

## “Short Segment pedicle screw fixation for the treatment of unstable thoracolumbar fracture”- a study of 50 cases.

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### Abstract:

**Introduction:** Short segment pedicle screw fixation is a popular procedure for treating unstable thoracolumbar burst fracture. But due to lack of adequate neurological improvement, progressive kyphosis and hardware failure- the efficacy of different methods remain debatable. **Method :** 50 patients with isolated thoracolumbar burst fractures were treated by short segment pedicle screw fixation and transforaminal thoracolumbar inter body fusion (TLIF) between January 2010 to December 2013. All patients were followed up for a minimum 2 years. Demographic data, Neurological improvement (Frankel) grade and Hardware failure related complication were evaluated. **Results:** All patients recovered with solid bony fusion by inter vertebral bone graft and pedicle screw without complications like misplacement of screw, nerve or vessel lesion or hardware failure. The post-operative radiographic demonstration reveals- good fracture reduction and it was well maintained until the bone graft fusion. Neurological recovery of the one to three Frankel grade was seen in 42 patients with partial neurological deficit. Among the 30 patients 3 grade improvements was seen in 4 patients, 2 grade of improvement was observed in 20 patients and 1 grade of improvement was found in 18 patients. 3 patients with Franke-D on admission showed no improvement. 5 patients with no paraplegia/hemiplegia on admission remained neurological intact. **Conclusion:** Posterior short segment pedicle fixation in conjunction with TLIF seems to be a feasible option in the management of selected thoracolumbar burst fracture with good neurological improvement.

**Key words:** Short segment fixation, unstable burst failure, pedicle screw, TLIF

### Introduction:

Management of thoracolumbar burst fracture still remains controversial<sup>1</sup>. Surgical treatment is generally recommended for patients with neurological deficit or those with instability. Currently posterior short segment pedicle screw fixation is one of the most common operative approaches to treat unstable thoracolumbar burst fracture. The clinical results of this surgery are usually satisfactory but progressive kyphosis persistence of neurological deficit and hardware failure remain a concern<sup>2</sup>. Kyphosis and hardware failure problems can be solved by bone grafting, balloon- assisted

vertebroplasty and corpectomy & cage placement . We retrospectively studied a consecutive series of 50 thoracolumbar burst fractures with posterior short segment pedicle screw fixation (one level cephalad to and one level caudal to a fracture) in conjunction with TLIF to evaluate the feasibility and efficacy of the technique.

### Methods:

This retrospective study includes a consecutive series of 50 patients ( 35 males & 15 females) with anti-traumatic thoracolumbar fractures who were operated between January 2010 to December 2013

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in department of Neurosurgery, Dhaka Medical Collage Hospital. The patients aged from 20 to 60 years mean 39.2 years and indication for surgery were the presence of anyone or more of the following: 1) Presence of neurological involvement caused by fracture or CT scanning of the affected level showed more than 50% spinal canal compromise; 2) More than 50% loss of anterior vertebral height or local kyphosis angle exceeds 25 degrees<sup>3</sup>. Plan X ray and CT scan of affected level was done to show fracture morphology before surgery. MRI was done to assess canal encroachment and for signal abnormalities in the spinal cord and other soft tissue changes. All patients underwent plain radiography in the early post-operative period within 7 days and then after 3, 6, 9 & 12 months as per demand. CT scan and MRI of respective level done only for selected patients. For clinical assessment, neurologic deficit was assumed using Frankel motor score system<sup>4</sup>.

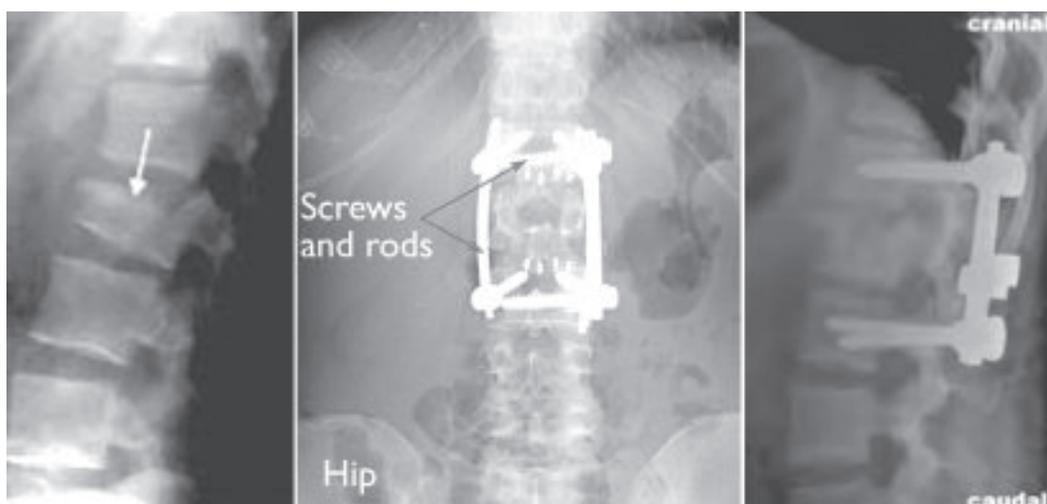
*Surgical Technique:*

The patient was placed in prone position. X-ray monitoring C-arm localization of fracture was done. A posterior mid line straight incision centered on the affected level was made to expose the Laminae 1 level above and below affected level. Subperiosteal dissection was carried out with an electric cautery until the facet joints on the both sides were visualized. Pedicle screws were introduced one level

below and above the affected level<sup>5</sup>. Spinous process was removed to decompress the posterior aspect of the thecal sac. The thecal sac & nerve root were gently retracted to expose the intervertebral disc which was completely removed subsequently. The retro pulsed fragments of the fractured vertebral body were removed thereby decompressing the anterior aspect of the thecal sac. Then granulated bone graft made from removed bone tissue was packed into the intervertebral space and vertebral body through fractured end plate. When the decompression procedure was finished the final verification of the screws & rod position was done. Drain was placed; muscle fascia and skin were closed in proper fashion.

**Results:**

Among 50 patients, 35 were male and 15 were female. The patients aged from 20-60 years, mean age 39.2 years. The affected levels were: T<sub>12</sub> level in 12 patients, L<sub>1</sub> in 7, L<sub>2</sub> in 20, L<sub>3</sub> in 8 and L<sub>4</sub> in 3. Neurologic deficit was graded according to Frankel motor score system. 7 Patients were classified as Frankel B, 15 as Frankel C, 13 as Frankel D, 15 as Frankel E. There was no patient classified as Frankel-A in the series. The cause of injury included 30 cases due to fall from height, 16 cases due to road traffic injury, 4 cases due to fall with heavy weights over head. The average injury surgery interval was 20 days, ranging from 2 to 30 days. All



Pre-operative

Post-operative AP view

Post-operative Lateral view

patients were treated with posterior short segment pedicle screw fixation in conjunction with TLIF. Average hospital stay was 45 days ranging from 20 to 60 days. In neurologically intact patients average hospital stay decreased to 20 days, ranging from 15 to 30 days. Neurological recovery of one to three Frankel grades was seen in 30 patients, three grades of improvement was seen in 4 patients (from grade B to E), two grades of improvement was observed in 20 patients and one grade of improvement was found in 18 patients. In 3 patients with partial neurological deficit (Frankel grade D) on admission, no improvement was observed. All the neurologically intact patients (5 cases) remained so during the follow up period. 45 patients recovered with solid fusion of the intervertebral bone graft without any complications, remaining 5 cases with some complications, like hardware failure in 3 cases (one case-screw broken, one case screw dislodged, one case rod extruded subcutaneously) and remaining two patients experienced cerebrospinal fluid leakage because of initial dural injury while introducing pedicle screw.

#### **Discussion:**

Burst fractures of thoracolumbar spine can cause neurological complications and kyphotic deformity<sup>6</sup> which may have a great impact on the patient's quality of life. The treatment option of burst unstable thoracolumbar fracture (where height of vertebral body loss >50% and kyphotic angulation deformity >25 degree) is posterior short segment transpedicular screw fixation with TLIF. It is a common surgical option and its acceptability is established. There are other surgical techniques but each technique has its own advantages and disadvantages. Although the combination of both anterior and posterior approach can provide the most stable biomechanical repair but the operation time, complications and morbidity is higher than that of single approach. Considering everything, the standard is posterior approach which relatively is an easy procedure where reduction of fractured vertebral body and augmentation of the anterior column without any complications is possible<sup>7</sup>. The

posterior approach instrumentation can be 1) short segment fixation - involving one level above and one level below the fractured level and 2) long segment fixation involving more than two upper and lower level below the fractured segment. Now a days short segment pedicle screw instrumentation is a well described and popular technique to reduce and stabilize thoracolumbar spine fracture<sup>8</sup>. Short segment fixation offers the advantage of saving motion segments when compared with longer instrumentations. But disadvantages are - earlier impact failure and correction loss of kyphotic angle<sup>9,10</sup>.

#### **Conclusion:**

Posterior short segment pedicle screw fixation and TLIF might be an optimal surgical treatment option for selected thoracolumbar unstable burst fractures. Most neurosurgeons are familiar with posterior decompression by laminectomy with TLIF with canal clearance by removing the protruding fracture fragments releasing spinal cord and nerve root. So posterior short segment pedicle screw fixation and TLIF is the best choice for the treatment of unstable thoracolumbar fracture. Lack of comparison group, proper record keeping and follow up facilities are the limitations of this study. Further investigations should be carried out to evaluate the effect of this technique in unstable thoracolumbar fracture groups.

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