgical approaches, the goal is to decompress the spinal cord and preserve the stability and alignment. The posterior approaches are usually considered for multiple level cervical diseases in which lordosis is maintained.\(^11,12\)

Many studies have compared the outcome of anterior and posterior approaches for CSM showed in the above Table 3.\(^1,13,14,16\) In this study, 29 cases were observed of multiple cervical level diseases. In which 14 cases were done through anterior and 13 through posterior and 2 cases global fusion were done. There was no significant difference were observed in both groups (p value=0.706) Table 2.

In Table 3, difference in mJOA score of anterior and posterior approaches were compared. In most of these studies there is no significant difference between both approaches, except in Yonenobu et al where anterior approach have got significant benefit. In this study there was no significant difference in betterment of mJOA score for both approaches.

---

**Table 1: Comparison of anterior and posterior approach.**

| Parameters                             | Anterior | Posterior |
|----------------------------------------|----------|-----------|
| Mean age                               | 50.5     | 60        |
| No. of cases                           | 16       | 13        |
| Mean m-JOA score                       | 13.9     | 13.5      |
| Mean Nurick score                      | 2.32     | 2.2       |
| Post op m-JOA after 1 year             | 15.9     | 15.25     |
| Post op Nurick score after 1 year      | 1.38     | 1.4       |

**Table 2: Surgical technique and statistics.**

| Approach | Improvement in mJOA | No improvement |
|----------|---------------------|----------------|
| Anterior | 11                  | 4              |
| Posterior| 8                   | 4              |

\(^*\) Chi square statistics=0.142, p value=0.7061
Table 3: Comparison of different studies.

| Study                | Approach   | mJOA before surgery | mJOA after surgery 1 year | Difference in mean mJOA |
|----------------------|------------|----------------------|---------------------------|------------------------|
| Yonenobu et al<sup>33</sup> | Anterior   | 8.2±2.2              | 13.3±2.6                  | 5.1                    |
|                       | Posterior  | 9.3±3.0              | 12.8±2.7                  | 3.5                    |
| Wada et al<sup>34</sup>   | Anterior   | 7.9±1.8              | 13.3±1.6                  | 5.4                    |
|                       | Posterior  | 7.4±2.2              | 13.1±2.0                  | 5.6                    |
| Liu et al<sup>35</sup>  | Anterior   | 8.16±3.14            | 13.2±2.72                 | 5.04                   |
|                       | Posterior  | 8.59±2.98            | 13.67±2.70                | 5.08                   |
| Ghogawala et al<sup>36</sup> | Anterior   | 13.4±0.44            | 15.44±0.39                | 2.04                   |
|                       | Posterior  | 11.6±0.5             | 13.54±0.45                | 1.96                   |

**Limitation**

The sample size is not adequate to commend on which procedure to choose. The surgery done by different surgeons were not standardised.

**CONCLUSION**

Both anterior approach and posterior approaches were associated with betterment in postoperative neurological function for multilevel CSM. The complication and reoperation rates were higher in the anterior group compared with the posterior group. Hence there is no significant advantage in doing anterior approach in multilevel CSM.

**Funding: No funding sources**

**Conflict of interest: None declared**

**Ethical approval: The study was approved by the Institutional Ethics Committee**

**REFERENCES**

1. Binder AI. Cervical spondylosis and neck pain. BMJ. 2007;334(7592):527-31.
2. Vernon H. The Neck Disability Index: state-of-the-art, 1991-2008. J Manipulative Physiol Ther. 2008;31(7):491-502.
3. Sharma A, Kishore H, Singh V. Comparative Study of Functional Outcome of Anterior Cervical Decompression and Interbody Fusion With Tricortical Stand-Alone Iliac Crest Autograft Versus Stand-Alone Polyetheretherketone Cage in Cervical Spondylotic Myelopathy. Global Spine J. 2018;8(8):860-5.
4. Singrakhia MD, Malewar NR, Deshmukh S, Deshmukh SS. Prospective Analysis of Functional Outcome of Single-Stage Surgical Treatment for Symptomatic Tandem Spinal Stenosis. Indian J Orthop. 2019;53(2):315-23.
5. Leak AM, Cooper J, Dyer S, Williams KA, Turner-Stokes L, Frank AO. The Northwick Park Neck Pain Questionnaire, devised to measure neck pain and disability. Br J Rheumatol. 1994;33(5):469-74.
6. Zhang RJ, Shen CL, Zhang JX. Clinical features and surgical outcomes of cervical spondylotic myelopathy in patients of different ages: a retrospective study. Spinal Cord. 2018;56(1):7-13.
7. Clarke E, Robinson PK. Cervical myelopathy: a complication of cervical spondylosis. Brain. 1956;79(3):483-510.
8. Ebersold MJ, Pare MC, Quast LM. Surgical treatment for cervical spondylitic myelopathy. J Neurosurg. 1995;82(3):745-51.
9. Nouri A, Tetreault L, Singh A, Karadimas SK, Fehlings MG. Degenerative Cervical Myelopathy: Epidemiology, Genetics, and Pathogenesis. Spine (Phila Pa 1976). 2015;40(12):675-93.
10. 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.
11. Cusick JF. Pathophysiology and treatment of cervical spondylotic myelopathy. Clin Neurosurg. 1991;37:661-81.
12. Wiberg J. Effects of surgery on cervical spondylotic myelopathy. Acta Neurochir (Wien). 1986;81(3-4):113-7.
13. Yonenobu K, Oda T. Posterior approach to the degenerative cervical spine. In: Aebi M, Gunzburg R, Szpalski M (eds). The Aging Spine. Springer, Berlin, Heidelberg. 2005.
14. Wada E, Suzuki S, Kanazawa A, Matsuoka T, Miyamoto S, Yonenobu K. Subtotal corpectomy versus laminoplasty for multilevel cervical spondylotic myelopathy: a long-term follow-up study over 10 years. Spine (Phila Pa 1976). 2001;26(13):1443-7.
15. Liu T, Xu W, Cheng T, Yang HL. Anterior versus posterior surgery for multilevel cervical myelopathy, which one is better? A systematic review. Eur Spine J. 2011;20(2):224-35.
16. Ghogawala Z, Martin B, Benzel EC, Dziru J, Magge SN, Abbed KM, et al. Comparative effectiveness of ventral vs dorsal surgery for cervical spondylotic myelopathy. Neurosurgery. 2011;68(3):622-30.

Cite this article as: Balakrishnan PK, Abraham TR, John A. Comparison of anterior and posterior surgical approaches in multi-level cervical spondylotic myelopathy. Int Surg J 2021;8:2371-3.