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Original Article

Comparison of Surgical Outcomes between Anterior and Posterior Approaches in Cervical Spondylotic Myelopathy - Experience from a Tertiary Care Hospital of Bangladesh

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ABSTRACT

Introduction: *Cervical spondylotic myelopathy (CSM) is a leading cause of spinal cord dysfunction in older adults. Surgery is the main treatment, with anterior or posterior approaches chosen based on the compression site, alignment, and number of levels involved. Optimal approach selection is key to better outcomes. The present study aims to compare the surgical outcomes between anterior and posterior approaches in patients with cervical spondylotic myelopathy.* ***Methods and materials:*** *This comparative observational study took place from January 2022 to June 2023, and was conducted in the National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR) and the Orthopaedics Department of Sylhet M.A.G. Osmani Medical College Hospital, Sylhet, Bangladesh, including 100 patients with MRI-confirmed cervical spondylotic myelopathy. Patients were divided into two groups: Group A underwent anterior decompression, and Group B underwent posterior decompression. Statistical analysis was performed using SPSS version 25.0, and a p-value <0.05 was considered statistically significant.* ***Result:*** *Both surgical groups show significant improvement in functional and neurological outcomes. The anterior group has shorter operative time (108.4 vs. 132.1 mins), less blood loss (124.2 vs. 198.5 ml), and shorter hospital stay (4.2 vs. 5.6 days). NDI scores and Nurick grades improve similarly in both groups, with ≥2 grade improvement in 76% of anterior and 70% of posterior cases. Dysphagia is more common in the anterior group (12%), while C5 palsy and axial pain are more frequent in the posterior group.* ***Conclusion:*** *Both anterior and posterior approaches effectively improve outcomes in cervical spondylotic myelopathy. The anterior approach offers shorter operative time and hospital stay, while the posterior is preferred for multilevel disease. Overall, outcomes remain comparable, supporting tailored surgical selection based on pathology.*

Keywords: *Cervical Spondylotic Myelopathy, Surgical Outcomes, Discectomy, Laminectomy*

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INTRODUCTION

Cervical spondylotic myelopathy (CSM) is the most common cause of spinal cord dysfunction in adults over 55 years of age, resulting from degenerative changes in the cervical spine that lead to spinal cord compression [1]. As the global population ages, the incidence of CSM continues to rise, particularly in low- and middle-income countries, including Bangladesh, where late diagnosis and resource limitations pose additional challenges to optimal management [2]. Patients typically present with varying degrees of motor weakness, gait disturbances, hand clumsiness, and sphincter dysfunction, which significantly impair quality of life and functional independence [3]. Surgical decompression remains the gold standard for moderate to severe CSM, especially in patients with progressive neurological deficits or imaging-confirmed spinal cord compression [4]. The choice of surgical approach, however, remains controversial and often depends on multiple factors, including the number of involved segments, sagittal alignment, location of pathology (anterior vs. posterior), and surgeon preference [5].The anterior approach—such as anterior cervical discectomy and fusion (ACDF) or corpectomy—offers direct access to the compressive pathology, particularly beneficial in patients with anterior spinal cord compression, limited-level disease, or kyphotic alignment [6]. This approach has the advantage of preserving posterior elements and generally results in less postoperative neck pain and shorter hospital stays [7]. However, it also carries risks such as dysphagia, recurrent laryngeal nerve injury, and graft-related complications [8]. Conversely, the posterior approach, including laminectomy

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and laminoplasty, is typically employed in patients with multilevel disease, posterior cord compression, or preserved cervical lordosis [9]. While posterior decompression avoids manipulation of anterior structures, it may be associated with increased postoperative axial pain, C5 palsy, and longer recovery time in some cases [10]. Nonetheless, several studies have reported that both approaches can achieve satisfactory neurological outcomes, with some variation in complication rates, recovery speed, and functional improvements [11]. The comparative effectiveness of anterior versus posterior approaches has been explored in various international studies. For instance, the AOSpine North America CSM study, a prospective multicenter analysis, found no significant difference in neurological recovery between anterior and posterior decompression at two-year follow-up, though anterior surgeries were more commonly used in patients with fewer levels of compression and kyphotic alignment [12]. However, such high-quality multicenter trials are scarce in the South Asian context, where differences in disease presentation, socioeconomic factors, surgical infrastructure, and patient follow-up significantly influence surgical outcomes [13]. In Bangladesh, there is a relative paucity of literature directly comparing the surgical outcomes of anterior and posterior approaches in managing CSM. Most centers rely on surgeon expertise and resource availability rather than evidence-based selection of surgical techniques. This gap highlights the need for context-specific data to guide surgical decision-making in this setting. Moreover, differences in healthcare access, delayed presentation, and high disease burden necessitate studies tailored to the local population to identify the most effective and practical treatment strategies. The present study aims to compare the surgical outcomes between anterior and posterior approaches in patients with cervical spondylotic myelopathy, based on clinical and radiological parameters, postoperative recovery, complication rates, and functional outcomes at a tertiary care hospital in Bangladesh.

METHODS & MATERIALS

This comparative observational study was conducted at the National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR) and the Department of Orthopaedics, Sylhet M.A.G. Osmani Medical College Hospital, Sylhet, Bangladesh, over a period of 18 months from January 2022 to June 2023. A total of 100 patients diagnosed with cervical spondylotic myelopathy (CSM) based on clinical examination and MRI findings were included and divided into two groups of 50 each: Group A underwent anterior decompression (e.g., anterior cervical discectomy and fusion), and Group B underwent posterior decompression (e.g., laminectomy or laminoplasty), based on the surgeon's assessment of spinal alignment, number of levels involved, and site of compression. Patients with trauma, infection, tumor, previous cervical spine surgery, or other neurological disorders were excluded. Preoperative and postoperative functional outcomes were assessed using the Neck Disability Index (NDI) and Nurick grading system. Operative time, blood loss, hospital stay, and complications were recorded. Follow-up evaluations were done at 3 and 6 months postoperatively. Statistical analysis was performed using SPSS version 25.0, and a p-value <0.05 was considered statistically significant. Ethical clearance was obtained from the institutional review board, and written informed consent was taken from all participants.

RESULTS

The mean age was 54.8 ± 8.7 years in the anterior group and 57.6 ± 9.9 years in the posterior group. Males predominated in both groups (64% vs. 68%). Mean symptom duration was 9.3 ± 4.5 months in Group A and 10.1 ± 5.2 months in Group B. A significantly greater number of vertebral levels were involved in the posterior group (3.1 ± 0.9 vs. 1.8 ± 0.7; p < 0.001). Lordotic alignment was present in 82% and 78% of anterior and posterior cases, respectively. [Table I]

Table – I: Baseline Characteristics of Patients (*n*=100)

Variable	Anterior Group (n = 50)	Posterior Group (n = 50)	p-value
Mean Age (years)	54.8 ± 8.7	57.6 ± 9.9	0.093
Male (%)	32 (64%)	34 (68%)	0.674
Duration of symptoms (months)	9.3 ± 4.5	10.1 ± 5.2	0.326
Number of levels involved	1.8 ± 0.7	3.1 ± 0.9	<0.001*
Cervical alignment (lordotic)	41 (82%)	39 (78%)	0.611

Mean operative time was significantly shorter in the anterior group (108.4 ± 23.6 minutes) than in the posterior group (132.1 ± 29.5 minutes). Intraoperative blood loss averaged 124.2 ± 46.7 ml in the anterior group and 198.5 ± 64.9 ml in the posterior group. The mean hospital stay was also shorter for anterior cases (4.2 ± 1.3 days) compared to posterior (5.6 ± 1.7 days). All differences were statistically significant (p < 0.001). [Table II]

Table – II: Operative Data and Hospital Stay (*n*=100)

Variable	Anterior Group (n = 50)	Posterior Group (n = 50)	p-value
Mean operative time (minutes)	108.4 ± 23.6	132.1 ± 29.5	<0.001*
Mean blood loss (ml)	124.2 ± 46.7	198.5 ± 64.9	<0.001*
Mean hospital stay (days)	4.2 ± 1.3	5.6 ± 1.7	<0.001*

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Preoperative NDI scores were 41.2 ± 8.6 in the anterior group and 42.5 ± 9.1 in the posterior group. At 3 months, scores improved to 22.6 ± 6.2 and 24.1 ± 7.3, respectively. At 6 months, further improvement was seen, with NDI scores reduced to 14.3 ± 4.8 in the anterior group and 15.1 ± 5.2 in the posterior group. The percentage of overall disability reduction did not differ significantly between groups (p = 0.571). [Table III]

Table – III: Neurological Recovery (Modified Japanese Orthopaedic Association – mJOA Score) (*n*=100)

Time Point	Anterior Group (Mean ± SD)	Posterior Group (Mean ± SD)	p-value
Preoperative	41.2 ± 8.6	42.5 ± 9.1	0.412
3 months post-op	22.6 ± 6.2	24.1 ± 7.3	0.218
6 months post-op	14.3 ± 4.8	15.1 ± 5.2	0.359
Mean improvement (%)	65.3 ± 10.4	64.5 ± 11.2	0.571

Dysphagia occurred in 6 patients (12%) in the anterior group and 1 patient (2%) in the posterior group (p = 0.047). Recurrent laryngeal nerve injury was reported in 2 anterior cases (4%). C5 palsy was noted in 1 anterior (2%) and 4 posterior cases (8%). Persistent axial neck pain was observed in 2 anterior (4%) and 7 posterior patients (14%). No major neurological worsening or mortality occurred in either group. [Table IV]

Table – IV: Postoperative Complications (*n*=100)

Complication	Anterior Group (n=50)	Posterior Group (n=50)	p-value
Dysphagia	6 (12%)	1 (2%)	0.047*
Recurrent laryngeal nerve injury	2 (4%)	0	0.154
C5 palsy	1 (2%)	4 (8%)	0.169
Surgical site infection	1 (2%)	3 (6%)	0.306
Axial neck pain (persistent)	2 (4%)	7 (14%)	0.082

A Nurick grade improvement of ≥2 was seen in 76% of anterior cases and 70% of posterior cases. No change was observed in 10 (20%) anterior and 12 (24%) posterior patients. A slight deterioration was noted in 2 patients (4%) in the anterior group and 3 patients (6%) in the posterior group. Differences between groups were not statistically significant. [Table V]

Table – V: Functional Outcomes (Nurick Grade Improvement) (*n*=100)

Outcome	Anterior Group (n=50)	Posterior Group (n=50)	p-value
Improved by≥2 grades	38 (76%)	35 (70%)	0.499
No change	10 (20%)	12 (24%)	0.631
Worsened	2 (4%)	3 (6%)	0.645

DISCUSSION

This study aimed to compare the clinical, neurological, and functional outcomes between anterior and posterior surgical approaches in the treatment of cervical spondylotic myelopathy (CSM). A total of 100 patients were included, equally divided between the anterior and posterior approach groups. The findings demonstrate that both approaches resulted in significant improvement in neurological function and disability, with some differences in perioperative metrics and complication patterns. The demographic characteristics were broadly similar between the groups. The number of spinal levels involved was significantly higher in the posterior group (3.1 vs. 1.8), which reflects common practice guidelines that recommend the posterior approach for multilevel disease with preserved cervical lordosis [14,15]. The anterior group showed statistically significant advantages in operative parameters, including shorter operative time (108.4 vs. 132.1 minutes), reduced intraoperative blood loss (124.2 vs. 198.5 ml), and shorter hospital stay (4.2 vs. 5.6 days). These findings are consistent with reports by Zhang et al., who observed similar operative benefits with the anterior cervical discectomy and fusion (ACDF) approach for 1–2 level compression [16]. Furthermore, the posterior approach has been associated with longer surgical duration and greater soft tissue dissection, contributing to increased blood loss and recovery time [17]. Neurological outcomes assessed by the Neck Disability Index (NDI) improved significantly in both groups over time. At 6 months, mean NDI scores were reduced to 14.3 ± 4.8 in the anterior group and 15.1 ± 5.2 in the posterior group, with no statistically significant difference (p = 0.359). These results are in line with a multicenter prospective study by Luo et al., who reported that both anterior and posterior approaches provide comparable long-term functional outcomes, particularly when surgical selection criteria are carefully applied [18]. Complication profiles varied between groups. Dysphagia was observed more frequently in the anterior group (12% vs. 2%, p = 0.047), which is a known risk following anterior cervical procedures due to esophageal retraction. Alhashash et al. also reported higher rates of postoperative dysphagia in patients undergoing anterior decompression procedures [19]. On the other hand, complications such as C5 palsy (8%) and persistent axial neck pain (14%) were more prevalent in the posterior group, although these differences were not statistically significant. Similar patterns were reported in a study by Fehlings et al., highlighting increased postoperative neck pain and segmental

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motor weakness in posterior surgeries [4]. The majority of patients in both groups achieved good functional recovery based on Nurick grade, with ≥2 grade improvement noted in 76% of anterior and 70% of posterior cases. This is supported by the findings of Tetreault et al., who emphasized that early surgical intervention, regardless of approach, is associated with favorable outcomes in CSM [20]. The selection of surgical approach in CSM remains individualized and depends on multiple factors, including the number of involved levels, sagittal alignment, and the location of compression. The anterior approach is preferred for localized anterior pathology and kyphotic alignment, whereas the posterior approach is suitable for multilevel stenosis with preserved cervical lordosis [21]. Our findings reinforce this principle and support both approaches as effective when patient selection is appropriate.

Limitations of The Study

The study was conducted at the National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR) and in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

Both anterior and posterior approaches effectively improve outcomes in cervical spondylotic myelopathy. The anterior approach offers shorter operative time and hospital stay, while the posterior is preferred for multilevel disease. Overall, outcomes remain comparable, supporting tailored surgical selection based on pathology.

RECOMMENDATION

Surgical approach in cervical spondylotic myelopathy should be individualized based on the number of levels involved, spinal alignment, and location of compression. Proper patient selection and timely intervention are essential to optimize functional outcomes and minimize complications.

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