MANAGEMENT OF THORACOLUMBAR SPINE INJURIES AT A TERTIARY CARE HOSPITAL

Riaz A. Raja

Department of Neurosurgery, Liaquat University of Medical & Health Sciences, Jamshoro, Pakistan

Background: The purpose of descriptive case series study was to see the conservative and surgical outcome in respect of neurological improvement, sphincter functions and early ambulation in cases of traumatic thoracolumbar injuries in a tertiary care hospital. **Methods:** This was a hospital based prospective study comprised of 50 thoracolumbar injury cases registered during the period of 1 year from September 2005 to September 2006. All cases were evaluated for their clinical features. During initial phase, level and degree of neurological injury was assessed using Frankle grades. Operative and postoperative record with x-rays and MRI were maintained. The follow-up ranged from 6 to 12 months with clinical and radiological assessment. **Results:** A total of 50 cases were registered, 43 (86%) were males and 7 (14%) were females. Fall was the most common cause of injury (92%). The most common level involved was L_1 (46%). The 2nd common site of injury was T_{12} (12%). The treatment given was conservative in 42.55%, and surgery was performed on 57.44%. Three (6.38%) patients were left against medical advice. **Conclusion:** Thoracolumbar injuries occur in young population and creates socio-economic burden to the society. Patients with partial neurological deficit benefit from surgery.

Keywords: Spinal injury, Thoracolumbar, Fall, Road Traffic Accident

INTRODUCTION

The Edwin Smith surgical papyrus is the oldest description of spinal cord injury in recorded history, Paraplegia due to injury of spine was first described in this papyrus and vertebral fractures as an "ailment not to be treated".[1] Recently advantages in surgery of spinal injury have become well established. Surgical approach is chosen in cases when conservative treatment is unlikely to produce satisfactory late results. Spinal instrumentation in past few decades has developed extensively.

Since early 1980s, technologies and implants provide better results in spine trauma with decreased mortality and morbidity, and current operative management rapidly returns the patients to work with satisfactory function. It has been shown that instrumentation reduces the occurrence of pseudoarthrosis, optimises spinal alignment and provides stability for patients who were formerly treated with prolonged bed rest.[2–4]

The thoracolumbar spine is the second most common site for traumatic spinal injuries after cervical spine that partially or completely compromises the main functions of the cord, i.e., motor, sensory, autonomic and reflex, resulting in paraplegia. Included in this group are the conus medullaris and the cauda equina injuries. Thoracolumbar spine injury is not a notifiable condition and figures for annual incidence can vary according to the source.[5] It predominantly affects young people. Thoracolumbar spine injury is a condition of comparatively low incidence but of great cost to individuals and to society.

The management of thoracolumbar spinal injuries has ranged from conservative approaches to operative decompression and stabilisation.[6] Goals of management, operative or otherwise, are to protect and improve the neurological function, stabilise the spine, early mobilisation and rehabilitation while minimising pain and subsequent deformity.

Several anatomic features predispose the thoracolumbar junction to axial compression and rotational injuries.[7] First, the thoracolumbar junction is situated between rigid thoracic complex and mobile lumbar spine. Second, during axial loading, the thoracic spine is protected from rotational strain by ribs and lumbar spine is protected by inwardly directed articular processes. Therefore thoracolumbar spinal region is predisposed to rotational injury. For this reason 60% of all fractures occur between T_{12} and L_2 and approximately 90% are located between T_{11} and L_4.

In 1983, Dennis *et al*, postulated a three column concept of spinal stability.[8] According to this concept, instability occurs when 2 or more columns are involved. Instability depends upon middle column failure. On the basis of middle column failure, 4 major types of injuries are identified. This comprises compression fractures, burst fractures, seatbelt type and fracture dislocations.

The objective in spinal cord injured patient is to achieve the best situation for residual function of cord to recover. Increased vigilance for spine stabilisation before a patient is moved from trauma scene is one factor that has contributed to the

decrease in complete spinal cord lesions from 5% to 39%. Except in cases of extreme urgency, such as fire, no patient should be moved before rigorous spinal stabilisation has been achieved. Stabilisation can be achieved by using log-rolling techniques or long spine boards. [9]

The role of steroids in treatment of spinal cord injury remains poorly defined. Several experimental studies have reported neurological recovery after administration of steroids in traumatic spinal cord injury. But until very recently, no medical treatment was conclusively demonstrated to improve neurological recovery and reverse the initial neurological deficit.

Other studies demonstrated that there is improvement in neurological functions in patents with spinal cord injuries treated with methyl prednisolone within 8 hours of injury. A dose of 30 mg/kg of body weight should be given in 15 to 30 minutes, followed by 5.4 mg/kg/hour for next 23 hours. There are chances of gastrointestinal bleeding in patients undergoing steroid therapy.[10]

MATERIAL AND METHODS

This prospective study was carried out during the period from September 2005 to September 2006. A total of 50 cases were registered in this study during the period of 3 years. Patients were admitted through casualty or out-patient department. The inclusion criteria were patients with traumatic thoracolumbar injuries except gunshot injuries, either sex, and above 12 years of age. Patients were admitted, proforma was filled, and Foley's catheter was passed. A complete history was taken regarding cause of injury, time between injury and hospital arrival and symptoms at the time of injury. Frankel grading used to assess the neurological status. X-ray thoracolumbar spine was carried out in all patients. The patients were given the bolus of Dexamethasone 20 mg I/V stat and 4 mg I/V 6 hourly with cover of H_2-receptor blocker. Methyl-prednisolone was not used because of cost.

CT Scan or MRI of involved levels was performed. Decision regarding further management depended upon the level of injury, neurological deficit and canal compromise on CT Scan or MRI.

Poor neurological deficits and higher level were more in favour of conservative treatment irrespective of canal compromise. Surgery was considered in patients with residual motor power and canal compromise of greater than fifty degree.

Patients' physical fitness was carried out. Preoperative prophylactic antibiotics were given to all patients before induction. General anaesthesia was given to all patients. Prone positions were used in cases of posterior approaches and lateral position in anterolateral approaches. Follow-up improvement in Frankel grading was noted in both the recumbent and surgical groups. Any complication during stay in hospital was noted. During the stay in hospital, physiotherapy was started by the help of department of physiotherapy. After discharge, patients were followed up to one year.

Data were analysed using SPSS 11. Frequency and percentage were calculated.

RESULTS

The study comprised of 50 cases registered during the period of 1 year from September 2005 to September 2006. Out of 50 patients, 43 (86%) were males and 7 (14.0%) were females. Male to female ratio was 6.1:1. The mean age was 30.74±10.31 years (Table-1).

Fall was the most common cause of injury (92%) out of which 41 fell from roof, 3 from trees and 2 from polls. Second cause was road traffic accident (8%) (Table-1). Time between injury and hospital arrival was 12–50 hours. X-Ray thoracolumbar spine was carried out in all patients. MRI was carried out in 34 (68.0%), while CT scan was done in 7 (14%) patients.

The most common level of injury involved was L_1 (46%). The second common site of injury was T_{12} (12%), followed by L_3 (12%) and L_2 (10%). The common type of fracture was compression (42%). Twenty patients had a Frankel grade of C, 14 had grade A, 9 had grade B and 2 patients each had grade D and E. Sphincter disturbance was present in 42 cases. The treatment was given to 47 cases. Conservative treatment was given to 20 (42.55%) cases while surgery was performed on 27 (57.44%) cases. Three (6.38%) patients left against medical advice. Anterolateral approach was used with corpectomy, fusion and screw fixation in 23 cases. Harrington rod placement was done in 3, and pedicle screw was fixed in 1. Out of 11 surgically treated patients, 7 had Frankel grade C, 2 had grade B, and 1 each had grade A and D. Conservative group had 3 patients in each grade A and C and 1 in grade B (Table-2).

Follow up Frankel grading shows patients in conservative group improved up to grade D and E from grade A and C respectively. In surgical group, patients improved from grade B and C up to maximum of grade E. Grade A was remain same post operatively (Table-3).

Out of 22 burst fractures, 9 were treated in recumbence and 13 were treated by surgery. Nine patients treated conservatively had a Frankel grade of 2 patients each in A, B, C and E and 1 in D. Frankel grade in surgical group was C in 8 patients, B in 4 patients and A in 1 patient.

Follow-up grading shows that patients in conservative group with Frankel grade C and D improved up to maximum of E, while patients with the grade A and B remain at same neurological status. Surgical group shows that 4 patients with grade of C improved each in grades of D and E, and 4 remains in grade C at follow up. Patients who were in grade A and B were improved up to grade of D (Table-3).

Out of 7 patients of fracture dislocation, 4 were treated conservatively and 3 under went surgical stabilisation. All patients had Frankel grade of A which was remain so during follow up. The post operative complications were found in 4 patients which include graft failure, displacement of rod from hooks, rod exposure and wound infection. Associated injuries were found in 5 patients, out of which 3 had calcanean fracture. Two had elbow fracture and facial injuries.

Table-1: Demographic

Variables	Number	%
Sex Distribution		
Male	43	86.0
Female	7	14.0
Aetiology		
Fall	46	92.0
Road Traffic accident	4	8.0
Level of Injury		
L_1	23	46.0
T_{12}	6	12.0
L_3	6	12.0
L_2	5	10.0
Type of fracture		
Burst	22	44.0
Compression	21	42.0
Dislocation	7	14.0
Treatment		
Conservation	20	42.55
Left against medical advice	3	6.38
Surgery	27	57.44

Table–2: Neurological status on admission

Frankle Grade	Type of Fracture							
	Burst		Compression		Fracture Dislocation		Total	
	Conservative	Surgery	Conservative	Surgery	Conservative	Surgery	Conservative	Surgery
A	2	1	3	1	4	3	9	5
B	2	4	1	2	0	0	3	6
C	2	8	3	7	0	0	5	15
D	1	0	0	1	0	0	1	1
E	2	0	0	0	0	0	2	0
Total	**9**	**13**	**7**	**11**	**4**	**3**	**20**	**27**

Table-3: Neurological status on follow-up

Frankle Grade	Type of Fracture							
	Burst		Compression		Fracture Dislocation		Total	
	Conservative	Surgery	Conservative	Surgery	Conservative	Surgery	Conservative	Surgery
A	2	0	2	1	4	3	8	4
B	2	1	1	0	0	0	3	1
C	0	4	2	0	0	0	2	4
D	0	6	1	2	0	0	1	8
E	5	2	1	8	0	0	6	10
Total	**9**	**13**	**7**	**11**	**4**	**3**	**20**	**27**

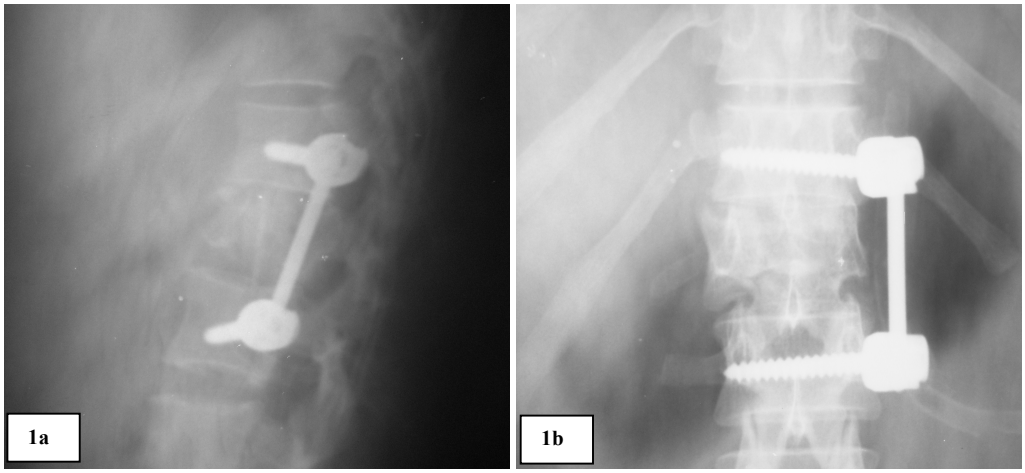

Figure-1a & b: Post-operative AP and Lateral X-Rays showing Anterior Vertebral body screws and rods in Traumatic L_1 burst fracture

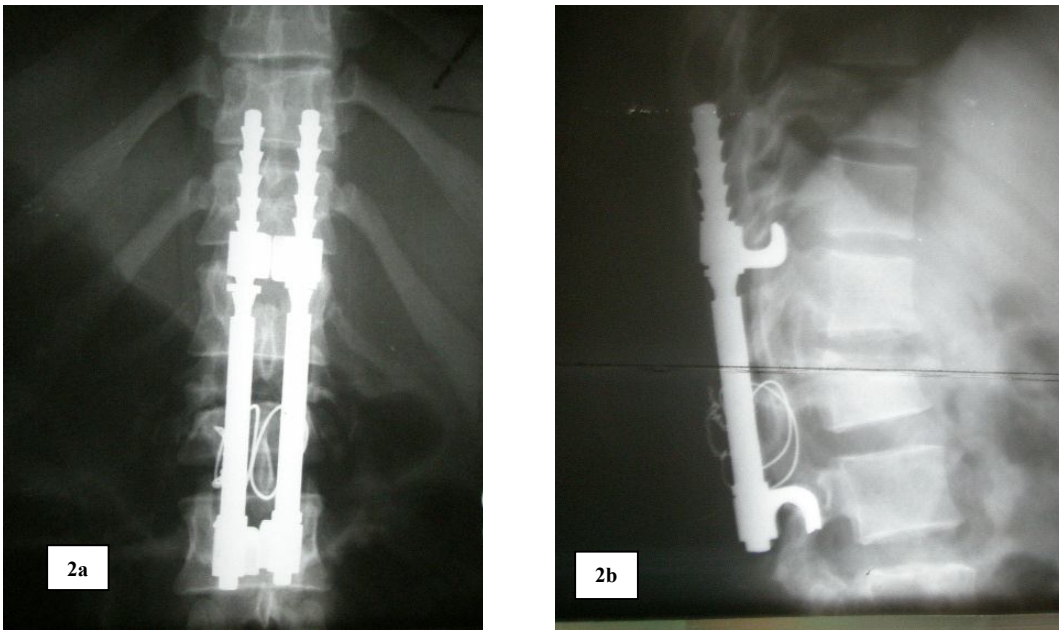

Figure-2a & b: Post-operative AP and Lateral View X-Rays showing Herrington rod placement

DISCUSSION

The demographic of thoracolumbar fracture are largely the demographic of trauma, and trauma is largely the disease of the young's. Majority of patients in our study were young. The mean age was thirty years. It is clear from many studies that young people suffer spinal cord injuries more often than any other age group. Out of fifty cases, forty three (86%) were male and seven (14%) females. Males are supposed to be more exposed to trauma than females.[11–13]

Fall was the most common cause of injury in forty six (92%), as we have observed in local studies,[11,12] but it is contrary to international studies where road traffic accident is the common cause of injury.[14] Hyperflexion and axial loading was the common mode of injury observed. In western studies, alcoholic beverages is a contributing factor for the cause of injury due to road traffic accidents but such incidents are not seen in our local studies.

Majority of patients arrived at hospital within 20 hours of trauma. None of patient had their spine protected while being shifted from the site of accident. No facilities were available in ambulances to maintain I/V line and give oxygen and no equipped medical staff to handle spinal injured patient at the scene of accident. This is contrary to what is observed in developed countries.[9,15] Most common level involved was L_1 followed by $T_{12,}$ this also coincides with other studies where common level of injury is T_{12}–L_1.[11–14] Compression fracture was the most common fracture found followed by burst fracture. Most common grade found in both types of fractures was grade C. It was also noted that there was a correlation between residual spinal canal and neurological deficit. More severe the canal compromise, worse the neurological deficit. This observation is similar to other studies conducted by Gerzbein and Hitchon.[16] Anterior surgery with corpectomy and reconstruction should be considered when neural injury occur in association with a burst fracture (Figure-1a, 1b). In patients with medical co morbidities, the posterior approach may be preferred, realizing patient may not tolerate thoracotomy.[17] The disadvantages of posterior approach include the need to resects major portions of neural arch which often are uninjured, to obtain access to middle column. It is difficult to reconstruct anterior and middle columns after the posterior approach. Disadvantages of anterior surgery include more extensive approach, increased haemorrhage, potential for thoracotomy pain and pulmonary complications and lack of familiarity by many neuro-surgeons.[18] Complete spinal cord injuries do not improve with surgery but morbidity and mortality are both reduced by early mobilisation and rehabilitation (Figure-2a, 2b). Some improvement can be seen in Cauda equina injury than thoracic injury and restoration of spinal alignment is indicated to stabilise the spine and decompresses the entrapped and compressed nerve roots.

Surgical intervention reserved for those with partial neurological deficit and unstable fractures.[19] Patients with complete loss of motor and sensory system in cases of fracture dislocations were treated surgically for spine stabilisation. Patients who were neurologically intact while CT scan shows canal compromise of less than 50% were treated conservatively. Our decisions for management coincides with other studies.[13,16] It is analysed from other studies that level of injury and canal compromise are the major determinants of neurological

deficit. It is also observed from other studies that surgery is beneficial in patients with partial neurological deficit. Anterolateral approaches were preferred when cord compressed from front, in cases of compression and burst fractures.

Follow-up neurological status of both groups (conservative and surgical) compared. Sphincter disturbance showed management problem in both groups. Follow-up showed no difference in sphincter recovery in both groups.

We have noted that hospital stay was short in surgical group compared to conservative group. This is compatible with other studies.[17]

Rehabilitation in terms of physiotherapy was started in wards. No proper rehabilitation centre available, compared to developed countries.

CONCLUSION

Thoraco-lumbar injuries occurs in young population and creates socio-economic burden to the society. No facilities are available in terms of transportation and medical staff at the scene of accident. Patients with partial neurological deficit benefit from surgery. There is a definite decrease in hospital stay and early rehabilitation in case of surgery.

REFERENCES

1. Spink MS, Lewis GL. Albucasis on Surgery and Instruments. California: Berkeley University Press; 1973.p. 812–19.
2. Dickman CA, Fessler RG, Macmillan M, Haid RW. Transpedicular screw rod fixation of the lumbar spine. Operative technique and outcome in 104 cases. J. Neurosurg 1992;77: 860–70.
3. Esses SI, Bostford DJ, Wright R, Bednar D, Bily S. operative treatment of spinal fractures with AO internal fixater. Spine 1991; 16:S146–S50.
4. Rimoldi RL, Huss SS, Zigler JE, Capen DA. The effect of surgical intervention on rehabilitation time in patients with thoracolumbar and lumbar spinal cord injuries. Spine 1992;17:1443–9.
5. Hammell KW. Spinal injury. Etiology, incidence and impairments, In: Spinal cord injury rehabilitation. Champer and Hall, 1995:57–65.
6. Ernest M, Found Jr. Fractures of the spine In: Orthopedics; Essentials of diagnosis and treatment. Clark B. (editor). New York: Churchill Livingstone;1994.p.199–214.
7. Bedbrook GM. Spinal injuries with tetraplegia and paraplegia. J Bone Joint Surg 1980;67A:360–9.
8. Dennis F. The three column spine and its significance in the classification of acute thoracolumbar spinal injuries. Spine 1983;8:817–31.
9. Chesnut RM, Marshall LF. Early assessment, transport and management of patient with posttraumatic spinal instability. In: Cooper PR. (editor). Management of post traumatic spinal instability. Neurosurgical topics. Park Ridge IL: American Association of Neurological surgeons; 1990. p. 1–18.
10. Braken M, Shepard MJ, Holford TR. Administration of methylprednisolone for 24 or 48 hours or tirilazad mesylate for 48 hours in the treatment of acute spinal cord injury. JAMA 1997;277:1597–1604.
11. Shah AA, Memon IA. Antero-lateral decompression for traumatic spinal cord compression. J Pak Med Assoc 1994;44:242–3
12. Sarwar MO. Hussain A, Khan AN. Surgical Management of unstable thoracolumbar injuries. Proceed Sheikh Zaid PGMI 1995;9(3–1),68–71.
13. Hitchon PW, Torner JC, Hadded SS, Follett KA, Thoracic and lumbar fractures. Management analysis. In: Hitchon, Traynelis, Rengachary, Techniques in spinal fusion and stabilization. New York: Thieme Medical Publishers;1995.p.338–44.
14. .MC Cormack B, Mac Millan M, Fessler RG. Management of thoracic, lumbar and sacral injuries. In: Tindall Gt, Cooper PR, Barrow DL. (Editors). Practice of Neurosurgery. Vol II. Baltimore: William and Wilkins; 1996.p.1721–8.
15. Gunby P. New focus on spinal cord injury, medical news, JAMA 1981;245:1201.
16. Gertzben SD, Court Brown CM, Mark P. The neurologic outcome following surgery for spinal fractures. Spine 1988;13:641–4.
17. McLain RF, Sparling E, Benson DR. Early failure of short-segment pedicle instrumentation for thoracolumbar fractures. A preliminary report. J Bone Joint Surg 1993;75:162–7.
18. Lewandrowski K, McLain RF, Thoracolumbar Fractures: Evaluation, Classification,and Treatment. In Frymoyer JW, Wiesel SW. (editors). The adult and pediatric spine. 3rd edition, Vol. 2, Philadelphia: Lippincot Williams & Wilkins; 2003.p.817–43.
19. Riebel GD, Yoo JU, Fredrickson BE, Yuan HA. Review of Harrington rod treatment of spinal trauma. Spine 1993;18:479–91.

Address for Correspondence:

Dr. Riaz A. Raja, 110-Defence, Hyderabad, Pakistan. **Tel:** +92-22-2780260, +92-22-2720317, **Cell:** +92-300-3039056
Email: riazrajamemon@yahoo.com