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SHORT SEGMENT PEDICLE SCREW FIXATION FOR DORSO-LUMBAR SPINE FRACTURE: A SERIES OF 68 PATIENTS

Orthopaedics

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ABSTRACT

Introduction-Dorsolumbar spinal segment is an unstable zone between fixed dorsal and mobile lumbar spine[1] are the commonest site of spinal injuries. The treatment remains controversial[2,3,4,5] for unstable fractures and fracture dislocations of dorsolumbar spine. The pedicle screws are passed one level above and one level below the fractured vertebra via posterior approach. The aim of this study was to evaluate the use of pedicle screw fixation for preservation of remaining spinal cord function, restoration of spinal alignment, early mobilization and maximization of neurological recovery in Spinal Injury Patients.

Materials and methods-Sixty-eight patients aged 18-65 years (mean 37.8 years) with posttraumatic instability (duration <3weeks) of lower thoracic or upper lumbar spine qualifying inclusion criteria were surgically managed at the Orthopaedics department, IGIMS, Sheikhpura, Patna.

Results –Fifty-six patients(91.80%) out of sixty-one with incomplete neurological deficit had some amount of neurological recovery in terms of Frankel scale but no neurological recovery was seen in six patients(85.71%) out of seven patients with complete neurological injury. Mean correction of kyphotic angle was 11.74 degrees. Mean postoperative increase in anterior vertebral body height was 42%. Complications like bed sore, superficial wound infections and peroperative dural tear were seen but all of which were treated successfully. Neurological deterioration after operation, screw pull out and implant failure were seen in none.

Conclusion- Short segment pedicular screw fixation is a safe and effective method for treatment of unstable spinal injury.

KEYWORDS

dorsolumbar spine fracture, pedicle screw, neurological recovery,

INTRODUCTION:

Dorsolumbar spinal segment is an unstable zone between fixed dorsal and mobile lumbar spine[1] are the commonest site of spinal injuries. The treatment remains controversial[2,3,4,5] for unstable fractures and fracture dislocations of dorsolumbar spine. Pedicular screws and rods for segment stabilization was found appropriate method. Optimising neural decompression while providing stable internal fixation over the least number of spinal segments is the goal of the treatment of unstable thoracolumbar injuries . Either anterior posterior or both approaches can be used to achieve fusion. However, posterior approach is less extensive. Pedicle screw devices provide stable fixation as the screws traverse all the three columns of vertebrae. The pedicle screws are passed one level above and one level below the fractured vertebra via posterior approach under fluroscopy. The aim of this study was to evaluate the use of pedicle screw fixation for preservation of remaining spinal cord function, restoration of spinal alignment, early mobilization and maximization of neurological recovery in Spinal Injury Patients. They provide three-column fixation in unstable injuries and limit the length of fusion in the lumbar spine.

OBJECTIVES OF STUDY

1. To evaluate the effectiveness of early ambulation and improving neurological status of the patient.
2. The aim of the surgery is to decompress the spinal cord and give it a better chance for neurological recovery.

Indications:

The indications for the surgery were unstable fractures for which instrumentation was needed to restore spinal stability or to protect neurological elements for farther damage and visible bone fragment that compressed the spinal cord.

Inclusion criteria:

All patients coming to IGIMS emergency or OPD within 3 weeks of injury with unstable fractures for which instrumentation was needed to restore spinal stability.

Narrowing of the spinal canal due to anterior bony fragment.
Patient giving informed written consent
Patient fit for anaesthesia
Single level vertebral body fracture
With neurological deficit
Age between 18-65 years of age
Minimum follow-up 2 yrs

Exclusion criteria:

Patients not giving consent
Patients not fit for anaesthesia
Moribund patients
Significant osteopenia
Pathological fracture
Stable fractures of thoraco lumbar spine
Any other systemic or genetic diseases likely to affect the outcome of the fracture fixation.
Patients with accompanying head or cervical injury

MATERIAL AND METHODS

Sixty-eight patients aged 18-65 years (mean 37.8 years) with posttraumatic instability (duration <3weeks) of lower thoracic or upper lumbar spine qualifying inclusion criteria were surgically managed at the Orthopaedics department IGIMS, Sheikhpura, Patna. The patients with pre-existing systemic illness or associated extra spinal injuries significant enough to result in increased morbidity or mortality were excluded from the study. A detailed history and examination was carried out especially evaluating the mode of trauma, Frankel grading, sensory and motor level and any spinal deformity. Plain x-rays, in anteroposterior and lateral views were done and the instability of the spine was confirmed using White and Panjabi criteria of spinal instability. MRI/CT scan was done to further evaluate the important relationships and instability of spine. Those patients with unstable spine were then explained pros and cons of the surgical treatment. Patients willing for surgery were included in this study. Sixty-eight patients with dorsolumbar spinal injury were treated by pedicular screw fixation along with direct or indirect decompression within 5 years period having 2 years of minimal follow-up. All patients underwent indirect reduction and internal fixation by posterior approach. Laminectomy to decompress spinal cord was carried out at the involved level and bone was saved to be used as bone graft.

Pedicles were localized using detailed anatomical landmarks and intraoperative image intensifier. Monoaxial/Polyaxial screws were inserted through pedicles into vertebral bodies, one level above and one level below fractured vertebra under fluoroscopy. The rod was coupled to Monoaxial/polyaxial screws. Distraction of anterior elements was produced by compressing the heads of Monoaxial/ Polyaxial screws by which annulotaxis was used for reduction of spinal deformity. The wound was then closed in layers. The patients were kept on broad-spectrum injectable antibiotics for 5 days. Check x-rays were done on the second postoperative day. All the patients were mobilized on third or fourth days with thoracolumbar spinal brace (Rigid type), the spinal brace was given for the initial three months postoperatively in all patients. The neurological status of the patients and any other complications were noted post-operative, at the time of discharge, at 6 weeks, at 12 weeks, 3 months, 6 months, and at two years.

Table1.
(modified Frankel's)

A=Complete: No motor or sensory function is preserved in sacral S4-S5
B=Incomplete: Sensory but not motor function is preserved below the neurological level
C=Incomplete: Motor function is preserved below the neurological Level (power<3)
D=Incomplete: Motor function is preserved below the neurological Level (power>3) E=Normal

Table 2: (White and Panjabi criteria for spinal instability (Quantitation of acute instability in sub-axial, cervical, thoracic, and lumbar injuries)

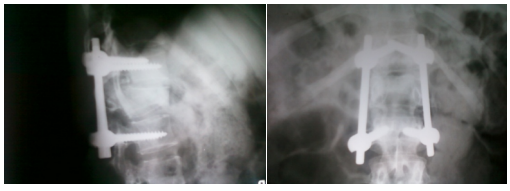
CONDITION	POINTS ASSIGNED
Loss of integrity of anterior (and middle) column	2
Loss of integrity of posterior column(s)	2
Acute resting translational deformity	2
Acute resting angulation deformity	2
Acute dynamic translation deformity exaggeration	2
Acute dynamic translation deformity exaggeration	2
Neural element injury	3
Acute disk narrowing at level of suspected pathology	1
Dangerous loading anticipated	1

A score of 5 points or more implies the presence of instability

Surgical technique
All patients were operated under general anaesthesia in prone position. A mid line posterior approach was used. The injured site was defined, posterior decompression was performed whenever indicated to ensure that the disrupted soft tissue or bone fragments did not compress neural elements during final reduction. Decompression also included undercutting the disrupted lamina and evacuation of any Epidural hematoma, by using the fluoroscopy control to identify the proper site. The fracture was stabilized by bilateral pedicle screws with short segment fixation, distraction was used to reduce the posterior displacement of vertebral body toward the neural canal and maintain a good alignment of the spine and fracture site.

Preoperative MRI lateral view burst fracture L_1

Preoperative MRI cross section $D_{12} - L_1$



Postoperative X-Ray Lateral view Postoperative X-Ray AP VEIW

OBSERVATION:
There were 68 patients (10 female, 58 male) who were managed with pedicle screws for thoracolumbar injuries. The age range was 18 to 65 years (mean age of 37.8 years). McAfee's classification of thoracolumbar injuries was used in our study. Wedge compression with visible fracture bone fragment protruded in spinal canal was the commonest in 49 patients (72.05%) whereas Fracture subluxation was seen in 8 patients (11.76%). There were 6 burst fractures (8,82%), 5 translational injuries (7.35%) and no distraction injuries. This patient did well post-operatively. No patient deteriorated after surgery.

The neurological status of the patients (Frankel grading) and subsequent improvement is shown in Table-3. The Table-3 shows that the patients are progressively moving from worse grade to a better grade. Fifty-six patients(91.80%) out of sixty-one with incomplete neurological deficit had some amount of neurological recovery in terms of Frankel scale but no neurological recovery was seen in six patients(85.71%) out of seven patients with complete neurological injury. Mean correction of kyphotic angle was 11.74 degrees. Mean postoperative increase in anterior vertebral body height was 42%. Complications like bed sore, superficial wound infections and peroperative dural tear were seen but all of which were treated successfully. Neurological deterioration after operation, screw pull out and implant failure were seen in none. This study indicates that short segment pedicular screw fixation is a safe and effective method for treatment of unstable spinal injury.

Two patients developed superficial infection and One developed deep infection where implant was removed and patient was treated conservatively. Implant failure was seen in two case after retrauma. Two patient developed DVT but improved with conservative management. One patient became severely depressed and required long term antidepressants. Four patient developed bedsores, Dural tear occurred in two patient. No other complications of recumbency were found.

Table 3:

Frankel Grading	A	B	C	D	E	Total
Pre –op	7	44	10	5	2	68
Post-op 2 Years	6	6	18	27	12	68

DISCUSSION:
The management of fractures in the dorsolumbar region is a controversial subject. Disadvantages of conservative treatment include deterioration in neurological status in 17% of the patients, progressive kyphotic deformity in 20%, persistent backache, decubitus ulcer and deep venous thrombosis[9]. Most of these complications can be avoided by early mobilization and decreased hospital stay by early surgery[10]. The pedicle offers a strong point of attachment of the posterior elements to the vertebral body and pedicle screw instrumentation has revolutionized spine surgery. Pedicle screw fixation is considered biomechanically superior to other stabilization constructs or parapedicular screws and are exceptionally rigid[11,12].

It has rapidly become one of the most popular strategies for achieving solid fusion. So instrumentation with pedicle screws is a commonly used procedure for correcting deformity and stabilizing the spine until bony fusion occurs. These instrumentation systems may be divided into those using rods and those using plates. Now-a-days, pedicle screw system using rods is more acceptable and it provides better stability than other implants[13,14,15]. Operative stabilization consists of segmental distraction with pedicle screw fixation one level above and one level below the injured segment. By applying distraction, annulotaxis is exploited to aid in reduction of retro-pulsed bone and disc fragments. Similarly, pedicle screws have been shown to be superior to hooks and Hartshell fixation in spine[13,14].

Intra-operative rod contouring using a French bender reduces the fatigue life of spinal constructs[16]. Tapping may decrease the pullout resistance of screws in osteoporotic spine but not in normal spine. We utilized rod contouring and tapping for screw placement in all our cases.

CONCLUSION: Dorsolumbar injury is a common neurosurgical problem in road traffic accidents and fall from height. Surgical treatment is a better option for early ambulation and faster recovery. Pedicle screw fixation is a useful choice, which achieves reduction and

stability in both anterior and posterior column injuries, does not require anterior decompression and does not affect extra motion segments. There are poor chance of recovery of patients with Frankel grade A .

The vertebral pedicle screw internal fixation was technologically applicable, which can efficiently reposition and stabilize the fractured vertebrae, indirectly decompress spinal canal, maintain spine stability, scatter stress of screw system, reduce the risk of loosening or breakage of screw and loss of vertebral height, and prevent the formation of posterior convex after operation.

REFERENCES

1) knigntly JJ, sonntag VKH. Thoraco lumber fractures in : menezes A ,sonntage V (eds) principle, OF spinal surgery New York ; McGraw-Hill; 1996 : 919-49. Char DPK ,Ser SNK, Kaun KT : Non operative treatment in burst
2) fractures of lumbar spine (LI - L5) without neurological deficit, Spine 1993 ; 18 : 971 - 976.
3) Sutherland CJ, Miller F, Wang CJ: Early post operative Kyphosis following compression fractures .clin orthop 1983 ,173:216-221
4) Cantor JB, Lebwohl NH , Garvey T et al: Non operative Treatment in burst fractures with early ambulation and bracing .Spine1993, 18 971 - 976 .
5) Weinstein JN, Lollaltop, LehmanTR :Thoracic lumbler burst Fractures ted1' conservatively. Along Term follow up. spine1988,8: 3-13.
6) Benson DR. unstable thoraco lumber fractures with emphasis on the burst fracture . clin orthop Relate Res 1988, 230 : 14-9.
7) CATTY HART et al, Paraplegia, Vol.32, 1994
8) LAN et al, Paraplegia, Vol.31, 1993
9) Rechtineet al.(1999)[93] Spinal Disorders: Fundamentals of Diagnosis and Treatment
10) Jacobs R.R., Asher M.A., Snider R.K.: Thoracolumbar spinal injuries: A comparative study of recumbent and operative treatment in 100 patients. Spine 1980; 5:463-477
11) Yue JJ, Sossan A, Selgrath C, Deutsch LS, Wilkens K, Testaiuti M, et al. The treatment of unstable thoracic spine fractures with transpedicular screw instrumentation: a 3-year consecutive series. Spine. 2002;27(24):2782-7
12) Shafiq K, Iqbal M, Hameed A, Mian JM. Role of transpedicular fixation in thoracolumbar spinal injuries. Neurol Surg 1998;1:21-7.
13) Biomechanical evaluation of pedicle screws versus pedicle and laminar hooks in the thoracic spine. Spine J. 2006;6(4):444-9. 23
14) itchon P.W., Brenton M.D., Black A.G., et al: In vitro biomechanical comparison of pedicle screws, sublaminar hooks, and sublaminar cables. J Neurosurg 2003; 99(1 Suppl):104-109
15) Panjabi MM, Biomechanical evaluation of spinal fixation devices: A conceptual framework. Spine 1998;13:1129-34
16) Lindsey C, Deviren V, Xu Z, Yeh RF, Puttlitz CM. The effects of rod contouring on spinal construct fatigue strength. Spine 2006;31(15): 1680-87