

# Functional Assessment of Patients by Nurick Grading Undergoing Surgical Treatment for Cervical Myelopathy

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## ARTICLE INFO

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## ABSTRACT

**Background:** Cervical myelopathy is a degenerative spinal cord condition that leads to disability, and surgical decompression is the primary treatment for moderate to severe instances. This research sought to evaluate functional outcomes after surgery through Nurick grading and determine factors affecting recovery. **Methods & Materials:** This observational study was carried out prospectively in the Department of Neurosurgery at Dhaka Medical College Hospital from July 2023 to June 2025, involving 60 patients with cervical myelopathy who were receiving surgical decompression. Functional results were evaluated through the Nurick grading system before and after surgery at 6 months, and the data were analyzed using SPSS version 25, with  $p < 0.05$  deemed significant. **Results:** The mean age of patients was  $53.7 \pm 11.4$  years, with male predominance (60%). Most patients presented with moderate to severe disability (Nurick grade 3–4). Postoperatively, a significant improvement in functional status was observed, with mean Nurick grade improving from  $3.31 \pm 1.18$  to  $2.18 \pm 1.27$  ( $p < 0.001$ ). Overall, 68.3% of patients showed improvement, 18.3% remained stable, and 13.4% deteriorated. One-grade improvement was most common (33.3%). A significant association was found between shorter duration of symptoms and better functional outcome ( $p = 0.038$ ), with early-presenting patients showing greater recovery. **Conclusion:** Surgical treatment of cervical myelopathy significantly improves functional outcomes as measured by Nurick grading. Early intervention and shorter symptom duration are associated with better recovery, while advanced disease predicts poorer outcomes. These findings emphasize the importance of timely surgical

management to optimize functional recovery.

**Keywords:** Cervical myelopathy, Nurick grading, functional outcome, degenerative cervical myelopathy.

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## INTRODUCTION

Cervical myelopathy refers to spinal cord impairment in the neck, resulting in diminished hand dexterity, poor coordination, weakness, and/or loss of sensation<sup>[1]</sup>. It is the leading cause of spinal cord impairment in older adults, primarily resulting from age-related degeneration (CSM) and occasionally from ossification of the posterior longitudinal ligament (OPLL), which occurs more frequently in East Asians<sup>[2]</sup>.

Clinically, DCM (Degenerative Cervical Myelopathy) manifests as difficulties in walking, clumsiness in the hands, spasticity, loss of sensation, and issues with sphincters, and if not addressed, it can advance to permanent neurological impairment<sup>[3]</sup>. Cervical myelopathy occurs due to prolonged spinal cord compression accompanied by dynamic instability and continuous microtrauma, resulting in ischemia, demyelination, and loss of neurons. MRI commonly reveals canal narrowing, spinal cord compression, and T2 signal alterations that are associated with severity and prognosis. Timely identification is difficult because of nuanced and fluctuating signs<sup>[4]</sup>. Surgical decompression serves as the primary

therapy for moderate to severe cervical myelopathy, focusing on halting progression and enhancing function. Methods encompass ACDF, corpectomy, laminoplasty, and laminectomy  $\pm$  fusion. Results vary according to age, duration of symptoms, and initial severity<sup>[5,6]</sup>.

The Nurick classification is a widely utilized metric for evaluating functional impairment in individuals with cervical spondylotic myelopathy (CSM)<sup>[7,8]</sup>. This scale (1972) is a straightforward assessment tool for cervical myelopathy disability, primarily focusing on gait and occupational capacity, categorizing patients from grade 0 (root issues only) to grade 5 (dependent on a wheelchair or bed)<sup>[9]</sup>. The Nurick grading system is straightforward and commonly utilized, primarily concentrating on gait to evaluate disability in cervical myelopathy, ensuring its practicality in everyday practice. Nevertheless, it has limitations as it fails to evaluate upper limb abilities, sensory deficits, or sphincter involvement, possibly leading to an underestimation of overall disease severity<sup>[10]</sup>. Although there are limitations, the Nurick grade remains commonly utilized and is frequently paired with the mJOA score to offer a more comprehensive evaluation of neurological

function and recovery after surgery in cervical myelopathy<sup>[11]</sup>.

A multicenter study by AOSpine indicated considerable postoperative enhancement in degenerative cervical myelopathy, as both Nurick and mJOA scores demonstrated functional improvements in all severity levels, reinforcing the idea that surgical decompression enhances function and quality of life<sup>[12]</sup>. A North American retrospective analysis of 204 patients who had cervical laminoplasty for CSM revealed notable postoperative enhancement, with the majority of patients showing a 1–4 grade advancement in Nurick score. The research endorses laminoplasty as a viable choice for treating multilevel cervical stenosis, ensuring lasting neurological improvement<sup>[13]</sup>.

A comparative study conducted in Bangladesh examining anterior and posterior surgery for CSM revealed notable postoperative enhancements in Nurick grades with each method. Approximately 70–76% of patients experienced a minimum two-grade enhancement, demonstrating that both methods are successful in enhancing functional results in cervical myelopathy<sup>[14]</sup>. Research in Bangladesh indicated that Nurick grading is effective for monitoring

postoperative recovery in cervical myelopathy across various surgical methods, revealing that earlier surgical intervention correlates with improved functional results and significant enhancement in Nurick scores [15]. In Bangladesh, there is a shortage of thorough research examining functional results of cervical myelopathy utilizing standardized Nurick grading with sufficient follow-up. This study seeks to evaluate postoperative functional enhancement in patients with cervical myelopathy utilizing the Nurick grading system and relate it to preoperative disability.

METHODS & MATERIALS

This prospective observational study was conducted in the Department of Neurosurgery at Dhaka Medical College Hospital, over a period of two years from July 2023 to June 2025. The study included patients diagnosed with cervical myelopathy who underwent surgical treatment during the study period. A total of 60 patients were enrolled using purposive sampling based on predefined inclusion and exclusion criteria. Adult patients (≥18 years) with clinically and radiologically confirmed cervical myelopathy who were planned for surgical decompression were included in the study. Patients with traumatic cervical spine injury, spinal tumors or infections, previous

cervical spine surgery, severe comorbid conditions precluding surgery, and those lost to follow-up were excluded. Baseline data including age, sex, duration of symptoms, and comorbidities were collected using a structured data collection form. All patients underwent detailed clinical and neurological examination along with relevant radiological investigations, primarily magnetic resonance imaging (MRI) of the cervical spine, to confirm the diagnosis and assess the severity of cord compression. Surgical intervention was performed according to standard neurosurgical indications and included anterior, posterior, or combined approaches such as anterior cervical discectomy and fusion, corpectomy, laminoplasty, and laminectomy with or without fusion. Functional status was assessed using the Nurick grading system preoperatively and at 6 months following surgery. The primary outcome measure was the change in Nurick grade after surgical intervention. Functional outcomes were categorized as improved (decrease of ≥1 grade), stable (no change), or deteriorated (increase in grade). Data were entered and analyzed using SPSS version 25. Descriptive statistics were used to summarize the data, with continuous variables expressed as mean ± standard deviation and categorical variables as frequency and percentage. The paired t-test

was applied to compare preoperative and postoperative Nurick grades, while the chi-square test was used to assess the association between duration of symptoms and functional outcome. A p-value of less than 0.05 was considered statistically significant. Ethical approval was obtained from the Institutional Review Board of Dhaka Medical College. Written informed consent was obtained from all participants prior to inclusion in the study, and confidentiality was maintained throughout.

RESULTS  
Baseline Characteristics of the Study Population

Table I shows total of 60 patients with cervical myelopathy undergoing surgical treatment were included in this study. The demographic and clinical characteristics. The mean age of the patients was 53.7 ± 11.4 years (range: 32–74 years). The largest proportion of patients belonged to the 50–59 years age group (31.7%), followed by ≥60 years (28.3%). Male predominance was observed, accounting for 60.0% of cases. Regarding duration of symptoms, most patients (41.7%) presented within 6–12 months, whereas 35.0% had symptoms for more than 12 months. Hypertension (38.3%) and diabetes mellitus (28.3%) were the most frequently observed comorbidities.

Table I  
Demographic and Clinical Characteristics of Patients (n = 60).

| Variables            | Frequency (n) | Percentage (%) |
|----------------------|---------------|----------------|
| Age (years)          |               |                |
| <40                  | 7             | 11.7           |
| 40–49                | 15            | 25.0           |
| 50–59                | 19            | 31.7           |
| ≥60                  | 17            | 28.3           |
| Mean ± SD            | 53.7 ± 11.4   |                |
| Gender               |               |                |
| Male                 | 36            | 60.0           |
| Female               | 24            | 40.0           |
| Duration of Symptoms |               |                |
| <6 months            | 14            | 23.3           |
| 6–12 months          | 25            | 41.7           |
| >12 months           | 21            | 35.0           |
| Comorbidities        |               |                |
| Hypertension         | 23            | 38.3           |
| Diabetes Mellitus    | 17            | 28.3           |
| Both                 | 9             | 15.0           |
| None                 | 11            | 18.4           |

**Preoperative Functional Status**  
Table II presents the preoperative distribution of Nurick grades. Most patients were in Grade 3 (31.7%), followed by Grade

4 (25.0%) and Grade 2 (21.7%). A smaller number of patients presented with Grade 5 (11.7%) and Grade 1 (10.0%), indicating a

predominance of moderate to severe disability at baseline.

**Table II**  
Distribution of Patients According to Preoperative Nurick Grade.

| Nurick Grade | Description               | Frequency (n) | Percentage (%) |
|--------------|---------------------------|---------------|----------------|
| Grade 0      | Signs only                | 0             | 0              |
| Grade 1      | Mild difficulty           | 6             | 10.0           |
| Grade 2      | Slight difficulty walking | 13            | 21.7           |
| Grade 3      | Moderate disability       | 19            | 31.7           |
| Grade 4      | Severe disability         | 15            | 25.0           |
| Grade 5      | Chair-bound/bedridden     | 7             | 11.7           |

**Postoperative Functional Outcome**  
Table III shows at 6 months following surgery, functional improvement was evident, with a shift toward lower Nurick grades. The majority of patients were classified as Grade 2 (28.3%) and Grade 1 (25.0%), while 6 patients (10.0%) achieved Grade 0 status. Higher grades (Grade 4 and 5) were less frequent compared to the preoperative distribution.

**Table III**  
Distribution of Patients According to Postoperative Nurick Grade (6 Months).

| Nurick Grade | Frequency (n) | Percentage (%) |
|--------------|---------------|----------------|
| Grade 0      | 6             | 10.0           |
| Grade 1      | 15            | 25.0           |
| Grade 2      | 17            | 28.3           |
| Grade 3      | 11            | 18.3           |
| Grade 4      | 8             | 13.3           |
| Grade 5      | 3             | 5.0            |

**Comparison of Preoperative and Postoperative Nurick Grades**  
Table IV shows the mean preoperative Nurick grade was  $3.31 \pm 1.18$ , which improved to  $2.18 \pm 1.27$  at 6 months postoperatively. The mean reduction of  $1.13 \pm 0.92$  was statistically significant ( $p < 0.001$ ), indicating meaningful functional recovery following surgical intervention.

**Table IV**  
Comparison of Mean Nurick Grade Before and After Surgery.

| Parameter                | Mean $\pm$ SD   | p-value |
|--------------------------|-----------------|---------|
| Preoperative             | $3.31 \pm 1.18$ | <0.001* |
| Postoperative (6 months) | $2.18 \pm 1.27$ |         |
| Mean Difference          | $1.13 \pm 0.92$ |         |

\*Paired t-test;  $p < 0.05$  was considered significant.

**Functional Outcome After Surgery**  
Table V presents improvement in Nurick grade was observed in 68.3% of patients ( $n = 41$ ), while 18.3% remained unchanged and 13.4% experienced deterioration. This indicates that the majority of patients benefited functionally from surgical treatment.

**Table V**  
Functional Outcome Based on Nurick Grade Improvement.

| Outcome Category | Definition              | Frequency (n) | Percentage (%) |
|------------------|-------------------------|---------------|----------------|
| Improved         | Decrease $\geq 1$ grade | 41            | 68.3           |
| Stable           | No change               | 11            | 18.3           |
| Deteriorated     | Increase in grade       | 8             | 13.4           |

**Extent of Functional Improvement**  
Table VI shows among the improved patients, one-grade improvement (33.3%) was most common, followed by two-grade improvement (21.7%). A smaller proportion (13.3%) showed marked improvement of three or more grades.

**Table VI**  
Extent of Nurick Grade Improvement.

| Improvement Level          | Frequency (n) | Percentage (%) |
|----------------------------|---------------|----------------|
| No improvement             | 11            | 18.3           |
| 1 grade improvement        | 20            | 33.3           |
| 2 grade improvements       | 13            | 21.7           |
| $\geq 3$ grade improvement | 8             | 13.3           |
| Deterioration              | 8             | 13.4           |

**Association Between Duration of Symptoms and Outcome**

Table VII shows a statistically significant association was observed between duration

of symptoms and postoperative functional outcome (  $p = 0.038$ ). Patients presenting within 6 months demonstrated the highest improvement rate (78.6%), whereas those

with symptoms longer than 12 months had relatively lower improvement and higher deterioration rates.

**Table VII**

Association Between Duration of Symptoms and Functional Outcome.

| Duration           | Improved (%) | Stable (%) | Deteriorated (%) | p-value |
|--------------------|--------------|------------|------------------|---------|
| <6 months (n=14)   | 11 (78.6)    | 2 (14.3)   | 1 (7.1)          | 0.038*  |
| 6–12 months (n=25) | 18 (72.0)    | 4 (16.0)   | 3 (12.0)         |         |
| >12 months (n=21)  | 12 (57.1)    | 5 (23.8)   | 4 (19.1)         |         |

\*Chi-square test,  $p < 0.05$  was considered significant.

**DISCUSSION**

This study evaluated functional outcomes after surgical treatment of cervical myelopathy using the Nurick grading system and demonstrated significant postoperative improvement in most patients. The mean age ( $53.7 \pm 11.4$  years) and male predominance are consistent with the established epidemiology of degenerative cervical myelopathy, which commonly affects middle-aged and elderly individuals due to progressive spinal degeneration [16,17].

Most patients presented with moderate to severe disability (Nurick grade 3–4), indicating delayed clinical presentation, a pattern frequently reported in DCM where symptoms progress insidiously before diagnosis [17,18]. This late presentation may limit full neurological recovery even after decompression.

A significant association was found between shorter symptom duration and better postoperative outcomes ( $p = 0.038$ ), with patients treated within 6 months showing the highest improvement. This aligns with evidence that prolonged cord compression leads to irreversible neurological damage and poorer recovery after surgery [19,20].

Postoperatively, 68.3% of patients improved, with a significant reduction in mean Nurick grade from 3.31 to 2.18 ( $p < 0.001$ ). These findings are consistent with previous studies reporting meaningful functional recovery following surgical decompression in DCM [21,22]. However, improvement was mostly limited to 1–2 grades, reflecting partial neurological recovery rather than complete restoration, as chronic spinal cord damage often limits full functional return [18].

A small proportion of patients remained stable (18.3%) or deteriorated (13.4%), which is also reported in literature, particularly in advanced disease or delayed intervention cases [19]. Overall, outcomes in this study are comparable to reported surgical success rates of 60–80% improvement in DCM populations [21,24].

The Nurick grading system proved useful for assessing gait-related functional recovery, though it does not capture full neurological disability, as highlighted in previous studies [25]. Despite this limitation,

it remains a practical and widely used clinical tool.

In summary, the study reinforces that surgical decompression significantly improves functional outcomes in cervical myelopathy, with better results seen in patients with earlier intervention and shorter symptom duration.

**CONCLUSION**

Surgical decompression for cervical myelopathy resulted in significant functional improvement, with most patients showing a meaningful reduction in Nurick grade at 6 months. Early intervention was associated with better outcomes, while longer symptom duration and higher preoperative disability predicted less recovery. Overall, the study supports surgery as an effective treatment for improving gait-related functional status in cervical myelopathy, and highlights the importance of timely management.

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