

## Original Research Article

# Outcome of fractures of dorso lumbar spine treated by short segment posterior stabilization with intermediate pedicle screws

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### ABSTRACT

**Background:** Spine fractures are common in today's world due to high frequency of motor vehicle accidents and work place injuries. These are major cause of disability in adult population. The mortality rate following spinal injuries is 7%. The aim of the study was to study the functional and radiological outcome of fractures of dorso lumbar spine treated by short segment posterior stabilization with intermediate pedicle screws.

**Methods:** Dorso-lumbar fractures with intact pedicle on the fractured segment, Load sharing classification score of equal or less than 6, Neurologic involvement caused by the fracture, loss of vertebral body height by more than 50% and kyphosis angle more than 20° are included. Patients with multiple level fractures and pathological fractures were excluded from the study. Denis classification and AO classification were used. Load sharing score is used to decision making for intermediate screw fixation.

**Results:** L1 is more frequently fractured followed by D12. Distraction type (AO) and burst (Denis) are most common types. 4 of our patients had complete neurological deficit. 15 had incomplete deficit and 11 patients doesn't have any neurological involvement. Frankel A grade cases remained in the same grade. Mean Kyphotic correction is 6.7°. Mean AVBCP in the postoperative cases 26. None of the cases developed kyphosis or loss of correction in the follow up. Outcome using Roland Morris disability questionnaire is excellent in 64.3%, good in 21.6% and poor in 14.3% cases.

**Conclusions:** To conclude that short segment posterior stabilisation with intermediate screws provides better biomechanical stability when compared with conventional short segment fixation.

**Keywords:** Thoracolumbar junction, Intermediate screws, Loads sharing classification, Kyphotic angle

### INTRODUCTION

It has been reported that 6% of all fractures affect the spinal column, and 90% of them are found in the thoracic or lumbar regions.<sup>1</sup> With the increase in motorized vehicles and greater exposure to high-energy trauma due to road traffic accidents (RTA), the occurrence of thoracolumbar fractures and dislocations has increased drastically. These injuries occur most frequently in male patients between 15 and 29 years of age and they usually present with neurological deficit.<sup>2</sup>

Fracture of the spine can occur when forces acting on the spinal column exceed its strength and stability. Common injuries, which are responsible for fracture of the spine, include falls from a height, motor vehicle accidents and penetrating trauma, including gunshot wounds and stabbings. The elderly are also at risk for these fractures after a fall from a standing position and trivial traumatic events because of their poor bone density. Approximately 90% of all spinal fractures occur in the thoracic and lumbar spines and mainly within the region between T11 and L2, commonly referred to as the thoracolumbar

junction and neurologic deficit is seen in approximately 50% of these injuries.<sup>2</sup> The recovery is dependent on the severity of primary trauma and its early intervention.<sup>3</sup> The injured spine is "clinically unstable" when physiological loads are likely to cause neurological impingement, incomplete healing with chronic pain, or progressive deformity.<sup>4,5</sup> Clinical instability usually follows major disruption of both the vertebral bodies or discs and posterior ligaments or facets.<sup>5</sup> Radiographic signs of axial instability include vertebral body collapse and retropulsion exceeding one third the canal diameter combined with widened pedicles and laminar fracture. Translational instability is evidenced by more than 2.5 mm transverse displacement between vertebral bodies.<sup>4</sup> Angular instability is signaled by abnormal spinous process widening combined with more than 50% anterior or lateral body collapse.<sup>6</sup> A neurological deficit implies clinical instability because it usually results from major retropulsion or acute deformity in the lumbar spine. With recent advances in spine surgery and instrumentation, there is a growing consensus that patients with clinical instability in any plane are best served by surgical reconstruction of their lumbar spine. They typically experience less pain and fewer complications and obtain better late alignment than those with comparable injuries treated with orthotics or casting.<sup>7</sup>

**Aim**

The aim was to study and analyze the functional and radiological outcome of fractures of dorso lumbar spine treated by short segment posterior stabilization with intermediate pedicle screws.

**METHODS**

This prospective study was done in department orthopedics at Tirunelveli Medical College Hospital in the patient with Fractures of Dorso lumbar spine from June 2017 to March 2018. Institutional review board approval and informed consent obtained.

**Inclusion criteria**

Inclusion criteria were age 20-60, Intact pedicle at the fractured vertebra, TLICS Score>4.

**Exclusion criteria**

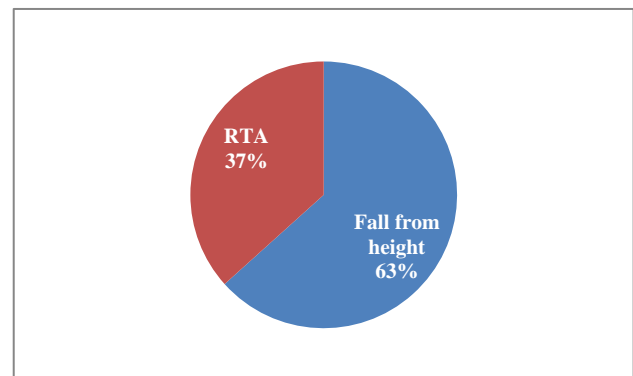
Exclusion criteria were the Minor progression -5 to 10 degrees increase of the kyphosis, Major progression - Increase of more than 10 degrees.

Development of kyphosis or implant failure or implant bending prior to fusion of the fixed levels, irrespective of the duration. Patients presenting to the OPD and casualty were admitted and evaluated thoroughly and screened from head to toe. The duration of the injury, mechanism of the injury, history of previous treatment and surgeries, history about associated comorbid illnesses were

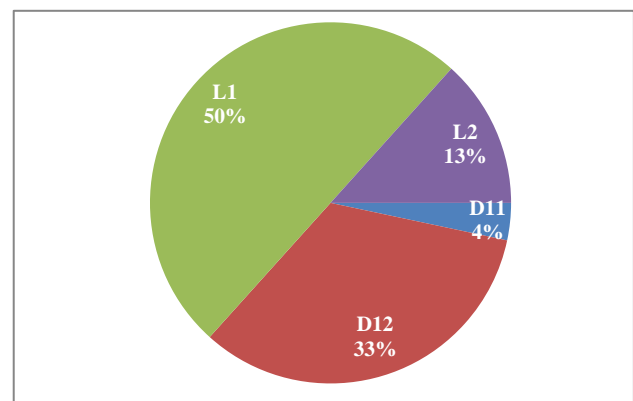
evaluated by detailed history taking. A thorough clinical evaluation was done for the patient as a whole. Generalized examination and complete skeletal survey focusing on evaluating the entire spine, the pelvis, clavicles, rib cage, and all long bones are necessary and done accordingly. Systemic examination to evaluate the cardiac status, respiratory system, neurological status and abdominal structures were evaluated thoroughly. Further neurological and radiological evaluation was carried out for the patients fulfilling the inclusion criteria.

**RESULTS**

In our study 20 patients were included in age ranged from 18 to 45 years. Our study had male domination with 19 out of 20 cases. Fall from height is the most common mode of injury followed by RTA. In the preoperative examination two of our patient had a complete neurological deficit. L1 is the most common vertebra fractured in our study group. D12 is the second most common.



**Figure 1: Mode of injury.**



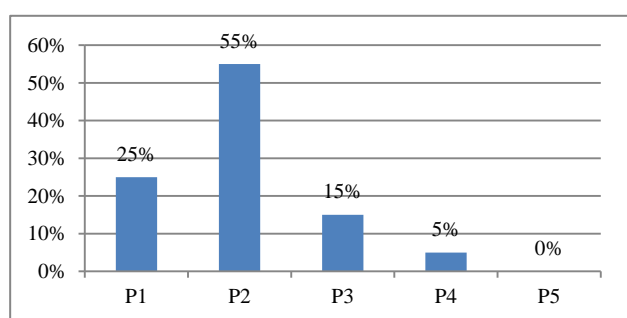
**Figure 2: Level of fracture.**

11 had an incomplete neurological deficit and 7 patients were neurologically intact. In our study along with the spine fracture 4 patients had calcaneum fracture, 2 had distal radius fracture and 3 had pubic rami fracture. For which the calcaneum and distal radius fractures were fixed. In our study 2 patients presented with grade A of AISA scoring and remained as grade A throughout the

study. No patient deteriorated neurologically in this study. Among the whole group the remaining patients showed some improvement in neurological status. We used Denis pain score to evaluate the postoperative effectiveness of the procedure. Most of the patient had improvement in Denis scores. Urinary tract infections: This occurred in two patients who were catheterized since they had no bladder control. Urine culture and sensitivity was done, bladder wash given and appropriate antibiotics were started which improved the patient's condition. Clean intermittent self-catheterization was taught to the patients to improve their life quality. Bedsore: It occurred in two patients in our study. One patient developed grade III sacral pressure sore following discharge due to poor care at home and another patient developed during a hospital stay. Both were treated with antibiotics, aseptic dressings and flap cover. Superficial infection: It occurred in 1 patient at around 5th postoperative day. Pus culture and sensitivity revealed no growth. Intravenous antibiotics were continued for 5 more days and suture removal was delayed. The patient was discharged home on the 17th postoperative day with a healthy wound. The kyphotic angle which is obtained from our study is comparable with others. The mean loss of correction is 0.93° which is insignificant. None of the patients developed Kyphotic collapse in the follow-up. The maintained Beck's index in our study signifies that there is no significant collapse in anterior or posterior vertebral body height.

**Table 1: Neurological status in pre and postoperative assessment.**

ASIA	Preoperatively	Postoperatively				
		A	B	C	D	E
A	2	2				
B	1	1				
C	4	2			2	
D	6	2		4		
E	7	7				



**Figure 3: Denis pain score postoperatively.**

**DISCUSSION**

The spinal injuries had been a big health problem and are being evaluated for centuries and its incidence is around 6% of all the fractures of a human being and about 60%

of these occurring at the dorsolumbar junction, which is a region of relatively high motion and lies between thoracic and lumbar segments. A significant amount of 15% to 20% are associated with neurological deficits.<sup>8</sup> The fracture disrupts the spinal column and affects the spinal function to the greater extent and hence the aim of the treatment is directed towards restoring the normal anatomy of the spinal column and promoting the recovery of the nerve function by removing the compression effect. Not all the spinal fractures are treated surgically; the unstable fractures and patients with neurological deficits are the ones who require surgical treatment. Studies on the spinal stability along with the innovation of new fixation methods created the foundations for achieving the goal. The primary indication for surgery in burst fractures is decompression. It has been documented that both experimentally and clinically the neurological status will improve following surgical decompression neural elements that have been compressed due to the fracture per se. Decompression can be achieved either by direct removal of compressing fragments from the canal or by realigning the spine indirectly. Posterior instrumentation uses the ligament axis principle in fracture reduction and thereby restoring the sagittal contour and indirectly producing the decompression. Posterior stabilization with conventional short-segmental fixation has been a very effective method for the management of dorsolumbar fractures.<sup>8,9</sup> But the conventional posterior stabilization method is not sufficient for a fracture with significant anterior column injury and is documented to have a high failure rate. This unacceptable failure rate mandates an additional fixation for converting this into a more reliable construct. Addition of a pedicle screw to the fractured vertebra in a conventional short segment stabilization construct has significantly reduced the failure rates and is associated with good functional outcome.

The average age at fixation was 43.7 years according to Tian et al, 34 according to Farrokhi et al.<sup>10,11</sup> The higher incidence among males in our study is comparable to Tian et al and Farrokhi et al which were 70.4 and 72.5 respectively.<sup>10,11</sup> This could be due to higher involvement in road traffic accidents.

Mahar et al concluded that an average of 15° of kyphosis correction could be obtained using limited posterior segmental fixation. This is likely better than traditional, non-segmental pedicle screw fixation.<sup>12</sup>

In a systematic review by Verlaan et al. in 2004 where different modalities for the treatment of traumatic thoracic and lumbar spine fractures were analyzed. Their review included posterior long and short constructs, anterior-only fixation, and circumferential fixation. They concluded that regardless of the severity of the injury, no technique was able to correct and maintain the fracture segment to the physiological level and kyphotic angle.<sup>13</sup> This statement was reaffirmed by Wang et al, who also

found no correlation between the degree of kyphosis and residual back pain.<sup>14</sup>

## CONCLUSION

Posterior stabilization with pedicle screw fixation is an effective method of restoring the near normal anatomy of the injured spinal column. The conventional short segment fixation which includes one level above and one level below the fractured vertebra has a high failure rate due to pull out. Short segment posterior stabilization with additional screws at the fractured vertebra provides better biomechanical stability. This prevents the future kyphotic collapse and restores the collapsed vertebral body height and provides better result especially in fractures involving the dorso lumbar junction. Load sharing classification by McCormack is very useful in decision making for additional screw fixation. Addition of the intermediate pedicle screw at the fractured vertebra provides added stability to the conventional construct and prevents failure. This avoids further anterior fusion in patients with severe anterior column injury and also it reduces the number of motion segments fused and hence provides a better functional outcome. Hence the addition of intermediate pedicle screws at the level of a fractured vertebra in conventional short segment posterior stabilization is more compelling. However long term follows up is needed to validate our findings further.

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*Ethical approval: The study was approved by the institutional ethics committee*

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