

Functional Outcome of Posterior Decompression and Stabilization for Thoracolumbar Fractures

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Abstract:**Background:** Owing to the fulcrum of increased motion at the T12-L1 junction, approximately 90% of spine fractures are located in the thoracolumbar region, and burstfractures account for nearly 10-20% of spine injuries. The surgical management aims to realign the spine, maintain its stability and optimise the neurological outcome.**Objectives:** To study the efficacy of posterior decompression and stabilization for thoracolumbar fractures with neurological deficits, and to study the complications associated with this treatment modality.**Methodology:** Total of 31 patients, operated with Posterior Decompression and Stabilization and were followed up and evaluated based on ASIA Motor score, ASIA Impairment scale, VAS Score and Kyphotic angle. Patients were followed up for minimum 6 months and there after every three months till 1½ year.**Conclusion:** The stabilization of spine using posterior short segment transpedicular fixation with posterior decompression is safe, technically easy, effective with neurological and functional improvement and early rehabilitation with less complication and prevents secondary spine deformities.**Keywords:** Thoracolumbar Region, RTA, SD.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Thoracolumbar fractures are usually the result of high energy trauma. Often associated visceral injuries are present in patients who have sustained significant injuries in this region. Patients with the suspected thoracolumbar injuries need rapid evaluation. [1] The thoracolumbar junction is the most common site of spinal injuries. It is the anatomical and mechanical transition zone between the relatively rigid thoracic and more flexible lumbar spine, a highly significant incidence of neurological deficits has been reported in patients with thoracolumbar fractures. Moreover, the late consequence of delayed neurologic deficit and painful kyphotic deformity may significantly impair health related quality of life. The goals of treatment of thoracolumbar fracture are early mobilization and rehabilitation by restoring stability of fracture and inducing neurologic recovery, thereby enabling patients to return to work. Neurologic injury should be identified by thorough examination for motor and sensory system in order to determine the appropriate treatment. The mechanical stability of fracture also should be evaluated by plain radiographs and computed tomography. In some cases, magnetic resonance imaging is required to evaluate soft tissue injury involving neurologic structure or posterior ligament

complex. Based on these physical examinations and imaging studies, fracture stability is evaluated and it is determined whether to use the conservative or operative treatment. [2] Management of thoracolumbar fractures remains a matter of debate in terms of the optimal treatment strategy. Proposed strategies include conservative treatment, anterior and posterior stabilization, percutaneous posterior fixation, with anterior and posterior approaches (with placement of an iliac bone graft or prosthetic cage). Given this absence of a therapeutic consensus, surgical indications and procedures vary with surgical teams and experience. Anterior approaches offer good exposure to the vertebral body, could provide optimal direct exposure for visualization of the ventral aspect of the duramater during surgical decompression. However, they offer little or no access to the posterior elements and can include greater potential for complications. Kyphosis is difficult to correct with the anterior approach. posterior approach allows for posterior decompression and strong segmental instrumentations but does not allow reconstruction of the anterior column. Combined approach provide access to anterior and posterior elements but with devastating intraoperative complications like prolonged anaesthesia, increased

blood loss, wound infection rate and potential to cause exacerbation of existing co-morbidities mainly of the respiratory system. Recent studies have mentioned that adequate circumferential decompression and stabilization is possible through posterior approach alone thereby reducing surgical time, blood loss, infection and overall morbidity of the patients. [3,4]

Objectives

To estimate the functional outcome of posterior decompression and stabilization in thoracolumbar fractures. To identify and study the complications associated with posterior decompression and stabilization.

Materials and Methods

All patients of thoracolumbar fractures with TLICS score ≥ 4 who are operated upon with posterior decompression and stabilization using pedicular screw rod system followed up 18 Months.

Inclusion criteria

- Patients between 18-50 years of age group.
- All patients having thoracolumbar fractures with TLICS score ≥ 4 as defined by Vaccaro et al.
- Thoracolumbar fractures with Neurological deficits.

Exclusion criteria

- Osteoporotic bone fractures, pathologic fractures.
- Fractures located in upper thoracic and cervical spine.
- Patients below 15 and above 50 years.

A total of 31 patients diagnosed with thoracolumbar lumbar fractures who satisfy inclusion criteria operated with posterior decompression and stabiliza-

tion in our hospital were included in our study. Department of Orthopaedics, Patna medical College and Hospital Patna, Bihar. Study duration of Two years. Clinical outcome was assessed as per ASIA motor score and VAS score. Neurological grading done as per ASIA impairment scale. Radiological outcome will be assessed using anteroposterior and lateral radiographs using kyphotic angle and implant status. Patients will be followed up at 3 weeks, 6 weeks, 3 months, 6 months and 12 months after surgery, with minimum follow up of 6 months and maximum follow up of 1½ year. Patients are interviewed and epidemiologic, historical, subjective and physical findings are recorded as per the questionnaire. Neurological charting done as per ASIA neurological chart (Annexure). Neurological grading was done as per ASIA impairment scale (Annexure). Routine plain roentgenograms of the thoracolumbar spine are obtained. An MRI scan of thoracolumbar spine is also done to determine the extent of the canal and nerve involvement. Based on all available information, a therapeutic and surgical plan is then laid out with a predetermined goal in mind for the surgery. Intra operative findings confirm or alter the preoperative plan and modifications are made accordingly. As with any major spine surgery, patient selection, education and communications are essential for good clinical and functional results.

Surgical procedure: General anaesthesia will be utilized for all the cases. Patient will be positioned prone on Relton Hall frame over a radiolucent operation table. Proper padding of the pressure points done. The involved level is marked under c-arm guidance. A posterior midline skin incision is made to expose one level above and one level below the affected levels.

Results

Neurological Recovery:

Neurologic Status	Pre –operative neurologic status		Post-operative neurologic status		Final –neurologic Status	
	n	%	N	%	N	%
ASIA-A	2	6.45	2	6.45	2	6.45
ASIA-B	6	19.35	-	-	-	-
ASIA-C	15	48.38	5	16.13	2	3.23
ASIA-D	8	25.82	16	51.61	12	38.70
ASIA-E	0	-	8	25.81	16	51.61
TOTAL	31	100	31	100	31	100

We used ASIA grading to assess neurological status in the preoperative and postoperative period. In our study postoperative neurological status remained unchanged in 2 patients with complete cord injury. Rest of the patients neurological status improved post operatively.

Motor Score	Mean \pm SD
Pre-operative	69.90 \pm 12.51
Post-operative	84.23 \pm 13.77
p-value	<0.001
Final-operative	90.58 \pm 13.55
Final-operative	<0.001

Mean and SD of ASIA Motor Score

Kyphotic Angle	Mean \pm SD
Pre-Operative	26.77 \pm 3.67
Post-operative	13.03 \pm 2.62
Final-operative	15.68 \pm 5.03
p-value	<0.001

In our study the correction of kyphotic angle obtained was 16.33 degree, which is statistically significant. There was 3.3degrees' loss of correction at final follow up. The averagepreoperative and postoperative kyphotic angles were 28.71 \pm 4.42 and 12.39 \pm 2.98 (Mean \pm SD) respectively.

VAS Score	Mean \pm SD
Pre-operative	7.74 \pm 0.66
Post-operative	5.03 \pm 0.7
Final-operative	2.19 \pm 1.42
P-value	<0.001

Mean and SD of VAS score

In our study the average preoperative and final follow up VAS was 7.74 and 2.19 respectively. The improvement was found statistically significant.

Complications	F	%
Yes	5	16.13
No	26	83.87
Total	31	100

Frequency and percentage wise cases according to their complications

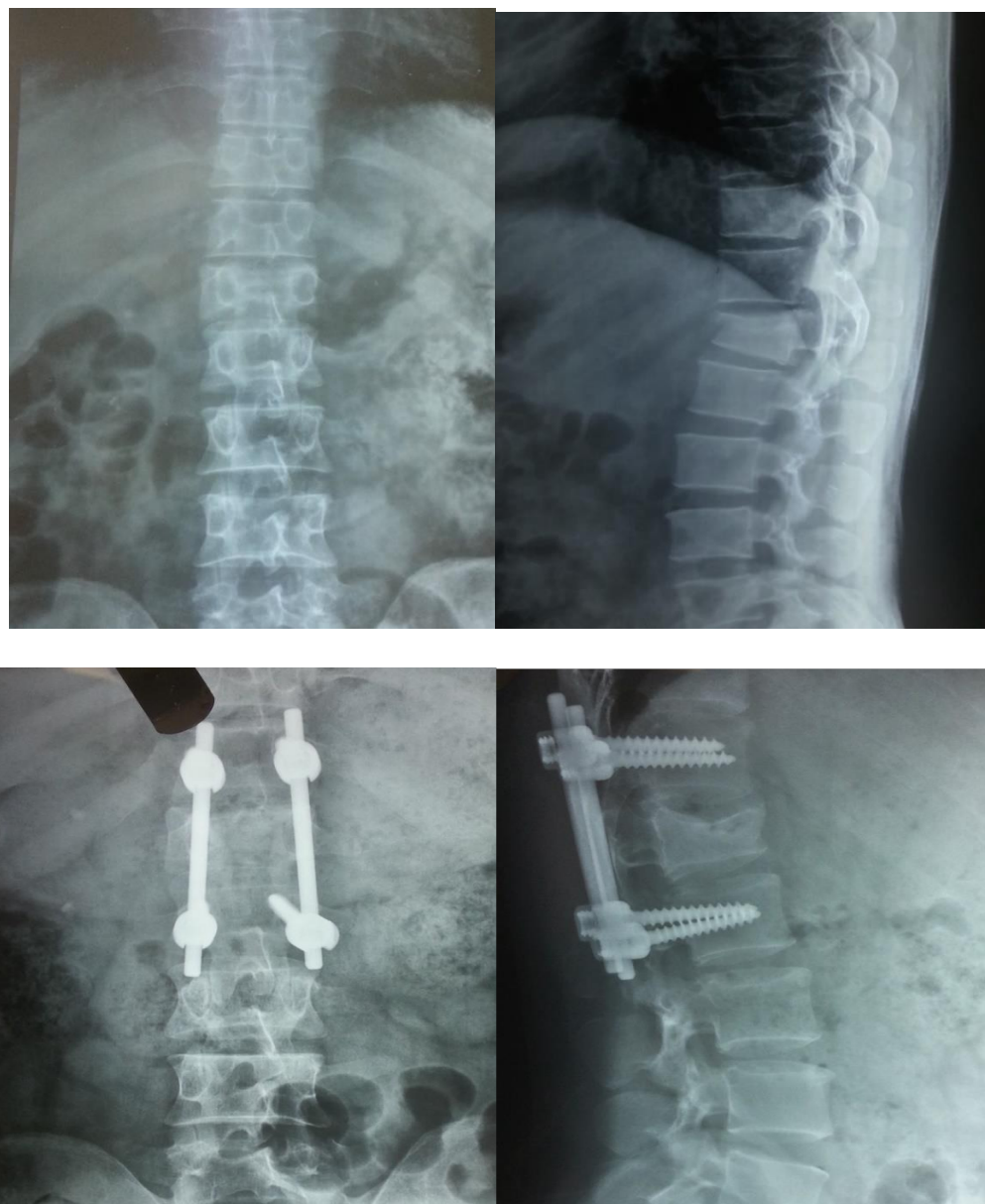
In our study, 5 of the 31 patients, that is 16.1% developed complications. Intra operatively 2 patient had Dural tear. Dural tear was treated by placing free fat graft and water tight closure of all layers. 2 patients developed bed sore and urinary track infections. Superficial wound infection was seen in 1 patients treated by antibiotics.

This condition is suspected if there is any increasing pain, progression of kyphosis andworsening of neurological status. In our study, 2 patients had screw breakage with persistent back pain at the time of their last follow up without worsening of the neurological status at the latest follow up.

Implant failure	Frequency	%
Yes	2	6.45
No	29	93.55
Total	31	100

Pre Operative Radiographs (AP/LAT)

Postoperative Radiographs (AP/LAT)



Discussion

Thoracolumbar junction is the most common site of spinal injuries. The treatment of thoracolumbar fractures remains challenging and debatable. The goals of treatment of thoracolumbar fractures are early mobilization and rehabilitation by restoring stability of fracture and inducing neurological recovery. It is generally recommended that patients with neurological involvement and unstable fractures require surgical intervention.^{2,26} Recent literature shows that circumferential decompression and stabilization of the fracture can be achieved through posterior approach alone with satisfactory results there by reducing the surgical time, blood loss, infection and overall morbidity and more complications associated with anterior and combined approach. [4] Pedicle screw fixation via posterior

approach has been widely used for most thoracolumbar fractures owing to its 3 column fixation and satisfactory clinical outcome. Short segment posterior fixation is frequently regarded as valuable choice. Even there are complications such as implant failure and loss of correction, it is easier to perform and allows more preservation of spinal motion segments. [5] The necessity of fusion is still questionable. Recent literature shows that there is no significant difference between the fusion and non-fusion groups. [6] TLICS classification system was used in our study which is defined by Vaccaro et al, based on three injury characteristics, morphology of injury, integrity of the posterior ligament complex and neurological status of the patient. This classification will be useful in decision making in terms of the need for the operative versus non-operative management. In our study patients who had

TLICS ≥ 4 were included. [7] In our clinical study, 31 patients were treated with posterior decompression and stabilization without fusion. The analysis of results was made in terms of – ASIA neurological grading, ASIA motor score, kyphotic angle, VAS, duration of surgery, complications, implant failure and duration of hospital stay. All the patients were followed up for minimum of 6 months and there after 3 monthly follow up for 1 year.

In numerous studies the mean age of the patients being treated for thoracolumbar fractures has ranged from 28.25 to 45.8. In our study of 30 patients, the mean age of the patients was found to be 32.32 ranging from 19-49 years. Majority of the patients were between the age of 21- 30(38.71) with maxi-

imum incidence being the productive age group 19-40 years (80.65). The observation in the study are comparable to numerous studies established in literature, they include male preponderance. In our study of 31 patients, 19 were males and 12 were females that is 61.29% are males and 38.71% are females. [8]

We observed that kyphotic angle correction obtained is comparable with other studies. The average preoperative and post-operative kyphotic angles being 26.77 ± 3.67 and 13.03 ± 2.62 (Mean \pm SD) respectively, this was statistically significant. There is loss of 2.65-degree correction in the last follow up with kyphotic angle being 15.68 ± 5.03 (Mean \pm SD).

Study	Correction obtained in degrees
Khare S et al [9]	11.01°
Deng Z et al [10]	8.78°
Feng Z et al [11]	16.6°
Jindal N et al [12]	8.47°
Our study	11.09°

The average VAS was 2.19 at the final follow up which was compared with other studies. The result was statistically significant ($p < 0.001$).

Study	Score
Dai LY et al [6]	1.5
Jindal N [12]	1.56
Chow PH [13]	2.1
Hwang JH [14]	3.4
Our study	2.19

In our study 2 patients had screw breakage, one patient at 10 months postoperatively and another patient at 12 months post operatively. There was no neurological worsening in these patients.

Study	Failure %
Deng Z et al [10]	3.8%
Jindal N [12]	4.2%
Muralidhar BM et al [15]	10%
Sanderson PL et al [16]	14%
Our study	6.4%

Conclusion

Fractures of the thoracolumbar spine are the most commonly occurring types of osseous spine injury. Surgical and non-surgical treatment option are well documented in literature for the treatment of thoracolumbar fracture. In general, patients with unstable fracture with neurological involvement with deformity were advised surgery. The main aim of the surgical treatment resides in early stabilization, direct or indirect decompression of the neural elements and early mobilization of the patient to prevent complications. Unstable burst fractures were the most common fracture type encountered in our study.

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