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# A Clinical Study of Anterior Versus Posterior Approach Management for Multilevel Cervical Spondylotic Myelopathy

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***Abstract:***
***Background****: Cervical spondylotic myelopathy (CSM) is a common cause of neurological dysfunction. Surgical decompression of the cervical spinal cord is effective in treating CSM. It ceases symptom progression and suggests a meaningful functional recovery in a remarkable size among treated individuals. This study is a comparative analysis and systematic review of anterior and posterior surgical approaches performed to determine the approaches' effectiveness in managing multilevel CSM.*
***Materials and Methods****: In this prospective non-randomized study, 60 patients admitted with cervical spondylotic myelopathy aged 51-60 years were allocated into two groups. The period of this study is between September 2018 - October 2020. All patients were examined using scores of two functional outcome scales - Nurick grading and modified Japanese Orthopaedic Association (mJOA) scores. The chi-square test and t-test were used for the statistical analysis of data. Results were considered significant at a p-value of < 0.05.*
***Results****: Based on the Nurick grading and mJOA scores, the commonest mode of presentation of CSM in admitted patients are motor dysfunction of upper and lower extremities, graded sensory loss, difficulties in gait and balance with or without sphincter disturbances. More than 70% of patients with CSM were diagnosed with segmental spondylotic changes at a 2–3-disc level. The rest were diagnosed with the same at 4–5-disc level.*
***Conclusion:*** *Both anterior and posterior surgical approaches have their own merits and demerits. Anterior approach was more beneficial for patients with 2-3 level segment involvement. The mean amount of blood loss was lesser and complications like dysphagia were more common. The posterior approach proved beneficial for patients with 4-5 level segment involvement. Neck pain and CSF leak were significantly common. The overall duration of stay in the hospital was higher in this approach. Adequate decompression of neurological elements leads to suitable functional results in both approaches.*
***Key Word****: Cervical spondylotic myelopathy; Functional scales; Corpectomy; Laminectomy; Segmental spondylotic changes.*

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## I. Introduction

Cervical spondylotic myelopathy (CSM) is a common cause of neurological dysfunction. Its onset is marked mainly by acceptable motor dysfunction, decreased hand dexterity, and worsening gait and balance. Upper and lower extremity sensory and motor dysfunction and sphincter disturbance most commonly occur slowly, stepwise with disease progression. Although rare neurological decline occurs in a few cases, it is evident that the incidence increases with advancing age. CSM constitutes the most common cause of spinal cord dysfunction in individuals older than 55 years[1].

It is a known fact that surgical decompression of the cervical spinal cord is an effective treatment option for CSM. It ceases symptom progression and suggests a meaningful functional recovery in a remarkable

size among treated individuals.[2, 3] Surgical decompression can be done via either an anterior or a posterior surgical approach. The anterior surgical approach is usually anterior cervical discectomy and fusion or corpectomy, and posterior surgery typically involves laminoplasty or laminectomy and fixation.

Presently, it remains ambiguous whether multilevel spondylotic compression is well treated via an anterior or posterior surgical approach and whether one of these surgical approaches is superior in terms of patient outcomes and/or complication profile. Several reports using large administrative databases have endeavored to explicate the safety and efficiency of the anterior versus posterior approach when treating CSM. Unfortunately, in the study conducted by Shamji et al., no conclusion could be achieved regarding the effects and differences of anterior versus posterior surgery due to the lack of pathoanatomical patient data in this large database.[4] Accordingly, the primary aim and objective of this report are to perform a systematic review by comparing both anterior cervical discectomy or corpectomy and posterior cervical laminectomy with or without fusion among the following clinical outcomes: postoperative neck pain, neurological outcomes, range of motion of the neck, and sagittal alignment, as well as the post-operative complications.

## II. Material And Methods

This prospective, non-randomized study was carried out on patients of the Department of Neurosurgery at Guntur General Hospital, Guntur, Andhra Pradesh from September 2018 to October 2020. A total of 60 subjects (both male and female) aged between 51-60 years have been considered for this study.

**Study Design:** Prospective study

**Study Location**: This was a tertiary-care teaching hospital-based study done in the Department of Neurosurgery, at Guntur General Hospital, Guntur, Andhra Pradesh.

**Study Duration:** September 2018 to October 2020.

**Sample size:** 60 patients.

**Sample size calculation:** Among all patients admitted to our hospital from September 2018 to October 2020, the sample size was calculated prospectively using a non-randomizing method and categorized into two groups. One group of 32 patients was selected for anterior surgical approach and another group of 28 patients for posterior surgical approach as per inclusion and exclusion criteria. Patients having tumor, trauma, single-level compression who are not fit for surgery and those who have not given consent for the surgery were excluded from the study.

**Subjects & selection method**: The study population was drawn from patients with spondylosis and degenerative kyphosis who presented to Guntur General Hospital with CSM. All patients were examined using scores of two functional outcome scales - Nurick grading and modified Japanese Orthopaedic Association (mJOA) scores. Patients were evaluated radiologically (AP view and; lateral view x-rays and MRI) before surgical intervention.

The group of patients in which anterior surgical approach was performed had 21 patients with spondylosis, 9 with ossification of posterior longitudinal ligament, and 2 with degenerative kyphosis. The group of patients in which the posterior surgical approach was performed had 16 patients with OPLL and 12 patients with spondylosis. The decision to use the chosen procedure depended on three main factors: direction of spinal cord compression, pre-operative cervical alignment, and the number of affected levels. Amongst a variety of scales, the two most commonly utilized scales to assess and quantify the functional disability of patients with CSM are the Nurick grade[5] and the modified Japanese Orthopedic Association (mJOA) scale[6]. The Nurick scale has been shown to have a good correlation with the mJOA scale with high inter and intra-rater reliability; however, it has also shown low sensitivity and responsiveness to change. The use of both these scales has been advocated as the standard scale for CSM grading in the Western population.[7]

**Nurick Grading System provides the following standard scale for CSM grading[5]:**

- Signs or symptoms of root involvement but without evidence of spinal cord disease 0
- Signs of spinal cord disease but no difficulty in walking 1
- Slight difficulty in walking which did not prevent full-time employment 2
- Difficulty in walking which prevented full-time employment or ability to do all housework 3
- Able to walk only with someone else's help or with the aid of a frame 4
- Chair bound or bedridden 5

**Modified Japanese Orthopaedic Association provides the following standard functional score for CSM grading[6]:**

| **I. Motor dysfunction score of the upper extremities** | **Score** |
|---|---|
| • Inability to move hands | 0 |
| • Inability to eat with a spoon but able to move hands | 1 |
| • Inability to button shirt but able to eat with a spoon | 2 |
| • Able to button shirt with great difficulty | 3 |
| • Able to button shirt with slight difficulty | 4 |
| • No dysfunction | 5 |

| **II. Motor dysfunction score of the lower extremities** | **Score** |
|---|---|
| • Complete loss of motor and sensory function | 0 |
| • Sensory preservation without the ability to move legs | 1 |
| • Able to move legs but unable to walk | 2 |
| • Able to walk on a flat floor with a walking aid (i.e., cane or crutch) | 3 |
| • Able to walk up and/or downstairs with handrail | 4 |
| • Moderate to significant lack of stability but able to walk up and/or downstairs without handrail | 5 |
| • Mild lack of stability but walk unaided with smooth reciprocation | 6 |
| • No dysfunction | 7 |

| **III. Sensation** | **Score** |
|---|---|
| • Complete loss of hand sensation | 0 |
| • Severe sensory loss or pain | 1 |
| • Mild sensory loss | 2 |
| • No sensory loss | 3 |

| **IV. Sphincter dysfunction** | **Score** |
|---|---|
| • Inability to micturate voluntarily | 0 |
| • Marked difficulty with micturition | 1 |
| • Mild to moderate difficulty with micturition | 2 |
| • Normal micturition | 3 |

**Inclusion criteria:**

1. All patients who were presented with symptoms of cervical radiculopathy and myelopathy and in whom conventional diagnostic imaging studies showed features of multilevel (two or more) CSM.

**Exclusion criteria:**

1. Single-level CSM.
2. CSM features due to trauma/tumor.
3. Patients who are unfit for surgery.
4. Patients who have not given consent for the study.

**Procedure methodology:**

After obtaining written informed consent, a prospective study was done from September 2018 to October 2020 on patients with cervical spondylotic myelopathy. All patients of both groups were examined and graded according to Nurick grading and mJOA scores and evaluated radiologically (AP view and lateral view x-rays and MRI) before surgical intervention. The intraoperative assessment was designed to calculate the time of surgery, the amount of blood loss, levels of decompression, postoperative complication, and hospital stay. All patients were followed up clinically and radiologically at the outpatient department post-operatively for up to one year.

All patients were investigated with x-ray c-spine (anteroposterior, lateral, flexion, and extension views), CT c-spine, and MRI c-spine. The grouping included for comparison was non-randomized. Clinical presentation, duration of surgery, blood loss, and length of hospital stay were compared. Post-operative surgical complications were noted. Neurological improvements were evaluated by using two functional outcome scales -

the Nurick grading system and mJOA scores. Patients were evaluated with regards to age, sex, clinical radiological presentation, before and after surgical treatment options, and prognostication.

Surgical decompression was done via an anterior approach (anterior cervical discectomy with or without fusion with auto/allograft implants) and posterior approach (cervical laminectomy with or without fusion with lateral mass fixation) in the two different groups. The patients' age, baseline function, rate of deterioration, the severity of symptoms, and overall health were taken into consideration before deciding on operative treatment for CSM. Only patients with ongoing symptoms refractory to conservative measures, those with progressive symptoms, bowel or bladder dysfunction, or overt weakness were considered for operative intervention.

Among 32 patients who underwent anterior approach, 24 patients (75%) had undergone 2 segment level and 8 patients (25%) had undergone 3 segment level surgeries. Among 28 patients who underwent posterior approach, the majority (78%) had undergone 4 segment level surgeries followed by 2 segment level surgery (11%).

Conservative treatments for CSM include neck immobilization, pharmacologic treatments, lifestyle modifications, physiotherapy, and other modalities. All the patients in this study were refractory to conservative treatment. The radiological examination included plain radiography, MR imaging, and CT scan. Stability was evaluated in both the anterior and posterior groups. The thirty-two patients in the anterior group were treated using a corpectomy followed by placement of iliac bone graft (auto-graft). Cervical plates were added in all. In the posterior group, 19 patients underwent laminectomy alone and 9 patients underwent laminectomy followed by posterior instrumentation with lateral mass screws.

**Statistical analysis:**

All data were entered on a personal computer in Microsoft Excel/SPSS software. The data were analyzed using SPSS software. During the analysis of data, continuous variables were compared using the student *t*-test. Dichotomous variables (e.g., sex) were compared using the Chi-square test. Descriptive statistics were used wherever required. Wherever appropriate, differences in distribution were tested with the *t*-test or Fisher's exact test. Other statistical methods were utilized wherever appropriate. The p-value of less than 0.05 was statistically significant. Proportions were compared using Chi-square (Pearson test) or Fisher's exact test or the One-Way ANOVA test, whichever applicable. The chi-square test and *t*-test were used for the statistical analysis of data. Results were considered significant at a p-value of $< 0.05$.

## III. Result

In the present study, 60 cases were admitted and categorized into different age groups ranging from less than 30 years up to 70 years. The commonest age group of presentation is 51-60 years which means that the mean age group of presentation is 50 years and constitutes 31% of the study population. The Nurick grading and mJOA scores of anterior and posterior surgical approaches have been compared in this study. The period of comparison is from the pre-operative stage to post-operative one-year follow-up. In the anterior surgical approach, recordings from pre-op to post-op one-year follow-up have shown significant improvement in cases with lower Nurick grades (2 and 3) as compared to those cases with higher Nurick grades (3 and 4). This difference was found to be statistically significant on the chi-square test (P-value $<0.05$) with mean improvement from 2.9 to 2.0. In the posterior surgical approach, post-op one-year follow-up recordings have found that the proportion of cases with Nurick grades 4 and 5 are higher as compared to the proportion of cases in the anterior approach. The distribution was not found to be statistically significant on the chi-square test (P-value $>0.05$. The mean improvement shown were 2.0 to 2.25 in anterior and posterior approaches respectively.

**Nurick grading and mJOA scores in anterior surgical approach (pre-op, immediate post-op, and post-op one-year follow up):**

Table no 1 shows the segmental levels of the surgery performed using the anterior approach. Among 32 patients who underwent anterior approach, 24 patients (75%) had undergone 2 segment level and 8 patients (25%) had undergone 3 segment level surgeries.

**Table no 1:** Shows the segmental levels of surgery performed using the anterior approach**.**

| No. of Segments | Patients (%) |
|---|---|
| 2 | 24 (75%) |
| 3 | 8 (25%) |

Figure 1 shows segmental levels done in surgery.

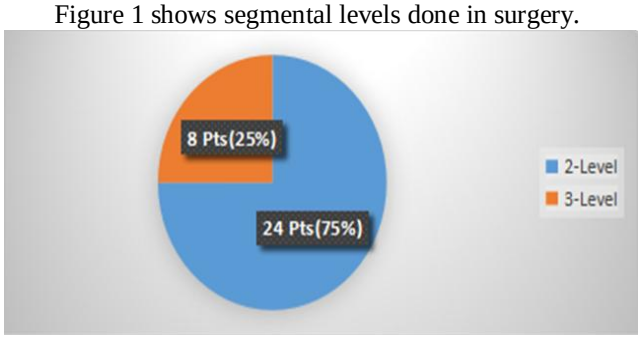



Table no 2 shows the segmental level of surgery performed using the posterior approach. Among 28 patients who underwent posterior approach, the majority (78%) had undergone 4 segment level surgeries followed by 2 segment level surgery (11%). 3 patients have undergone 2 segment level surgery, 1 has undergone 3 segment level, 22 have undergone 4 segment level and 2 have undergone 5 segment level surgery using the posterior approach.

**Table no 2:** Segmental level of surgery performed using the posterior approach

| No. of Segments | Patients (%) |
|---|---|
| 2-LEVEL | 3 (11%) |
| 3-LEVEL | 1 (4%) |
| 4-LEVEL | 22 (78%) |
| 5-LEVEL | 2 (7%) |

Figure 2 is a chart showing the distribution of segmental compression on the posterior approach.

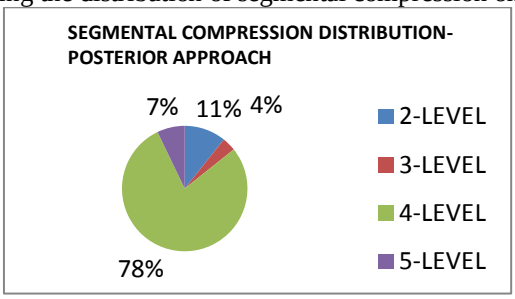



Table 3 shows the anterior approach Nurick grading distribution in patients. The anterior approach recordings from pre-op to post-op 1-year follow-up show that the proportion of cases with lower Nurick grades (1 and 2) has increased and the proportion of cases having higher Nurick grades (3 and 4) have decreased. This difference was found to be statistically significant on the chi-square test (P-value <0.05).

**Table 3: Anterior approach Nurick grading distribution (patients).**

| | | | Time | | | Total |
|---|---|---|---|---|---|---|
| | | | Pre-Op | Post-Op | Post-Op at 1 year | |
| Nurick grades | 1 | Count | 3 | 10 | 10 | 23 |
| | | % | 9.4% | 31.3% | 31.3% | 24.0% |
| | 2 | Count | 10 | 12 | 14 | 36 |
| | | % | 31.3% | 37.5% | 43.8% | 37.5% |
| | 3 | Count | 8 | 5 | 5 | 18 |
| | | % | 25.0% | 15.6% | 15.6% | 18.8% |
| | 4 | Count | 8 | 2 | 0 | 10 |
| | | % | 25.0% | 6.3% | 0.0% | 10.4% |
| | 5 | Count | 3 | 3 | 3 | 9 |
| | | % | 9.4% | 9.4% | 9.4% | 9.4% |
| Total | | Count | 32 | 32 | 32 | 96 |
| | | % | 100.0% | 100.0% | 100.0% | 100.0% |

| | Value | df | P-value |
|---|---|---|---|
| Pearson Chi-Square | 16.328 | 8 | 0.038 (S) |

Figure 3 shows Nurick grading of anterior approach in pre-op, post-op, post-op one-year follow-up.

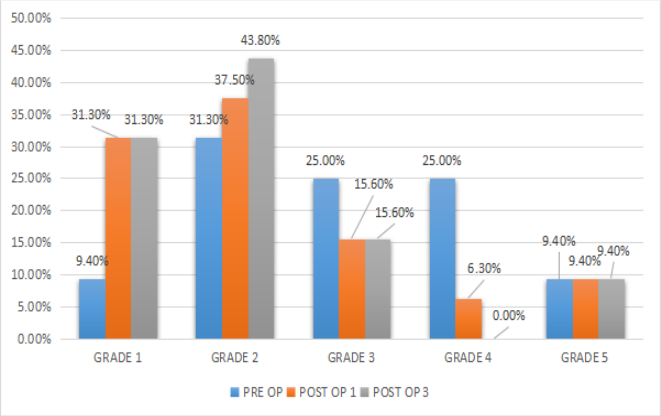



Table no 4 shows the mJOA score distribution in the anterior approach from pre-op to post-op one-year follow-up. It is observed that the mean scores of mJOA have increased from 11.563 to 14.156 until post-op one-year follow-up. This change was found to be statistically significant on the One-Way ANOVA test (P-value <0.05).

**Table no 4:** mJOA score distribution (Anterior approach)

| Time | N | Mean | Std. Deviation | F | P-Value |
|---|---|---|---|---|---|
| Pre-op | 32 | 11.563 | 3.2621 | 6.346 | 0.003 (S) |
| Post-op | 32 | 13.969 | 3.3359 | | |
| Post-op 1year | 32 | 14.156 | 3.1429 | | |
| Total | 96 | 13.229 | 3.4258 | | |

Figure 4 shows mJOA scoring in the anterior approach.

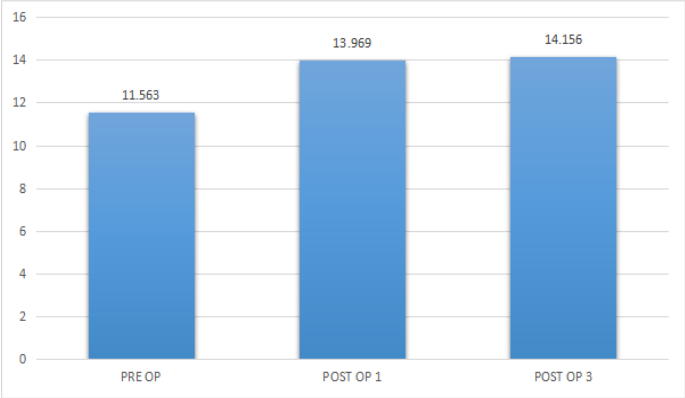



Table no 5 shows that during pre-op to post-op one-year follow-up, the proportion of cases having lower Nurick grades (1 and 2) has increased and the proportion of cases having higher Nurick grades (3 and 4) has decreased in the posterior approach. This difference was found to be statistically significant on the chi-square test (P-value < 0.05).

**Table no 5: Posterior approach Nurick grading distribution (patients)**

| | | | Time | | | Total |
|---|---|---|---|---|---|---|
| | | | Pre-op | Post-op | Post-op 1 yr follow up | |
| Nurick grades | 1 | Count | 2 | 7 | 7 | 16 |
| | | % | 7.1% | 25.0% | 25.0% | 19.0% |
| | 2 | Count | 6 | 13 | 14 | 33 |
| | | % | 21.4% | 46.4% | 50.0% | 39.3% |
| | 3 | Count | 12 | 3 | 3 | 18 |
| | | % | 42.9% | 10.7% | 10.7% | 21.4% |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 4 | Count | 7 | 2 | 1 | 10 |
| | | % | 25.0% | 7.1% | 3.6% | 11.9% |
| | 5 | Count | 1 | 3 | 3 | 7 |
| | | % | 3.6% | 10.7% | 10.7% | 8.3% |
| Total | | Count | 28 | 28 | 28 | 84 |
| | | % | 100.0% | 100.0% | 100.0% | 100.0% |
| | | | Value | df | P-Value | |
| Pearson Chi-Square | | | 22.922 | 8 | 0.003 (S) | |

Figure 5 shows the Nurick grading of patients operated using the posterior approach in pre-op, immediate post-op, and post-op one-year follow-up.

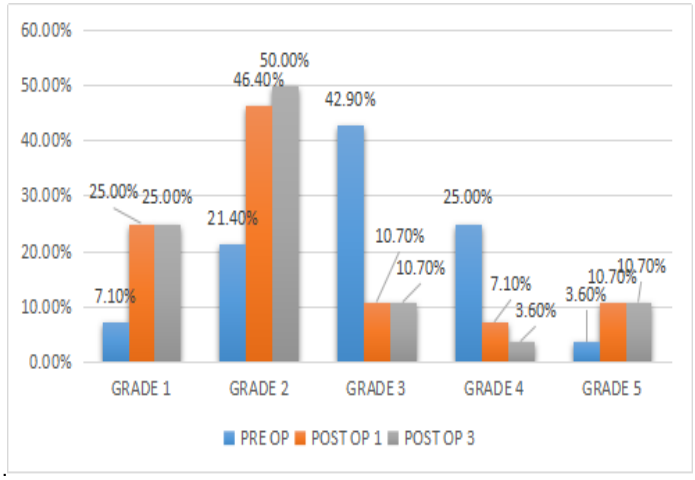



Table no 6 shows the mJOA score distribution of patients operated using the posterior approach. The mean scores of mJOA have increased from pre-op to post-op one-year in the posterior approach from 10.679 to 12.964. This change was found to be statistically significant on the One-Way ANOVA test (P-value <0.05).

**Table no 6:** mJOA score distribution (posterior approach)

| Time | N | Mean | Std. Deviation | F | P-Value |
|---|---|---|---|---|---|
| Pre-op | 28 | 10.679 | 2.7896 | 4.584 | 0.013 (S) |
| Post-op | 28 | 12.821 | 3.3228 | | |
| Post-op 1 yr follow up | 28 | 12.964 | 3.3498 | | |
| Total | 84 | 12.155 | 3.2984 | | |

Figure 6 shows the distribution of mJOA score among patients with the posterior approach.

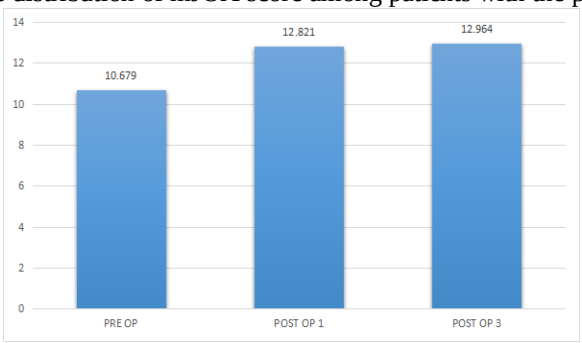


Table no 7 compares the pre-op Nurick grading of anterior and posterior surgical approaches. It is observed during pre-op recordings that even though the proportion of cases having Nurick grades 1 and 2 are higher in the anterior approach as compared to those in the posterior approach, the Nurick grades were higher in the posterior approach than in the anterior. The difference in distribution was not found to be statistically significant on the chi-square test (P-value >0.05).

**Table no 7:** Pre-op Nurick grading (anterior versus posterior)

| | | | Type of Surgery | | Total |
|---|---|---|---|---|---|
| | | | Anterior | Posterior | |
| Pre-op Nurick grade | 1 | Count | 3 | 2 | 5 |
| | | % | 9.4% | 7.1% | 8.3% |
| | 2 | Count | 10 | 6 | 16 |
| | | % | 31.3% | 21.4% | 26.7% |
| | 3 | Count | 8 | 12 | 20 |
| | | % | 25.0% | 42.9% | 33.3% |
| | 4 | Count | 8 | 7 | 15 |
| | | % | 25.0% | 25.0% | 25.0% |
| | 5 | Count | 3 | 1 | 4 |
| | | % | 9.4% | 3.6% | 6.7% |
| Total | | Count | 32 | 28 | 60 |
| | | % | 100.0% | 100.0% | 100.0% |

| | Value | Df | P-Value |
|---|---|---|---|
| Pearson Chi-Square | 2.813 | 4 | 0.590 (NS) |

Figure 7 shows the comparison of pre-op Nurick gradings in both anterior and posterior approaches.

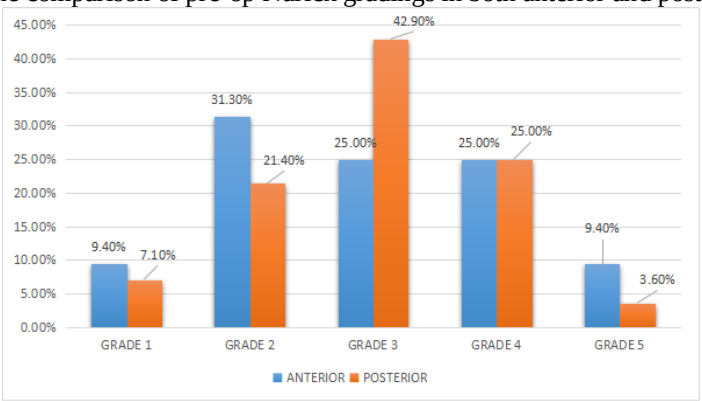



Table no 8 compares the post-op Nurick gradings of anterior and posterior surgical approaches. According to the recordings, it is observed that during post-op, the proportion of cases with Nurick grades 4 and 5 are higher in the posterior approach as compared to that in the anterior approach. The distribution was not found to be statistically significant on the chi-square test (P-value >0.05).

**Table no 8:** Post-op Nurick grading comparison (anterior versus posterior)

| | | | Type of Surgery | | Total |
|---|---|---|---|---|---|
| | | | Anterior | Posterior | |
| Post-op Nurick grading | 1 | Count | 10 | 7 | 17 |
| | | % | 31.3% | 25.0% | 28.3% |
| | 2 | Count | 12 | 13 | 25 |
| | | % | 37.5% | 46.4% | 41.7% |
| | 3 | Count | 5 | 3 | 8 |
| | | % | 15.6% | 10.7% | 13.3% |
| | 4 | Count | 2 | 2 | 4 |
| | | % | 6.3% | 7.1% | 6.7% |
| | 5 | Count | 3 | 3 | 6 |
| | | % | 9.4% | 10.7% | 10.0% |
| Total | | Count | 32 | 28 | 60 |
| | | % | 100.0% | 100.0% | 100.0% |

| | Value | Df | P-Value |
|---|---|---|---|
| Pearson Chi-Square | .806 | 4 | 0.938 (NS) |

Figure 8 shows the comparison of post-op Nurick gradings in anterior and posterior approaches.

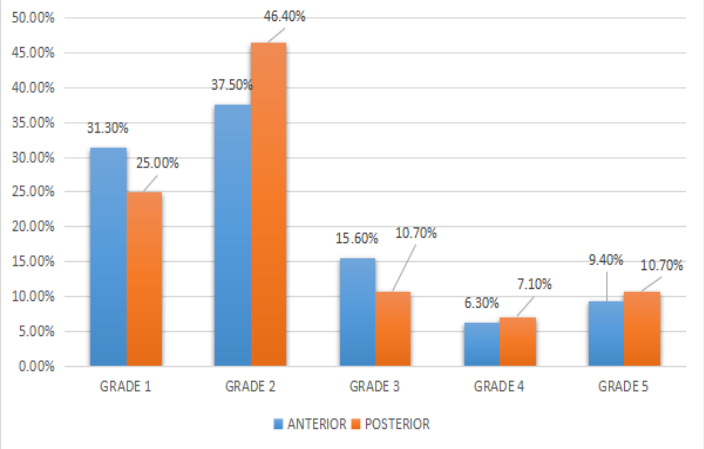



Table no 9 shows the comparison of Nurick gradings at post-op one-year follow-up of anterior and posterior approaches. It is observed during post-op readings at one year, the proportion of cases with Nurick grades 4 and 5 are higher in the posterior approach as compared to those in the anterior approach. The distribution was not found to be statistically significant on the chi-square test (P-value >0.05).

**Table no 9:** Post-op Nurick grading comparison at 1 year follow up (anterior versus posterior)

| | | | Type of Surgery | | Total |
|---|---|---|---|---|---|
| | | | Anterior | Posterior | |
| Post-op one-year follow up Nurick grading | 1 | Count | 10 | 7 | 17 |
| | | % | 31.3% | 25.0% | 28.3% |
| | 2 | Count | 14 | 14 | 28 |
| | | % | 43.8% | 50.0% | 46.7% |
| | 3 | Count | 5 | 3 | 8 |
| | | % | 15.6% | 10.7% | 13.3% |
| | 4 | Count | 0 | 1 | 1 |
| | | % | 0.0% | 3.6% | 1.7% |
| | 5 | Count | 3 | 3 | 6 |
| | | % | 9.4% | 10.7% | 10.0% |
| Total | | Count | 32 | 28 | 60 |
| | | % | 100.0% | 100.0% | 100.0% |

| | Value | Df | P-Value |
|---|---|---|---|
| Pearson Chi-Square | 1.771 | 4 | 0.778 (NS) |

Figure 9 compares the post-op one-year Nurick grading in anterior and posterior approaches

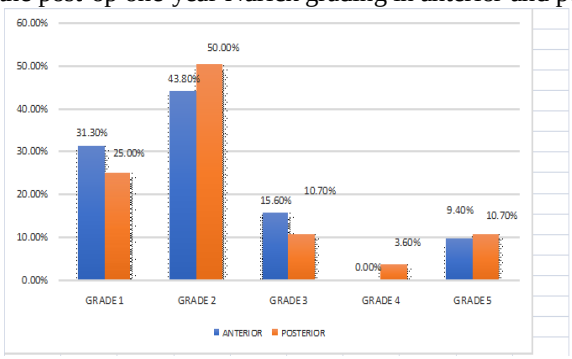
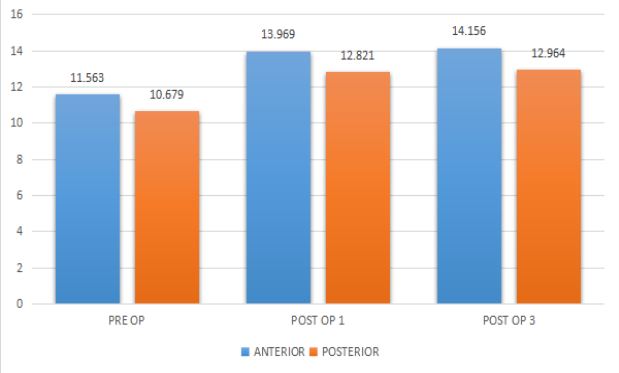



Table no 10 shows the comparison of mJOA scores of anterior and posterior approaches at pre-op, immediate post-op, and post-op at one year. It is observed that even though the mean scores of mJOA are higher in the anterior approach as compared to the posterior, the difference was not found to be statistically significant on the unpaired *t*-test (P-value >0.05).

**Table no 10: mJOA score comparison (anterior versus posterior)**

| Time | Site | N | Mean | Std. Deviation | T | -Test P-Value |
|---|---|---|---|---|---|---|
| Pre-op mJOA | Anterior | 32 | 11.563 | 3.2621 | 1.119 | 0.268 (NS) |
| | Posterior | 28 | 10.679 | 2.7896 | | |
| Post-op mJOA | Anterior | 32 | 13.969 | 3.3359 | 1.332 | 0.188 (NS) |
| | Posterior | 28 | 12.821 | 3.3228 | | |
| Post-op mJOA 1 year | Anterior | 32 | 14.156 | 3.1429 | 1.421 | 0.161 (NS) |
| | Posterior | 28 | 12.964 | 3.3498 | | |

Figure 10 shows the distribution of mJOA scores in anterior and posterior approaches at pre-op, immediate post-op, and post-op at 1 year.




## IV. Discussion

Cervical spondylotic myelopathy is a common cause of neurological dysfunction. C.S.M. constitutes the most common cause of spinal cord dysfunction in individuals older than 55 years.[1] Surgical decompression of the cervical spinal cord has proven to be an effective treatment option for CSM.

Our study presents a comparative analysis and systematic review of the merits and demerits of both surgical approaches – anterior and posterior – to treat multilevel CSM among the following clinical outcomes: postoperative neck pain, neurological outcomes, range of motion of the neck and sagittal alignment, as well as postoperative complications. This is a prospective, non-randomized study carried out on patients admitted to the Department of Neurosurgery at Guntur General Hospital, Guntur, Andhra Pradesh from September 2018 to October 2020. The pre-operative, post-operative and one-year post-operative follow-up results for the anterior and posterior surgical approaches have been recorded using Nurick grading and mJOA scores.

In this study, 60 cases were categorized according to different age groups ranging from less than 30 years to 70 years. The commonest age group of presentation is 51-60 years which indicates that the mean age group presentation of 31% of the study population is 50 years.

During this period, it was found that the proportion of cases having lower Nurick grades of 2 and 3 was upgrading to Nurick grades 1 and 2 and the proportion of cases having higher Nurick grades of 4 and 5 was static or further deteriorating. This difference was found to be statistically significant on the chi-square test (P-value <0.05) with mean improvement from 2.9 during pre-op to 2.0 at one-year post-op follow-up. The posterior approach recordings showed that the proportion of cases having lower Nurick grades of 2 and 3 were upgrading to Nurick grades 1 and 2 and the proportion of cases having higher Nurick grades 4 and 5 was static or further deteriorating. This difference was found to be statistically significant on the chi-square test (P-value <0.05) with a mean improvement from 2.9 to 2.2.

In the present study, during pre-op recordings, though the proportion of cases having Nurick grade 1 and 2 are higher in anterior approach than in posterior and cases with Nurick grade 3 were higher in posterior than in anterior, the difference in distribution was not found to be statistically significant on chi-square test (P-value >0.05). During immediate post-op readings, the proportion of cases with Nurick grades 4 and 5 was found to be higher in the posterior approach. The distribution was not found to be statistically significant on the chi-square test (P-value >0.05). Mean improvement in anterior and posterior groups were 2.2 and 2.3 respectively.

Recordings of post-op at one-year follow-up show that the proportion of cases with Nurick grades 4 and 5 are higher in the posterior approach than in the anterior approach. The distribution was not found to be statistically significant on the chi-square test (P-value >0.05). The mean improvement of anterior and posterior approaches were 2.0 to 2.25 respectively. Edwards et al., in a study, reported that there is a significant improvement in the anterior approach than in the posterior approach as the mean pre-op Nurick gradings read 1.9 and 2.3 in anterior and posterior respectively and the post-op Nurick gradings read 1.0 and 0.8 in the anterior and posterior respectively.[8,9,10] In our study, from pre-op to post-op one-year follow-up in the anterior approach,

mJOA mean scores have increased from 11.563 to 14.156 with a standard deviation of 3.42. In the posterior approach (during the same period), mean scores of mJOA have increased from 10.679 to 12.964 with a standard deviation of 3.29. Both changes were found to be statistically significant on the One-Way ANOVA test (P-value <0.05).

Though the mean scores of mJOA were higher in the anterior approach than in the posterior approach at pre-op, immediate post-op, and post-op at one-year follow-up, it was not statistically significant. Michael G. Fehlings et al. reported in a study that the improvement in mJOA scores was significantly lower in the anterior group when compared to the posterior group (2.47 and 3.62, respectively, P <0.01), despite the groups having started at different levels of baseline impairment.[11,12,13]

The ideal treatment in CSM is still a matter of discussion. Anterior decompression is indicated in patients who have one or two segments affected. It has been observed that this procedure offers better correction of kyphotic deformities and recovering sagittal balance. The patients were not randomized to the surgical procedure they underwent. The type of surgical procedure performed was surgeon-dependent. The number of levels compared was different as the anterior surgical approach involved slightly fewer levels compared to the posterior.

## V. Conclusion

Both anterior and posterior surgical approaches have their own merits and demerits. It has been observed that the anterior approach was more beneficial for patients with 2-3 level segment involvement. The mean amount of blood loss was lesser and complications like dysphagia were more common. Whereas the posterior approach proved beneficial for patients with 4-5 level segment involvement. Neck pain and CSF leak were significantly common. The overall duration of stay in the hospital was higher in this approach. Adequate decompression of neurological elements offers suitable functional results in both approaches.

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