

Sensory Outcome after Transpedicular Screw Fixation for Burst Fractures of Thoracolumbar Fractures

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ABSTRACT

Background: Burst fractures of spine occur when vertebra are axially loaded resulting in reduced vertebral height & space. Modern concept favors surgery with expectation of early neurological recovery and early return to work. Orthopedic fractures are a common daily acute health issue. With the advancement of surgery, transpedicular screw fixation is observed to be effective in achieving success.

Objectives: The objective of this study is to determine the functional outcome of transpedicular screw fixation in patients with burst fractures of thoracolumbar region.

Place and Duration of Study: Department of Neurosurgery, Jinnah Hospital, Karachi within 6 months of period from December 2018 to May 2019.

Methods: It was a descriptive case series study conducted on patients admitted within one week of Burst fractures of thoracolumbar region. Informed consent was taken. Initial assessment and treatment were given in emergency department. Postoperatively patients were followed-up for assessment of pain using Denis pain scale and neurosensory function using ASIA on the 1st post-op day, 1st week, 2nd week, 4th week, 6th week, 3rd month and 6th month. No or mild pain and normal neurosensory function was labeled.

Results: The mean ages of the patients was noted as 32.26±14.86 years. The male patients were 74% whereas the female patients were 26%. The study results showed that 92% patients had no pain status whereas the only 8% patients had pain. The study results showed that 84% patients had normal sensation whereas the only 16% patients had abnormal sensations.

Conclusion: Thus it was proved through results of this study that transpedicular screw fixation for burst fracture for thoracolumbar region are effective in controlling pain and neurosensory function of patients.

Keywords: Burst fracture, Thoracolumbar region, Transpedicular screw fixation, Pain, Neurosensory function.

INTRODUCTION

Annual incidence of spinal fractures account for 63.3 per one hundred thousand population in the world.¹ Road traffic accidents and accidental falls stand out as the main causes of these type of debilitating fractures^{1,2,3}. Male population is more affected in such casualties⁴. Burst fractures account for 20% of all the spinal fractures encountered in the emergency department^{4,5}. They are more common in thoracolumbar region of spine.⁶ Burst fractures are associated with neurological damage to spinal cord in 30% of cases & pose surgical, social & economical issues to any nation^{1,2,6}.

Burst fractures of spine occur when vertebra are axially loaded resulting in reduced vertebral height & space³. It may damage the spinal cord causing variable neurological damage as fractured retro-pulsed fragments occupy spinal column area^{2,5,6}. Usually anterior & middle column fail so this is considered unstable type of spinal fracture.¹⁻³ Treatment of these fractures has been under the debate since long and controversies still exist among the surgeons, some preferring conservative while other would go for some sort of operative procedure^{5,7,8,9,10,11}.

Aim of the management is to prevent and neurological loss, obtaining canal decompression and

stabilize the spine thus enabling early return to normal life routine work and schedule^{6,9}. Disadvantage of the conservative treatment is persistent deformity, backache, deep venous thrombosis and bed sores and all those can be avoided if operative option is Selected.² Modern concept favors surgery with expectation of early neurological recovery and early return to work.³ It reduces hospital stay and expenses.¹² Surgical option has also advantage of obtaining early stabilization, decompression without using cumbersome casting and splinting^{3,7}.

Surgical treatment is recommended in patients with progressive worsening neurology, loss of vertebral height more than 50%, angulation >20 degree, canal compromise >50%^{3,9}. Spinal segment will fail if operative reduction is not performed in such conditions⁹. Some surgeons prefer anterior fixation while other opt for posterior Fixation & some recommend a combination of both procedures so controversies exist³. Though in the recent era many surgeons opt for posterior fixation because it is less expensive⁹. Posterior loss, less hospitalization and less morbidity as compared to anterior fixation with good efficacy^{1,2,9}. Posterior decompression & fixation with transpedicular screws has revolutionized the spine surgery⁷.

This treatment was first devised by Boucher. These screws control the three dimensional spinal motions and are stable constructs maintaining reduction until bony union is achieved.⁹ Screw fixation not only restore vertebral

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column but importantly better functional outcome.¹³ It became the popular choice in treating such fractures^{3,8}. Transpedicular screw fixation is a reasonable alternate to anterior decompression procedure as it provides mechanical stability to all spinal columns and satisfactory decompression coupled with good neurological improvement and usually patients do not require anterior decompression procedure^{7,14}.

Various studies conducted in the recent years around the world has shown that Functional outcome after managing burst fractures with transpedicular screws measured with Dennis Pain Scale is very satisfactory^{7,9}. Rationale of this study was to determine the success of transpedicular screw fixation in patients with burst fractures of thoracolumbar region. The goal of the treatment of unstable thoracolumbar injuries is optimizing neural decompression while providing stable internal fixation over the least number of spinal segments. Through this study I wanted to prove that transpedicular screw fixation is a suitable operative choice so that good treatment option can be offered to patients and it would help establish our practice guidelines. This would help to achieve more patients' satisfaction by reducing post-operative pain level which is common with other techniques and reduce the burden of surgeons and hospital.

MATERIAL & METHODS

In this study 100 patients were admitted in Neurosurgery Ward within 10-60 years of age in both sexes through outpatient and emergency departments of Jinnah Hospital, Karachi who fulfill the inclusion and exclusion criteria. Informed consent was taken. Patient demographic data was noted. After initial assessment and treatment in the emergency department, patients were shifted to general operation theatre. General anesthesia was employed. All surgeries were performed by a single surgical team. Postoperatively patients were admitted for five days, same antibiotics and analgesics was given to all patients for 1 week, drain was removed the second day, aggressive physiotherapy was done and patients were mobilized without brace in the second week. Patients were followed-up for assessment of pain using Denis pain scale and neurosensory function using ASIA on the 1st post-op day, 1st week, 2nd week, 4th week, 6th week, 3rd month and 6th month. No or mild pain and normal neurosensory function was labeled. No or mild pain after 6 months of procedure as by using Dennis pain scale. Normal Sensation was measured as presence of normal motor and sensory function as per (E in ASIA impairment scale) after 6months of procedure on American Spine Injury Association.

RESULTS

The mean age of patients was 32.26±14.86 years with minimum and maximum ages of 10 and 60 years respectively. In this study out of 100 patients, the male patients were 74% whereas the female patients were 26% (Table 1). The mean Dennis pain score at day 1 was noted as 4.88±0.43, the mean Dennis pain score was 3.04±1.02 at week 1, the mean Dennis pain score was 2.48±0.70 at week 2, similarly the pain score decreased gradually at week 4, week 6, Month 3 and Month 6 respectively. No

pain status of the patients (Table 2). The mean Neurosensory Function Status scale at day 1 was noted as 1.60±0.56, the mean NFS was 3.0±0.98 at week 1, the mean NFS was 3.48±1.14 at week 2, similarly the NFS increased gradually at week 4, week 6, Month 3 and Month 6 respectively. The study results showed that 84% patients appeared with normal sensation status whereas the only 16% patients appeared abnormal status (Table 3).

Table 1: Demographics of patients (n=100)

Age (Years)	32.26±14.86
Male	74
Female	26

Table 2: Pain assessment on Dennis pain scale (n=100)

Day 1	4.88±0.43
Week 1	3.04±1.02
Week 2	2.48±0.70
Week 4	1.92±0.74
Week 6	1.36±0.62
Month 3	1.2±0.56
Month 6	1.12±0.43
No Pain	92%
Pain present	8%

Table 3: Neurosensory Function Status (n=100)

Day 1	1.6±0.56
Week 1	3.0±0.98
Week 2	3.48±1.14
Week 4	3.96±0.96
Week 6	4.36±0.84
Month 3	4.56±0.80
Month 6	4.72±0.66
Normal sensation	84%
No sensation	16%

DISCUSSION

The treatment of thoracolumbar fractures remains controversial despite the advances in operative techniques, the increased knowledge of spine biomechanics and improvements in recovery of the central nervous system. The indications for operative and non-operative treatment of these fractures are even more confusing, especially when patients remain neurologically intact¹⁵. The popularization of pedicle screw fixation and the modern instrumentation systems which have been developed are advocated in the operative treatment of thoracolumbar fractures with anterior and posterior fusions¹⁶.

Transpedicular screw fixation is a useful choice for achieving better neurological recovery and good pain control in post-traumatic thoracolumbar fractures¹⁷. Our study results showed that most of the patients of thoracolumbar injuries were males as supported by Riaz-ur-Rehman et al study. In their study 55 were males and 25 were females. Thoracolumbar junction injuries are common in young and male patients¹⁷. Males were more than double of females in this study. This is because of the fact that males mainly constitute the working population in our society. So they are more prone to trauma than females. Similar findings were noted in previous studies as well¹⁸. In a study, normal neurosensory function was achieved in 100% cases with no or mild pain in 90.3% cases⁹. But in another study, 90% of patients showed no or

mild pain after management with transpedicular screws but normal neurosensory function was observed only in 12.5% cases⁴.

Helton et al, in his study found that 44% patients had no pain and 17% had moderate to severe pain according to Denis pain scale two years after surgery while in another study, 57.9% patients had no pain one year after surgery, 2.6% had moderate to severe pain, with occasional loss of work days and significant changes in daily activities¹⁹. In Riaz-ur-Rehman et al study, follow up time was 6 months and is significant pain control after surgery was noted. Seventy percent patients were completely pain free (P1), 6 months after surgery and no patient was in P5 (chronic pain medication) after 6 months follow up^{1,7}. Various studies conducted in the recent years around the world has shown that functional outcome after managing burst fractures with transpedicular screws measured with Dennis Pain Scale is very satisfactory^{7,8,9}. But our study also showed satisfactory results from Denis pain scale. In our study 92% patients appeared with no pain status at the end of the follow up. Many authors have reported that neurological recovery does not correlate with the treatment method or with the percentage spinal canal stenosis²⁰⁻²⁴.

On the other hand Bohlman, Denis and others are convinced that persisting compression of neural tissue should be operatively removed. They consider the level of improvement after operative decompression to be superior to the recovery reported after conservative treatment. According to them, the cord compression should be removed to enhance neurological recovery even in patients with a very low percentage spinal canal stenosis²⁴⁻²⁸. The present study showed that 84% patients appeared with normal sensation status at the end of the follow up, whereas the various studies showed different results regarding neurological improvement after spinal fixation. There were only 48 patients in Frankel grade A whereas at 6 months follow-up, there were only 16 patients in Frankel grade A. Many other national and international studies proved the benefits of spinal fixation regarding improvement in neurology status^{29,30,31}. In a study, normal neurosensory function was achieved in 100% cases with no or mild pain in 90.3% cases⁹. But in another study, 90% of patients showed no or mild pain after management with transpedicular screws but normal neurosensory function was observed only in 12.5% cases.⁴

CONCLUSION

Thus it was proved through results of this study that transpedicular screw fixation for burst fracture for thoracolumbar region are effective in controlling pain and neurosensory function of patients. Hence it was proved through this study that transpedicular screw fixation is a suitable operative choice so that good treatment option can be offered to patients.

REFERENCES

1. Oprel PP, Tuinebreijer WE, Patka P, den Hartog D. Combined anterior-posterior surgery versus posterior surgery for thoracolumbar burst fractures: a systematic review of the literature. *Open Orthop J* 2010;4:93-100.

2. M ilenković S, Saveski J, Trajkovska N, Vidić G, Radenković M. Transpedicular Screw Fixation of Thoracolumbar Spine Fractures. *Scientific J Faculty Med* 2010;27(2):63-8.
3. Liao JC, Fan KF, Chen WJ, Chen LH, Kao HK. Transpedicular bone grafting following short-segment posterior instrumentation for acute thoracolumbar burst fracture. *Orthopedics* 2009;32(7):493.
4. Riaz ur R, Azmatullah, Azam F, Mushtaq, Shah M. Treatment of traumatic unstable thoracolumbar junction fractures with transpedicular screw fixation. *J Pak Med Assoc* 2011;61(10):1005-8.
5. Defino HL, Canto FR. Low thoracic and lumbar burst fractures: radiographic and functional outcomes. *Eur Spine J* 2007;16(11):1934-43.
6. Rajasekaran S. Thoracolumbar burst fractures without neurological deficit: the role for conservative treatment. *Eur Spine J* 2010;19 Suppl 1:S40-7.
7. Khan I, Nadeem M, Rabbani ZH. Thoracolumbar junction injuries and their management with pedicle screws. *J Ayub Med Coll Abbottabad* 2007;19(4):7-10.
8. Liao JC, Fan KF, Chen WJ, Chen LH. Posterior instrumentation with transpedicular calcium sulphate graft for thoracolumbar burst fracture. *Int Orthop* 2009;33(6):1669-75.
9. Modi HN, Chung KJ, Seo IW, Yoon HS, Hwang JH, Kim HK, et al. Two levels above and one level below pedicle screw fixation for the treatment of unstable thoracolumbar fracture with partial or intact neurology. *J Orthop Surg Res* 2009;4:28.
10. Altay M, Ozkurt B, Aktekin CN, Ozturk AM, Dogan O, Tabak AY. Treatment of unstable thoracolumbar junction burst fractures with short- or long-segment posterior fixation in magerl type a fractures. *Eur Spine J* 2007;16(8):1145-55.
11. Wahba GM, Bhatia N, Bui CN, Lee KH, Lee TQ. Biomechanical evaluation of short-segment posterior instrumentation with and without crosslinks in a human cadaveric unstable thoracolumbar burst fracture model. *Spine (Phila Pa 1976)* 2010;35(3):278-85.
12. Fuentes S, Blondel B, Metellus P, Gaudart J, Adetchessi T, Dufour H. Percutaneous kyphoplasty and pedicle screw fixation for the management of thoraco-lumbar burst fractures. *Eur Spine J* 2010;19(8):1281-7.
13. Yang H, Shi JH, Ebraheim M, Liu X, Konrad J, Husain I, et al. Outcome of thoracolumbar burst fractures treated with indirect reduction and fixation without fusion. *Eur Spine J* 2011;20(3):380-6.
14. Mavrogenis A, Tsibidakis H, Papagelopoulos P, Antonopoulos D, Papathanasiou J, Korres D. Posterior transpedicular decompression for thoracolumbar burst fractures. *Folia Med (Plovdiv)* 2010;52(4):39-47.
15. Davies W, Morris JH, Hill V. An analysis of conservative (non-surgical) management of thoracolumbar fractures and fracture-dislocations with neural damage. *J Bone & Joint Surg* 1980;62(8):1324-8.
16. Kaneda K, Abumi K, Fujiya M. Burst fractures with neurologic deficits of the thoracolumbar-lumbar spine results of anterior decompression and stabilization with anterior instrumentation. *Spine* 1984;9(8):788-95.
17. Riaz-ur-Rehman A, Azam F, Mushtaq SM. Treatment of traumatic unstable thoracolumbar junction fractures with transpedicular screw fixation. *J Pak Med Assoc* 2011;61:1005-8.
18. Khan AA, Khanzada K, Ayub S, Ali M. Surgical outcome of transpedicular fixation in thoracolumbar fractures. *JAMC* 2008;20:104-7.
19. Helton LA, Defino Fabiano RTC. Low thoracic and lumbar burst fractures. Radiographic and functional outcomes *Eur Spine J* 2007;16:1934-43.
20. Boerger T, Dickson R. Does 'canal clearance' affect neurological outcome after thoraco-lumbar burst fractures? *J Bone & Joint Surg, Br.* 2000;82(5):629-35.

21. Herndon WA, Galloway D. Neurologic return versus cross-sectional canal area incomplete thoracolumbar spinal cord injuries. *J Trauma-Injury, Infection & Critical Care* 1988;28(5):680-3.
22. Kilcoyne R, Mack L, King H, Ratcliffe S, Loop J. Thoracolumbar spine injuries associated with vertical plunges: reappraisal with computed tomography. *Radiology* 1983;146(1):137-40.
23. Osebold WR, Weinstein SL, Sprague BL. Thoracolumbar spine fractures: results of treatment. *Spine* 1981;6(1):13-34.
24. Willen J, Lindahl S, Nordwall A. Unstable Thoracolumbar Fractures A Comparative Clinical Study of Conservative Treatment and Harrington Instrumentation. *Spine* 1985;10(2):111-22.
25. de Klerk LW, Fontijne WPJ, Stijnen T, Braakman R, Tanghe HL, van Linge B. Spontaneous remodeling of the spinal canal after conservative management of thoracolumbar burst fractures. *Spine* 1998;23(9):1057-60.
26. Denis F. The three column spine and its significance in the classification of acute thoracolumbar spinal injuries. *Spine* 1983;8(8):817-31.
27. Dickson JH, Harrington P, Erwin W. Results of reduction and stabilization of the severely fractured thoracic and lumbar spine. *J Bone & Joint Surg* 1978;60(6):799-805.
28. Klerk L. Burst fractures of the thoracic and lumbar spine: Operative versus Conservative treatment: Erasmus MC: University Medical Center Rotterdam; 1994. Javed S, Mahmood A, Akram R, Ahmad M, Aziz A. Functional outcome of transepedicular screw fixation in patients with unstable Thoracolumbar junction injuries. *JPOA* 2010;22:7-13.
29. Khan I, Nadeem M, Rabbani ZH. Thoracolumbar junction injuries and their management with pedicle screws. *JAMC* 2007;19:7-10.
30. Olumide AD, Christopher IS, John AJ. Surgical approaches for the correction of unstable thoracolumbar burst fractures: a retrospective analysis of treatment outcomes. *Neurosurgery* 1995;83:977-83.