RESEARCH ARTICLE

Outcome of central laminectomy and lateral mass screw fixation in multilevel cervical spondylotic myelopathy. our experience at Ghurki Trust Teaching Hospital, Lahore

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Abstract

Objective: To analyse clinical and radiological outcomes of central laminectomy and lateral mass screw fixation from C3 to C6 in multilevel cervical spondylotic myelopathy.

Method: The retrospective cohort study was conducted at the Department of Orthopaedic and Spine Surgery, Ghurki Trust Teaching Hospital Lahore, Pakistan, from March 1 to August 31, 2023, and comprised data of patients who underwent central laminectomy and lateral mass screw fixation from C3 to C6 by magrel technique between March 2015 and August 2022, and were followed up till 1 year. Clinical outcomes were evaluated according to the Nurik grade and the modified Japanese Orthopedic Association scoring system. Radiological outcomes were assessed by Cobb's method. Data was analysed using SPSS 27.

Results: Of the 66 patients, 56(86.2%) were males and 9(13.8%) were females. The overall mean age at the time of surgery was 56.81±10.96 years (range: 45-75 years). Mean preoperative cervical lordosis was 10.5±3.70 and postoperative lordosis was 21.44±8.20. The mean preoperative and postoperative modified Japanese Orthopedic Association scores were 4.21±1.79 and 7.08±2.64, respectively. There were 32(49.2%) patients in Nurik grade 0, 2(3%) in grade 1, 10(15.4%) in grade 4, 12(18.5%) in grade 5 and 10(15.4%) in grade 6. There were 5(7.6%) cases of intraoperative iatrogenic dural tears, which were repaired with 7.0 prolene, and 7(10.6%) patients' wound infections were treated with wound wash and intravenous antibiotics.

Conclusion: Cental laminectomy and lateral mass screw fixation in multilevel degenerative spondylotic myelopathy were found to be safe and effective procedures with good to excellent results.

Key Words: Cervical spondylotic myelopathy, Lateral mass screw, Cobb's angle.

(JPMA 75: 1868; 2025) **DOI: https://doi.org/10.47391/JPMA.25-11612**

Introduction

Degnerative cervical myelopathy (DCM) is the most common form of non-traumatic spinal cord injury affecting adults aged >50.[1] Cervical spondylosis is progressive in nature and is caused by degenerative changes in vertebrae, disc, facet joints, and ligaments of the vertebral column leading to canal narrowing causing direct compression on the spinal cord and surrounding blood vessels, resulting in ischemic damage of the spinal cord.[2,3] The most common presentations of DCM are paresthesia and loss of fine motor function of the hand, gait instability, and frequent falls. Due to the subtle nature of symptoms, there is an average delay of 6.3 years in the diagnosis. In advanced cases, patients have bowel and bladder dysfunction.[4]

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Submission complete: 03-06-2024 **First Revision received:** 16-08-2024

Acceptance: 13-09-2025 **Last Revision received:** 12-09-2025

Magnetic resonance imaging (MRI) is the gold standard for the diagnosis of such anatomical location of lesions as well as intramedullary cord signals. Surgical decisions based on MRI scans have limitations as it shows morphology of the lesion.[5] To know the functionality of the cord, neurophysiological studies, such as motor evoke potential (MEP) and somatosensory evoked potential (SSEP), are done.[6]

Operative treatment is considered in all DCM cases with severe neurological symptoms, however asymptomatic or mildly symptomatic patients are treated conservatively, which consists of pain control, physical therapy, and injection treatment.[7,8] The choice of operative treatment depends on the extent of compression as well as the presence of ossification of the posterior longitudinal ligament.[9] An anterior approach is considered if there are one or two levels of compression. Posterior approach is safe and effective in cases when there are more than two levels of compression.[10,11]

The current study was planned to analyse clinical and radiological outcomes of central laminectomy and lateral mass screw (LMS) fixation from C3 to C6 in multilevel cervical spondylotic myelopathy.

Materials and Methods

The retrospective cohort study was conducted at the Department of Orthopaedic and Spine Surgery, Ghurki Trust Teaching Hospital Lahore, Pakistan, from March 1 to August 31, 2023, and comprised data of cervical spondolytic myelopathy patients of either gender regardless of age who underwent central laminectomy and LMS fixation from C3 to C6 by magrel technique between March 2015 and August 2022, and were followed up till 1 year. Data of patients who missed follow-up and those who had previous cervical spine surgery, or a history of trauma or infection was excluded. The sample was rised using non-probability convenience sampling technique.

Preoperative evaluation included detailed history, physical examination and radiological screening, including plain radiographs and MRI. All the patients were followed up for a uniform period of 1 year; at 6 and 12 months), and Patient-Reported Outcome Measures (PROMs) were noted on each visit. Computed tomography (CT) scans were employed to diagnose posterior longitudinal ligament (OPLL).

All the patients were operated upon by experienced surgeons employing the Magerl LMS insertion technique. The patients were placed prone with the head fixed over a horseshoe frame. Following confirmation of aseptic precautions, an image intensifier was employed to locate landmarks, followed by a routine midline incision. Subperiosteal dissection was carried out until the lateral border of the lateral mass was revealed. All four lateral mass borders were located.[11]

Decompression was achieved by laminectomy to unload neural compression, providing sufficient room for the

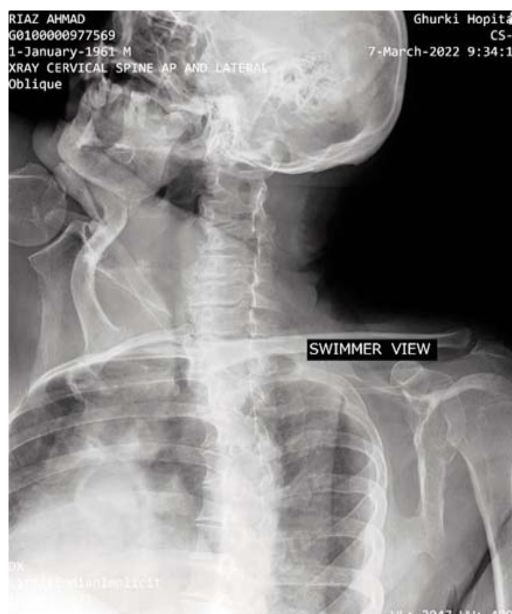

Figure-1: Arrow pointing at the right lower parathyroid gland in the picture. Stitch is retracting the right lobe of the thyroid gland medially.

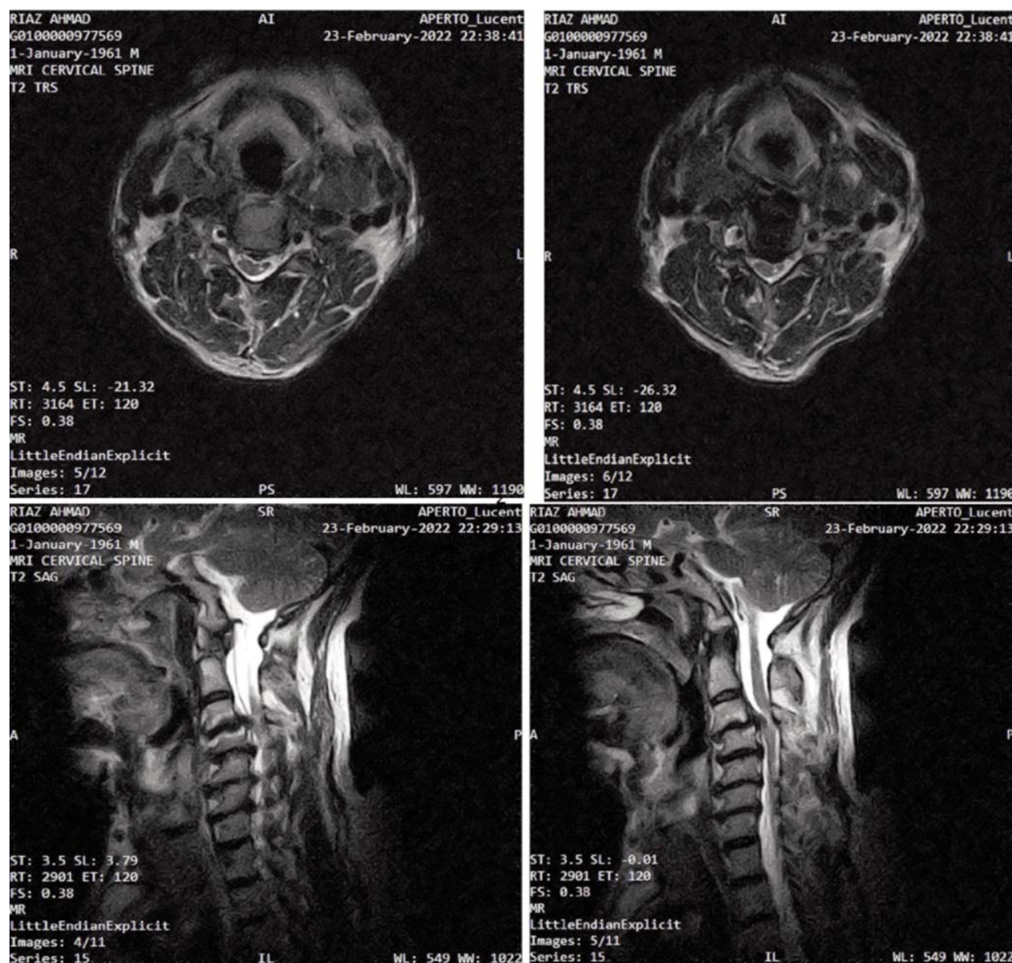

Figure-2: A preoperative magnetic resonance imaging (MRI) scan of the cervical spine.

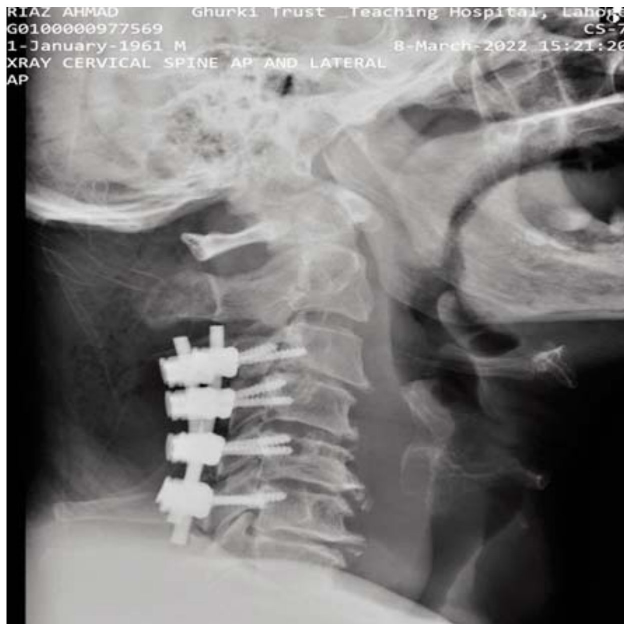

Figure-3: A postoperative radiograph of the cervical spine.

spinal cord. Hypertrophic ligamentum flavum and any compressive osteophytes were removed with care. The degree of decompression was determined by preoperative imaging results.

For screw insertion, the point of entry was made with a thin burr at the intersection of lines drawn 2mm above the inferior facet joint and 2mm lateral to the medial border. For mediolateral angulation, the direction of the drill was directed 250 laterally to miss the vertebral artery anterior to the point of entry. Laterally, a Penfield elevator was placed in the facet joint to direct the direction of the drill parallel to it, so that the facet joint remained intact. Each 2mm movement of the drill was verified with a ball-tip probe. A monocortical 14-16mm, 4mm LMS was employed. The rod was curved to the necessary angulation and locked to the screws with inner screws. The wound was cleaned in good fashion, a drain was inserted, and the wound was closed in layers with an aseptic dressing afterwards (Figure 1-3).

Postoperative evaluation included clinical and radiological outcomes. The clinical outcome was assessed according to the Nurick grade and the modified Japanese Orthopedic Association (mJOA) scoring system.[12,13] Radiological outcomes were assessed in terms of postoperative cervical lordosis by Cobb's method.[12] Data was analysed using SPSS 27. Data was expressed as eith mean ± standard deviation, or as frequencies and percentages. Data normality was assessed using the Wilk test. Paired sample t-test was applied to measure the significance of improvement in Cobb's angle and JOA score. Chi-square test was used where necessary. P≤0.05 was considered significant.

Results

Of the 96 patients who underwent surgery, 30(31.2%) were lost to follow-up. Data of the remaining 66(68.8%) patients was anaysed. Among them, 56(86.2%) were males and 9(13.8%) were females. The overall mean age at the time of surgery was 56.81±10.96 years (range: 45-75 years). Mean preoperative cervical lordosis was 10.5±3.70 and postoperative lordosis was 21.44±8.20. The mean preoperative and postoperative mJOA scores were 4.21±1.79 and 7.08±2.64, respectively. Postoperatively, there were 32(49.2%) patients in Nurik grade 0, 2(3%) in grade 1, 10(15.4%) in grade 4, 12(18.5%) in grade 5 and 10(15.4%) in grade 6, showing significant improvement compared to preoperative values (Table 1).

Table: Demographic nd clinical charateristics (n=66).

Parameters	N	%	Mean	SD	p-value
Gender					
Male	57	86.4			
Female	9	13.6			
Age (Years)			56.08	10.64	
Pre-op Cobbs' angle				10.5	<.05
Post-op Cobbs' angle			21.44		
Pre-op JOA			4.21	1.79	
Post-op JOA			7.08	2.64	<.05
Pre-op Nurick Grade					
Grade IV	18	27.3			
Grade V	28	42.4			
Grade VI	20	30.3			<.05
Post-op Nurick Grade					
Grade 0	32	49.2			
Grade I	2	3.0			
Grade IV	10	15.2			
Grade V	12	18.2			
Grade VI	10	15.2			

JOA: Japanese Orthopedic Association.

There were 5(7.6%) cases of intraoperative iatrogenic dural tears, which were repaired with 7.0 prolene, and 7(10.6%) patients' wound infections were treated with wound wash and intravenous (IV) antibiotics.

Discussion

DCM is a progressive degeneration of the spine leading to its functional impairment. Successful management of myelopathy depends upon timely detection of its signs by the treating clinician and identification of its typical symptoms that are reported by the patient.[14]

The current study analysed the functional and radiological outcomes of patients using mJOA, Nurick

classification, and Cobb's angle.[15] Though Nurick grade and mJOA score represent different functional capabilities, not many studies have performed an indepth analysis and comparison of the domains assessed by these two scoring systems, with most studies reporting results of decompressive surgery using either Nurick grade or mJOA score.[16,17] Only a few have reported patients' functional status using both the scales.[18]

The current retrospective analysis showed that the majority of patients recovered, and better clinical results were obtained in most cases. The findings demonstrated significant improvements in radiological outcomes, as indicated by the increased postoperative Cobb's angle. This suggests a successful surgical correction of the condition. The mean JOA scores observed in the study indicated a lower degree of functional impairment postoperatively. However, the majority of patients were classified as having no or minimal neurological deficits based on the Nurick classification, indicating favourable functional outcomes.

Revanappa et al.[19] revealed that of the 8 patients in whom there was no improvement in JOA, 6 had improved from Nurick grade 3 to 2 (preoperative JOA was 6 in one patient, and 5 in three, and 4 in the other two), and 2 patients had improved from Nurick grade 1 to 0. The two patients who had improved from Nurick grade 1 to 0 had no dysfunction on JOA preoperatively. The current results were in line with the study.[19]

Zhai et al.[20] compared clinical and radiological outcomes of the anterior versus posterior approach in treating four-level cervical spondylotic myelopathy, JOA score was used to measure the outcome preoperatively and postoperatively. The findings revealed significant difference in the average pre-op JOA score from 12.1±1.5 to 14.2±1.1 ($p<0.05$) postoperatively. The mean Cobb's angel postoperatively was -1.4±7.5° and it had significantly improved at the last follow-up to 9.0±2.6°.

Hirai et al.[21] compared the outcomes between anterior and posterior approaches, and the findings indicated that the mean pre-op JOA score 9.7±2.9 imprived to 13.3±2.5 at one-year follow-up. The current findings were consistent with such results.

The limitations of the current study were its small sample sise, retrospective design, selection bias, and long follow-up period, which may have limited the generalizability of the findings. Multicentre randomised controlled trials (RCTs) are needed to validat the current findings. Besides, to get a complete picture, it would be useful to know the number of degenerative cervical myelopathy patients treated with anterior-only and combined anterior-posterior methods.

Conclusion

Cental laminectomy and LMS fixation in multilevel degenerative spondylotic myelopathy were found to be safe and effective procedures with good to excellent results.

Disclaimer: None.

Conflict of Interest: None.

Source of Funding: None.

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AUTHOR'S CONTRIBUTION:
FAK: Concept and framework of study.
FUH: Study methodology.
LK: Critical review of the study.
AI: Data collection.
FQ: Results draw.
RA: Supervision of the study.