Treatment of thoracolumbar fractures

Awad A. El-Awad, MD, PhD, Walid M. Othman, MD, FRCS, Khalaf R. Al-Moutaery, MD, FRCS.

ABSTRACT

Objective: To study the outcome of patients with thoracolumbar fracture treated surgically or conservatively at the Armed Forces Hospital, Riyadh, Kingdom of Saudi Arabia, between the year 1989 through to 1999.

Methods: The medical and surgical record of all patients diagnosed as having thoracolumbar fracture (thoracic 10-lumbar 12) between the years 1989 to 1999 were reviewed. The parameter studies included the personal patient data, type of fracture, mechanism and cause of injury and neurological affection. For the outcome, the method of treatment and recovery from neurological deficit, return to pre-injury activity and work as well as complications were noted.

Results: One hundred patients were treated for thoracolumbar fracture. Seventy two percent were related to motor vehicle accident, 37% had neurological deficit, 19 of them had complete lesion. Thoracic 12 Lumbar 1 constituted 63% of injury level. Forty-four patients were treated surgically whereas 56 had conservative treatment. At follow up, 17 patients had complete recovery from neurological deficit while 6 had partial recovery and 14 had no recovery at all. No major complication has occurred due to method of treatment in both groups.

Conclusion: Treatment of thoracolumbar fracture was carried out using both surgical and conservative methods. In our view, surgical treatment is indicated in cases of instability or removal of retropulsive fragment if there is neurological deficit or to correct deformity. For other cases conservative treatment was selected and gave satisfactory results.

Keywords: Thoracolumbar, fracture, instability.

Saudi Med J 2002; Vol. 23 (6): 689-694

Fractures of the thoracolumbar area occur more frequently in cases of spinal fractures. The treatment of such injuries has been controversial for many years and still the controversy continues. In the early 1970's, Bedbrook[1] recommended a period of 6-8 weeks of bed rest in extension followed by mobilization, this proved to be efficient at that time. With the development of spinal instrumentation and anesthesia, the surgical management of such fractures gained popularity. The surgical treatment became widely accepted. The advocate for such approach based their view on short hospitalisation leading to low cost of treatment, better correction of deformity and improvement in neurological status as well as prevention of late neurological deterioration.[2] However, recent reports have shown that late neurologic deterioration is uncommon (0%-3%).[3-6] One of the indications for surgery is instability. Posterior column fractures alone are considered to be stable and can be treated conservatively. Fractures that affect the anterior and middle column are considered unstable and are better treated surgically. Decompression of the spinal canal by removing the retropulsive fragment is believed to enhance

From the Division of Neurosurgery and Spinal Unit, Department of Neurosciences, Armed Forces Hospital, Riyadh, Kingdom of Saudi Arabia.

Received 14th October 2001. Accepted for publication in final form 27th January 2002.

Address correspondence and reprint request to: Dr. Awad A. El-Awad, Consultant Orthopedic Spinal Surgeon, Division of Neurosurgery and Spinal Unit, Department of Neurosciences, Armed Forces Hospital, PO Box 7897, Riyadh 11159, Kingdom of Saudi Arabia. Tel. +966 (1) 4777714 Ext. 4153. Fax. +966 (1) 4784057. E-mail: awadelawad@hotmail.com

neurological recovery. However, in a recent report, Dickson et al contradicted this notion.[7,8] Most fractures of the thoracolumbar area can be treated conservatively especially in neurologically intact patients. However, we should consider other factors such as degree of kyphosis, as in these cases where there is kyphotic deformity the patient usually balances that with hyperlordosis, which leads to muscular pain and causes more concern to the patient and affects his quality of life. With all this, it seems that we still do not reach full agreement on when, and how to treat this type of injury. In this report we present our experiences in treating such injuries both surgically and conservatively.

Methods. The medical and radiological records of all patients diagnosed as having thoracolumbar fractures (T10-L2) who were treated between the years 1989 through to 1999 were reviewed. The patient's personal data was noted and recorded. The parameters studied were: 1. Level of fracture, type of fracture, cause and mechanism of injury. 2. Associated injury and neurological deficit, use of seat belt. 3. Method of treatment, surgical or conservative, use of external orthosis after surgery. 4. Outcome of treatment, complications and return to pre-injury activity. Radiological assessment was carried out to determine type of fracture, instability and presence of retropulsive fragment in the canal as well as associated fractures.

Results. One hundred patients (69 male and 31 females) with thoracolumbar fractures were treated at our hospital between the years 1989-1999. Seventy-two percent of the cases were related to motor vehicle accident; only 6 patients were using seat belts. The other causes of injury were fall 25, roof collapse on one patient, gunshot one patient and one patient involved in a jet-ski accident. Thirty-seven percent had neurological deficit, 19 of them had complete lesions at the time of presentation to the hospital. Thoraco 12 - Lumbar 1 (T12-L1) constituted 63% of the injured level. Type A fractures are 59, B-29 and C-12 according to the associate orthopedic (AO) classification. Twenty-four patients had associated injuries. Forty-four patients were treated surgically (surgical group). The indication for surgery was one or more of the following: instability, Kyphotic deformity and presence of retropulsive bony fragment in the canal causing compression to the neural element. Neurological deficit per se was not considered as an absolute indication for surgery. **Table 1, 2 and 3** shows the patient data for all patients as well as in each group. **Figures 1-5** show the types of surgical procedure and instruments used.

Discussion. There are still contradicting opinions regarding the best method for treatment of thoracolumbar fractures. The controversy is 2 fold, one are patients with fracture and neurological impairment versus those without neurological deficit. On the other hand, the stability of the spine and the presence of retropulsive fragments in the canal concerns most spinal surgeons. The argument that surgical treatment for patients leads to better clinical outcome is opposed by the excellent results of non-operative treatment. From the available data in the literature there are conflicting views and ideas regarding how and when to treat thoracolumbar fracture.[7-9] The advocate of the surgical treatment supports the view that removal of retropulsive fragments enhance neurological recovery, prevents late deterioration as well as reducing post-traumatic kyphosis. However, removal of retropulsive fragment was not proved to be of significance in the neurological outcome.[8,10] From our study it was difficult to draw a conclusion whether surgical treatment is superior to non-surgical treatment due to the retrospective nature of the study and the fact that

Table 1 - Patient data.

Treatment Group	Cause of injury	Level of Fracture	Type of Fracture	Neurological Deficit	Complications	Outcome (Neurology)	Personal Data Age (18-90 years)
Conservative N=56 Surgical N=44	MVA N=72 Fall (N=25) ***Others: 3*** Jet ski Gunshot Roof fall	T10 8 T10-11 2 T11 8 T11-12 5 T12 23 T12-L1 11 L1 29 L1-L2 5 L2 9	A 59 B 29 C 12	No deficit 63 Incomplete 18 Complete 19	DVT 2 ARDS 1 MI 1 Superficial infection 1	Full recovery 17 Partial 6 No recovery 14	Male 69 Female 31 Saudi 90 Non Saudi 10

N - number, MVA - motor vehicle accident, T - thoracic, L - lumbar, DVT - deep vein thrombosis, ARDS - adult respiratory distress syndrome , MI - myocardial infarction

Table 2 - Surgical treated group.

Type of Surgery	Cause of injury	Level of Fracture	Type of Fracture	Neurological Deficit	Complications	Outcome (Neurology)	Personal Data (Age 18-63 years)
Anterior decompression and posterior instrumentation (13) Anterior decompression and fusion (4) Anterior decompression fusion and instrumentation (5) Posterior instrumentation and fusion (22)	MVA N=33 Fall N=10 Others: 1	T10 0 T10-11 1 T11 2 T11-12 3 T12 9 T12-L1 8 L1 14 L1-L2 3 L2 4	A 3 B 9 C 12	No deficit 9 Deficit 35	ARDS 1 died Superficial infection 1	Full recovery 15 Partial 6 No recovery 14	Male 32 Female 12 Saudi 40 Non Saudi 4
N - number, MVA - motor vehicle accident, T - thoracic, L - lumbar, ARDS - adult respiratory distress syndrome							

Table 3 - Conservative treated group.

Type of Brace	Cause of injury	Level of Fracture	Type of Fracture	Neurological Deficit	Complications	Outcome (Neurology)	Personal Data Age (19-90 years)
POP (Plaster jacket) (9) POP then BBO (Boston brace overlap) (7) BBO (40)	MVA N=39 Fall N=15 Others: 2	T10 8 T10-11 1 T11 6 T11-T12 3 T12 13 T12-L1 4 L1 15 L1-L2 2 L2 4	A 56 B 0 C 0	No deficit 24 Partial deficit 2	DVT 2 MI 1 1	Full recovery 2 Partial 0	Male 37 Female 19 Saudi 50 Non-Saudi 6
N - number, MVA - motor vehicle accident, T - thoracic, L- lumbar, DVI - deep vein thrombosis, MI - myocardial infarction							

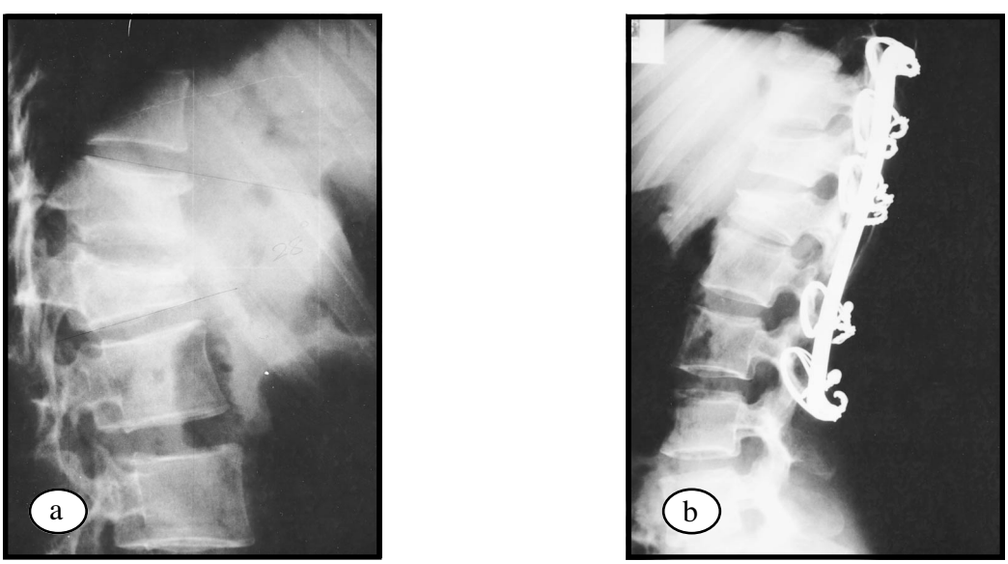

Figure 1 - Lateral x-ray of the lumbar spine in a 28-year-old female involved in a motor vehicle accident. **a)** First lumbar spine fracture type (B). **b)** Post-operative posterior stabilization with Hartshill rectangle.

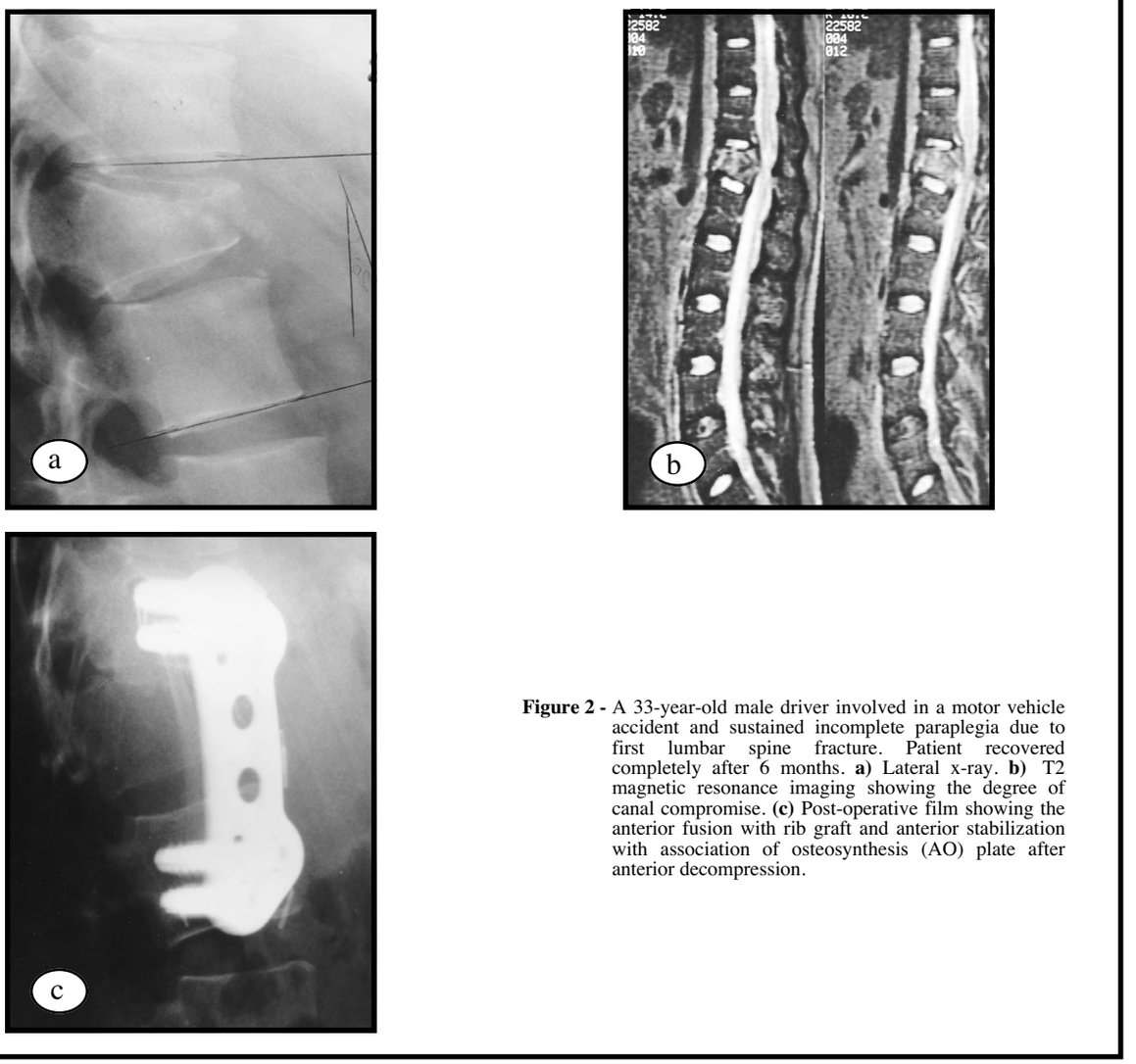

Figure 2 - A 33-year-old male driver involved in a motor vehicle accident and sustained incomplete paraplegia due to first lumbar spine fracture. Patient recovered completely after 6 months. **a)** Lateral x-ray. **b)** T2 magnetic resonance imaging showing the degree of canal compromise. **(c)** Post-operative film showing the anterior fusion with rib graft and anterior stabilization with association of osteosynthesis (AO) plate after anterior decompression.

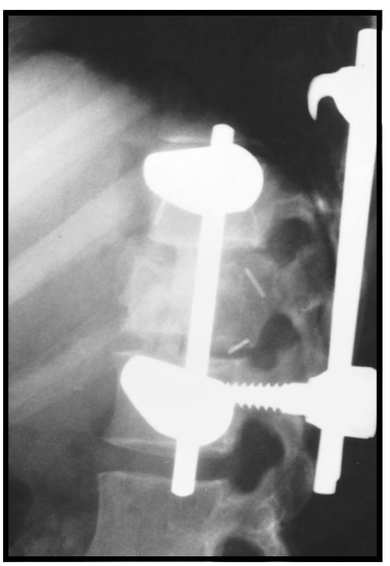

Figure 3 - Lateral post-operative x-ray of a 30-year-old female involved in a motor vehicle accident. She had complete paraplegia due to type (C) fracture of lumbar 1. Anterior and posterior decompression and stabilization was carried out and the patient had partial recovery but is still using a wheelchair 2 years post-operatively.

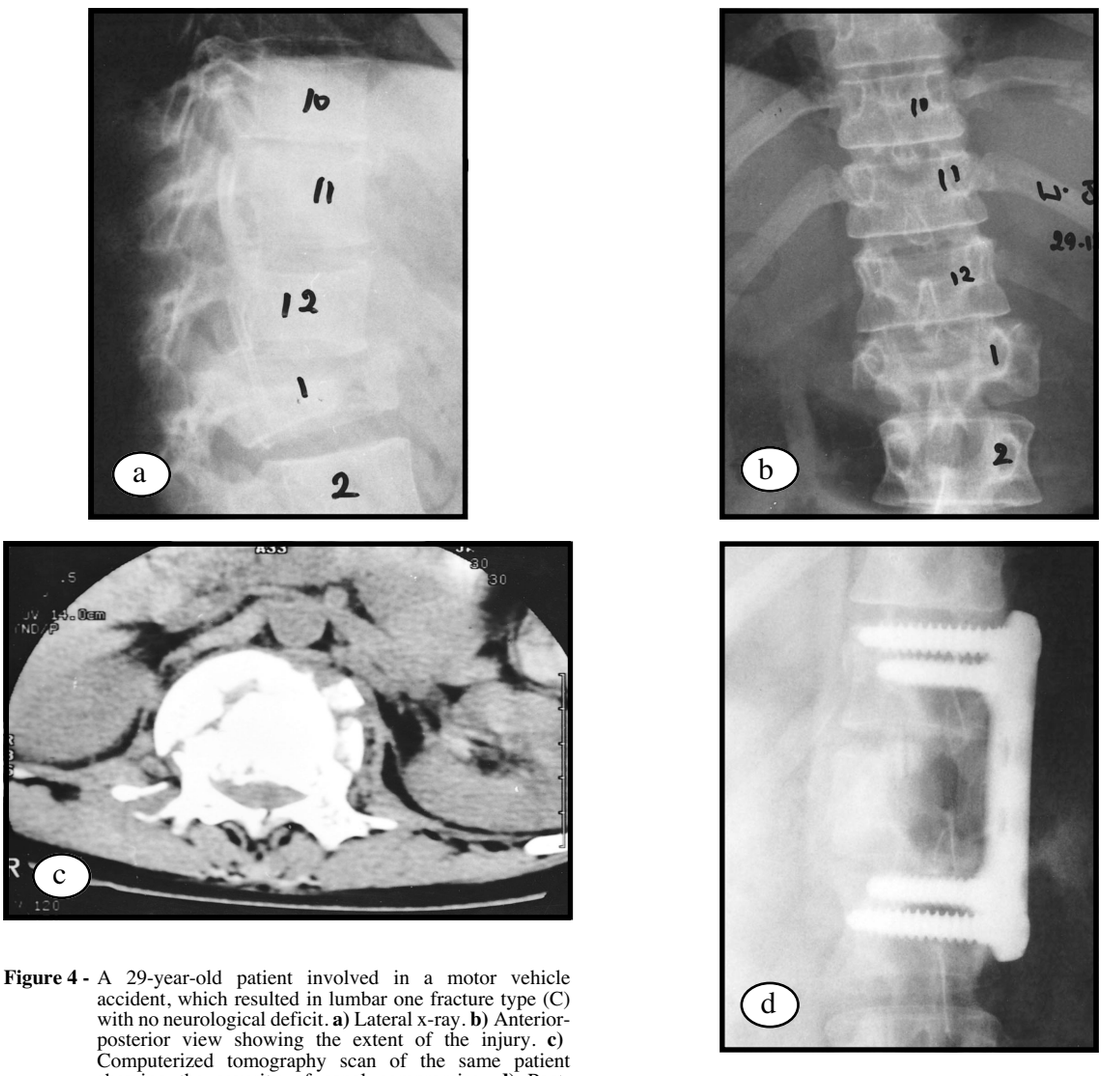

Figure 4 - A 29-year-old patient involved in a motor vehicle accident, which resulted in lumbar one fracture type (C) with no neurological deficit. **a)** Lateral x-ray. **b)** Anterior-posterior view showing the extent of the injury. **c)** Computerized tomography scan of the same patient showing the severity of canal compromise. **d)** Post-operative lateral x-ray showing anterior fusion and stabilization, after anterior decompression.

the indication was different for each type of treatment modality. In the non-surgical group of our study most of the fractures are type A according to the AO classification, and these are to be considered stable, so the outcome was comparable to published data on conservative management of burst thoracolumbar fractures.[2,8] None of our patients in the conservative treated group had deterioration of neurological symptoms nor was there post-traumatic kyphosis that merited surgical intervention. This is in agreement with other reports where the incidence of post-traumatic kyphosis is less than 10% and the return to pre-injury work in those without neurological deficit is more than 80%. For the surgically treated group our indication for surgery is comparable to published studies, however instability was our major concern. Posterior element injury carried out was reported to be associated with more neurological deficit. The presence of retropulsive fragment in the canal was considered in our study as an indication for surgery if it is associated with neurological deficit. Those without deficit were treated conservatively if the fracture was stable. At the latest follow up we did not encounter any deterioration of neurological status. This supports that canal compromise should not be used as a reason to operate in order to avoid late neurologic deterioration which was proved in several studies to be 0%-3%.[3-6] The use of anterior versus posterior approach is another area of controversy. The choice depends on the type of fracture, the

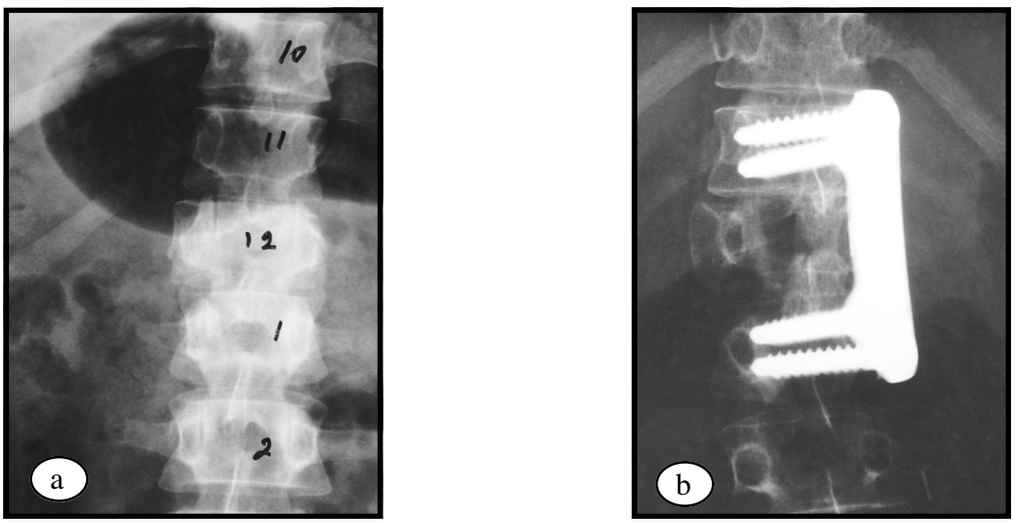

Figure 5 - Anterio-posterior x-ray of a 40-year-old driver involved in a motor vehicle accident with cauda equina syndrome and paraplegia. The patient improved and he is walking with only residual right foot drop. **a)** Showing fracture of T12 type (C). **b)** Post-operative x-ray after anterior decompression, fusion and stabilization with association of osteosynthesis (AO) plate.

neurologic status and if clearance of the canal is contemplated. In our view, the indication for surgery depends on the presence of instability, which will lead to persistent back pain. Loss of 50% anterior vertebral height, canal compromise of 30% at T11-T12, 40% or more at Lumbar (L1) and 50% or more at L2. Associated posterior element damage and progressive neurologic deficit. Concerning the outcome for both modalities of treatment as we mentioned, the indication was different but both of them yielded satisfactory outcome with no late complication. In those who were neurologically intact all of our patients were classified as W1 and W2 according to the Denis's work scale. Those with neurological deficit were graded as W3 at the latest follow up since all of them are wheel chair bound.

In this study both modalities gave satisfactory results and is considered to be appropriate when the indication set before is applied. In order to avoid this controversy and debate on surgical versus non-surgical treatment of TL fractures, we need to have a large prospective randomised study. This may be difficult to obtain until that kind of study is available. The end to this controversy is far from over.

References

1. Bedbrook GM. Treatment of thoracolumbar dislocation and fracture with paraplegia. *Clin Orthop* 1975; 112: 27-43.
2. Chow HG, Nelson JB, Gebhard JS, Brugman JL, Brown CW, Donaldson DH. Functional outcome of thoracolumbar burst fracture managed with Hyperextension casting or bracing and early mobilization. *Spine* 1996; 21: 2170-2175.
3. Cantor JB, Lebwohl NH, Garvey T, Eismont FJ. Non-operative management of stable thoracolumbar burst fracture with early ambulation and bracing. *Spine* 1993; 18: 971-976.
4. Mumford J, Weinstein JN, Spratt KF, Guel VK. Thoracolumbar burst fractures, the clinical efficiency and outcome of non-operative management. *Spine* 1993; 18: 955-970.
5. Reid D, Hu R, Davis L, Sabue L. The non-operative treatment of burst fracture of the thoracolumbar junction. *J Trauma* 1998; 28: 1188-1192.
6. Weinstein JN, Collato P, Lehman TR. Thoracolumbar burst fracture treated conservatively. A tong term follow up. *Spine* 1988; 13: 33-38.
7. Kaneda K, Abumi K, Fujita M. Burst fractures with neurologic deficit of thoracolumbar spine: results of anterior decompression and stabilization with anterior instrumentation. *Spine* 1984; 9: 788-795.
8. DeKlerk WL, Fontijine WP, Stijinen T, Braakman R, Taughe HL, Linge BV. Spontaneous remodelling of the spinal canal after conservative management of thoracolumbar burst fractures. *Spine* 1998; 23: 1027-1060.
9. Gerzbein SD, Court-Brown CM, Jacobs RR, Attol J. Decompression and circumferential stabilization of unstable spinal fracture. *Spine* 1988; 13: 892-895.
10. Dickson RA, Boerger TU, Limb D. Does canal clearance affect neurological outcome after thoracolumbar burst fracture. *JBJS* 2000; 82: 629-635.