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ORIGINAL ARTICLE

MANAGEMENT OF UNSTABLE THORACOLUMBAR FRACTURES BY POSTERIOR INSTRUMENTATION WITH TRANSPEDICULAR PEDICLE SCREWS AND CONNECTING RODS

Jayaram B. S[1], Yatish R[2], Suhas D[3], Lokesh M[4]

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ABSTRACT: OBJECTIVE: To evaluate the use of pedicle screw and rod fixation in post-traumatic unstable thoracolumbar Spine fractures. **METHODS:** Thirty six patients with posttraumatic instability of thoracolumbar were included in the study. Thoracolumbar injury severity scoring was used to assess spinal instability. All patients underwent open reduction and internal fixation by posterior approach. Pedicles were localized using detailed anatomical landmarks and intraoperative imaging. The neurological status of the patients was assessed using ASIA grading and any other complications were noted up to 6 months. **RESULTS:** There were 36 patients with unstable thoracolumbar junction injuries who were managed with pedicle screws and rods. Males were more affected (M: F ratio was 8: 1). AO type A was the commonest. The most common level was L1. None of the patients deteriorated after surgery. 27 patients with incomplete cord injury showed at least one frankel grade improvement. 8 patients with complete cord injury showed no improvement. The mean kyphotic angle by Cobb's method was 20.8° on admission, 4.6° post operatively and 6.1° at latest follow-up. Average anterior vertebral body height at the time of admission was 52%, post op was 85% and at final follow up was 80%. There was 1 case of malpositiong of screw and 5 patients developed bed sores. **CONCLUSION:** Pedicle screw fixation is a useful choice for thoracolumbar junction injuries for achieving reduction and stability, without affecting extra motion segments.
KEYWORDS: Pedicle screws, Thoracolumbar junction injuries.

INTRODUCTION: The spinal trauma is one of the leading problems in orthopaedic practice, more so in modern era where the individuals are more at risk due to high energy trauma.[1] Thoracolumbar spinal segment is the 2nd most commonly involved segment after the cervical segment in spinal injuries, about 30 to 60% of all spinal injuries. Thoracolumbar injuries in trauma are concentrated at the thoracolumbar junction region, 60% occurring between T12 and L2.[2] 15 to 20% patients with fracture at thoracolumbar level have associated neurological injury.[3] Historically, thoracolumbar fractures have been treated with recumbency for 8-12 weeks.[4] Complications due to recumbency were high. Conservative management, more often than not, end up as benign neglect, so there is an urgent need for exploring possibilities of surgical stabilization, early mobilizations and rehabilitation of patients.

Internal fixation and stabilization of spinal lesion allows early mobilization of all patients, regardless of neurological deficit, while protecting the neurological structures from further injury and enhancing their recovery.[5] surgical treatment can be anterior, posterior or combined approach. As most orthopedic and spinal surgeons are more experienced in posterior approach and at the same time this approach requires less operative time with less blood loss, hence a safe alternative.[6]

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The goals of surgery are to achieve stability, to correct deformity, early mobilization, to expedite post-operative recovery and to decrease pseudoarthrosis. The pedicle screw plate or rod construct helps to achieve all these.[7] in this study, we have stabilized cases of thoraco lumbar unstable spinal lesions with pedicular screw and rod fixation. Pedicle screw system has gained much popularity in recent times.

MATERIALS AND METHODS: A total of 36 cases were evaluated and assessed during the study period. The study was conducted in the Department of Orthopedics, KIMS HOSPITAL, BANGALORE. All the above patients underwent treatment, as per a specific treatment plan. All the patients were initially assessed according to their presentation, a detailed evaluation of their hemodynamics, spine, neurological status and other injuries if associated with trauma. After initial investigations and haemodynamic stabilization, patients were assessed neurologically in detail. A neurological chart was maintained for each patient. All the patients had routine X-rays of thoracolumbar and lumbar spine in both Anteroposterior and Lateral views. In all the patients MRI with limited CT films was done. The pre-operative neurological status was graded on the basis of ASIA grading. It was also used to assess post-operative recovery and follow-up. The indication for the surgery was instability for which instrumentation was needed to restore spinal stability or to protect neurological elements.

Inclusion Criteria: a. Age group >18yrs, b. Traumatic thoracolumbar fractures and c. Unstable fractures with or without neurological deficits.

Exclusion Criteria: a. Age <18yrs, b. Traumatic cervical spine fractures and sacral spinal fracture, c. Spinal instability due to congenital spinal abnormality, c. Patients not willing for surgery, d. Medically unfit for surgery.

Preoperative work up:

1. Plain radiograph (Static and dynamic wherever necessary) anteroposterior view and lateral views. To assess extent of degeneration, instability, mechanism of injury, fracture pattern and its severity and canal compromise or deformity.
2. Magnetic resonance imaging (MRI) was useful in determining the condition of the spinal cord following trauma and any soft tissue encroachment (Intervertebral disc) of the spinal Cord.

Post-operative Treatment: Physiotherapy was started from first day post operatively. On the second day patients were allowed to roll from side to side. They were allowed to sit up and were mobilized on a wheel chair after application of KT brace on fifth post-operative day. A close watch was kept for any improvement or deterioration in the neurological status.

Those with incomplete neurological deficits were given physiotherapy and gradually ambulated. Patients with complete neurological deficits were given physiotherapy and ambulated on wheel chair.

Follow up: All the patients were followed up at interval of 6 weeks, 12 weeks and at 24 weeks. On each follow up clinical, radiological & neurological examination was done to assess spinal stability.

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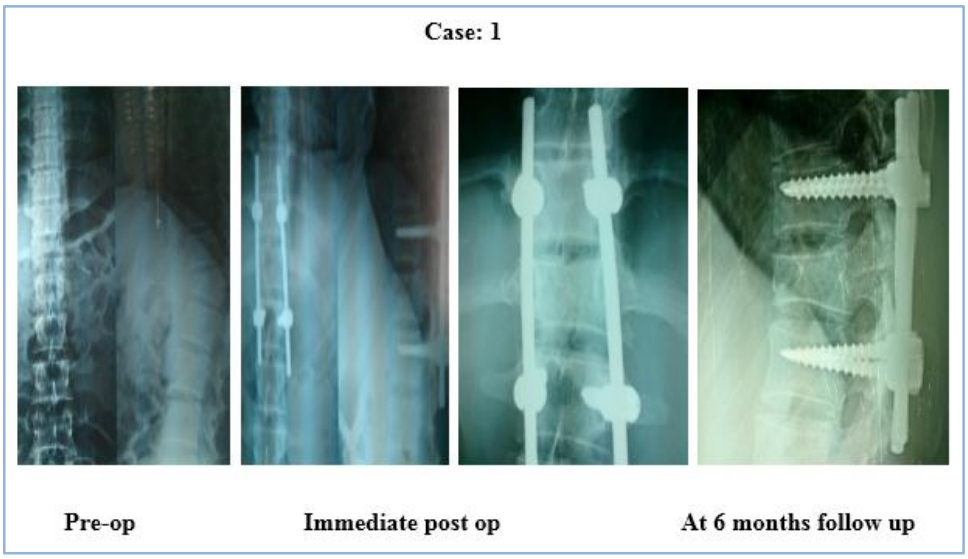
Case: 1



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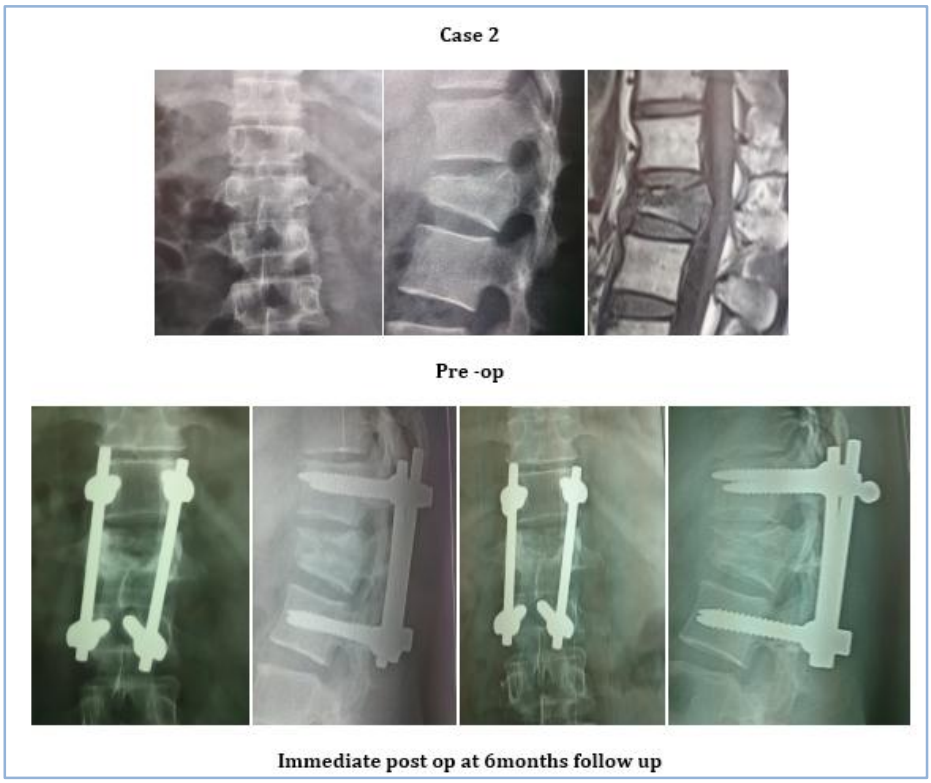
Case 2:



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RESULTS:

Variables	Value	
Age	**37yrs**	
Sex	Male	**88.8% (n=32)**
	Female	**11.2% (n=4)**
TYPE OF FRACTURE Classification	A	**78% (n=28)**
	B	**17% (n=6)**
	C	**5% (n=2)**
LEVE OF INJURY	T11	**0**
	T12	**42% (n=15)**
	L1	**44% (n=16)**
	L2	**14% (n=5)**
MODE OF INJURY	RTA	**19% (n=7)**
	Fall of object	**3% (n=1)**
	Fall from height	**78% (n=28)**
MEAN KYPHOTIC ANGLE	PRE OP	**20.8**
	3 MONTHS	**4.6**
	6 MONTHS	**6.1**

Table 1: Demographic Details

PREOP		FOLLOW UP				
		A	**B**	**C**	**D**	**E**
A	**7**	**7**				
B	**-**	**-**				
C	**9**				**8**	**1**
D	**20**				**1**	**19**
E						

Neurological Status

ANTERIOR VERTEBRAL BODY HEIGHT	Pre-op	**52%**
	Immediate post-op	**85%**
	At 6 Months	**80%**
Type of implants	Polyaxial	**78% (n=28)**
	Monoaxial + Polyaxial	**22% (n=8)**
Complications	Pressure sores	**14% (n=5)**
	Superficial wound infection	**0**
	Malpositioning of screws	**3% (n=1)**

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DISCUSSION: Thoracolumbar fractures are relatively common injuries. Numerous classification systems have been developed to characterize these fractures and their prognostic and therapeutic implications. Recent emphasis on short, rigid fixation has influenced surgical management. Most compression and stable burst fractures should be treated nonsurgically. Neurologically intact patients with unstable burst fractures that have >25 degrees of kyphosis, >50% loss of vertebral height, or >40% canal compromise often can be treated with short, rigid posterior fusions. Patients with unstable burst fractures and neurologic deficits require direct or indirect decompression. Posterior stabilization can be effective with Chance fractures and flexion-distraction injuries that have marked kyphosis, and in translational or shear injuries. Advances in understanding both biomechanics and types of fixation have influenced the development of reliable systems that can effectively stabilize these fractures and permit early mobilization.[8]

The use of pedicle screw instrumentation in the spine has evolved over the last two decades. The initial use of pedicle screws began in the lumbar spine, the use of pedicle instrumentation has evolved to include their use in the thoracolumbar and thoracic spine. The impetus behind their increased use is a result of the many advantages that pedicle screw anchorage offers over traditional hook and rod constructs. Improved deformity correction and overall construct rigidity are two important advantages of pedicle screw instrumentation due its three-column control over the spinal elements.

The prognosis of patients with thoracolumbar spine fractures and neurologic deficits has improved in terms of survival and quality of life since principles of timely fracture reduction, decompression, and stabilization have been implemented. In patients with incomplete spinal cord injuries, acute intervention has been shown to lead to improved neurologic recovery rates. The type of surgical treatment and timing depends upon the fracture type and neurologic status of the patient.[9]

Pedicular screw rod systems are the most widely used spinal stabilization systems worldwide today. The superior biomechanical strength of pedicular screws has yielded better fusion rates and has been shown to give better corrections in complex deformities. Although used widely in various spinal disorders, pedicle screws are used with caution in the thoracic spine. The main deterrent for the use of thoracic pedicular screws is the feared neurovascular complications due to screw misplacements. Screw misplacements in the thoracic spine range from 20% to 30% in the hands of the best of spine surgeons. Pedicle fractures, screw breakage, and loosening range from 0.5% to 1% in most of the studies. The neurovascular complications reported due to misplaced screws are between 0% and 1. Therefore, only a small fraction of the misplaced screws actually cause any complication.[10]

CONCLUSION: This study was conducted to assess the Radiological, Neurological and Clinical outcome of surgical management of thoracolumbar fracture spine with pedicle screws and rod system.

We conclude: Most number of patients with thoracic and lumbar spine fractures were in the 3rdand 4th decade of life with an average age of 37 years. There was a significant male predominance with 32(88.8%) male patients. In the present study the most common mode of injury fall from height 28 patients (78%), RTA 7 patients (19%) and 1 patient (3%) due to fall of heavy object. In our study we had 28(78%) patients with AO Type A fractures, 6(17%) with AO Type B fractures and 2(5%) with AO Type C fractures. The most common level was L1 (44%), followed by T12 (42%) and L2 (14%).

Our study noted that patients with neurological deficit improved by at least 1 ASIA grade improvement in 27 cases. And the mean kyphotic angle improved from 20.8 degrees on admission to 4.6^0 Post operatively and to 6.1^0 at latest follow up. Complications included pressure sores in 5(14%) patients, and misplacement of screws in 1 case. There were no neurologic complications associated with the screw misplacement.

Management of thoracolumbar spine fractures requires careful pre-operative planning, patient selection, neurological evaluation and meticulous intra-operative care and post-operative rehabilitation including detailed counseling for good functional outcome. The posterior midline approach provides adequate exposure and direct visualization. Pedicle screw instrumentation provides less surgical exposure, correction of deformity and better stabilization, of one motion segment above and below the fracture. It provides fixation and stabilization of all the three columns. So stabilization, reduction and decompression using pedicle screws and rods helps in stabilization of unstable fractures and helps in further neurologic recovery of the patient.

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AUTHORS:

1. Jayaram B. S.
2. Yatish R.
3. Suhas D.
4. Lokesh M.

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Orthopaedics, KIMS, Bangalore.
2. Assistant Professor, Department of Orthopaedics, KIMS, Bangalore.
3. Post Graduate, KIMS, Bangalore.
4. Assistant Professor, Department of Orthopaedics, KIMS, Bangalore.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Suhas D,
Room No. 319, 3rd Floor,
KIMS Residents Quarters,
K. R. Road, V. V. Puram,
Bangalore.
E-mail: suhasdgowda5@gmail.com

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