

Original Research

Anterior Lateral Approach for Anterior Decompression, Corpectomy, and Fixation with Webb Morley Procedure for Dorsolumbar Spinal Fracture

Aurangzeb Kalhoro, Vashdev Khimani, Muhammad Hamid Ali, Mubarak Hussain, Mahesh Kumar Luhano

Department of Neurosurgery, Liaquat University of Medical and Health Sciences, Jamshoro-Pakistan

ABSTRACT

Objective: Efficacy of anterolateral approach Webb Morley procedure in a low-income country.

Materials & Methods: A descriptive study was conducted at the Department of Neurosurgery, Liaquat University of Medical and Health Sciences, Jamshoro. Patients of any gender presented to us with dorsal or lumbar injury, plus a presentation on X-ray / MRI as spinal fractures having bone fragments pressing the cord, especially from the anterior side were included in the study. The assessed tool was based on clinical findings of Frankel's grading.

Results: We had 64 patients, who had dorsal and lumbar fractures and went through the procedure of Webb Morley 43 were male and 31 were female patients The male-to-female ratio was 2:1 and the mean age was 39 ± 3 yrs. with a median age was 42.5yrs. Fall (n = 34, 53.12%) was the common cause, road traffic accidents were (n = 16, 25%), fall of heavy objects (n = 11, 17.18%), and assault (n = 03, 4.68%).

Conclusion: Based on the current study of our Centre the anterior lateral approach for lower dorsal and upper lumbar level with decompression and fixation with Webb-Morley procedure is a safe and effective method.

Keywords: Webb-Morley procedure, Anterior lateral decompression, Frankel's grading, Motor deficit Injury, Thoracic and Lumbar.

Corresponding Author: Aurangzeb Kalhoro
Department of Neurosurgery, Liaquat university of Medical and Health Sciences, Jamshoro-Pakistan
Email: draurangzebkalhoro@gmail.com

DOI: 10.36552/pjns.v28i1.953

Date of Submission: 12-11-2023
Date of Revision: 02-02-2024
Date of Acceptance: 01-03-2024
Date of Online Publishing: 08-03-2024
Date of Print: 31-3-2024

INTRODUCTION

The main role of the vertebral column is to save the spinal cord from injury but even then, the injury at spinal column injuries represents 3% of traumatic cases, in addition overall thoracic lumbar area is involved in 90% of traumatic

injuries. In the spine, the thoracolumbar segment (D10 to L2) is a vulnerable zone to injury that is second to cervical spine injury in adults.¹⁻³ Trauma to the thoracic and lumbar vertebra can lead to neurological deficit that can be from mild to severe that as traumatic paraparesis, which may progress to paraplegia, involving the bowel and bladder which can be transient or permanent injury, lately can lead to syringomyelia.⁴

Most of the fractures are unstable in this area of the dorsolumbar fractures. Mode of traumatic injury can be either Thoraco-lumbar burst fractures due to axial load, road traffic accident, or assault, on the spinal column resulting in displacement of the middle column resulting in injury to the vertebral canal and reducing the diameter, the retropulsion bone fragment are unstable leading to neural injury. Usually, injuries, are not associated with high mortality but may cause moderate to severe morbidity to the patient. Overall, around 75% of individuals with dorso-lumbar damage experienced some kind of neurological loss.⁵

The patient with spinal injury can go through certain investigations to recognize the traumatic injury of the dorsolumbar segment which starts with x ray spine, MRI dorsolumbar spine, and 3-D reconstruction which helps in surgical planning and prognosis while for the associated injury images of cervical spine, long bone or fast scan can be required for exclusion of other injuries.^{6,7}

The management can begin by conservatively treating the patient, maybe with posterior reduction and instrumentation, or it may need anterior decompression and instrumentation, but primarily early mobilization and rehabilitation are important steps of the management.⁸ In recent advances thoracolumbar fractures are treated with a minimally invasive approach, which is available at limited centers robotic surgery is also progressing in this field in developed countries.^{9,10}

Also, it can be said that there are many surgically managed options available special in the era of minimal invasive but for low-income

countries like Pakistan Webb Morley procedure is still a viable option as it gives vision for anterior fixation, it is a shorter, low cost, easy approach procedure more importantly better result good results. This study was conducted to determine the neurological outcome of dorsolumbar spinal injury after decompression and fixation with the Webb-Morley procedure.

MATERIALS AND METHODS

Study Design and Setting

This is a descriptive study performed at the Department of Neurosurgery at Liaquat University of Medical and Health Sciences, Jamshoro, from February 2017 to November 2021.

Inclusion Criteria

Patients of both genders, aged 16-60 years presented to us with dorsal or lumbar injury, confirmed with X-ray spine and MRI spine and spinal fractures having bone fragment pressing the cord from the anterior side, leading to neurological deficit were included in the study.

Exclusion Criteria

Those who were not fit for anesthesia due to multiple issues and patients with multiple comorbid and bed sores were excluded from the study.

Data Collection and Data Analysis

The study was approved by the Ethics Committee of the Hospital and informed consent was taken from all patients included in the study. All the patients who fulfilled the inclusion criteria were included in this study. Dorsal and lumbar X-rays (along with other protocol X-rays) and MRI of the spine dorsal spine plain were also performed and the level of fractures was identified. The patients who were included in the study were assessed, on a grading system based on Frankel's grading that

was applied pre- and postoperatively to observe the neurological outcome.

Surgical Management

Surgically anterior dorsolumbar decompression was followed by grafting and fixation of fracture as per Webb-Morley procedure. Post surgically after 48 hours, X-rays spine were done. The stay in the hospital was between 10 – 15 days (2 weeks) after post-surgery and the Follow-up was regularly done for six months. Post-surgical care with Side changing, for those patients suffering urinary incontinence and having transient bedridden patients. Post operatively physiotherapy was started. Patients were given good broad-spectrum antibiotics and painkillers for ten days after surgery.

The data was recorded regarding gender, age, presenting complaints, MRI dorso-lumber plain findings, and surgical outcomes were managed on proforma. Frankel grading system was used. Results or outcomes were calculated in all the patients in the post-surgical period and follow-up was kept every two months.

Data Analysis

This is a descriptive study. Mean and standard deviation were calculated for quantitate data, and for qualitative data, frequency was calculated.

RESULTS

Gender & Age Distribution

In our study, we had 64 patients, who had dorsal and lumber fractures and went through the procedure of Webb Morley. 43(67.18%) were male and 21(32.81%) were female patients, while male to female ratio was 2:1 and the mean age was 39±3 years with a median age was 42.5yrs.

Mode of Injury

Presentation with Fall (n = 34, 53.12%) was the common cause, a road traffic accident was 16(25%), fall of heavy objects 11(17.18%), and assault 03 4.68%). The presentation of the patient was with backache and weakness in the lower limb was seen in patients at different levels.

Radiological Findings

Based on radiology the, initial diagnosis was based on plain X-ray dorsal and lumber spine for in (plain X-rays and MRI), the common level of the fracture involved was seen at dorso- and lumbar junction with 42(65.62%) (with L1 = 22 and D12 = 20 involved), 09(14.0%) at L2 level, 06(9.37%) at D11 level, 05(7.812%) at L3 spinal level and 2(3.125%) at L4 level.

Neurological Improvement

Postoperatively 24(37.5%) patients improved to Frankel's grade-E, while 24(37.5%) improved to grade-D as shown in Table I. There was minimal improvement / no improvement in power in patients having grades Frankel grade A or Frankel grade B, however, marked functional betterment was determined in Frankel's grade and D. Patients with complete motor deficit had showed no improvement in their functional power while patients with partial motor deficit, had shown excellent improvement.

Surgical Complications

We did not have any mortality at the center among patients who were included in this study. Check X-rays were done in all cases within 48 hours of surgery. The average stay in the hospital was around 10 days. Based on complications one patient had a CSF leak postoperatively in 3(4.68%) patients which was resolved conservatively a chest tube was needed in two patients and bed sores were seen in 13(20.3%) patients.

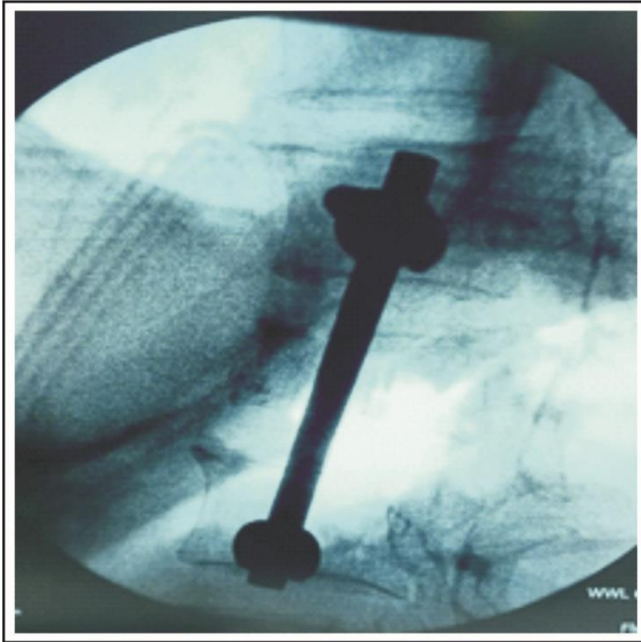


Figure 1: Image showing the fixation of dorsolumbar junction with Webb Morley procedure (with permission of patient).

maintained their improved status. Refer to **Table 1** for a summarized view.

DISCUSSION

The common level of the fracture involved was seen at the dorsal- and lumbar junction followed by the L-2 level. Postoperatively 24(37.5%) patients improved to Frankel’s grade-E, while 24(37.5%) improved to grade-D as shown in Table I. There was minimal improvement / no improvement in power in patients having grades Frankel grade A or Frankel grade B, however, marked functional betterment was determined in Frankel's grade and D. Patients with complete motor deficit had showed no improvement in their functional power while patients with partial motor deficit, had shown excellent improvement.

In this particular study, they observed a 4.7% occurrence of Posterior Junctional Failure (PJF) accompanied by delayed neurological deficits after surgery for Adult Spinal Deformity (ASD). The patients exhibited various morphological characteristics indicative of these complications. Notably, upon undergoing revision surgery, a high incidence of perioperative complications was identified.¹¹

In a report, they had 85% of patient injury ‘fall from height’, and they had 55% of the fracture presentation at dorsal-lumbar junction (T12-L1). Burst-type morphology was reported in a maximum number of patients (65%). 55% of patients were reported to be neurologically intact. Neurology was stable for all patients at 1, 3, and 6 months,¹² we had (32.81%) with a history of falls, the follow-up was done, similarly, patients were neurologically improved. In another study, 86 patients underwent surgery with a median age of 42 years; the most common level was L1). While 32.5% had a preoperative neurological defect. Complications occurred in 36 patients, with most of them were transient. They favor the extra-pleural retroperitoneal approach for single-level unstable dorsolumbar fracture with minimized

Table 1: Neurological status based on pre and post-operative based through Frankel grades.

Pre-operative Grade	n	Post-operative Grade Improvement				
		A	B	C	D	E
A	10	2	8	-	-	-
B	6	-	4	2	-	-
C	30	-	-	-	22	8
D	16	-	-	-	2	14
E	2	-	-	-	-	2
Total	64	2	12	2	24	24

Neurological Status Based on Frankel Grades

In Frankel grade A, out of 10 patients, 2 patients showed no change while 8 patients progressed to grade B. In Frankel grade B, among 6 patients, 4 remained stable while 2 advanced to grade C. For Frankel grade C, 30 patients were observed, with 22 upgrading to grade D and 8 advancing to grade E. Among the 16 patients in grade D, 2 stayed unchanged while 14 upgraded to grade E. In the case of Frankel grade E, both patients

infection rate, helped in minimizing low rate of construct failure, and ability to perform anterior stability, correct kyphotic deformity.¹³

With the advances in the procedure of diagnostic criteria, and spinal instrumentation, they found no proper, straight consensus based on the best possible treatment of thoracolumbar fracture. The treatment basis spectrum begins from, an orthosis based on external bracing, to advanced invasive instrumental fusions.¹⁴ In another study the results stated that the corpectomy approach is as safe and effective for anterior column reconstruction with less invasive and good exposure, the ratio of clinical improvement and radiological basis suggested that this technique is still useful for the patients.¹⁵

Also, the minimally invasive approach for thoracolumbar corpectomy and reconstruction of the thoracolumbar spine for tumors, infections, and traumas is similar while when compared with standard open corpectomy procedures, they required no additional access for exposure. Such a new technique, requires more studies in the short and long term based on clinical and radiographic results of minimally invasive vs. open corpectomy,¹⁶ it is also said in another study that the mini-open anterolateral approach to the thoracolumbar spine can be an alternative to the conventional open approaches but long-term studies may be required as such technique, require proficiency and expertise as minimal approaches may have their own set of complications.¹⁷

A comparative study between minimal versus open corpectomies had findings of less blood loss and transfusions as compared to the former. Additionally, minimal invasive corpectomy had shorter operative times and hospital stays and decreased but open surgery has a better view plus in underdeveloped countries this is a vast procedure done for such injuries.¹⁸

For Thoracolumbar spinal fractures for either a minimal approach or open method eventual outcome is to minimize the potential morbidity,

with surgical approach should be made as soon as possible to give better results, the advancements are always welcomed.¹⁹

Al Mamun et al,²⁰ for the short segment fixation has advised early mobilization for better results while Sanandia et al,²¹ concluded that for patients with neurologically deficient or having an unstable vertebral fracture, surgery should be advised for better results as compared to conservative management to minimize the kyphotic issue or minimizing the pain of spinal instability, in addition, the study by Rehman et al,²² similar to our study results have shown that Webb-Morley procedure is an effective and safe approach for those with partial motor deficit while no improvement in complete motor deficit.

LIMITATIONS

Recent advancements in minimally invasive techniques have indeed emerged; however, our study cannot directly compare with them due to their unavailability at our center. Additionally, some patients were lost to follow-up, rendering them excluded from the study. Furthermore, the occurrence of numerous complications can be attributed to the delayed presentation of patients.

CONCLUSION

Based on the current study of our Centre the anterior lateral approach for lower dorsal and upper lumbar level with decompression and fixation with Webb-Morley procedure is a safe and effective method while those patients who presented with complete injury had no improvement but with those who had a partial motor deficit, had good results with reducing pain and delaying the kyphotic angle as managed properly.

REFERENCES

1. Lukas R, Suchomel P, Sram J. Surgical treatment of

- thoracolumbar spine fractures. *Coluna/columna*. 2006;5(2):84-9.
- Pandey S, Khare A, Mishra PK, Maravi DS, Gaur S. Post-operative neurological outcomes in patients of dorsolumbar fractures with incomplete spinal cord injury. *International Journal of Orthopaedics*. 2020;6(3):680-3.
 - Dashti H, Lee HC, Karaikovic EE, Robert W. Gaines Jr Decision making in dorsolumbar fractures. *Neurology India*. 2005;53.
 - Khursheed N, Sarmast A, Ramzan A, Dar B. Dorso-Lumbar Burst Fractures Secondary to a Peculiar Tipper Truck Injury: A Report on Two Cases. *Indian Journal of Neurotrauma*. 2015;12(02):140-3.
 - Ahsan MK, Sakeb N, Zaman N, Jannat SN. Management of traumatic spinal column injury: A tertiary hospital experience. *Bangabandhu Sheikh Mujib Medical University Journal*. 2015;8(2):95-104.
 - Ramani PS, Singhanian BK, Murthy G. Combined anterior and posterior decompression and short segment fixation for unstable burst fractures in the dorso lumbar region. *Neurology India*. 2002;50(3):272.
 - Ajay MB, Vijayakumar AV. Comparative study between conventional open spine pedicle screw fixation surgery minimally invasive percutaneous pedicle screw fixations in the management of thoracolumbar spine fracture in adult. *Int J Orthop Sci*. 2016;2(4):154-9.
 - Lakshmanan P, Jones A, Mehta J, Ahuja S, Davies PR, Howes JP. Recurrence of kyphosis and its functional implications after surgical stabilization of dorsolumbar unstable burst fractures. *The Spine Journal*. 2009;9(12):1003-9.
 - Pannu CD, Farooque K, Sharma V, Singal D. Minimally invasive spine surgeries for treatment of thoracolumbar fractures of spine: a systematic review. *Journal of clinical orthopaedics and trauma*. 2019;10:S147-55.
 - Hai Y, Chan L. Recent Advancements in Robot-Assisted Spinal Surgery in China and Future Perspective. In *Technical Advances in Minimally Invasive Spine Surgery: Navigation, Robotics, Endoscopy, Augmented and Virtual Reality 2022* (pp. 303-310). Singapore: Springer Nature Singapore.
 - Ha KY, Kim EH, Kim YH, Jang HD, Park HY, Cho CH, Cho RK, Kim SI. Surgical outcomes for late neurological deficits after long segment instrumentation for degenerative adult spinal deformity. *Journal of Neurosurgery: Spine*. 2021;35(3):340-6.
 - Kamboh UA, Mehboob M, Ashraf M, Shahid S, Sultan KA, Raza MA, Hussain SS, Ashraf N. Early Experience with Percutaneous Transpedicular Screw Fixation for Thoracolumbar Fractures at a Tertiary Hospital in Pakistan. *Pakistan Journal of Neurological Surgery*. 2021;25(2):215-24.
 - Delgado-López PD, Rodríguez-Salazar A, Martín-Velasco V, Martín-Alonso J, Castilla-Díez JM, Galacho-Harriero A, Araús-Galdós E. Rationale and complications of the anterior-lateral extrapleural retroperitoneal approach for unstable thoracolumbar fractures: experience in 86 consecutive patients. *Neurocirugía (English Edition)*. 2017;28(5):218-34.
 - Neeley OJ, Kafka B, El Tecle N, Shi C, El Ahmadi TY, Sagoo NS, Davies M, Johnson Z, Caruso JP, Hoeft J, Stutzman SE. Percutaneous screw fixation versus open fusion for the treatment of traumatic thoracolumbar fractures: A retrospective case series of 185 Patients with a single-level spinal column injury. *Journal of Clinical Neuroscience*. 2022;101:47-51.
 - Shin SR, Lee SS, Kim JH, Jung JH, Lee SK, Lee GJ, Moon BJ, Lee JK. Thoracolumbar burst fractures in patients with neurological deficit: Anterior approach versus posterior percutaneous fixation with laminotomy. *Journal of Clinical Neuroscience*. 2020;75:11-8.
 - Le H, Barber J, Phan E, Hurley Jr RK, Javidan Y. Minimally invasive lateral corpectomy of the thoracolumbar spine: A case series of 20 patients. *Global spine journal*. 2022;12(1):29-36.
 - Baaj AA, Dakwar E, Le TV, Smith DA, Ramos E, Smith WD, Uribe JS. Complications of the mini-open anterolateral approach to the thoracolumbar spine. *Journal of Clinical Neuroscience*. 2012;19(9):1265-7.
 - Hundal RS, Brooks NP, Williams SK. Lateral corpectomy and reconstruction for thoracolumbar burst fractures with neurological injury. In *Seminars in Spine Surgery 2021 Mar 1* (Vol. 33, No. 1, p. 100849). WB Saunders.
 - Wood KB, Li W, Lebl DS, Ploumis A. Management of thoracolumbar spine fractures. *The Spine*

- Journal. 2014;14(1):145-64.
20. Al Mamun MB, Hasan M, Islam SS, Alam MN, ur Rahman MM. Evaluation of Short Segment Fixation of Dorsolumbar Vertebral Injury with Incomplete Spinal Cord Injury. The Journal of Bangladesh Orthopaedic Society (JBOS). 2019;34(2): 57-61.
21. Sanandia J, Kansal DN, Dabhi R, Patel H. A study of operative and non-operative management of dorsolumbar spine fracture (A study OF 40 cases). International Journal of Orthopaedics. 2020;6(3):628-32.
22. Rehman L, Hashim AS, Khan HA, Arain SH, Ali S, Sheikh HA. Anterior decompression and fixation with Webb-Morley procedure in dorsolumbar spinal injury. Journal of the College of Physicians and Surgeons Pakistan. 2013;23(5):330-3.

Additional Information

Disclosures: Authors report no conflict of interest.

Ethical Review Board Approval: The research was a retrospective study.

Human Subjects: Consent was obtained by all patients/participants in this study.

Conflicts of Interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following:

Financial Relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

Other Relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Funding: No funding was available for this work.

Availability of Data: The data is available on request.

AUTHORS CONTRIBUTIONS

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
1.	Aurangzeb Kalhoro	1. Study design and methodology & editing and quality insurer.
2.	Vashdev Khimani	2. Paper writing.
3.	Muhammad Hamid Ali	3. Data collection and calculations.
4.	Mubarak Hussain	4. Analysis of data and interpretation of results.
5.	Mahesh Kumar Luhano	5. Literature review and referencing & editing and quality insurer.