

The failure rate of short and long segment fixation of post traumatic thoracolumbar fractures

Alaa A. Farag, Mohamed H. El Sayed and Mohamed A.S. Osman

Department of Neurosurgery, Banha University Hospitals, Banha, Egypt
Dr.mhmd.saied@gmail.com

Abstract: Background: Thoracolumbar area of the spine is the most common site for injuries and the surgical treatment of fixation for treatment of these fractures remain controversy. **Objectives:** to evaluate the failure rate of short and long segment fixation of post traumatic thoracolumbar fractures. **Methods:** 40 patients had been taken and divided into two groups I and II; each category consists of 20 patients whom undergo fracture at thoracolumbar region (D11, D12, L1, L2 or L3). Group I was operated by short segment posterior fixation (one level above and one level below fractured vertebrae) while group II was operated by long segment posterior fixation (two levels above, two levels below or two levels above, one level below or one level above and two levels below). All cases were followed up clinically for improvement of neurological deficits & late postoperative complications (broken screws, kyphosis and back pain). Also all cases had been followed up radiologically by plain radiogram +/- C.T. scan for assessment of the instrumental system, decompression & improvement of kyphotic deformities. Operation's time and the amount of blood loss were considered. Follow up at least six months. **Results:** Complications are more in short segment fixation (30%) than long segment fixation (5%). Back pain is the most common complication followed by post-operative kyphosis then system failure (broken screw or dislodgment). Blood loss and time of surgical procedure in short segment fixation (SS) is less than long segment fixation (LS). **Conclusion:** The surgical treatment of unstable thoracolumbar fractures using a short fixation showed greater loss of kyphosis correction in the long-term follow-up of patients and high rate of instrumental failure, compared to long fixation. These radiographic findings make long fixation an effective option in the management of thoracolumbar fractures. Despite the higher rate of failures with short fixation, it has shorter surgical times and less blood loss.

[AlaaA. Farag, Mohamed H. El Sayed and Mohamed A.S. Osman. **The failure rate of short and long segment fixation of post traumatic thoracolumbar fractures.** *Nat Sci* 2016;14(9):147-149]. ISSN 1545-0740 (print); ISSN 2375-7167 (online). <http://www.sciencepub.net/nature>. 20. doi:[10.7537/marsnsj140916.20](https://doi.org/10.7537/marsnsj140916.20).

Key words: short segment fixation, long segment fixation, thoracolumbar fractures.

1. Introduction

Each year, more than 150,000 persons in North America sustain fractures of the vertebral column¹. Ninety percent of all spine fractures are related to the thoracolumbar region². The National Spinal Cord Injury Registry reported that 40% of spinal injuries were caused by motor vehicle accidents, 20% by falls, and 40% by gunshot wounds, sporting accidents, industrial accidents, and agricultural accidents combined. The spectrum of injury severity related to motor vehicle accidents ranges from minor soft tissue contusions to paraplegia and death.¹

The thoracolumbar spine consists of the more cephalad thoracic spine, and then the more flexible lower lumbar spine.³

The aim of the work is to evaluate the failure rate of short and long segment fixation of post traumatic thoracolumbar fractures.

According to Denis, failure of middle column was a key in defining instability.⁴

On the basis of a radiographic review, thoracolumbar injuries were divided into minor and major injuries. Minor injuries, which accounted for over 15% of fractures, included fractures of the spinous and transverse processes, the pars

interarticularis, and the facet articulations. While major spinal injuries were divided into compression fractures, burst fractures, seat-belt injuries, and fracture-dislocations.⁵

The location of the fracture can influence the surgeon's choice of fusion. A long fusion in the upper and middle thoracic spine does not reduce patient's spinal mobility and function very much. However, the thoracolumbar and lumbar spines are functionally very important. Preservation of mobility in these segments of the spinal column is fundamental, particularly in manual workers whose jobs require increase demands on the spine.⁶

High velocity grossly unstable injuries like fracture dislocations usually requires multilevel spinal stabilization. Fixation of two to three segments above and below the injury is recommended for reducing the dislocation and achieving stable fixation. Similarly, unstable fractures of the thoracic spine are subjected to significant shear stresses and hence are treated with multilevel posterior fixation.⁷

Patients and Methods

Forty medical records of cases of post traumatic thoracolumbar fractures who were admitted at neurosurgery department, Banha University. They

divided into two groups I and II; each group consists of 20 patients whom undergo fracture at thoracolumbar region. Group I was operated by short segment posterior fixation (one level above and one level below fractured vertebrae) while group II was operated by long segment posterior fixation (two levels above, two levels below or two levels above, one level below or one level above and two levels below). All cases were followed up clinically for improvement of neurological deficits & late postoperative complications (broken screws, kyphosis and back pain). Also all cases had been followed up radiologically by plain radiogram +/- C.T. scan for assessment of the instrumental system, decompression & improvement of kyphotic deformities. Operation's time and the amount of blood loss were considered. Follow up at least six months.

3. Results

Age of the studied cases ranged between 15&56 years, with mean age was 27.6 years. There were 23 cases (57.5%) males & 17 cases (42.5%) females. The mean blood loss in group I was 495 ml while in group II was 707.5 ml and mean time of operation in group I was 152.25 min while in group II was 225.65 min.

In group I; 6 cases (30%) had late post-operative complication, 3 cases (15%) had broken screws due to direct trauma to the back or lifting heavy objects after short duration of surgery or implant failure, 5 cases (25%) had progressive kyphosis either due to previous causes or due to patient become pregnant, all 6 cases (30%) presented to us with post-operative back pain. In group II; one case (5%) had late post-operative complication, this case came with broken screw and severe back pain after direct trauma with blunt object.

Table (1) Comparison between different studied groups regarding blood loss and time of operation.

	Group I	Group II	P*
Blood loss / ml (mean± SD)	495.0 ± 158.9	707.5 ± 160.0	0.001**
Time of operation / min (mean± SD)	152.25 ± 18.7	225.65 ± 31.0	0.001**

Table (2): Comparison between different studied groups regarding late post-operative complications

	Group I		Group II		P*
	No	%	No	%	
Late post-operative complications					
Yes	6	30.0	1	5.0	0.096
No	14	70.0	19	95.0	
❖ Broken screw					0.598
Yes	3	15.0	1	5.0	
No	17	85.0	19	95.0	
❖ Kyphosis					0.056
Yes	5	25.0	0	0.0	
No	15	75.0	20	100.0	
❖ Pain					0.096
Present	6	30.0	1	5.0	
Absent	14	70.0	19	95.0	

4. Discussion

Depending on their experience, the surgeon choose their surgical approaches.⁸ some doctors recommended conservative treatment like bed rest, physical therapy and braces; however, this will not treat the kyphotic angulation and restore the original shape.⁹

Before "Dick *et al.*" whom invented what was called "fixateur interne" in 1985, there were two great surgeons who used pedicular screws, Boucher at 1959 and Roy-Camille *et al.* at 1963. At that time (SS) method was considered the best way for the treatment of unstable fracture.¹⁰

Some studies showed that (LS) fixations were superior to (SS) one. Yu *et al.* founded that (SS) fixations had a failure rate in thoracolumbar region. Moon *et al.* founded that (LS) fixation was more effective than (SS) method. Korovessis *et al.* reported that claw figuration on two levels above and below the site of fracture was the best way in creating hard fixation. Katonis *et al.* reported that fixation two levels above the burst fracture associated with low instrumental complications. The advantage that makes (SS) method reliable is preserving the spinal motion segments, less blood loss and operative time is shorter.¹⁰

In the present study, we found that; 7 cases had complications in their follow up; 6 cases which were treated with short segment fixation (SS) had complications, 3 cases had broken screws due to obvious cause as direct trauma to the back and lifting heavy objects after short duration of surgery or non-obvious cause as implant failure, 5 cases had progressive kyphosis either due to previous causes or due to patient become pregnant, all 6 cases (30%) presented to us with post-operative back pain.

One case only which were treated with long segment fixation (LS) had complication in its follow up, this case came with broken screw and severe back pain after direct trauma with blunt object.

In this present study, we found that; Mean estimated blood loss was 495 ml (range, 300–800) in group I (short segment fixation) while Mean estimated blood loss was 707.5 ml (range, 500–1000) in group II (long segment fixation). The mean time of operation in group I (SS) was 152.25 min (range 120-180) while in group II (LS) was 225.65 min (180-270). These results in agreement with previous studies which showed that short instrumentation was considered a method of instrumentation that would bring the advantages of sparing arthrodesis levels in the surgical treatment of spinal fractures. However, subsequent work showed high rates of failure of this technique.¹¹

A greater kyphotic deformity would result in higher anterior vertebral stress transmitted to the pedicle screws, which would explain these failures. Long fixation distributes the stress between the screws, and also promotes greater correction of the kyphotic deformity, which decreases the demand for instrumentation material and, consequently, the chance of failure.¹¹

Conclusion

Our study demonstrates that the surgical treatment of unstable thoracolumbar fractures using a short fixation showed greater loss of kyphosis correction in the long-term follow-up of patients and high rate of instrumental failure, compared to long fixation. These radiographic findings make long fixation an effective option in the management of thoracolumbar fractures. Despite the higher rate of

failures with short fixation, it has shorter surgical times and less blood loss.

References

1. Federico CV, Francisco T., William OS, Goldstein JA, Lee HR. Lumbar Spine Fractures and Dislocations. (Oct 2015).
2. Kim BG, DanJM and Shin DE. Treatment of Thoracolumbar Fracture. *Asian Spine J.* 9(1): 133–146 (2015).
3. Wood kB, Li W., Lebl DS, Ploumis A. Management of thoracolumbar spine fractures. *Spine J;* 14(8): 145-164 (2014)
4. Denis F. The three column spine and its significance in the classification of acute thoracolumbar spinal injuries. *Spine* 8: 817-31 (1983).
5. Denis F.: Spinal instability as defined by the three column spine concept in acute spine trauma. *Clin. Orthop.* 189: 65, (1984).
6. Hassan D., Lee HC, Eldin E. Karaikovic, Robert W. Gaines Jr. Decision making in thoracolumbar fractures. *Neurology India* 53(4):538 (December 2005).
7. Rajasekaran S, Kanna RM, and Shetty AP. Management of thoracolumbar spine trauma: An overview. *Indian J Orthop.;* 49(1): 72–82. (2015).
8. Schmid R, LindtnerRA, Lill N, Blauth M, Krappinger D, and KammerlanderC, “Combined posteroanterior fusion versus transforaminal lumbar interbody fusion (TLIF) in thoracolumbar burst fractures,” *Injury*, vol. 43, no. 4, pp. 475–479, 2012.
9. Rajasekaran S. Thoracolumbar burst fractures without neurological deficit : the role for conservative treatment. *Eur Spine J* 2010; 19 : S40-47.
10. Raheem HQ. Comparison between short and long segment posterior spinal fixation in thoracolumbar burst fractures. *Mustansiriyah Medical Journal.* 15(1):45-48 (April 2016).
11. Filho CAA, Simões FC, Prado GO. Thoracolumbar burst fractures, short x long fixation: a meta-analysis. *Coluna/Columna.;* 15(1):78-84 (2016).

9/25/2016