Saudi Journal of Medicine (SJM)
Scholars Middle East Publishers
Dubai, United Arab Emirates
Website: www.saudijournals.com

ISSN 2518-3389 (Print)
ISSN 2518-3397 (Online)

A Comparative Study of Thoracolumbar Spine Fractures Treated by Conservative Management versus Pedicle Screw Fixation

Dr. Dodda Prasad Reddy[1], Dr. Kovvuru Kranthi Kiran[2*]
[1]Assistant Professor, Department of Orthopedics, Kakatiya Medical College and MGM Hospital, Warangal, Telangana, India
[2]PG Department of Orthopedics, Kakatiya Medical College and MGM Hospital, Warangal, Telangana, India

***Corresponding author**
Dr. Kovvuru Kranthi Kiran

Article History
Received: 02.12.2018
Accepted: 09.12.2018
Published: 30.12.2018

DOI:
10.36348/sjm.2018.v03i12.002

Abstract: Spinal trauma is very common in orthopedic practice. There is a debate as to whether the surgical or conservative approach is more effective in the treatment of spine fractures. We in the present study tried to evaluate the outcomes of patients with spinal fractures treated with the conservative treatment and surgical treatment and overall outcome of treatment in the patients. Methods: In this prospective cross-sectional study conducted in the Department of orthopedics, MGM hospital attached to Kakatiya Medical College. A total of 30 patients were included in the study of which (n=15) patients were treated with conservative treatment based on the presentation of fractures and similarly (n=15) were taken for operative treatment depending on the type of fractures. A Detailed history of the injury was obtained they were clinically and radiologically evaluated for the thoracolumbar fracture. The radiographs included the anteroposterior and lateral views. Laboratory investigations were carried out before the surgery. CT and MRI scans were carried out to evaluate the relationship and instability of the spine. Results: The L1 vertebra was the most common to get fractured and most of the fractures (74%) were appeared at T12 and L1. AO type, A fractures were only studied with the majority of the fractures (66.6) were falling into AO type A3 (burst fractures). DENIS pain scale scores in conservative treatment, category 8 (53.3%) of patients were in the P3 category similarly in operative treatment 46.67 % of patients were in P1 category. Those managed conservatively 60% could return to their original jobs which could be either heavy work or sedentary work, and remaining 40% could not be able to return to their activity but works in less challenging jobs of those managed operatively 86% of people could able to work in their original jobs and 13% of people changed their working function to less challenging jobs. Conclusion: The study shows that pedicle screw-rod instrumentation is an excellent method for improving the clinical and radiological parameters (correcting kyphosis) in the operatively treated group. Based on the findings of this study considering the complications and cost associated with the surgical procedure, we advocate operative spinal deformity reduction and posterior short segment stabilization with pedicle screw-rod instrumentation for patients with AO type A3 (burst fractures) fractures without neurological deficit, especially in those with significant kyphotic deformity

Keywords: Thoracolumbar Spine Fractures, Conservative treatment, Pedicle Screw Fixation.

INTRODUCTION

The spinal traumas are a very common presentation and a leading problem in orthopedic practice. The modern era has exposed the individuals to risk of high energy trauma [1-3]. Thoracolumbar fractures are serious injuries of concern because if left untreated may result in marked morbidity and disability to the patient. The fractures to the spine are reported to be around 6% approximately of the trauma patients, of which around 2.6% of the patients sustain spinal cord or nerve root level neurological injury. Such fractures are commonly associated with motor and sensory disturbance, bladder and bowel disturbances, erectile dysfunction, deformities like kyphosis, scoliosis as a result of the neurological injury. The patients are also prone to bed sores and pulmonary infections [4].

Most of the vertebral fractures are located in the thoracolumbar region T10–L4. The thoracolumbar segment is the second most commonly involved segment in the spinal cord following spinal injuries, followed by cervical segment. It constitutes 30 to 60% of all spinal injuries [5]. AO Type A fractures comprises approximately 66% of these fractures. Despite the fact that these AO Type A fractures are common, there are various opinions regarding the ideal

management, especially in patients without an associated neurologic deficit [6].

Both operative and nonsurgical approaches are advocated. Decision making regarding non-operative versus operative treatment of patients with vertebral fractures in the absence of neurologic deficits is contentious. Proponents of non-operative management argue that avoiding surgery decreases associated costs and surgical complications including infection, hardware-related complications, and iatrogenic injury. Indications for operative treatment may include deficit, unstable fracture, severe kyphosis, canal compromise greater than 50%, or posterior ligamentous complex injury. Open reduction, internal fixation, and spondylodesis offer the possibility of correction of deformity, early mobilization, reduced reliance on orthotic containment, and the protection against spinal malalignment or late neurologic injury. Non-operative care offers the avoidance of surgical intervention with its attendant morbidity. Assessment of the success rate of the treatment modality should include radiologic parameters, clinical results, and complications as well as patient-reported outcomes regarding pain, daily function, and return to work In this prospective study, patients with thoracolumbar AO Type A fractures without associated neurologic deficits are randomized for either surgical intervention using posterior short segment transpedicular screw fixation or nonsurgical treatment consisting of a period of bed rest followed by mobilization with a thoracolumbosacral orthotic device [7]. Purpose of this study was to compare the results of conservative and operative (pedicle screw fixation) treatment of thoracolumbar fractures in terms of clinical (pain and functional outcome) and radiological (kyphotic angle, and vertebral height) outcome.

MATERIALS AND METHODS

In this prospective cross-sectional study conducted in the Department of orthopedics, MGM Hospital attached to Kakatiya Medical College. The study was approved by the Institutional Ethical Committee. Written consent was obtained from all the participants of the study after explaining the study in the local language only those willing to participate in the study were included. A total of 30 patients were included in the study of which (n=15) patients were treated with conservative treatment based on the presentation of fractures and similarly (n=15) were taken for operative treatment depending on the type of fractures. A Detailed history of the injury was obtained they were clinically and radiologically evaluated for the thoracolumbar fracture. The radiographs included the anteroposterior and lateral views. Laboratory investigations were carried out before the surgery. CT and MRI scans were carried out to evaluate the relationship and instability of the spine. The conservative treatment consisted of the Thoracolumbosacral orthosis in 9 patients, body cast in 2, body cast followed by thoracolumbosacral orthosis in 1 and bed rest for three months in 3 patients. The patients selected for the operative procedure were put in prone position with accentuated lordosis by a four-poster frame from two levels proximal to injured segment a midline posterior incision was given to two levels distal to the same. The injured area was exposed after soft tissue dissection. The tissue was separated laterally the transverse process. A hole was made with trocar at the entry point of the pedicle after removing bone at the site. Introduction of K wire through the blunt hole and its position was checked with image intensifier in frontal and sagittal planes. Screws of selected length were fixed into the pedicle. Appropriate size rods were contoured by cam action bending instrument in the shape of the template. The contoured rods held in the slots of the implant the rods are fixed with previously placed implants. Once all the screws were applied the distraction force was given to assembly with the help of angled spreader. The screws were then tightened and homeostasis achieved drain applied and closed in layers and sterile dressing done. All the patients were given post-op intravenous antibiotics (third-generation cephalosporin + aminoglycoside) for 5 days. They were switched over to oral antibiotics till suture removal. Physiotherapy was started from first-day postoperatively. Sutures were removed on the eleventh day. On the second day, patients were allowed to roll from side to side. After 3 rd postoperative day patients were allowed to sit up and were mobilized after application of thoracolumbosacral orthosis for the next 3 months. A standardized physiotherapy program was followed to train trunk musculature. Routine postoperative X-rays were taken prior to discharge. Follow up: Patients were followed up at 6 wks 3 months and 6 months period and in the follow up visits local and regional kyphotic angles, anterior vertebral eights were recorded and in the final follow up patients reported pain and return to the work were graded and recorded on a Denis pain and work scale, and all patients completed their RMDQ 24 questionnaire.

RESULTS

In the present study, we selected 15 patients for conservative treatment and 15 for operative treatment out of total 30 patients. There was a higher incidence of vertebral fractures, 10 out of 30 patients (36.66%) in the age group of 20 to 30 yrs in this study. The age wise distribution of cases is shown in table-1.

Table-1: Age wise distribution of patients involved in the study

Age group	Conservative Treatment	Percentage	Operative Treatment	Percentage	Total (%)
20 – 30	5	16.67	6	20	11 (36.67)
31 – 40	6	20	4	13.33	10 (33.33)
41 – 50	3	10	4	13.33	7 (23.33)
51 - 60	1	3.33	1	3.33	2 (6.66)
Total	15	50	15	50	30 (100)

The sex distribution of the cases shows that Males were 21 (70%) involved in the fracture and females were 30% in this study. The predominant trauma mechanism leading to thoracolumbar fracture was falling from height 19 out of 30 patients (63%), the remaining 11 (37%) were due to road traffic accident.

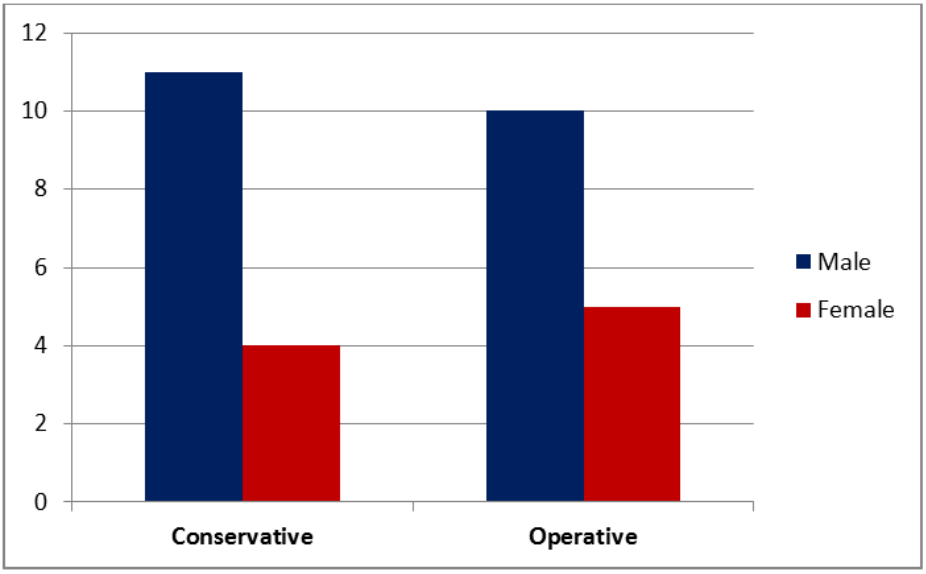

Fig-1: The sex wise distribution of patients involved in the study

The L1 vertebra was the most common to get fractured and most of the fractures (74%) were appeared at T12 and L1, without a significant difference concerning fracture localization in the two treatment groups in this study. In this study AO type, A fractures were only studied with the majority of the fractures (66.6) were falling into AO type A3 (burst fractures).

Table-2: AO classification of fractures in the study

AO Type	Conservative Treatment	Operative Treatment	Total	Percentage
A1	4	3	7	23.33
A2	2	1	3	10
A3	9	11	20	66.67

The local and regional kyphotic angles and vertebral heights were comparable and did not show much difference at the time of admission between the two groups. After surgical stabilization, there was a significant decrease in the local and regional kyphotic angles and improvement in vertebral height; although a considerable part of this reduction of deformity was lost during follow up the operatively treated patients still showed a significant difference in the sagittal malalignment compared with non-surgical group shown in table 3 & 4

Table-3: Local Kyphotic Angle during and after treatment

Local Kyphotic Angle [LKA]	Conservative treatment	Operative treatment
At Admission	19.46	21.26
Postoperative	--	12.53
6 months	22.53	14.4

Table-4: Regional Kyphotic Angle during and after treatment

Regional Kyphotic Angle [RKA]	Conservative treatment	Operative treatment
At Admission	17.6	19.2
Postoperative	--	9.33
6 months	20.46	10.9

In this study, DENIS pain scale devised by Francis Denis [8, 9] was used on patients with spinal injuries scale ranging from P1 (no pain) to P5 (continuous Pain). In conservative treatment, category 8 (53.3%) of patients were in the P3 category similarly in operative treatment 46.67 % of patients were in P1 category shown in table-5.

Table-5: DENIS Pain scores in the patients involved in the study

DENIS PAIN	Conservative Treatment	Percentage	Operative Treatment	Percentage
P1 (No Pain)	1	6.67	7	46.67
P2 (Mild Pain)	3	20	4	26.66
P3 (Moderate Pain)	8	53.3	3	20
P4 (Severe Pain)	2	13.3	1	6.66
P5 (Continuous Pain)	1	6.67	0	0

In this study of those managed conservatively 60% could return to their original jobs which could be either heavy work or sedentary work, and remaining 40% could not be able to return to their activity but works in less challenging jobs of those managed operatively 86% of people could able to work in their original jobs and 13% of people changed their working function to less challenging jobs.

Table-6: DENIS Work scores in the patients involved in the study

DENIS Work	Conservative Treatment	Percentage	Operative Treatment	Percentage
W1 (return to previous physically demanding activities)	3	40	10	66.67
W2 (return to heavy labor with restrictions)	6	20	3	20
W3 (full-time work but not heavy)	3	40	2	13.3
W4 (unable to return to full-time work)	0	0	0	0
W5 (no work completely disabled)	0	0	0	0

All the patients at the time of admission were evaluated for their disability due to pre-existing back pain with the RMDQ-24 questionnaire [10] and again at the end of 6 months (table-7). The mean scores indicating their disability were similar at the time of admission and at the end of 6 months the disability due to back pain was significantly high in the conservatively treated group than operatively treated group (p-value = 0.000805)

Table-7: Roland-Morris Low Back Pain and Disability (RMDQ)

RMDQ SCORE	Conservative Treatment	Operative Treatment
At admission	0.73	0.73
After 6 Months treatment	8.26	2.73

DISCUSSION

Despite the fact that Type A thoracolumbar fractures are common, there are various opinions regarding optimal management especially in patients without neurological deficit. Until now, there is no evidence-based guideline for the treatment of traumatic thoracolumbar spine fractures and only very few studies comparing the non-surgical and operative treatment of neurologically intact patients. In this prospective study conducted in the Department of Orthopaedics, MGM hospital 30 cases of thoracolumbar spine fractures of AO type A were admitted and randomized into conservative and operative groups, 15 patients received conservative treatment and 15 patients received operative treatment. The aim of the present study was to compare the two treatment methods regarding radiological results as well as functional outcome such as pain, disability due to back pain and return to work. The average age in our present study was 36 yrs in a similar study conducted by Wood et al; the average age was 43.3 yrs [11]. In our study we had 21 male patients and 9 female patients showing male predominance (70%) in our study, these results of our study were similar and comparable to studies conducted by Wood K *et al*., [11]. In the present study, we found 19 (63.3%) patients were due to fall from height and 11(36%) were due to RTA. In other similar studies have found FFH from 34% to 59% and RTA were 25-42% [11-13]. The

most common vertebra involved in this study was between T12 to L2 to the extent up to 90%, while Wood *et al*., noted 100% cases involved between T12 to L2. Amit Kumar *et al*., found T12 to L2 were fractured in 88.3% of cases [14]. In this study, we found the average pre-operative kyphosis was 21.2 degree with an average of 8 degrees of correction of kyphosis noted in the postoperative period. Our study results are close to that observed by Siebenga *et al*., who found 16.8 degrees of preoperative kyphosis and 10.9 degrees of postoperative kyphosis with 5 degrees of correction of kyphosis in the postoperative period [13].

The present study shows that in the operatively treated group 86% of patients were able to return to their original jobs whereas 53% of the patients treated conservatively could return to their original employment, rest of the patients opted for less physically demanding jobs. Wood K *et al*., found in a similar study that 53% of the patients managed operatively could return to their original employment in contrast to 79% could return to their original employment managed conservatively [11]. However, the difference could be due to the severity of fractures and other comorbid conditions the patients may be suffering from. The RMDQ-24 scores were used in the study to assess the disability due to back pain. The scores of 0 indicate no disability and score of 24 denotes max disability. The conservatively treated patients were having average scores of 8.26 as compared to an average of 2.73 in the operative group indicating higher functional disability in the conservatively treated group. The results are in agreement with Siebenga *et al*., who have found average scores of 3 in the operative group of patients and 9 in the conservatively treated group of patients [13]. The average duration of hospital stay in this present study was 10.4 days for the operatively treated group and 9.2 days for the conservatively treated group. In this present study 80% of people don't have any complications in the non-operative group 2 complications occurred one patient had transient ileus which recovered without medication and one patient had severe continuous pain. In the operative group, there are 2 cases of postoperative wound infection managed with antibiotics and one patient had loosening of pedicle screw-rod construct and one patient had screw malpositioning.

CONCLUSION

Within the limitations of the present study, it can be shown that pedicle screw-rod instrumentation is an excellent method for improving the clinical and radiological parameters (correcting kyphosis) in the operatively treated group. Based on the findings of this study considering the complications and cost associated with the surgical procedure, we advocate operative spinal deformity reduction and posterior short segment stabilization with pedicle screw-rod instrumentation for patients with AO type A3 (burst fractures) fractures without neurological deficit, especially in those with significant kyphotic deformity.

Conflict of Interest: None
Source of support: Nil
Ethical Permission: Obtained

REFERENCES

1. Chapman, J. R., & Mirza, S. K. (2001). Rockwood, Green Fractures in Adults. 5th ed., (2). Philadelphia: Lippincott Williams and Wilkins; 1295-466.
2. Benson, D. R., & Keenen, T. L. (1990). Evaluation and treatment of trauma to the vertebral column. *Instructional course lectures*, *39*, 577-589.
3. Leventhal, M. R. (1998). Fractures, dislocations, and fracture dislocations of spine. In: Canale ST, editor. Campbell's Operative Orthopedics. 9th ed., (3). Mosby-year book, Inc. Missouri; 2747-79.
4. Burney, R. E., Maio, R. F., Maynard, F., & Karunas, R. (1993). Incidence, characteristics, and outcome of spinal cord injury at trauma centers in North America. *Archives of Surgery*, *128*(5), 596-599.
5. Rohela, H., Ravinath, T. M., Vasudeva, J., & Mallick, T. (2016). Management of fractures of thoracolumbar spine with pedicle screw fixation. *Journal of Health Research and Reviews*, *3*(2), 55.
6. Magerl, F., Aebi, M., Gertzbein, S. D., Harms, J., & Nazarian, S. (1994). A comprehensive classification of thoracic and lumbar injuries. *European Spine Journal*, *3*(4), 184-201.
7. Heary, R. F., & Kumar, S. (2007). Decision-making in burst fractures of the thoracolumbar and lumbar spine. *Indian journal of orthopaedics*, *41*(4), 268.
8. Denis, F. (1984). Spinal instability as defined by the three-column spine concept in acute spinal trauma. *Clinical Orthopaedics and Related Research®*, *189*, 65-76.
9. Denis, F., Davis, S., & Comfort, T. (1988). Sacral fractures: an important problem. Retrospective analysis of 236 cases. *Clinical orthopaedics and related research*, *227*, 67-81.
10. Stratford, P. W., Binkley, J., Solomon, P., Finch, E., Gill, C., & Moreland, J. (1996). Defining the minimum level of detectable change for the Roland-Morris questionnaire. *Physical Therapy*, *76*(4), 359-365.
11. Wood, K., Butterman, G., Mehbod, A., Garvey, T., Jhanjee, R., & Sechriest, V. (2003). Operative compared with nonoperative treatment of a thoracolumbar burst fracture without neurological deficit: a prospective, randomized study. *JBJS*, *85*(5), 773-781.
12. Gnanenthiran, S. R., Adie, S., & Harris, I. A. (2012). Nonoperative versus operative treatment

for thoracolumbar burst fractures without neurologic deficit: a meta-analysis. *Clinical Orthopaedics and Related Research®*, *470*(2), 567-577.

13. Siebenga, J., Leferink, V. J., Segers, M. J., Elzinga, M. J., Bakker, F. C., Henk, J. T. M., ... & Patka, P. (2006). Treatment of traumatic thoracolumbar spine fractures: a multicenter prospective randomized study of operative versus nonsurgical treatment. *Spine*, *31*(25), 2881-2890.
14. Kumar, A., Aujla, R., & Lee, C. (2015). The management of thoracolumbar burst fractures: a prospective study between conservative management, traditional open spinal surgery and minimally interventional spinal surgery. *Springerplus*, *4*(1), 204.