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Profile of patients with thoracolumbar spine injuries: A descriptive study

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Abstract
Introduction: Thoracic spine is much stiffer than the lumbar spine in sagittal plane. This restricts lateral flexion- extension. This is due to restraining effects of the rib cage, and the relatively thinner discs of the thoracic spine, which restrict the arc of motion. Rotation about the craniocaudal axis is greater in the thoracic spine.
Methodology: All patients were initially evaluated in the out-patient department or casualty according to their presentation and then they underwent detailed assessment of their hemodynamics, spine, neurological status and other injuries if associated with trauma.
Results: L1 was the commonest site of fracture followed by T12, L4, L2.L3, T11 and T5. Overall thoracolumbar junction showed highest incidence of fracture.
Conclusion: Commonest mode of injury was Road traffic accident followed by fall from height.

Keywords: RTA, Spine injury, Thoracolumar

Introduction
Biomechanics should be considered in terms of Kinematics (i.e. the physiologic motion allowed with the constraints of anatomy) and the forces acting on the spine.
Any motion of the spine may be resolved into 6 components using a three dimensional co-ordinate system. The three pure types of translation along a single axis are anteroposterior translation along sagittal plane (along z axis), mediolateral translation in the frontal plane (along x axis), and craniocaudal translation along longitudinal plane (along y axis). [1]
Angular motion can also be described by the coordinate system. The three pure types of angulations are flexion extension in the sagittal plane (x is the axis of rotation), lateral flexion in the frontal plane (z is the axis of the rotation) and rotation about the craniocaudal axis (y is the axis of rotation). The six cardinal motions (three linear and 3 angular) can be coupled.
Motions of translation are relatively restricted in the thoracolumbar spine, especially anteroposterior or mediolateral translation. Consequently physiologic motion of the spine is achieved chiefly by angulations. [2]
Thoracic spine is much stiffer than the lumbar spine in sagittal plane. This restricts lateral flexion- extension. This is due to restraining effects of the rib cage, and the relatively thinner discs of the thoracic spine, which restrict the arc of motion [3]. Rotation about the craniocaudal axis is greater in the thoracic spine [4]. In the lumbar spine, rotation is limited by the orientation of the facets and the anterior portion of the annulus to only 10 degrees for the entire lumbar spine versus about 75 degrees of rotation to each side in the thoracic spine [5].
The forces acting on the spinal column include internal (i.e. muscle) forces and external forces resulting from contact with the environment (e.g. gravity, acceleration or missile). Kelly and Whitesides [6] observed that the vertebral bodies and discs primarily function to support compressive loads, whereas the processes, with their profusion of connecting ligaments seem best adapted to withstand tensile forces.
Jacobs *et al* [7] analyzed the normal physiological forces acting on the spine. Thoracolumbar junction transmits a compressive load of approximately 400 Newton's, owing to the weight of the body above that point. Because the center of gravity is located anterior to the spine, this eccentric position results in a flexion. Bending forwards to 90 degrees at the hips, results in 400N shear force between the two vertebrae.

In addition the flexion bending moment increases shear force dramatically to 120NM. Treatment should restore the ability of the vertebral column to withstand these physiological stresses.

Haher [8] and co-workers analyzed the load-carrying capacity at thoracolumbar junction. By disrupting the anterior column, they found that the load-carrying capacity of the thoracolumbar junction decreased by 30%. Ablating the anterior and middle columns decreased the load carrying capacity by 70%. Ablating posterior columns decreased capacity by 65%. By ablating annuls, rotatory stability diminished by 80%. This helps us evaluate the instability more accurately.

Methodology

All patients were initially evaluated in the out-patient department or casualty according to their presentation and then they underwent detailed assessment of their hemodynamics, spine, neurological status and other injuries if associated with trauma. The patient's epidemiological, historical, subjective and physical findings were noted. After initial investigations and hemodynamic stabilization, patients were assessed neurologically in detail. A neurological chart was maintained for each patient.

Methyl prednisolone was administered to all patients according to NASCIS, I, II, III protocol: Methyl prednisolone bolus 30 mg /kg followed by 5.4mg/kg/s infusion for 24 hours. If bolus given within 8 hours of injury. Infusion for 48 hours if bolus given within 3 to 8 hours after injury.

All the patients had routine X-rays of thoracolumbar and lumbosacral spine in both AP and lateral views. In all patients CT scanning was done, MRI was done in affordable patients. The exact level of injury, type of fracture and mechanism of injury were ascertained. The preoperative neurological status was graded on the basis of ASIA grading. It was also used to assess post-operative recovery and follow-up.

Results

Of the 20 patients, 16 were male and 4 female. The age ranged from 18 years to 45 years. The most common age group involved was between 21-30 years. So the young male adults were the most affected

Table 1: Age and Sex Distrubution

No. of Cases		
Male		**Female**
11 to 20	2	0
21 to 30	6	3
31 to 40	6	0
41 to 50	2	1

Road traffic accident was the commonest mode of injury, followed by fall from height and weight falling on the back. All three modes of injury are high energy trauma.

Table 2: Mode of injury

Mode of injury	No of cases	Percentage
Road traffic accident	10	50
Fall from height	08	40
Fall of weight on back	02	10

L1 was the commonest site of fracture followed by T12, L4, L2.L3, T11 and T5. Overall thoracolumbar junction showed highest incidence of fracture.

Table 3: Level of Fracture

T 5	1
T 11	1
T 12	4
L1	8
L 2	2
L 3	1
L4	3

Table 4: Level of Fracture

T1-T10	T11-L2	L3-L4
1	15	4
5%	75%	20%

All the fractures were classified according to Magerl classification system. All the fracture patterns were judged by plain radiographs of the involved area. According to Magerl classification, 8 cases were type A (40%), 8 cases were type B (40%) and 4 cases of type C (20%) fractures. Each broad classification was subdivided.

Table 5: Type of Fracture

Type	No. of cases
A1	2
A2	0
A3	6
B1	2
B2	4
B3	2
C1	*2*
C2	2

Discussion:

Of the 20 patients, 75% (15) were between 21-40 years, i.e. young adults. Among which 60% (12) were male. One of the reasons for high incidence in young adults could be due to their predominant outdoor activities. This is economically most active group and thus these fractures incur a great economic burden on the society. The range was between 18-45 years. The mean age was 29.65 years. These findings are consistent with most other similar studies. R. Roy Camille et al studied 123 patients and their range was 15-70 years, with a mean age of 30 years. K.D. Tripathib A.K Singh in their study cited age between 14-45 years with a mean of 29.3 years. Aebi. M, *et al* in their study found that mean age was 30 years with a male predominance of the 20 patients 16 were (80%) male and 4were female (20%). According to R. Roy Camille[9] *et al* 63% were males and 37% females. According to K.D. Tripathi and AK Singh [10] 80% were males and 20% were females. According to Aebi. M [11] et al 75% were males and 25% females Predominantly manual labor and climbing the trees for harvesting fruits by males, and household indoor activities by females might be responsible for very high incidence of fracture in males especially in India.

Road traffic accident contributed maximum no of cases i.e. 10 (50%) in our study, making it the commonest cause. Fall from the height contributed 8(40%) of cases, and fall of weight over the back contributed 2(10%) cases. Fall from height is the commonest cause in a study by KD Tripathi and AK singh [10] (60%). But R. Roy Camille *et al* [9] found Road traffic accidents as the commonest cause (46%). In their series fall from height was second most common cause (36%). Aebi. M *et al* also reported in their study that fall from height is the major contributor.

L1 was the commonest site of fracture followed by T12. T11

to L2 level accounted for 75% of cases. K.D. Tripathi and A.K. Singh [10] also found T11–L2 accounting for 66% of cases. Roy Camille [9] found similar results with T11-L2 accounting for 42% cases. The thoracolumbar junction is very vulnerable to injury due to high mobility at this site. Also rib cage gives additional support for thoracic segments.

Conclusion

Thoracic and lumbar spine fractures are more common in younger age group.

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