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ORIGINAL ARTICLE

Outcome of Spine Fixation for Unstable Fractures at Dorsolumbar Junction including Fractured Vertebrae in Pedicular Screw Fixation

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ABSTRACT

Background: The most serious injury that may change a person's life is a spinal cord injury that results in loss of neurological function. Many people in Pakistan suffer from spinal injuries every year. Although research on spinal injuries has been published in Pakistan, it is still unclear how often spinal injuries are there.

Objective: To assess the radiological and clinical outcomes of transpedicular screw fixation for fractures of the spine, including vertebral fractures

Methodology: This prospective research carried out by the Department of Orthopaedics and Spine Surgery**,** PIMS, Islamabad and Health Net Hospital Phase 5, Hayatabad Peshawar between November 2022 and April, 2023. This research comprised 130 individuals with single-level fractures ranging from D11 to L2. In every patient, a dorso-lumbar MRI and a full spine X-ray were performed. Clinical criteria included back pain measured by the Visual Analogue Score (VAS) and disability measured by the Oswestry Disability Index (ODI). Version 23 of the SPSS software was used to analyze the data.

Results: A total of 130 patients were included in this study. The mean age (SD) of the enrolled patients was 32.8 (±2.11) years. There were 97 (74.62%) males patients while the female patients were 33 (25.38%). A statistical significant improvement was observed post-operatively in posterior vertebral height, anterior vertebral height, Cobb angle and sagittal index. ($p<0.05$). Statistical significant improvement in Oswestry disability index (ODI) and reduction in VAS was observed in our study. ($p<0.05$). The post-operative complications were observed in only 12 (9.24%) Patients.

Conclusion: Excellent radiological and clinical results were obtained in our investigation using transpedicular screw fixation that included the fractured vertebrae. By providing an additional pedicle for fixation, it shortened the fixation segment and enhanced biomechanical stability while also aiding in reduction and repair of deformities. Therefore, in the case of dorso-lumbar spine fractures, we highly advise transpedicular screw stabilization of the fractured vertebra.

Keywords: Spine fixation; Unstable fractures; Dorsolumbar junction.

INTRODUCTION

The most serious injury that may change a person's life is a spinal cord injury that results in a loss of neurological function[1-3]. The annual rate of spinal cord injuries in the United States is 30 cases/ million individuals, or 8,000 new cases annually[4-6]. Many people in Pakistan suffer spinal injuries every year[7]. Although research on spinal injuries has been published in Pakistan, it is still unclear how common spinal injuries are there[8–10]. According to Denis's Three Column Concept[11] two or three column fractures are considered unstable vertebral burst fractures, and any vertebral fracture that results in > 50% loss of vertebral height, > 20 degrees of angulation, or >50% spinal canal compromise requires surgery[12]. For the usual management of fracture dislocation or unstable burst fractures, a consistent agreement has not yet been established[13]. Surgical spine fixation may help patients overcome anatomic fractures, execute rehabilitative therapies, become mobile sooner, and, in most situations, enhance nerve functioning via decompression and fixation[14,15]. The previous several decades have seen significant advancements in the posterior fixation of thoraco-lumbar spine fractures using various techniques, such as hooks and Harrington rods. Additionally, pedicle screw fixation has transformed spinal procedures globally[16]. The most popular simple therapy is short-segment posterior fixation. One benefit is that it allows the function to include fewer motion segments[17,18]. The posterior fixation, which includes the fractured vertebra (PFFV), has biomechanical benefits over conventional short-segment fixation. Screwing it in at the level of fracture will make it biomechanically stronger, perhaps eliminating the need for more anterior repair. According to studies, the fracture level is taken into account when fixing short segments[19,20]. The purpose of this research was to assess the radiological and clinical outcomes of transpedicular screw fixation for fractures of the spine, including vertebral fractures.

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METHODOLOGY

This prospective research carried out by the Department of Orthopaedics and Spine Surgery, PIMS Islamabad and Health Net Hospital Phase 5, Hayatabad, Peshawar between November 2022 and April, 2023. The ethical review board of hospital gave its approval to the research plan. The patients gave their signed, informed permission. This research comprised 130 individuals with single-level fractures ranging from D11 to L2. Every patient underwent a thorough history and physical examination. In every patient, a dorso-lumbar MRI and a full spine X-ray were performed. The study excluded patients with polytraumatic injuries who required quick fixation of extra long bones or other surgical operations, nor were those with pathological or osteoporotic spine fractures. Transpedicular rods and screws were used to treat all patients with unstable dorsolumbar fractures from the posterior. By inserting transpedicular screws into broken vertebrae, we were able to incorporate them in the fixation. All the patients underwent radiological and clinical assessments. Clinical criteria included back pain measured by the Visual Analogue Score (VAS) and disability measured by the Oswestry Disability Index (ODI). Radiological measures included the anterior and posterior vertebral heights, Cobb angle, and sagittal index. Prior to surgery, just after surgery, and six months following surgery, all of these parameters were assessed. Version 23 of the SPSS software was used to analyze the data.

RESULTS

A total of 130 patients were included in this study. The mean age (SD) of the enrolled patients was 32.8 (±2.11) years. There were 97 (74.62%) males patients while the female patients were 33 (25.38%). (Figure 1) Based on the causes of fractures, the most common cause was falling from the height observed in 71 (54.62%) cases followed by road traffic accident in 55 (42.31%) cases and 4 (3.08%) were others.(Figure 2) Based on the type of fracture, the most common fracture was L1 observed in 75

(57.69%) cases followed by L2 in 46 (35.38%) and 9 (6.92%) patients had Th 12 fractures.(figure 3) A statistical significant improvement was observed post-operatively in posterior vertebral height, anterior vertebral height, Cobb angle and sagittal index. ($p<0.05$).(table 1) Statistical significant improvement in Oswestry disability index (ODI) and reduction in VAS was observed in our study. ($p<0.05$.(table 2) The post-operative complications were observed in only 12 (9.24%) Patients.(Figure 4) Bases on types of complications, Dural Tear was observed in 6 patients while Metal Failure and Wound Infection was observed in 3 patients. (Figure 5)

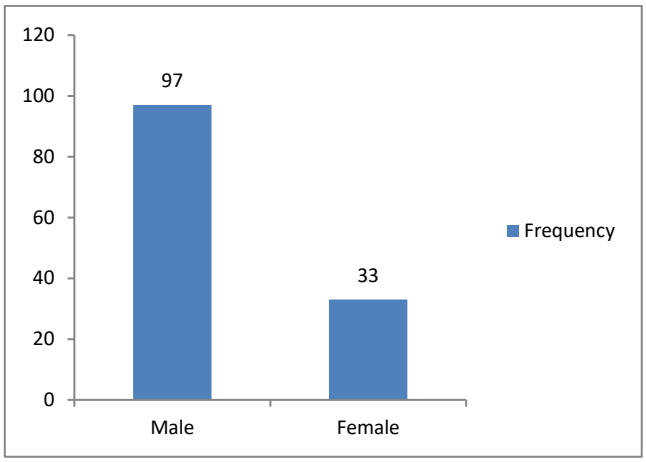

Figure 1: Gender wise distribution of patients

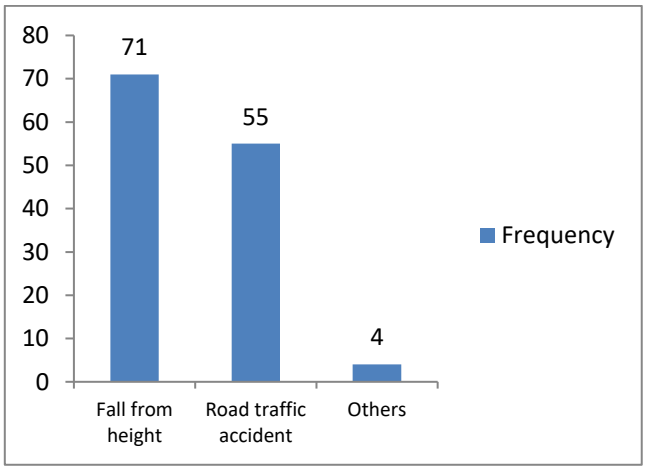

Figure 2: Distribution of patients based on causes of fracture

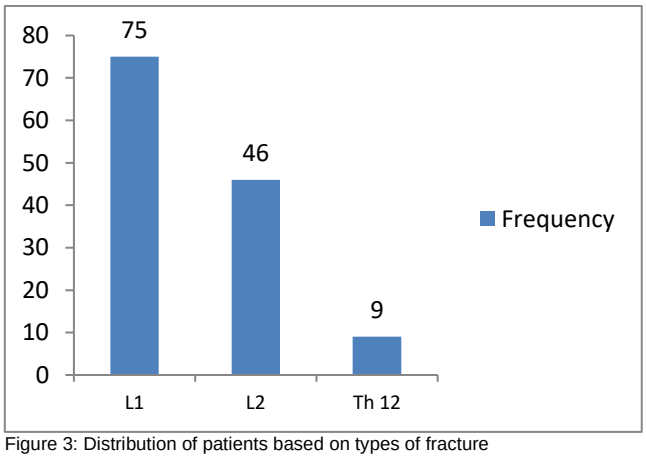

Figure 3: Distribution of patients based on types of fracture

Table 1: Post-operative outcomes in our patients

Parameter	Pre-operative	Post-operative	p
Cobb angle	9.11±2.21	3.36±0.09	0.001
anterior vertebral height	17.99±3.34	26.11±2.21	
posterior vertebral height	26.01±3.11	37.99±5.31	
sagittal index	18.33°	7.23°	

Table 2: Pre-operative and post-operative ODI and pain score

Parameter	Pre-operative	Post-operative	p
Oswestry disability index (ODI	72.01±11.76%.	42.21±16.55%	0.001
pain score (VAS)	8.23±4.11	1.12±4.09	0.001

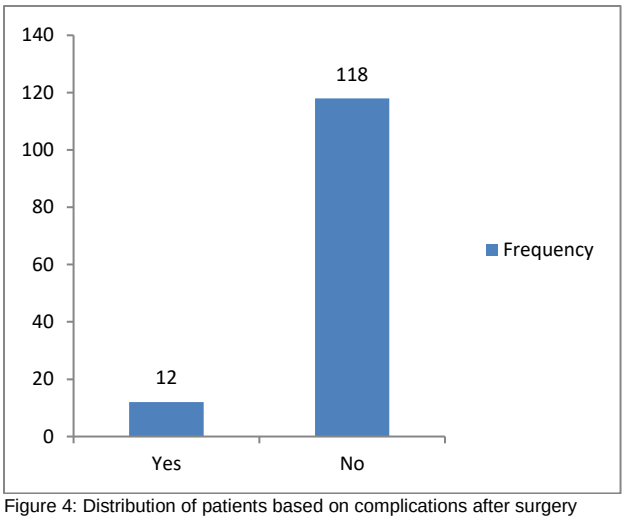

Figure 4: Distribution of patients based on complications after surgery

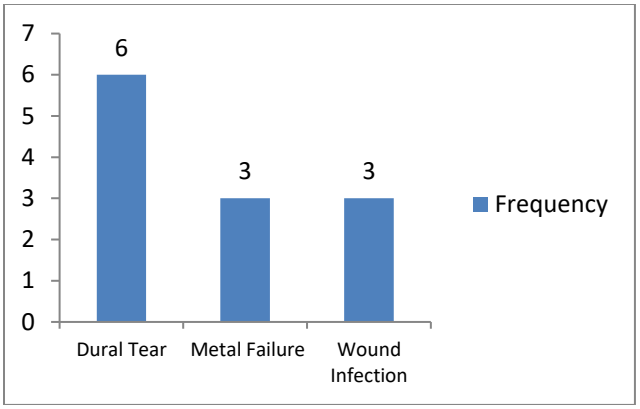

Figure 4: Distribution of patients based on types of complications

DISCUSSION

In thoracolumbar unstable fractures, surgical intervention is justified for the decompression of neural components, early mobilization, and prevention of late neurological damage (21). The kyphotic deformities and neurologic consequences resulting from thoracolumbar/lumbar spine burst fractures may have a substantial influence on a patient's quality of life (22). Most physicians believe that surgery is required to treat patients with unstable thoracolumbar/lumbar burst fractures and those who have current or likely nerve impairments. According to biomechanical and clinical studies, spinal segments that have lost >50% of their vertebral body height or have an angulation deformity of > 25° ultimately result in acute spinal instability and eventual collapse of the injured segment (23). In our study, a total of 130 patients were included in this study. The mean age (SD) of the enrolled patients was 32.8 (±2.11) years. There were 97 (74.62%) males patients while the female patients were 33 (25.38%). (Figure 1) Based on the causes of fractures, the most common cause was falling from the height observed in 71 (54.62%) cases followed by

road traffic accident in 55 (42.31%) cases and 4 (3.08%) were others. Based on the type of fracture, the most common fracture was L1 observed in 75 (57.69%) cases followed by L2 in 46 (35.38%) and 9 (6.92%) patients had Th 12 fractures. These results were similar to those of the earlier research (24, 25). The majority of cases (67, 56.3%) had L1 fractures, followed by L2 fractures in 40, 33.6%, and Th 12 fractures in 12 (10.1%) individuals (26). There is neither implant failure nor 10° corrective loss when fractured vertebrae are included into the implant assembly (27). In our study, A statistical significant improvement was observed post-operatively in posterior vertebral height, anterior vertebral height, Cobb angle and sagittal index. ($p<0.05$). Statistical significant improvement in ODI and reduction in VAS was observed in our study. ($p<0.05$). These results are consistent with a prior research that demonstrated a substantial improvement in sagittal index, anterior and posterior vertebral height, Cobb angle, and p-value <0.05. The ODI increased from 70.6±16.43% to 41.13±19.42%. The mean VAS decreased to 1.01±5.23 with a p-value of less than 0.05 (28). Prior to and during surgery, the average height of the front and posterior vertebrae was 0.60.1 and 0.90 (2), accordingly, according to a recent study. After the surgery completed, this showed significant post-operative improvement and sustained (29). In another investigation, the average pre-operative kyphosis angle ranged from 22.9° to 7.6°. The temperature decreased to a considerably more tolerable 9.2°6.6° (30) after surgery. The mean Cobb angle at the start of our study was 7.354.57, but at the conclusion of it, it had dropped to 2.181.71. Long segment stability was associated with better long-term follow-up results, in a study done by Sapkas et al. (30). According to patient satisfaction, only around 45% of patients managed with short segments had low disability, while about 80% of patients treated with lengthy segments had small impairment. We have seen remarkable radiological and clinical outcomes from individuals who had transpedicular screws used to treat their injured vertebrae. An additional pedicle for fixing was added to increase biomechanical stability, reducing the length of the fixation segment and correcting irregularities at the same time.

CONCLUSION

Excellent radiological and clinical results were obtained in our investigation using transpedicular screw fixation that included the fractured vertebrae. By providing an additional pedicle for fixation, it shortened the fixation segment and enhanced biomechanical stability while also aiding in reduction and repair of deformities. Therefore, in the case of dorso-lumbar spine fractures, we highly advise transpedicular screw stabilization of the fractured vertebra.

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