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ORIGINAL ARTICLE

Neurological outcomes following Morley procedure in traumatic dorso-lumbar fractures: An analysis of anterolateral corpectomy and fixation.

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ABSTRACT… Objective: Asses the follow up results of anterolateral approach. **Study Design:** Descriptive Type Research. **Setting:** Department of Neurological, Jinnah Post graduate Hospital Karachi. **Period:** March 2019 to December 2024. **Methods:** Patients from both genders, the Frankel's grading scale was used for thoracic and lumber trauma, including the X-ray and MRI were done for diagnostic purpose. **Results:** This study had 61 patients, those who had presented with thoracic either lumber spine injury had Webb Morley procedure. We had 14 (22.95%) female patients and 47(77.18%) males, a median group age value was 54.5yrs and the mean value age group was calculated 46±2 years. The mode of trauma was with Fall 36 (77.00%) followed by, a road trauma around 17(25 %), and objects fall 8 (17.18 %). The presentation of the patient was with backpain, sensory loss, splinter function involvement and weakness of the lower limb with different level of power and sensory loss. **Conclusion:** Patients undergoing this approach have shown significant neurological and functional improvement, especially those presenting with partial motor deficits. These individuals often experience substantial pain relief and effective control of kyphotic deformity progression. Selectivity plays pivotal role.

Key words: Anterior Lateral Decompression, Frankel's Grading, Motor Deficit Injury, Thoracic and Lumbar Facture, Webb-Morley Procedure.

INTRODUCTION

The spinal column primarily functions as a protective cage for the delicate and sensitive spinal cord. However, it is not completely resistant to injury. Spinal column injuries account for approximately 3% of all traumatic cases, underscoring its vulnerability. Notably, around 90% of these injuries occur in the thoracic and lumbar regions. Among these, the segment from D10 to L2—often referred to as the thoracolumbar junction—is particularly prone to trauma. In adults, this region is the second most common site of spinal injury, following the cervical spine. As such, the lower thoracic and upper lumbar areas represent a critical zone in the diagnosis, management, and prevention of spinal cord injuries.[1-3] Injury to the dorsal/ lumbar vertebrae may cause, neural deficits, and yet severity can differ. These can include paraparesis, or progress to further paraplegia, potentially involving bowel and bladder dysfunction or lead to syringomyelia.[4]

Most dorsolumbar bony injuries are not stable. These injuries often result from thoracolumbar burst fractures caused by axial load, road traffic accidents, or assault. Such trauma can displace the middle column of the spinal column, reduce the vertebral canal's diameter and lead to neural injury from unstable retro pulsed bone fragments. While these injuries typically don't have high mortality. Overall, about 75% of individuals with dorsolumbar damage experience some form of neurological loss.[5] To make a solid ground, of dorsolumbar segment, patients' needs to under investigation, that include X-rays dorsolumbar area and MRI of the dorsolumbar spine, as well as 3-D reconstruction. If other injuries are suspected, imaging of the cervical spine, long bones.[6,7]

Management of these injuries often begins conservatively, but may require instrumentation. Regardless of the surgical approach, early mobilization and rehabilitation are crucial to recovery.[8]

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Recent advances in treating thoracolumbar fractures include minimally invasive approaches, currently available at a limited number of centers.[9,10]

The rationality of the topic relies on the fact that, although numerous surgical options, including minimally invasive techniques, are available for managing thoracolumbar fractures, the Webb-Morley procedure remains a practical and effective choice in low-resource settings such as Pakistan. This approach offers adequate exposure for decompression, is cost-effective, and widely accessible, while still delivering favorable clinical outcomes. This study specifically aimed to evaluate the neurological outcomes following thoracolumbar fracture management using the Webb-Morley procedure.

METHODS

This was a conducted as descriptive type research at Neurological department, Jinnah post graduate hospital Karachi from March 2019 to December 2024 after approval from ethical review committee (No.F.2-81/2023-GENL/158/JPMC).

Patients from both genders, the Frankel's grading scale was used for thoracic and lumber trauma, including the X-ray and MRI were done for diagnostic purpose. The inclusion criteria comprised patients of aged 20 to 60 age, of any genders had thoracic / lumbar spinal trauma diagnosed by relevant X-ray and MRI, exhibiting spinal fractures with anteriorly pressing bone fragments causing neurological deficits. Patients were excluded if they had contraindications to anesthesia due to multiple underlying health conditions or the presence of pressure ulcers. Sampling technique it was continuous consecutive sampling

Data collection and data analysis

After Hospital's Committee approval, we obtained permission from all participating patients. Only individuals who fitted the criteria for procedure were enrolled for the research. Participants underwent relevant X-rays investigation, associated with standard imaging protocols, including MRI scans of the dorsal spine, to accurately locate fracture levels. The selected patients were evaluated using a grading system derived from Frankel's classification, which was applied both before and after surgery to monitor neurological recovery and outcomes.

Surgical Management

Surgical intervention involved anterior lateral Thoracic/lumbar decompression, additional graft was placed and fixation was done using the Webb-Morley technique. Postoperative X-rays of the spine were obtained 48 hours after surgery. The hospital stay was around 10 days, typically spanning around two weeks, and patients were monitored regularly over a three-month follow-up period. Postoperative care included frequent position changes for patients with urinary incontinence or those who were temporarily bedridden. Physiotherapy was initiated soon after surgery to aid recovery. Patients received antibiotics broad-spectrum and the analgesics for 12 days post procedure.

Data collection included details such as gender, age, presenting symptoms, MRI findings of the dorsal and lumbar spine, and surgical outcomes, all recorded systematically on a designated form. The Frankel grading system was employed to assess neurological status. Outcomes were evaluated for all patients during the postoperative period, with follow-up assessments conducted at bi monthly. Our data analysis for this descriptive study involved calculating means and standard deviations for all quantitative variables. For qualitative data, we determined frequency distributions.

RESULTS

We enrolled 61 patients with dorsal and lumbar fractures who underwent the Webb Morley procedure. Patient demographics showed a clear male predominance, with 47 males (77.18%) compared to 14 females (22.95%). The mean value age of the patient group was 46±2 years, and the median value age was 54.5 years.

Falls were the leading cause of injury 36 (77.00%), followed by road injury (17%) and falling heavy

objects (8, 17.18%). Patients presented with typical symptoms like back pain, sensory loss, sphincter involvement, and lower limb weakness, with varying severity. Diagnosis relied on images that is MRI spine plain and relevant X RAY of the thoracic /lumbar spine. The fracture was seen frequently at lower dorsal – upper lumber spine junction n = 38, (62.29%), predominantly L1 (n = 22) and D12 (n = 20). Fractures were also observed at L2 (n = 13, 21.3%), D11 (n = 7, 11.47%), and L3 (n = 8, 13.11%).

Significant postoperative improvement was observed in a substantial portion of patients, with 20 (32.7%) achieving Frankel's grade E and 21 (34.42%) reaching grade D (Table-I). Patients commencing at Frankel grades A or B experienced limited or no gains in motor strength. However, a pronounced functional enhancement was evident in individuals categorized as Frankel grade C or D. Critically, complete motor deficit at baseline precluded functional power recovery, whereas partial motor deficit was associated with excellent improvement.

Surgical Complications

All patients included in this study survived their hospital stay, with no reported in-hospital mortality. Routine postoperative X-rays were performed on all admitted cases. Postoperative complications included a CSF leak in one patient (1.64%), which resolved spontaneously or with conservative treatment. Two patients required chest tube drainage, and bedsores developed in 11 patients (18.0%).

Frankel Grades	Pre treatment n	Post- treatment Frankel Grades Better				
		A	B	C	D	E
A	11	7	4	-	-	-
B	9	-	5	4	-	-
C	25	-	-	-	19	6
D	12	-	-	-	2	10
E	4	-	-	-		4
Total	61	7	9	4	21	20

Table-I. Frankel grades based on pre and post-surgery for neurological status

Statical changes based on Frankel grades

Grade A (n=11): Seven patients showed no change in their neurological status, while four progressed to Grade B.
Grade B (n=9): Five patients were stable, and four improved to Grade C.
Grade C (n=25): Nineteen patients' betterment to Grade D, and six further advanced to Grade E.
Grade D (n=12): Two patients stayed unchanged, while ten upgraded to Grade E.
Grade E (n=4): All four patients maintained their improved neurological status.

DISCUSSION

Despite the inherent difficulties of the procedure, it remains a common practice in South Asia. Our study yielded significant results, demonstrating minimal complications when performed by expert surgeons. These findings highlight the potential for improved patient outcomes with specialized surgical expertise.

Our observations regarding Frankel grading further illustrate these advancements: Frankel Grade A: Out of 11 patients, 7 maintained their neurological status, while 4 showed improvement to Grade B. Frankel Grade B: Among 9 patients, 5 remained stable, and 4 progressed to Grade C. Frankel Grade C: Of the 25 patients in this group, 19 upgraded to Grade D, and 6 advanced to Grade E. Frankel Grade D: Among the 12 patients, 2 remained unchanged, while a significant 10 improved to Grade E.

A recent investigation into surgical outcomes for Adult Spinal Deformity (ASD) revealed a 4.7% incidence of Posterior Junctional Failure (PJF), often accompanied by delayed neurological deficits. This study indicated a correlation between these complications and the diverse morphological characteristics observed among the patient cohort. Furthermore, a high rate of perioperative complications was noted when these patients required revision surgery.[11]

A recent report sheds light on key trends in patient injuries and fracture characteristics. The study revealed that "falls from height" were responsible for 85% of patient injuries. In terms

of fracture location, the thoracolumbar junction (T12-L1) was affected in 55% of cases. The predominant fracture morphology observed was burst-type, accounting for 65% of patients. A positive outcome highlighted in the report is that 55% of patients presented with intact neurological function. Furthermore, neurological stability was consistently maintained across all patients during their 1, 3, and 6-month follow-up assessments.[12] in another study among 86 surgical patients with dorsolumbar fractures, having median age of median age of 42 years, they identified, L1 vertebra as identified as the most frequently affected level. Notably, 32.5% of these patients exhibited a preoperative neurological deficit.[13]

Even after marked advancements spinal instrumentation, a definitive, universally accepted consensus on the optimal treatment for thoracolumbar fractures remains elusive. The spectrum of treatment options is broad, ranging from non-invasive methods like external bracing and orthoses to complex, invasive instrumental fusions.[14] Another study has they supported by both clinical improvements and favorable radiological evidence, the study's findings underscore the corpectomy approach as a valuable and viable option for patients.[15]

To fully confirm its long-term efficacy and safety, more comprehensive studies are essential. Future research should meticulously compare the clinical and radiographic outcomes of minimally invasive versus traditional open corpectomy procedures. This research needs to involve a larger patient cohort and extended follow-up periods to provide a clearer understanding of its true advantages and limitations.[16], Another study suggests that the mini-open anterolateral approach to the thoracolumbar spine could serve as a viable alternative to conventional open surgical techniques.[17]

A comparative study assessing minimally invasive versus open corpectomy procedures revealed several significant distinctions. The minimally invasive approach was linked to substantially less blood loss and fewer blood transfusions when compared to open surgery.[18]

Regardless of whether a minimally invasive or open surgical approach is chosen for thoracolumbar spinal fractures, the ultimate objective remains consistent: to minimize potential morbidity for the patient.

It is generally understood that a surgical approach should be undertaken as promptly as possible to yield superior outcomes. Continuous advancements in surgical techniques and technology are always welcomed, as they hold the promise of further enhancing patient care and reducing adverse events.[19]

Aminul Islam et al.[20] Studies on short-segment fixation have advocated for early mobilization as a means to achieve better patient outcomes. Furthermore, for patients presenting with neurologically deficient or unstable vertebral fractures, surgical intervention is strongly recommended over conservative management. The primary goals of such surgical recommendations are to minimize kyphotic deformity and alleviate pain associated with spinal instability.

LIMITATIONS

Our study couldn't directly compare with recent advances as they are least done in this part of region. We also had to exclude some patients from the study due to loss to follow-up. Furthermore, the delayed presentation of patients likely contributed to the high number of complications observed.

CONCLUSION

The Webb-Morley procedure shows better outcome specially in south Asia region remains a valid and viable surgical option for managing lower thoracic and thoracolumbar spinal injuries, particularly in resource-limited settings. It provides safe and effective access to the lower dorsal and lumbar spine, allowing for adequate decompression and stabilization as shown result. Patients undergoing this approach have shown significant neurological and functional improvement, especially those presenting with partial motor deficits. These individuals often experience substantial pain relief and effective

control of kyphotic deformity progression. Selectivity plays pivotal role.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Aurangzeb Kalhoro:** Proposed topic, study design, data collection.
2	**Sher Hassan:** Statistical analysis, manuscript writing.
3	**Muhammad Ali:** Data analysis, methodology.
4	**Iram Bokhari:** Proof reading, final approval.