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Original Article

Comparison of outcomes following anterior versus posterior surgical approaches for cervical myelopathy: A retrospective analysis of 260 cases from a single institution

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Abstract

Aim: This study retrospectively evaluated clinical outcomes in patients diagnosed with cervical myelopathy who underwent surgical intervention using either anterior or posterior cervical spinal approaches.
Materials and Methods: Medical records and magnetic resonance imaging (MRI) datasets of patients treated between 2012 and 2025 were reviewed retrospectively. The two groups were compared based on age, sex, and preoperative and postoperative Modified Japanese Orthopaedic Association (mJOA) scores and Visual Analog Scale (VAS) scores. Age distribution between groups was assessed using the Student's t-test. Pre- and postoperative mJOA scores were analyzed with both the Student's t-test and paired sample t-test. Repeated measures analysis of variance (ANOVA) was applied to compare changes in preoperative and postoperative mJOA and VAS scores between the two surgical approach groups.
Results: There was no statistically significant difference in preoperative mJOA scores between patients undergoing anterior and posterior approaches (P=0.120). Postoperative mJOA scores demonstrated a statistically significant improvement in both groups (P<0.001), with the posterior approach group achieving higher mean postoperative mJOA scores than the anterior group. Repeated measures ANOVA indicated that surgery had a positive effect on mJOA scores over time, particularly in patients treated with the posterior approach. The same analysis demonstrated a significant reduction in VAS scores postoperatively, suggesting a beneficial effect of both procedures on pain levels.
Conclusion: Both surgical approaches resulted in significant postoperative improvement in neurological function and pain severity among patients with cervical myelopathy. However, comparative analysis indicates that the posterior approach may provide superior functional outcomes based on postoperative mJOA scores.

Keywords: Cervical myelopathy, cervical spine surgery, anterior approach, posterior approach, modified japanese orthopaedic association, visual analog scale, retrospective study

INTRODUCTION

Degenerative cervical myelopathy (DCM) is a progressive disorder characterized by spinal cord compression and neurological decline. Surgical intervention is typically indicated when conservative management fails to provide adequate clinical improvement (1). As global life expectancy increases, the incidence of DCM has risen, making it one of the most common etiologies of spinal cord dysfunction in adults (2). Despite its prevalence, there is ongoing debate regarding the optimal surgical approach, and no clear consensus has been established on whether anterior or posterior techniques provide superior outcomes (3). Current evidence suggests that both strategies may offer comparable neurological recovery, with no definitive superiority demonstrated in long-term functional improvement (4).

Although DCM is a well-recognized cause of progressive neurological impairment, it may still be underdiagnosed in clinical practice. Early recognition and timely referral rely on accurate application of diagnostic criteria (5). Magnetic resonance imaging (MRI) remains the standard modality for radiological assessment (6). In patients with a short duration of symptoms (≤1 month), T2-weighted hyperintensity has been identified as a negative prognostic indicator and can serve as justification for early decompressive intervention (7). Postoperative neurological recovery has been correlated with increases in spinal cord cross-sectional area on follow-up MRI, suggesting a relationship between decompression, cord expansion, and clinical improvement (8).

Clinical outcomes in DCM are commonly evaluated using the Modified Japanese Orthopaedic Association (mJOA) scoring system and the Visual Analog Scale (VAS) for pain severity (9). The mJOA score ranges from 0 to 18, with lower scores indicating more severe impairment. This scoring system assesses motor function of the upper and lower limbs, upper extremity sensation, and urinary function, providing a structured framework for disease classification and postoperative monitoring (10).

MATERIALS AND METHODS

Study Design

This study is a retrospective observational study of patients who underwent cervical spine surgery at the Department of Neurosurgery, Ordu University Training and Research Hospital, between January 1, 2012, and July 1, 2025. Medical records and MRI studies were reviewed. Patients were categorized according to surgical approach (anterior vs. posterior) and compared based on age, gender, and pre- and post-operative mJOA and VAS scores (Table 1). Postoperative outcomes were evaluated during a one-year follow-up.

Table 1. Age distribution of patients undergoing anterior and posterior cervical spinal surgery

Approach	n	Mean	Standard deviation	t-value	p-value
Anterior	120	67.04	8.45	-3.826	<0.001
Posterior	140	71.08	8.50		

Data Collection and Statistical Analysis

Age distribution between the two surgical groups was evaluated using the Student's t-test. Differences in preoperative and postoperative mJOA scores between the anterior and posterior approach groups were analyzed with the Student's t-test. Within-group comparisons of preoperative and postoperative mJOA scores were performed using paired t-tests. Repeated measures ANOVA was applied to compare changes in mJOA and VAS scores over time between groups. Descriptive statistics were reported as count, percentage, mean, and standard deviation. Statistical analyses were performed using SPSS software (version 21.0). A p-value <0.05 was considered statistically significant.

Ethical Approval

This study was approved by the Scientific Research Ethics Committee of Ordu University (Approval date:12.09.2025; Decision No: 284).

RESULTS

The preoperative mJOA scores of the two groups are presented in Table 2. There was no statistically significant difference in preoperative scores between the anterior and posterior approach groups (P=0.120).

Postoperative mJOA scores are shown in Table 2. A statistically significant difference was observed between the groups, with the posterior approach group achieving higher postoperative mJOA scores than the anterior group (P<0.001).

Within-group comparisons are summarized in Table 3 In the anterior surgery group, postoperative mJOA scores demonstrated a significant improvement compared with preoperative values (P<0.01). Similarly, the posterior surgery group showed a statistically significant increase in postoperative mJOA scores compared to preoperative measurements (P<0.01).

Table 4 provides an overall comparison of preoperative and postoperative mJOA values. Repeated-measures ANOVA demonstrated that both the surgical intervention and the approach used had a significant positive effect on postoperative neurological outcomes, reflected by improved mJOA scores over time.

Figure 1 illustrates the distribution of preoperative and postoperative mJOA scores for both surgical groups.

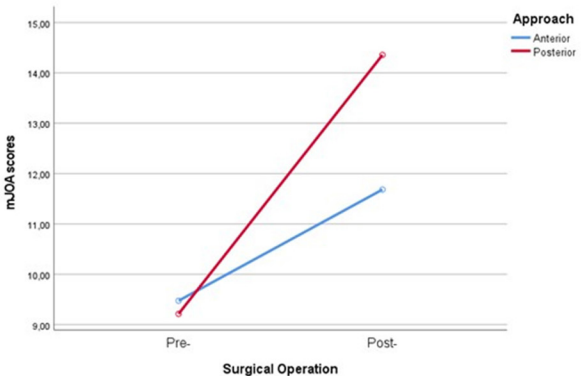

Figure 1. This shows the distribution of preoperative and postoperative mJOA scores for surgical groups

Preoperative VAS scores are summarized in Table 5. There was a statistically significant difference between the groups before surgery, with the anterior approach group demonstrating higher mean preoperative VAS scores than the posterior group (P=0.012).

Postoperative VAS values are presented in Table 5. A significant difference was found between the two groups postoperatively (P<0.001), with the posterior approach group exhibiting lower VAS scores, indicating better postoperative pain outcomes.

Within-group analyses are shown in Table 6 In the anterior surgery group, postoperative VAS scores significantly decreased compared to preoperative measurements (P<0.001). Similarly, in the posterior group, a significant reduction in VAS values was observed at one-year follow-up (P<0.001), demonstrating sustained postoperative pain improvement.

An overall comparison of preoperative and postoperative VAS scores is summarized in Table 7. Repeated measures ANOVA confirmed a significant reduction in VAS values over time, indicating that surgery had a positive effect on pain outcomes. This effect was more pronounced in patients who underwent the posterior approach.

Figure 2 illustrates the changes in VAS scores for both groups before and after surgery.

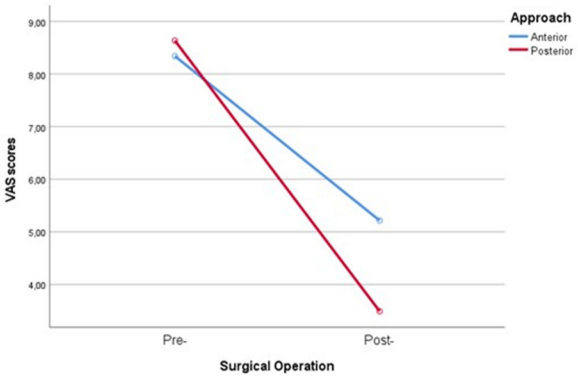

Figure 2. This shows the changes in pre- and post-operative VAS scores for surgical groups

Table 2. Preoperative mJOA scores of patients who underwent anterior and posterior cervical spinal surgery, Preoperative and postoperative mJOA scores of patients who underwent anterior and posterior cervical spinal surgery

Approach	n	Mean	Standard deviation	t-value	p-value
Anterior	120	9.48	1.25	1.560	0.120
Posterior	140	9.21	1.42		
Approach	**n**	**Mean**	**Standard deviation**	**t-value**	**p-value**
Anterior	120	11.68	1.62	-13.931	<0.001
Posterior	140	14.36	1.47		

Table 3. Preoperative and postoperative mJOA scores of patients who underwent anterior cervical spinal surgery, Preoperative and postoperative mJOA scores of patients who underwent anterior and posterior cervical spinal surgery

Anterior Approach	n	Mean	Standard deviation	t-value	p-value
Pre-op	120	9.48	1.25	-10.998	<0.001
Post-op	120	11.68	1.62		
Posterior Approach	**n**	**Mean**	**Standard deviation**	**t-value**	**p-value**
Pre-op	140	9.21	1.42	-29.658	<0.001
Post-op	140	14.36	1.47		

Table 4. Preoperative and postoperative mJOA scores of patients who underwent anterior and posterior cervical spinal surgery

	Anterior (n=120)	Posterior (n=140)	Effects	
Operation	**Mean±SD**	**Mean±SD**	**Process Time**	**Process*Time**
Pre-op	9.48±1.25	9.21±1.42	<0.001	<0.001
Post-op	11.68±1.62	14.36±1.47		

Table 5. Preoperative VAS scores of patients who underwent anterior and posterior cervical spinal surgery, Postoperative VAS scores of patients who underwent anterior and posterior cervical spinal surgery

Approach	n	Mean	Standard deviation	t-value	p-value
Anterior	120	8.34	1.08	-2.540	0.012
Posterior	140	8.64	0.78		
Approach	**n**	**Mean**	**Standard deviation**	**t-value**	**p-value**
Anterior	120	5.22	1.29	12.264	<0.001
Posterior	140	3.49	0.97		

Table 6. Preoperative and postoperative VAS scores of patients who underwent anterior surgery, Preoperative and postoperative VAS scores of patients who underwent posterior cervical spinal surgery

Anterior Approach	n	Mean	Standard deviation	t-value	p-value
Pre-op	120	8.34	1.08	21.378	<0.001
Post-op	120	5.22	1.29		
Anterior Approach	**n**	**Mean**	**Standard deviation**	**t-value**	**p-value**
Pre-op	140	8.64	0.78	51.892	<0.001
Post-op	140	3.49	0.97		

Table 7. Preoperative and postoperative VAS scores of patients who underwent anterior and posterior cervical spinal surgery

	Anterior (n=120)	Posterior (n=140)	Effects	
Approach	Mean±SD	Mean±SD	Process Time	Process*Time
Pre-op	8.34±1.08	8.641±0.78	<0.001	<0.001
Post-op	5.22±1.29	3.49±0.97		

DISCUSSION

This study compared anterior cervical spinal fusion with autogenous iliac bone graft and posterior decompression in the treatment of cervical spondylosis. Our findings demonstrated that both approaches produced significant clinical improvement; however, notable differences were observed in postoperative functional recovery and pain reduction.

In the anterior surgery group, mJOA scores showed a statistically significant improvement following the operation ($P<0.01$). The higher mean postoperative mJOA scores indicate that anterior cervical fusion provided favorable neurological recovery and symptomatic relief. This improvement suggests that, in appropriately selected patients, the anterior approach offers a direct and effective decompression of the affected spinal segment. Representative pre- and postoperative radiographs of anterior procedures are shown in Figure 3, further illustrating successful interbody reconstruction and alignment restoration.

Surgical approach selection is influenced by disease characteristics, particularly the extent of spinal cord compression. Previous reports have emphasized that when compression involves more than two vertebral levels or when severe cervical canal stenosis is present, a posterior approach may be preferable due to its ability to provide wider decompression (11). Consistent with these recommendations, most patients in our clinic who presented with multilevel (two or more) anterior-to-posterior compression were treated with posterior decompression. Figure 4 demonstrates the preoperative MRI and postoperative CT appearance in a representative patient treated with posterior decompression, highlighting the restoration of canal diameter.

Patient-related factors, including age, also contribute to surgical decision-making. Prior clinical data have identified increasing age as a parameter that may influence postoperative outcomes and neurological recovery potential (12). While age alone is not a contraindication, it should be considered when evaluating risk–benefit profiles and selecting the optimal surgical approach.

Overall, the results of this study indicate that both anterior and posterior cervical surgeries can lead to meaningful neurological recovery and pain reduction. The anterior approach was particularly effective for localized pathology and direct disc removal, whereas the posterior approach may be more appropriate for patients with multilevel or extensive stenosis. Selecting the correct operative strategy remains essential in achieving satisfactory clinical outcomes (13).

We examined the ages of all patients who underwent surgical

treatment in our series. The mean age in the anterior surgery group was 67.04 years, whereas the posterior surgery group had a higher mean age of 71.08 years. This indicates that patients treated with the posterior approach tended to be older. Consistent with previous literature, earlier surgical intervention was associated with more favorable clinical outcomes. Prior studies have also shown that greater spinal cord compression on MRI correlates with lower baseline mJOA scores and increasing patient age (13).

Similar to our findings, another comparative study reported no significant difference in preoperative JOA scores between anterior and posterior surgical groups (14). In our analysis, there was no statistically significant difference in preoperative mJOA scores between the two approaches (P=0.120), supporting these published results. Historically, posterior cervical management with laminectomy alone has shifted toward laminectomy combined with instrumentation and fusion (15). In our institution, all patients undergoing posterior surgery received posterior cervical instrumentation following decompression. Notably, posterior fixation with laminectomy demonstrated a greater postoperative increase in mJOA scores, reflecting improved clinical outcomes (16).

In our series, postoperative mJOA scores were significantly higher than preoperative scores (P<0.01), indicating meaningful neurological improvement. Patients who underwent posterior surgery demonstrated greater postoperative mJOA improvement compared to those who received anterior surgery. These findings are consistent with previously published literature reporting favorable outcomes following posterior decompression in appropriately selected cases (17). A separate meta-analysis comparing anterior and posterior approaches for multilevel disease concluded that both techniques possess distinct advantages and limitations, and that no definitive consensus has been established regarding superiority (17).

When postoperative mJOA scores and clinical outcomes were compared between groups in our study, both approaches produced successful results. Repeated-measures ANOVA demonstrated that both surgical intervention and surgical approach were associated with a significant positive effect on postoperative mJOA scores. In support of these findings, a prior study utilizing both VAS and mJOA scales reported that patients with coexisting depression at long-term follow-up experienced less symptomatic improvement than those without depressive symptoms (18). Additionally, another large cohort study evaluating 253 patients reported significant postoperative improvement based on VAS and mJOA outcomes (19).

In our study, postoperative VAS scores differed significantly between groups (P<0.001), with lower postoperative VAS values observed in the posterior approach group. Repeated-measures analysis further demonstrated that both the surgical intervention and operative approach were associated with a reduction in postoperative pain severity. Clinically, these results suggest that posterior surgery may provide greater postoperative pain reduction in selected patients.

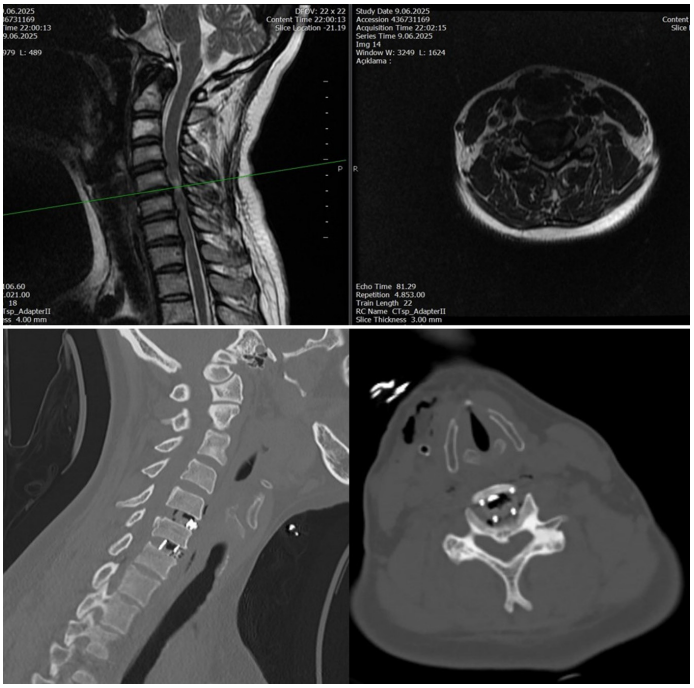

Figure 3. Preoperative MRI and postoperative CT images of a patient treated with anterior decompression

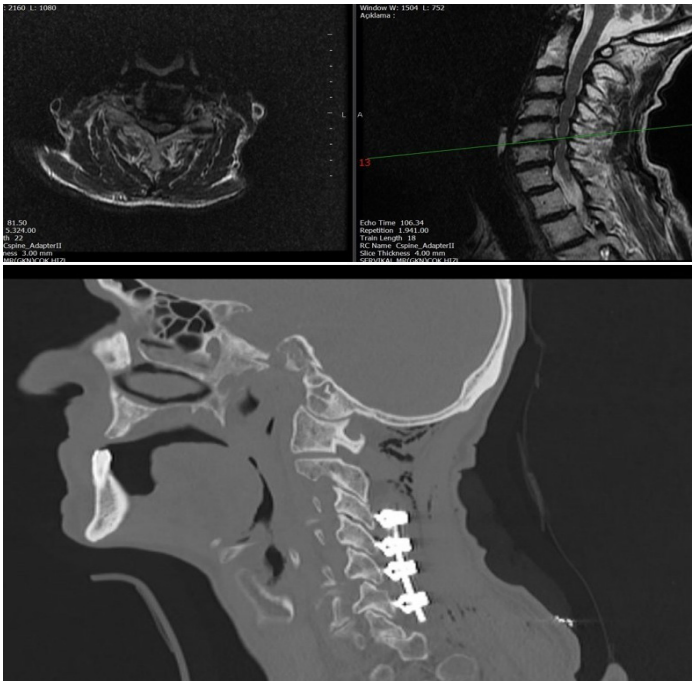

Figure 4. Preoperative MRI and postoperative CT images of a patient treated with posterior decompression

Limitations

This study was not randomized, which may introduce selection bias. Furthermore, anterior interventions were limited to three levels, whereas no level restriction was applied in posterior procedures, potentially influencing comparability between groups. Future prospective, controlled studies are needed to more

clearly determine the optimal approach for different clinical presentations.

CONCLUSION

Postoperative outcomes were significantly improved in both anterior and posterior surgical groups compared to preoperative status, indicating that surgical intervention is effective in managing cervical myelopathy. When the two approaches were compared, posterior surgery was associated with greater improvements in neurological function and lower postoperative pain scores. While these findings suggest that the posterior approach may offer more favorable outcomes in selected patients, definitive conclusions regarding superiority cannot be drawn due to the non-randomized study design and anatomical differences between treatment indications. Further prospective and controlled studies are recommended to clarify optimal approach selection.

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that there is no financial support.

Ethical Approval
The study protocol received approval from the Non-Interventional Scientific Research Ethics Committee of Ordu University (Approval number:12.09.2025 and decision number 284).

REFERENCES

1. Zygogiannis K, Christakakis PC, Gerasimidis P, et al. Cervical disc arthroplasty for isolated one-level degenerative spine disease: a comprehensive review of the current trends. Cureus. 2025;17:e90097.
2. Nouri A, Cheng JS, Davies B, et al. Degenerative cervical myelopathy: a brief review of past perspectives, present developments, and future directions. J Clin Med. 2020;9:535.
3. Bak AB, Alvi MA, Moghaddamjou A, Fehlings MG. Comparison of outcomes after anterior versus posterior surgery for degenerative cervical myelopathy: a pooled analysis of individual patient data. Spine J. 2025;25:1964-73.
4. Zou P, Zhang R, Yang JS, et al. Anterior and posterior approaches for 4-level degenerative cervical myelopathy: low-profile cage versus cervical pedicle screws fixation. J Clin Med. 2023;12:564.
5. Zipser CM, Margetis K, Pedro KM, et al. Increasing awareness of degenerative cervical myelopathy: a preventative cause of non-traumatic spinal cord injury. Spinal Cord. 2021;59:1216-8.
6. Zipser CM, Pfender N, Spirig JM, et al. Study protocol for an observational study of cerebrospinal fluid pressure in patients with degenerative cervical myelopathy undergoing surgical deCOMPression of the spinal CORD: the COMP-CORD study. BMJ Open. 2020;10:e037332.
7. Zhong W, Wang L, Huang T, Luo X. Risk factors for rapid progressive neurological deterioration in patients with cervical spondylotic myelopathy. J Orthop Surg Res. 2021;16:75.
8. Zheng Y, Yang Q, Tan B, et al. Radiographical changes and clinical prognosis after cervical laminectomy with posterior instrumented fusion for degenerative cervical myelopathy. Eur Spine J. 2025;34:3376-88.
9. Zhong JB, Hu Y, Chu ZT, et al. Zero-profile intervertebral fusion with cage-titanium plate for the treatment of multilevel cervical spondylotic myelopathy. Zhongguo Gu Shang. 2024;37:1188-95.
10. Yee TJ, Upadhyaya C, Coric D, et al. Correlation of the modified japanese orthopedic association with functional and quality-of-life outcomes after surgery for degenerative cervical myelopathy: A quality outcomes database study. Neurosurgery. 2022;91:952-60.
11. Zileli M, Maheshwari S, Kale SS, et al. Outcome measures and variables affecting prognosis of cervical spondylotic myelopathy: WFNS Spine Committee recommendations. Neurospine. 2019;16:435-47.
12. Zika J, Alexiou GA, Giannopoulos S, et al. Outcome factors in surgically treated patients for cervical spondylotic myelopathy. J Spinal Cord Med. 2020;43:206-10.
13. Karpova A, Arun R, Davis AM, et al. Predictors of surgical outcome in cervical spondylotic myelopathy. Spine (Phila Pa 1976). 2013;38:392-400.
14. Zhu B, Xu Y, Liu X, et al. Anterior approach versus posterior approach for the treatment of multilevel cervical spondylotic myelopathy: a systemic review and meta-analysis. Eur Spine J. 2013;22:1583-93.
15. Kristof RA, Kiefer T, Thudium M, et al. Comparison of ventral corpectomy and plate-screw-instrumented fusion with dorsal laminectomy and rod-screw-instrumented fusion for treatment of at least two vertebral-level spondylotic cervical myelopathy. Eur Spine J. 2009;18:1951-6.
16. Rodríguez Domínguez V, Gandía González ML, García Feijoo P, et al. Treatment of cervical myelopathy by posterior approach: laminoplasty vs. laminectomy with posterior fixation, are there differences from a clinical and radiological point of view? Neurocirugia (Engl Ed). 2022;33:284-92.
17. Luo J, Cao K, Huang S, et al. Comparison of anterior approach versus posterior approach for the treatment of multilevel cervical spondylotic myelopathy. Eur Spine J. 2015;24:1621-30.
18. Zong Y, Xue Y, Zhao Y, et al. Depression contributed an unsatisfactory surgery outcome among the posterior decompression of the cervical spondylotic myelopathy patients: a prospective clinical study. Neurol Sci. 2014;35:1373-9.
19. Zhang Y, Li C, Dong Q, et al. Prevalence and distribution of cervical facet joint degeneration in patients with cervical spondylotic myelopathy without/with instability and ossification of the posterior longitudinal ligament-a comparative study. Eur Spine J. 2025;34:1229-37.