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Outcomes of transpedicular screw fixation with unstable thoracolumber spine injury

Mahmood Ahmad[1], Irfan Anwar[2], Mian Muhammad Hanif[3], Kamran Siddiqui[4], Mazhar Choudhary[5], Majid Raza[6]

1. Consultant Orthopedic surgeon, NHM
2. Assistant professor Orthopedic surgeon, CMH Rawalpindi
3. Professor Orthopedic surgeon LGH Lahore
4. Professor Orthopedic surgeon NHM
5. Assistant professor Orthopedic surgeon NHM
6. Consultant Orthopedic surgeon NHM

Correspondence Address:
Mahmood Ahmad
mahmoodspinesurgeon@gmail.co

Mob #+923337622986

Abstract… Objective: to evaluate the role of transpedicular screw fixation of thoracolumber spinal injury in terms of postoperative pain control and neurological recovery. Study Design: Quasi experimental trial. Place and duration: Study was conducted in the department of orthopedic and spinal surgery in Nishter Hospital Multan. Study was completed in one year duration from August 2021 to August 2022. **Methodology:** Study was initiated after permission from hospital academic affairs committee and written informed consent was obtained from patients. Sixty patients presented at orthopedic outpatient department with history of one week of unstable thoraco lumbar spine injury. Main variables were age, duration of surgery, duration of injury, control of pain, CSF leakage, nerv rout damage and wound infection. **Results:** Statistically significant between preoperative and postoperative, after one moth and after three months with regards to Frankel classification of neurological injury**.** Similarly,the difference was statistically significant between preoperative and postoperative, after one moth and after three months with regards to Denis pain scale at follow-up. **Conclusion:** Thoracolumbar junction injuries are common in young adults and Transpedicular screw fixation is useful choice for good pain control and achieving better neurological recovery in traumatic thoracolumbar fractures**.**

Keywords: Thoracolumbar Spine injury, Transpedicular Screw, Orthopedic, Frankle scale,

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INTRODUCTION

The incidence of thoraco lumbar spine injury is increasing day by day in developing countries[1]. Dislocation and fractures of spine are fatal injuries mostly found in Indian people and most common causes are motor vehicle accidents, gunshot injuries and falls[2]. Many classification techniques and methods are available to differentiate the thoraco lumbar spine injuries, among them Denis classification is most popularand useful which paste on III column theory[3]. According to this classification if two or more columns are involved fracture will be labelled as unstable further injuries classified into six different types[4].

Two basic mechanisms were involved when neurological injury is suspected; one is compression and second is distraction. Another classification system was frankle classification[5]. Evaluation of thoraco lumbar spine injury radiographically can be made on anterio posterior and lateral graphs[6]. Computed tomography is helpful for evaluation of degree and pattern of canal compromise. If neurological deficiency was found magnetic resonance imaging is useful. Management of dislocation and unstable fractures of thoraco lumbar spine injury includes fixation with internal devices like anterior plates and screws and posteriorly Harrington and Luke instrumentation[7,8].

Early stability, better nursing care and proper pain control is necessary for the management of unstable spine fractures with internal fixation and stabilization[9]. Purpose of management of unstable spine is to restore the

normal function of spine with no pain and static protective recovery[10,11]. Three column fixations can be achieved with pedicle screw fixation necause it can passes through body of vertebrae easily. Success and effectiveness of transpedicular screw fixation was studied many international studies but in Pakistan very short data is available.

Methodology

This quasy experimental trial was conducted in the department of orthopedic and spinal surgery in Nishter Hospital Multan. Study was completed in one year duration from August 2021 to August 2022. Study was initiated after permission from hospital academic affairs committee and written informed consent was obtained from patients. Sixty patients presented at orthopedic outpatient department with history of one week of unstable thoraco lumbar spine injury. Non probability consecutive sampling was used for collection of data. Both genders with age limit of 20 to 50 years and traumatic unstable thoraco

lumbar spine dislocation and fracture were included in the study. Pathological thoraco lumber fractures,open fractures, unconscious patients, significant osteoporosis and pressure sore were excluded from the study. Radiograph and CT scan of the spine were used for diagnosis of thoraco lumber fractures. History was taken about duration and mode of injury. Physical examination was done for neurological assessment and level of pain. Radiological investigation for CT scan and MRI was done. Spine immobilizer we're applied for immobilization of injury sight. After pre medication and administration of the fluid, patient were shifted in Operation Theater for surgery under general anesthesia. Posterior mid line skin incision was given and tissue dissection was done for vertebral column exposure and demarcation of fracture vertebrae. Image intensifier was used for transpedicular screw fixation one level below or one level above the fracture sight wound was closed and external force was given with Boston Brace.

Data was entered and analyzed in SPSS version 23. Quantitative variables were to be analyzed included age, duration of surgery, duration of injury and qualitative variables to be analyzed included control of pain, CSF leakage, nerve rout damage and wound infection. Student T test and chi square test was applied to see the association of variables and probability values less than or equal to 0.05 recognized as significant.

Results

Sixty patients were included in this study, both genders. Gender distribution showed that there were more males than females i.e. n=48 (80%) and n=12 (20%), respectively. The mean age of the patients was 32.30±3.25 years. Types of implants i.e. fixator internae and moss miami was used in n=30 (50%) and n=30 (50%), respectively. Concerning mode of trauma, n=38 (63.3%) patients fall from height, n=13 (21.7%) road traffic accident and n=9 (15%) others. (Table. I).

Majority of the patients i.e. n=17 (28.3%) was 1st lumbar vertebra, while different level of injuries were shown in table II. Preoperative Frankel classification of neurological injury observed as complete (A) in n=39 (65%) patients, sensory only (B) in n=8 (13.3%) patients, motor useless (C) in n=4 (6.7%) patients, motor useful (D) in n=3 (5%) patients and intact (E)in n=6 (10%) patients. (Table. III). Most of the patients i.e. n=29 (48.3%) had p5 preoperative Denis pain scale. (Table. IV).

The difference was statistically significant between preoperative and postoperative, after one moth and after three months with regards to Frankel classification of neurological injury. (Table. V-VII). Similarly,the difference was statistically significant between preoperative and postoperative, after one moth and after three months with regards to Denis pain scale at follow-up.(Table. VIII-X).

Table. I: Demographic, involvement of vetebra

Variable	Presence
Age (years)	32.30±3.25
Gender	
Male	n=48 (80%)
Female	n=12 (20%)
Type of implants	
Fixator Internae	n=30 (50%)
Moss Miami	n=30 (50%)
Mode of trauma	
Fall from height	n=38 (63.3%)
Road traffic accident	n=13 (21.7%)
Others	n=9 (15%)
Level of injury	
9th Thoracic vertebra	n=3 (5%)
10th Thoracic vertebra	n=3 (5%)
11th Thoracic vertebra	n=5 (8.3%)
12th Thoracic vertebra	n=13 (21.7%)
1st Lumbar vertebra	n=17 (28.3%)
2nd Lumbar vertebra	n=8 (13.3%)
2nd Lumbar vertebra	n=8 (13.3%)
3rd Lumbar vertebra	n=5 (8.3%)
4th Lumbar vertebra	n=6 (10%)

Table. II: Neurological involvement, dennis score

Preoperative Frankel classification	n (%)
Complete (A)	n=39 (65%)
Sensory only (B)	n=8 (13.3%)
Motor useless (C)	n=4 (6.7%)
Motor useful (D)	n=3 (5%)
Intact (E)	n=6 (10%)
Preoperative Denis pain scale	
P1	n=2 (3.3%)
P2	n=4 (6.7%)
P3	n=10 (16.7%)
P4	n=15 (25%)
P5	n=29 (48.3%)

Discussion

Results of our study show that most common mode of injury was fall from height but in Western countries most common cause of thoraco lumbar spine injury is road traffic accident as reported by Pickett GE et al[12] in 2004 but in a Pakistani study conducted by Nadeem M et Al[13] reported the most common cause of thoraco lumber injury is fall from height according to our study is the second most common cause of thoraco lumbar spine injury which can be avoided taking precautionary measures like wearing helmets,limited vehicle speed and obeying the traffic rules.

Table-III: Frankle Scale

Frankel Classification	Preoperative	Postoperative	Chi-square p-value
Complete (A)	n=39 (65%)	n=34 (56.7%)	0.000
Sensory only (B)	n=8 (13.3%)	n=16 (26.7%)	
Motor useless (C)	n=4 (6.7%)	n=6 (10%)	
Motor useful (D)	n=3 (5%)	n=2 (3.3%)	
Intact (E)	n=6 (10%)	n=2 (3.3%)	
Frankel Classification	**Preoperative**	**After one month**	**Chi-square p-value**
Complete (A)	n=39 (65%)	n=26 (43.3%)	0.000
Sensory only (B)	n=8 (13.3%)	n=24 (40%)	
Motor useless (C)	n=4 (6.7%)	n=5 (8.3%)	
Motor useful (D)	n=3 (5%)	n=2 (3.3%)	
Intact (E)	n=6 (10%)	n=3 (5%)	
Frankel Classification	**Preoperative**	**After 3 months**	**Chi-square p-value**
Complete (A)	n=39 (65%)	n=18 (30%)	0.000
Sensory only (B)	n=8 (13.3%)	n=25 (41.7%)	
Motor useless (C)	n=4 (6.7%)	n=11 (18.3%)	
Motor useful (D)	n=3 (5%)	n=2 (3.3%)	
Intact (E)	n=6 (10%)	n=4 (6.7%)	

A study was conducted by **Sen D et al**[14] on indian population in 2005 and reported that first lumbar vertebrae is the most common fracture. The reason of this fracture is that first lumbar vertebrae located at the transition zone of thoraco lumber junction (between flexible lumbar spine and rigid thoracic spine). This study is identical to our study because in our study we also found 1st lumbar vertebrae are a most common fracture in injuries of thoracolumber spine.

As regard to pain control in thoracolumber spine injury many pharmacological techniques and drugs have been used in last few years but surgical management of the fracture sights is the ideal choice for the pain control. Verloan JJ et al[15] conducted a study in 2004 on surgical management of traumatic lumber and thoracic spine and recommended that surgical management of thoracolumber vertebrae is the only choice for pain control. In his study he reported a significant control of pain after surgical management or intervention.

Table-IV: Post operative outcomes

Denis pain Scale	Preoperative	Postoperative	Chi-square p-value
Complete (A)	n=2 (3.3%)	n=1 (1.7%)	0.000
Sensory only (B)	n=4 (6.7%)	n=24 (40%)	
Motor useless (C)	n=10 (16.7%)	n=13 (21.7%)	
Motor useful (D)	n=15 (25%)	n=17 (28.3%)	
Intact (E)	n=29 (48.3%)	n=5 (8.3%)	
Denis pain Scale	**Preoperative**	**Postoperative**	**Chi-square p-value**
Complete (A)	n=2 (3.3%)	n=33 (55%)	0.000
Sensory only (B)	n=4 (6.7%)	n=14 (23.3%)	
Motor useless (C)	n=10 (16.7%)	n=8 (13.3%)	
Motor useful (D)	n=15 (25%)	n=3 (5%)	
Intact (E)	n=29 (48.3%)	n=2 (3.3%)	
Denis pain Scale	**Preoperative**	**Postoperative**	**Chi-square p-value**
Complete (A)	n=2 (3.3%)	n=44 (73.3%)	0.000
Sensory only (B)	n=4 (6.7%)	n=8 (13.3%)	
Motor useless (C)	n=10 (16.7%)	n=3 (5%)	
Motor useful (D)	n=15 (25%)	n=4 (6.7%)	
Intact (E)	n=29 (48.3%)	n=1 (1.7%)	

Another study was conducted by Ahmed MS et al[16] and reported that surgical management of thoracolumber spine with transpedicular screw fixation is better results in terms of neurological recovery and pain control. Fixation with transpedicular screw also provides early mobilization and immediate stability of the fracture sight. We also conducted our study to evaluate the role of transpedicular screw in thoraco lumbar spine fractures.

A similar study was condycted by Ghasemi AA et al[17] and concluded that pedicular screw fixation is an effective and safe method for fixation of upper limb or thoracolumber spine injury. Mean degree of kaphosis in his study was

27.04 ± 7.33 before surgery but it improved to 15.96 ± 5.76 degrees at final follow up. Another similar study was conducted by Muralidhar BM et al[18] and reported that pedicular screw or rod fixation for management of thoracolumber spine is the treatment of choice. It reduces the kyphosis and improves the quality of life with minimum life time complications.

Singh R et al[19] also conducted a study on this topic kin 2014 and reported that pedicular screw in posterior surgical instrumentation is an effective and useful technique that should be adopted in modern treatment modalities of spine injuries. In another study Rehman R et al[20] also reported similar findings while treatment of transpedicular screw fixation of thoracolumber spine injury. Treatment modalities and clinical findings of these all studies were similar to our study.

Conclusion

Our results reveal that thoracolumbar junction injuries are common in young adults and Transpedicular screw fixation is useful choice for good pain control and achieving better neurological recovery in traumatic thoracolumbar fractures.

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