

A STUDY OF CLINICAL AND RADIOLOGICAL OUTCOME IN DORSOLUMBAR SPINE FRACTURES STABILISED BY PEDICLE SCREW FIXATION

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ABSTRACT

BACKGROUND

Incidence of dorsolumbar injuries accounted for 75% of all spine injuries in a study from India. Most commonly fractured level in whole spine is L1 followed by T12. Fractures around dorsolumbar junction are wedge compression fractures, burst fractures. Wedge compression fractures are the most common fracture in Indian population.

The aim of the study is to study the outcome of patients with dorsolumbar spine fractures stabilised by pedicle screw fixation.

MATERIALS AND METHODS

The present study was conducted among 20 patients with dorsolumbar junction spine fractures operated with pedicle screw fixation.

RESULTS

19 cases were improved, in that 11 (55%) cases showed one grade improvement, 7 (35%) cases showed two grade improvement and 1 (5%) case improved by three grade. 1 (5%) case failed to recover by any grade.

CONCLUSION

By the analysis of the data collected in the present study, pedicle screw and rod fixation remains as the implant of choice in management of dorsolumbar fractures.

KEYWORDS

Spine, Dorsolumbar Fractures, Pedicle Screws and Rod.

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BACKGROUND

Incidence of dorsolumbar injuries accounted for 75% of all spine injuries in a study from India. Population incidence of SCI varies in different countries varies from 15-40 per million per year. Most commonly fractured level in whole spine is L1 followed by T12. Fall from height are common cause than road traffic accident in most Indian series.

In developed countries, RTA are most common than fall from height. Fractures around TLJ are wedge compression

fractures and burst fractures. Wedge compression fractures are the most common fracture in Indian population.

Surgical management of TLJ fracture is different from cervical and thoracic fractures due to transition from stiff kyphotic spine to lumbar lordotic spine, which is mobile.

Part of spinal cord that extends and ends near the mechanically vulnerable TLJ contains primary efferents of all lumbosacral roots and have canal encroachment and also the presence of attachment of diaphragm around the TLJ and so having significant neurological consequences.

In this study, we are going to study the outcome of patients with dorsolumbar spine fractures stabilised by pedicle screw fixation.

Aims and Objectives- 1. To evaluate the restoration and alignment of spine and spinal canal using kyphotic angle and vertebral body height. 2. To study the clinical and radiological outcome following fixation of dorsolumbar spine fractures with or without neurological deficit. 3. To study postoperative complications following surgery.

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MATERIALS AND METHODS

The study was conducted in 20 patients between October 2014 to October 2016 for a period of 2 years in Government General Hospital, Kurnool. Patients were operated for thoracolumbar junction spine fractures with pedicle screw fixation and were followed for 4 to 24 months (mean 14.75 months).

Inclusion Criteria- 1. Traumatic thoracolumbar spine fractures (fall from height, road traffic accidents). 2. Haemodynamically stable patients. 3. Age between 20 and 75 years.

Exclusion Criteria- 1. Pathological fractures of spine. 2. Spondylolisthesis.

Methodology- After a detailed examination consisting of detailed history pertaining to mode of injury and time of injury are taken, clinical examination, which included general examination of head, cervical spine, abdomen and chest was completed. Then, after the patient was stabilised, examination of the spine with neurological evaluation for motor power, sensory, reflexes and bowel bladder was done to evaluate the level of spine injury and extent of cord damage following the American Spinal Injury Association of neurological evaluation.

A radiograph of the injured spine in two views AP and lateral was done to classify the fracture type using the MacAfee's System of Classification.¹ In cases with associated injuries, additional radiographs were included to rule out fractures. Patients with neurological involvement caused by the fracture include all neurologically unstable patients with instability criteria of kyphotic deformity (sagittal angle) more than 20, loss of vertebral body height (sagittal index) of more than 50% were considered to have an indication for surgical stabilisation of the spine. Patients were operated between 7 and 50 days of injury surgical interval with a mean of 10.1 days. Surgery delayed in few cases due to delay in reporting to hospital. MRI scan was taken routinely in all cases for status of spinal cord and was correlated with the ASIA scale. For all cases, posterior approach was used and pedicle screw fixation was done.

RESULTS

The study included 20 cases of which 15 (75%) cases were males and 5 (25%) cases were females.

The mean age of the study population was 33 years ranging from 20 to 55 years. The most common mode of injury in the study group was fall from height in 16 cases (80%) followed by road traffic accidents in 4 cases (20%). In our study, we observed that 12 cases (60%) of fractures are at the site of L1 level, 5 cases with fracture at L2 (25%), 2 cases (10%) of fractures were at T12 level and 1 case with fracture at L3 level (5%).

The most common type of fracture observed in the study was wedge compression fracture with 16 cases (80%) followed by 4 cases (20%) with burst fractures.

The radiological evaluation of sagittal angle was done both preoperatively and postoperatively. Mean preoperative

sagittal angle was 25.40 degrees and postoperative sagittal angle was 11.15 degrees. The mean vertebral body height was 58.65%, which was improved to 75.5%, postoperatively.

Neurological evaluation was done according to American Spinal Injury Association scale in the preoperative period and at all followups. 19 cases were improved. In that, 11 (55%) cases showed one grade improvement, 7 (35%) showed two grade improvement and one case (5%) improved by three grade. 1 case (5%) fail to recover any grade.

Mean duration of injury- Surgery interval was 5.1 days.

The common complications associated in the study were bedsores and urinary tract infections accounting for 2 cases (20%) each followed by superficial skin infection and misplaced screws seen in one case (5%).

Age	Number of Patients	Percentage
20-30 years	10	50%
31-40 years	7	35%
41-50 years	1	5%
51-60 years	2	10%

Table 1. Age of the Patients

Gender	Number of Patients	Percentage
Males	15	75%
Females	5	25%

Table 2. Sex of the Patients

Mechanism of Injury	No. of Patients	%
Fall from height	16	80%
Road traffic accident	4	20%

Table 3. Mode of Trauma

Average preoperative kyphotic angle	25.42
Average postoperative kyphotic angle	11.15
Average at final follow up kyphotic angle	7.807

Table 4. Kyphotic Angle

Level	Number of Patients	Percentage
T12#	2	10%
L1#	12	60%
L2#	5	25%
L3#	1	5%
Total	20	100%

Table 5. Level of Injury

Type	No. of Cases	%
Wedge compression fractures	16	80%
Burst fracture	4	20%

Table 6. Type of Fracture

Superficial wound infection	1 (5%)
Bedsore	2 (10%)
Urinary tract infection	2 (10%)
Hardware failure	1 (5%)

Table 7. Complications in the Patients who Underwent Surgical Fixation

Number of cases improved	19
Number of cases not improved	1

Table 8. Neurological Improvement

DISCUSSION

Pedicle screw fixation is considered biomechanically superior to other stabilisation constructs or perpendicular screws and are exceptionally rigid. So, instrumentation with pedicle screws is a commonly used procedure for correcting deformity and stabilising the spine. Francaviglia N.² et al (1995) studied 67 patients with burst fracture or fracture dislocations of the thoracolumbar spine. All were treated by early surgical reduction and stabilisation with either Harrington instrumentation or transpedicular devices. They found transpedicular devices to be reliable in achieving a near anatomical reconstruction of fractured site and rate of complications was low. Now-a-days, pedicle screw system using rods is more acceptable and it provides better stability than other implants.

Age- The finding of the present study of mean age being 33 years is consistent with studies by Roy Camille et al³ who reported a mean age of 30 and Tezeren (33.4) years.⁴

Mode of Injury- The predominance of fall from height as the mode of injury (80%) is little higher comparable to the findings of study by Dipankar and Patro,⁵ which reported 64.7% and Knop et al in his study has 68.5% of patients from fall from height.⁶

Level of Fracture- Levels of fracture in this study were around T12, L1 and L2 constitute 95% comparable with the study by Dipankar and Patro,⁵ which is 82%. Similar observations are noted by Knop et al⁶ who in his study found 74.28% in T12 and L1 level comparable to the findings of the present study (70%).

Fracture Type- In this study, after radiological and MRI evaluation, McAfee's system was used to classify the fractures. The most common fracture pattern in this study was wedge compression fracture followed by burst fractures. Wedge compression fracture being the commonest type in 80% (16 cases) is little higher comparable with Gertzbein study with 68%.⁷ Nam-Hyun et al⁸ also reported a high degree of neurological involvement in patients with posterior element involvement- i.e. burst fractures and rotational injuries.

Kyphotic Angle- Radiological evaluation of the cases in this study for sagittal angle was preoperatively 25.40 degrees, postoperatively 11.15 degrees and at final follow up the kyphotic angle was 7.8 degrees comparable with the similar study by Mohammad F Butt et al reported sagittal angle preoperatively 21.40, postoperative 12.8 and loss of angle at final followup 3.40.⁹

Vertebral Height- Vertebral height was measured and recorded preoperatively, immediate postoperatively and at follow up. Average preoperative vertebral height was 58.65%, whereas average immediate postoperative vertebral height was 75.5%. At final follow-up, the average vertebral height was 71.05%. This proves that the short

segment posterior fixation is useful not only in restoring the vertebral height, but also in maintaining it to some extent.

Neurological Evaluation- Neurological evaluation done using American Spinal Injury Association Scale; in that, out of 20 patients, 19 (95%) were improved; in that, 11 (55%) cases showed one grade improvement, 7 (35%) showed two grade improvement and one (5%) improved three grade, one case (5%) fail to recover any grade. Shafiq¹⁰ did not show the neurological improvement, whereas significant neurological improvement was shown in this study group.

COMPLICATIONS- Overall complications occurred in 6 (30%) cases, in that 2 cases had bedsores; 2 cases had urinary tract infection; one case had superficial wound infection and misplaced screws in one case are less comparable with Mohammad M Butt et al⁹ study recorded 50% complications.

CONCLUSION

Fracture and fracture dislocations of the thoracolumbar spine are the most commonly occurring types of osseous spine injury. In the developed countries, road traffic accidents causing the major percentage and fall from height being the commonest mode of injury in the developing countries. Males are more commonly involved than females. L1 vertebral level is the most common site of injuries in this study. Unstable wedge compression fractures were the most common fracture type encountered in the study, which leads to deformity and neurological compromise. The neurological improvement was observed to be fair enough in cases of incomplete neurological injury. 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 and was technologically applicable, which can efficiently reposition and stabilise the fractured vertebrae, indirectly decompress spinal canal to maintain spine stability.

Short segment fixation using the posterior approach with pedicle screw-rod fixation devices with or without bone grafting achieves good stabilisation and fair enough neurological recovery in patients with unstable thoracolumbar fractures.

The advantages of surgical treatment with pedicle screw and rod fixation systems in spine injuries are shorter hospital stay, more complete rehabilitation, fewer complications due to early mobilisation and reduced morbidity and mortality. Hence, posterior pedicle screw fixation helps in early mobilisation of patients with unstable thoracolumbar spine fractures and provides better relief in neurological recovery also.

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