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Original Research Article

EVALUATION OF CLINICAL AND RADIOLOGICAL OUTCOME IN THORACOLUMBAR SPINE FRACTURES FIXED BY PEDICLE SCREW

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ABSTRACT

Background: Evaluation Of Clinical and Radiological Outcome in Thoracolumbar Spine Fractures Fixed by Pedicle Screw.
Materials and Methods: This study was conducted on 20 patients with thoracolumbar vertebral fractures who underwent surgical fixation with pedicle screw.
Results: In this study19 cases improved, 11 (55%) cases improved by one grade, 7 (35%) by two grades, and 1 (5%) by three grades. 1 (5%) case did not show any improvement.
Conclusion: Based on the analysis of the data collected in this study, the pedicle screw and rod fixation remains the implant of choice for the treatment of thoracolumbar fractures.
Keywords: Spine, Thoracolumbar Fractures, Pedicle Screws and Rod.

INTRODUCTION

According to an Indian study, thoracolumbar injuries made up 75% of all spine injuries. The incidence of SCI in the population varies by country, ranging from 15 to 40 per million year. L1 is the most often fractured level in the entire spine, followed by T12. In most Indian series, falls from heights are a more common source of accidents than automobile accidents.

In developed countries, RTA is more common mode of injury than fall from height. Fractures around the TLJ are wedge compression fractures and burst fractures. Wedge compression fractures are the most common fractures in the Indian population.

Surgical management of a TLJ fracture differs from cervical and thoracic fractures because of the transition from a rigid kyphotic spine to a lordotic lumbar spine that is mobile.

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

In this study, we intend to evaluate the outcome of patients with thoracolumbar vertebral fractures which are surgically managed by pedicle screw fixation.

Aims and Objectives

1. To assess the recovery and alignment of the spine and spinal canal using the kyphotic angle and height of vertebral body.
2. To evaluate the clinical and radiological outcome after fixation of thoracolumbar fractures with or without neurological deficit.
3. To investigate postoperative complications.

MATERIAL AND METHODS

The study was conducted from October 2021 to October 2023 in 20 patients at Government General Hospital, Nandyal. Patients underwent surgery for vertebral fractures at the thoraco-lumbar junction and were followed for 4 to 24 months (mean, 14.75 months).

Inclusion Criteria

1. Thoracolumbar vertebral fractures which are traumatic(fall from height, road traffic accidents).

2. Patients who are Haemodynamically stable.
3. Patients whose age is between 20 to 75 years.

Exclusion Criteria

1. Vertebral fractures due to any other cause.
2. Listhesis.

Methodology

After taking complete history regarding mechanism of injury and time at which injury has happened, thorugh clinical examination was done which includes general physical examination of head and face, neck, chest, abdomen. Following thorough examination patient was stabilised and then spinal examination was commeneced in which motor power, sensory, reflexes and bowel bladder which roughly briefs the level of injury and extent of cord damage following the american spinal injury association of neurological evaluation.

MacAfee's Classification was used to classify the injury after obtaining the x-ray of spine in AP and lateral views. In case of other injuries, additional radiographs were taken to rule out fractures. Patients with a history of fracture-induced neurological effect include all neurologically unstable patients whose instability criterion is kyphotic deformity (sagittal angle) greater than 20, vertebral height (sagittal index) reduction greater than 50% was considered suitable for surgical stabilization. Patients underwent surgery between 7 and 50 days, with an average interval of 10.1 days. In some cases, the operation was delayed due to a delay in reporting to the hospital. An MRI scan was routinely performed in all cases to determine the status of the spinal cord and correlated with the ASIA score. Fracture was approached posteriorly in all cases and screw fixation was performed.

RESULTS

The study included 20 cases, of which 16 (80%) were male and 4 (20%) were female.

The mean age of the study population was 33 years and ranged between 20 and 55 years. The most common mechanism of injury was fall from a height in 16 cases (80%) and a traffic accident in 4 cases (20%). In our study, we found 12 fractures at the L1 level (60%), 5 cases (25%) at the L2 level, 2 cases (10%) at the T12 level, and 1 case of at L3 level (5%). Wedge compression fracture[16 cases (80%)], most common type of fracture observed in the study and rest were burst fractures[4 cases(20)].

Radiological evaluation of the sagittal angle was performed both before and after surgery. The mean preoperative sagittal angle was 25.40 degrees and the postoperative sagittal angle was 11.15 degrees. The mean vertebral height preoperatively was 58.65%, which improved to 75.5% postoperatively.

Neurological assessment was performed using the ASIA scale preoperatively and at all follow-ups. 19 cases were treated. In it, 11 (55%) cases improved by one grade, 7 (35%) improved by two grades, and one case improved by three grades (5%). 1 case (5%) did not turn up any improvement.

Average duration of injury - The interval between surgery was 5.1 days. The most common complications which were encountered were bed rest and urinary tract infections in 2 cases (20%), followed by superficial dermatitis and misplaced screws in 1 case (5%).

Table1: Age of the Patients

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

Table 2: Sex of the Patients

Gender	NumberofPatients	Percentage
Males	15	75%
Females	5	25%

Table 3: Mode of Trauma

MechanismofInjury	No.ofPatients	%
Fallfromheight	16	80%
Roadtrafficaccident	4	20%

Table 4: Kyphotic Angle

Averagepreoperativekyphoticangle	25.42
Averagepostoperativekyphoticangle	11.15
Averageatfinalfollowupkyphoticangle	7.807

Table 5: Level of Injury

Level	NumberofPatients	Percentage
T12#	2	10%
L1#	12	60%
L2#	5	25%
L3#	1	5%
Total	**20**	**100%**

Table 6: Type of Fracture

Type	No.ofCases	%
Wedgecompressionfractures	16	80%
Burstfracture	4	20%

Table 7: Complications in the Patients who Underwent Surgical Fixation

Superficialwoundinfection	1(5%)
Bedsore	2(10%)
Urinarytractinfection	2(10%)
Hardwarefailure	1(5%)

Table 8: Neurological Improvement

Numberofcasesimproved	19
Numberofcasesnotimproved	1

DISCUSSION

Pedicle screw fixation is considered biomechanically superior to other stabilizing constructs and is exceptionally rigid. Thus, instrumentation with pedicle screws is a commonly used procedure to correct deformities and for spine stabilization. FrancaviglianN,[2] et al (1995) studied 67 patients with a burst fracture or fracture with dislocation of the dorsolumbar spine. All were treated with early surgical reduction and stabilization with either Harrington instrumentation or transpedicular devices. They found that transpedicle devices were reliable in near-anatomical fracture reconstruction and the complication rate was low. Today, the pedicle screw system using rods is most acceptable and provides better stability compared to other implants.

Age

The average age of 33 years in this study is consistent with the studies of Roy Camille et al,[3] where the average age was 30 and Tezeren (33.4) years.[4]

Mode of Injury

The incidence of fall from a height as an injury (80%) is slightly higher compared to the results of a study by Dipankar and Patro,[5] who reported 64.7%, and Knop et al.[6]

Level of Fracture

In this study, fracture levels were approximately T12, L1 and L2 accounting for 95% comparable to the study by Dipankar and Patro5 which is 82%. Similar findings were observed by Knop et al6, who in their study found that 74.28% of T12 and L1 levels were comparable to the results of this study (70%).

Fracture Type

This study used the McAfee system to classify fractures after X-ray and MRI evaluation. In this study, the most common fracture pattern was wedge compression fracture, followed by burst fractures. Wedge compression fracture, the most common type ,80% (16 cases), is slightly higher than the 68% in Gertzbein'sstudy.[7] Nam-Hyun et al,[8] also reported a high rate of neurological involvement in patients with posterior components, ie.burst fractures and rotational injuries.

Kyphotic Angle

The radiological assessment of sagittal angle of the cases in this study was 25.40 degrees preoperatively, 11.15 degrees postoperatively, and kyphotic angle at final follow-up was,[7.8]degrees, which is comparable to Mohammad F Buttin et al. report sagittal angle before surgery 21.40, postoperative 12.8 and angle loss at final follow-up 3.40.[9]

Vertebral Height

Height of fractured vertebra was measured and recorded preoperatively, immediately postoperatively, and during follow-up. The mean preoperative vertebral height was 58.65%, while the mean immediate postoperative vertebral height was 75.5%. At the last follow-up, the average height of the vertebrae was 71.05%.

Neurological Evaluation

Neurological assessment using the ASIA scale; 19 of 20 patients (95%) improved; 11 (55%) cases had one grade improvement, 7 (35%) by two grades and one (5%) by three grades, one case (5%) did not obtain any improvement. Shafiq,[10] showed no neurological improvement, while significant neurological improvement was observed in this study group.

Complications

Overall, complications occurred in 6 (30%) cases, of which 2 were bedsores; Urinary tract infection occurred in 2 cases; One case had a superficial wound infection and one case of misplaced screws comparable to the study by Mohammad M Butt et al9 which recorded 50% complications.

CONCLUSION

Fractures and fractures of the dorsolumbar spine are the most common types of vertebral injuries to the spine. Road traffic accidents, which account for the highest proportion in developed countries, and falls from a height are the most common accidents in developing countries. Men are associated with it more often than women. The L1 vertebral level is the most common site of injury in this study. Unstable wedge compression fractures were the

most common fractures in the study, causing deformity and neurological compromise. Neurological improvement was found to be moderate enough for incomplete neurological injury. Pedicle screw fixation is a useful option for achieving reduction and stabilizing both anterior and posterior column injuries, does not require anterior decompression, does not affect additional motion segments, and has been technically feasible for effective movement and stabilization of fractured vertebrae. Short segmental fixation using a posterior approach with pedicle-screw-rod fixation devices with or without bone grafting achieves good stabilization and adequate neurologic recovery in patients with unstable dorsolumbar fractures.

The advantages of surgical treatment of spinal cord injuries with pedicle screws and rod fixation systems include shorter hospital stays, more complete rehabilitation, minimal complications due to early mobilization, and reduced morbidity and mortality. Thus, posterior screw fixation helps in early mobilization of patients with unstable thoracolumbar vertebral fractures and also facilitates better neurological recovery.

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