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ORIGINAL ARTICLE

Outcome of Spine Fixation for Unstable Fractures at Dorslumbar Junction Including Fractured Vertebrae in Pedicular Screw Fixation

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ASBTRACT

Objective: In the present study, the researchers want to establish the outcome of spine fixation for unstable fractures at the dorsolumbar junction, including fractured vertebrae, while using pedicular screw fixation techniques.
Study Design: Prospective study
Place and Duration: The study was conducted at Orthopaedics Department, Hayatabad Medical Complex, Peshawar and Neurosurgery Department, Frontier Medical and Dental College, Abbottabad for the duration of six months from May 2021 to October 2021.
Methods: There were hundred and nineteen patients of both genders had unstable fracture at dorslumbar junction. Patients were aged between 20-55 years. Transpedicular screws were used to secure the fractured vertebra. Both radiographic and clinical assessments of back pain and impairment were conducted using the Visual Analogue Scale (VAS) and the Oswestry Disability Index (ODI) to evaluate patients (ODI). Before surgery, shortly after surgery, and eight months afterwards, all of these data were assessed. SPSS 23.0 version was used to analyze complete data.
Results: Mean age of the patients was 33.5±5.42 years. 85 (71.4%) cases were males and 34 (28.6%) patients were females. Falling from the height was the most common reason found in 60 (50.4%) cases followed by road traffic accident 45 (37.8%) cases and 14 (11.8%) were others. L1 fractures were majority found in 67 (56.3%) cases followed by L2 in 40 (33.6%) cases. Post-operatively, we found significantly improvement in Cobb angle, anterior vertebral height, posterior vertebral height and sagittal index with p value <0.05. Oswestry disability index (ODI) was improved to 41.13±19.42% from 70.6±16.43%. Mean pain score (VAS) was reduced to 1.01±5.23. Post-operatively only 7 (5.9%) patients had complications.
Conclusion: Our patients who had transpedicular screw fixation, which included fixing the broken vertebrae, had outstanding radiological and clinical outcomes. Treatment of the fractured vertebra in transpedicular screw fixation of dorsolumbar spine fractures is, thus, highly recommended.
Keywords: Dorsolumbar Junction, Transpedicular screw fixation, Outcomes, VAS

INTRODUCTION

Spinal joints are maintained by a network of strong muscles and tendons that connect the vertebrae to each other and to the intervertebral disc (IV). Structural stability of the spine relies on all four of these components: bony, cartilaginous, ligamentous, and muscular. [1] The spine's three primary tasks are safeguarding the spinal cord and spinal nerves, carrying the body's weight, and serving as a flexible axis for head and trunk motions. It is possible to move the vertebral column in four directions: forward, backward, and in a side-to-side motion. However, the extent to which the spine is able to migrate differs from location to region. The cervical, thoracic, lumbar, and sacro-coccygeal spines all have four curves. [2] The fulcrum of increased motion occurs at the dorsolumbar junction, causing the vertebral body to collapse with associated kyphotic deformity on many occasions. The patient may suffer from a neurological deficiency as a result of the spinal collapse that occurred. [3] As defined by the American Fracture Society, an unstable fracture is any two-column injury that fails, including the middle column, which accounts for 25 percent to 50 percent of all fractures in this region. It is extremely common in younger patients, and it has the potential to have a major impact on their daily physical activity levels. For example, fracture type, origin of injury, neurodeficiency, and posterior ligamentous complex (PLC) damage are all classification systems that may be used to fractures and other injuries. All three of these imaging methods are used to identify the amount of bone damage, although X-rays are the main tool for detecting the extent of soft tissue and spinal cord injuries. All three of these imaging techniques are used to evaluate the extent of bone damage. [5]The American Spinal Injury Association (ASIA) technique is used to evaluate neurological function, and the ASIA Impairment scale is used to grade the results. Testing for both full and partial neurological deficiency should be done as part of any standard procedure, including measurements of anal and sphincter autonomic feeling and contraction. [6]

Surgery for spinal fusion allows patients to become mobile sooner, complete rehabilitation treatments and overcome anatomic fractures while improving their nervous system's function in the majority of situations.[7,8]

The use of hooks and Harrington rods for thoracolumbar spine fracture posterior repair has improved dramatically in the previous two decades.. Furthermore, pedicle screw fixation has transformed spine procedures across the globe. Pedicle screw fixation [9] It is the most frequent and straightforward therapy. An benefit is that there are less motion segments to fuse together. [10,11] In terms of biomechanical benefits, posterior fixation incorporating the fractured vertebra (PFFV) is superior to traditional short-segment fixation. Inserting screws at the fracture level will make it biomechanically stronger, reducing the likelihood of a subsequent anterior reconstruction being necessary. For short segment fixation, studies have indicated that the fracture level should be taken into account.[12]

For the purpose of this research, radiological and clinical outcomes of transpedicular screw repair of spine fractures, including the broken vertebra, were evaluated.

MATERIAL AND METHODS

This prospective study was conducted at Orthopaedic Department of Hayatabad Medical Complex, Peshawar and Neurosurgery Department of Frontier Medical and Dental College, Abbottabad for the duration of six months from May 2021 to October 2021. A total of 119 patients with ages 20 to 55 years were included in the study. After obtaining written agreement, demographic information of the enrolled patients was compiled. Osteoporotic spine fractures and patients needing rapid fixation of additional long bones or other surgical treatments were not included in this research.

Transpedicular screws and rods were used to stabilize all of the patients who had unstable dorsolumbar fractures. In order to incorporate broken vertebrae in the fixation, we inserted transpedicular screws in the fractured vertebrae. Clinical and radiological examinations were performed on all of the patients. Prior and posterior vertebral heights, Cobb angle, and Sagittal index were measured radiographically, while back pain was measured using the Visual Analogue Scale (VAS) and disability was measured using the Oswestry Disability Index (ODI) clinically (ODI). These parameters were assessed before surgery, shortly after surgery, and again at 8 months following surgery. The SPSS programme version 23 was used to analyse the data.

RESULTS

Mean age of the patients was 33.5±5.42 years. 85 (71.4%) cases were males and 34 (28.6%) patients were females. Falling from the height was the most common reason found in 60 (50.4%) cases followed by road traffic accident 45 (37.8%) cases and 14 (11.8%) were others.(table 1)

Table 1: Detailed demographics of included patients

Variable	Frequency	Percentage
Mean Age (years)	33.5±5.42	
Sex		
Male	85	71.4
Female	34	28.6
Causes		
Fall	60	50.4
RTA	45	37.8
Others	14	11.8

L1 fractures were majority found in 67 (56.3%) cases followed by L2 in 40 (33.6%) and 12 (10.1%) patients had Th 12 fractures.(fig 1)

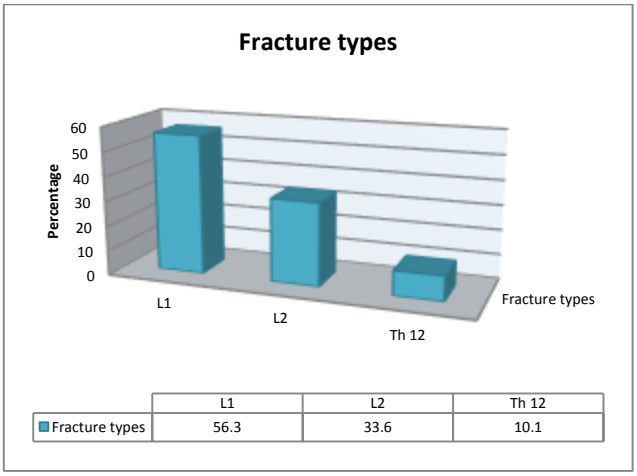

Figure 1: Types of fracture among included cases

Post-operatively, we found significantly improvement in Cobb angle, anterior vertebral height, posterior vertebral height and sagittal index with p value <0.05.(table 2)

Table 2: Post-operatively outcomes among enrolled cases

Outcomes	Before Surgery	After Surgery
Cobb angle	8.19±4.29	3.12±0.21
anterior vertebral height	18.13±7.12	27.8±3.44
posterior vertebral height	25.24±6.143	38.15±8.55
sagittal index	19.32°	7.04°

Oswestry disability index (ODI) was improved to 41.13±19.42% from 70.6±16.43%. Mean pain score (VAS) was reduced to 1.01±5.23 with p value <0.05.(table 3)

Table 3: Comparison of ODI and pain score before and after surgery

Outcomes	Before Surgery	After Surgery	P value
ODI	70.6±16.43	41.13±19.42	<0.04
VAS score	8.01±7.45	1.01±5.23	<0.03

Post-operatively only 7 (5.9%) patients had complications.(table 4)

Table 4: Association of complications among enrolled cases

Variable	Frequency	Percentage
Complications		
Yes	7	5.9
No	112	94.1
Types of complications		
Dural Tear	3	2.5
Metal Failure	2	1.7
Wound Infection	2	1.7

DISCUSSION

Decompression of neural components, avoidance of late neurological damage in unstable fractures, and early mobilisation are all reasons for surgical intervention in thoracolumbar unstable fractures. [13] A patient's quality of life may be significantly impacted by neurologic sequelae and kyphotic deformities caused by thoracolumbar/lumbar spine burst fractures [14]. When it comes to dealing with unstable thoracolumbar/lumbar burst fractures and those with present or probable nerve handicaps, the majority of clinicians agree that surgery is necessary. Acute spinal instability and final failure of the damaged segment are the end consequences of spinal segments that have lost more than 50% of their vertebral body height or have an angulation deformity of more than 25° in biomechanical and clinical investigations [15].

In this prospective study 119 patients were included. Mean age of the patients was 33.5±5.42 years. 85 (71.4%) cases were males and 34 (28.6%) patients were females. Falling from the height was the most common reason found in 60 (50.4%) cases followed by road traffic accident 45 (37.8%) cases and 14 (11.8%) were others. These findings were comparable to the previous studies.[16,17] L1 fractures were majority found in 67 (56.3%) cases followed by L2 in 40 (33.6%) and 12 (10.1%) patients had Th 12 fractures.[16] When broken vertebrae are included into the implant assembly, no implant failure or 10° corrective loss occurs. For thoracolumbar fractures with mild to moderate instability, unilateral pedicle screw fixation via the pedicle of the fractured vertebra coupled with the short segment of pedicle screw is successful. [18]

Post-operatively, we found significantly improvement in Cobb angle, anterior vertebral height, posterior vertebral height and sagittal index with p value <0.05. Oswestry disability index (ODI) was improved to 41.13±19.42% from 70.6±16.43%. Mean pain score (VAS) was reduced to 1.01±5.23 with p value <0.05.[19] In a recent research, averages for anterior and posterior vertebral height were 0.60.1 before and after surgery and 0.90.2 after the procedure was completed, respectively. This indicated considerable post-operative improvement and was sustained after the procedure was completed. [20] The mean pre-operative kyphosis angle in another research was 22.9°–7.6°. After surgery, the temperature dropped to a much more manageable 9.2°6.6°. [21] At the beginning of our research, the mean Cobb angle was 7.354.57, but at the end of the study, it had decreased to 2.181.71. According to Sapkas et al.[22], long segment stability was linked to improved outcomes in the long term follow up. In terms of patient satisfaction, roughly (80%) of patients treated with long segment had minor impairment, but only about 45% of patients treated with short segment had minimum disability.

In our experience, patients who had transpedicular screw fixation with their damaged vertebrae have had exceptional radiological and clinical results. Increased biomechanical stability was achieved by including an extra pedicle for fixing, which resulted in a reduction in the length of the fixation segment while also correcting abnormalities. As a result, we strongly recommend

that the fractured vertebra be fixed when transpedicular screw repair of dorso-lumbar spine fractures is performed.

CONCLUSION

Our patients who had transpedicular screw fixation, which included fixing the broken vertebrae, had outstanding radiological and clinical outcomes. Treatment of the fractured vertebra in transpedicular screw fixation of dorsolumbar spine fractures is, thus, highly recommended.

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