

Outcomes of Transpedicular Screws Fixation in the Management of Thoracolumbar Spine Injury

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Cite this paper as: Dr. Raziq Shah, Dr. Asghar Ali, Dr. Sanaullah Pathan, Dr. Aurangzeb Kalhoro, Dr. Assad Javed, Dr. Muhammd Anwar (2023) Outcomes of Transpedicular Screws Fixation in the Management of Thoracolumbar Spine Injury. Frontiers in Health Informa 4032-4048

ABSTRACT

Introduction

The frequency of injuries to the Thoracolumbar spine is rising daily in emerging nations. Fracture of Thoracolumbar spine are more prevalent in males compared to women, making them one of the most prominent injuries in the young, healthy population and the risk stage of life is 20-40 years of age. The thoracic and lumbosacral spine fractures are far more prevalent than cervical spine fractures.

Research questions

1. What are the postoperative outcomes of management of Thoracolumbar spine injury with transpedicular screws fixation?
2. What are the differences in outcomes at different follow up?

Objective

The aim of this study was to determine the Outcomes of transpedicular screws fixation in the management of thoracolumbar spine injury.

Material and Methods

This study was conducted at the Neurosurgery and Spine Unit Mardan Medical Complex from May 2022 to September 2023 after taking the approval from the ethical committee of the institute and written informed consent obtained from the participants. 62 patients with a history of an unstable thoracolumbar spine injury lasting one week visited the outpatient department were enrolled and their data was gathered via sequential sampling. Thoracolumbar fractures

were diagnosed using a plain radiograph and a CT scan of the spine. For transpedicular screw fixation, an image intensifier was employed one level below or one level above the fracture site. By using SPSS version 23, data was input and examined.

Results

A total of 62 patients participated in this study in which male were 79.65 % (n=50) and female were 19.35 % (n=12). The patients' average age was 32.30 ± 3.25 years. Implant types such as fixator interna and miami were operated in n = 31 (50%) and n = 31 (50%), respectively. In terms of trauma type, there are 62.3% (N=39) who fall from a height, 22.7 % (N=14) who are involved in a car accident, and 15% (N=9) others. The majority of patients (n=17) 28.3% were in the first lumbar vertebra. Preoperative Frankel categorization of neurological damage showed that n = 40 (64%) patients had full (A) neurological injury, n = 9 (14.5%) patients had sensory only (B) neurological injury, n = 4 (6.4%) patients had motor useless (C), n = 3 (4.8%) patients had motor helpful (D), and n = 6 (9.6%) patients had intact (E) neurological injury. The majority of patients, n = 29 (46.7%) had a preoperative Denis pain scale of p5. Regarding Frankel, there was a statistically significant difference between the preoperative and postoperative conditions at one month and three months.

Conclusion

our study evaluated that in young adults thoracolumbar spine injuries are most prevalent and for obtaining better recovery in traumatic thoracolumbar fractures and pain management Transpedicular screw fixation is useful and the best choice.

Keywords

Outcomes; transpedicular screws fixation; thoracolumbar spine injury

INTRODUCTION

The frequency of injuries to the thoracolumbar spine is rising daily in emerging nations. (1) Of all trauma cases, 3 to 6 % injuries occur in the spinal cord (2). These fractures and dislocations occur, with car crashes, gunshot wounds, and falls being the main causes (3). 20–40% of these fractures lead to neurological defects (4). Fracture of Thoracolumbar spine are more prevalent in males compared to women, making them one of the most prominent injuries in the young, healthy population and the risk stage of life is 20-40 years of age. The thoracic and lumbosacral spine fractures are far more prevalent than cervical spine fractures (5). The most often injured part of the axial skeleton is the thoracolumbar junction. The physical and structural junction between the more elastic lumbar spine and the more inflexible thoracic spine makes this area susceptible (6). This area frequently suffers from extremely unstable spinal fractures that leave a significant kyphotic deformity (7). There are several methods and approaches available to distinguish between thoracolumbar spine injuries; the Denis categorization scheme is the most often used (8). This categorization indicates that a fracture involving two or more columns will be designated as unstable, with further damage falling into one of six categories. (9) When paired with spinal cord injury, fractures of the spine provide a difficult medical, social, and cost-effective challenge. In the previous thirty years all nonsurgical treatments for spine fractures were employed but surgical stability was not obtained. There were other challenges associated with this kind of treatment, which included an extended time of the immobilization in a cast. (10) The best way to treat catastrophic lumbar and the thoracic spine fractures is still up for dispute. Fractures can be treated surgically or nonsurgical. Currently, surgery is one way to treat spinal column fractures; in most cases, surgery yields the best outcomes (11). It works well and is safe. Decompression and screw-based transpedicular fixation are two of the best surgical therapies (10) Many foreign research have examined the efficacy and success of transpedicular screw fixation; however, there is a dearth of reliable data in Pakistan. The current study was designed to find out the outcomes of

transpedicular screws fixation in the management of thoracolumbar spin injury

MATERIAL AND METHODS

This study was conducted at the Neurosurgery and Spine Unit Mardan Medical Complex in hospital from May 2022 to September 2023 after taking the approval from the ethical committee of the institute and written informed consent obtained from the participants. 62 patients with a history of an unstable thoracolumbar spine injury lasting one week visited at the Neurosurgery outpatient department were enrolled and their data was gathered via sequential sampling.

Inclusion criteria

The study included subjects of both genders with age limits of between twenty and fifty years, as well as those with traumatic unstable thoracolumbar spine dislocation and fracture.

Exclusion criteria

Patients with fractures that are open, pathologic thoracolumbar fractures, significant bone loss, or pressure sores have been excluded from the research project.

Thoracolumbar fractures were diagnosed using a plain radiograph and a CT scan of the spine. A medical history was obtained on the extent and kind of the injury. A physical examination was performed to determine the severity of discomfort and to examine the nervous system. A radiological examination was conducted for both CT and MRI scans. Spine immobilizers are used to immobilize people with injuries to their bodies. Following premedication and fluid delivery, the patient was moved into the operating room where they underwent general anesthesia. A posterior midline skin incision was made, and tissue dissection was carried out to expose the spinal column and demarcate the fractured vertebrae. For transpedicular screw fixation, an image intensifier was employed one level below or one level above the fracture site wound. The wound was closed, and a Boston Brace was used to apply external force.

In SPSS version 23, data was input and examined. Age, the length of the surgery, and the time elapsed between injury and presentations were among the quantitative variables which needed to be examined. The qualitative variables were wound infection, CSF leaking, nerve root damage, and pain management. To determine the association between the variables, the student T test and chi square test were used. Significant results were defined as the probability ratios that were equal or less than to 0.05.

RESULTS

A total of 62 patients participated in this study in which male were 79.65 % (n=50) and female were 19.35 % (n=12). The patients' average age was 32.30±3.25 years. Implant types such as fixator internae and moss miami were operated in n = 31 (50%) and n = 31 (50%), respectively. In terms of trauma type, there are 62.3% (N=39) who fall from a height, 22.7 % (N=14) who are involved in a car accident, and 15% (N=9) others. (Table I).

The majority of patients, or n=17 (28.3%), were in the first lumbar vertebra, with table II displaying various degrees of damage. Preoperative Frankel categorization of neurological damage showed that n = 40 (64%) patients had full (A) neurological injury, n = 9 (14.5%) patients had sensory only (B) neurological injury, n = 4 (6.4%) patients had motor useless (C), n = 3 (4.8%) patients had motor helpful (D), and n = 6 (9.6%) patients had intact (E) neurological injury. (Table III). The majority of patients, or n = 29 (46.7%), had a preoperative Denis pain scale of p5. (Tabel IV) Regarding Frankel, there was a statistically significant difference between the preoperative and postoperative conditions at one month and three months. In a comparable way, the Denis pain scale showed statistically significant differences between preoperative and postoperative, one- and three-month intervals.

Table no 1 Demographic, involvement of vertebra	
Variables	Presence
Age in years	32.30±3.25
Sex	
Male	N=50 (79.65%)
Female	N= 12 (19.35%)
Kind of inserts	
Fixator Internae	N=31 (50%)
Moss Miami	N =31(50%)
Traumas	
Drop from height	N= 39 (62.3%)
Traffic accident	N=14 (22.7%)
General	N= 9(15%)
Injury level	
Thoracic vertebra no 9	N= 4(6.4%)
10 th	N=4(6.4%)
11 th	N=5(8.0%)
12 th	N=13(20%)
Lumbar vertebra no 1	N= 17(27.4%)
2 nd	N= 8(12.9%)
2 nd	N= 8(12.9%)
3 rd	N= 5(8.0%)
4 th	N= 6(9.6%)

Table. II: Nerve involvement, Dennis score	
Frankel classification(Preoperative)	N (%)
COMPLETE (A)	40(64)
SENSORY (B)	9(14.5)
MOTER USELESS (C)	4 (6.4)
MOTER USEFUL (D)	3 (4.8)
INTACT (E)	6 (9.6)
Preoperative Denis pain scale	
P1	3(4.8)
P2	5(8)
P3	10(16)
P4	15(24)
P5	29(46.7)

Table-III: Frankle Scale			
Frankel Classification	Preoperative	Postoperative	Chi-square p-value
Complete (A)	40 (64%)	35 (56%)	0.000
Sensory only (B)	9 (14.5%)	17(27.4%)	
Motor useless (C)	4 (6.4%)	6(9.6%)	
Motor useful	3 (4.8%)	2(3.2%)	

(D)			
Intact (E)	6 (9.6%)	2 (3.2%)	
Frankel Classification	Preoperative	After one month	Chi-square p-value
Complete (A)	40 (64%)	27(43.5)	0.000
Sensory only (B)	9 (14.5%)	25(40)	
Motor useless (C)	4 (6.4%)	5(8)	
Motor useful (D)	3 (4.8%)	2(3.2)	
Intact (E)	6 (9.6%)	3(4.8)	
Frankel Classification	Preoperative	After three months	
Complete (A)	40 (64%)	19(30)	0.000
Sensory only (B)	9 (14.5%)	26(41.9)	
Motor useless (C)	4 (6.4%)	11(17.7)	
Motor useful (D)	3 (4.8%)	2(3.2)	
Intact (E)	6 (9.6%)	4(6.4)	

Table-IV: Post-operative outcomes

Denis pain Scale	Preoperative N (%)	Postoperative N(%)	Chi-square p-value
Complete (A)	3(4.8)	2(3.2)	0.000
Sensory only (B)	5(8)	25(40)	
Motor useless (C)	10(16.1)	13(20)	
Motor useful (D)	15(24)	17(27.4)	
Intact (E)	29(46)	5(8)	
Denis pain Scale	Preoperative N (%)	Postoperative N (%)	
Complete (A)	3(4.8)	34(54)	0.000
Motor useless (C)	10(16.1)	8(12)	
Motor useless (C)	15(24)	3(4.8)	
Intact (E)	29(46)	2(3.2)	
Denis pain Scale	Preoperative N (%)	Postoperative N (%)	Chi-square p-value
Complete (A)	3(4.8)	45(72.5)	0.000
Sensory only (B)	5(8)	9(14.5)	
Motor useless (C)	10(16.1)	3(4.8)	
Motor useless (C)	15(24)	4(6.4)	
Intact (E)	29(46)	1(1.6)	

DISCUSSION

In our study it was explored that the most common source of injury was fall from height. However, as documented by a study that the most frequent cause of thoracolumbar spine injuries in Western nations is motor vehicle crashes.(12) However a study conducted in Pakistan found that falls from heights are the leading cause for thoraco lumbar injuries. Our study found that falls from a height are the second-leading cause of thoraco lumbar spine injuries, both of which can be prevented by adopting preventative measures like wearing

helmets, reducing speed when driving, and following laws governing traffic.(13)

A previous study in India reported that the most common kind of fracture is to the first lumbar vertebrae which are situated in the transition zone of the thoracolumbar junction—between the hard thoracic spine and the flexible lumbar spine—are the cause of this fracture. This research is comparable to ours since we also discovered that the most frequent fracture in thoracolumbar spine injuries is to the first lumbar vertebrae. (14) As reference to pain management in thoracolumbar spinal trauma many pharmacological strategies and pharmaceuticals have been used in previous several years but surgical care of the fracture locations is the optimal alternative for overall pain control. A research was carried out on surgical care of traumatic lumbar and thoracic spine and proposed that surgical therapy of thoracolumbar vertebrae is the sole approach for pain control and observed a considerable decrease of pain following surgical therapy or intervention. (15) In a different research, it was evaluated that transpedicular screw fixation combined with surgical care of the thoracolumbar spine yields superior outcomes in terms of neurological recovery and pain management. Additional benefits of transpedicular screw fixation include early mobilization and instant stabilization of the fracture site.(16). Additionally, we carried out our investigation to assess the function of transpedicular screws in lumbar spine fractures of the thoraco lumbar spine fractures. Similar research was conducted and reported that pedicular fixation with screws is a safe and efficient way to treat injuries to the upper limb or spine. Before surgery, the mean degree of kyphosis in the patient's study was 27.04 ± 7.33 degrees, but at the last follow-up, it had improved to 15.96 ± 5.76 degrees. (17). the preferred course of therapy for the management of spine injury is pedicular screw or rod fixation, according to a different comparable research (18). It lessens kyphosis and enhances quality of life with the least amount of lifetime consequences. Using pedicular screws in posterior surgical instrumentation is a practical and successful method that needs to be used in contemporary spine injury treatment techniques as reported (19). Rehman R et al. Also documented comparable results in their treatment of thoracolumbar spine injuries treated with transpedicular screw fixation. All of these studies' treatment approaches and clinical conclusions were comparable to our own.(20)

CONCLUSION

The findings of our research explored that in young adults thoracolumbar spine injuries are most prevalent and for obtaining better recovery in traumatic thoracolumbar fractures and pain management Transpedicular screw fixation is useful and the best choice

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