

Original Research Article

Incidence of flexion distraction injuries of thoraco lumbar spine

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ABSTRACT

Background: Thoraco-lumbar spine fractures form majority of spine fractures and is an important cause of morbidity. However, comprehensive data regarding epidemiological pattern of trauma patients with spinal fractures are scarce. Many epidemiological reports about spinal fractures focus on osteoporosis as an etiologic factor. But in Indian population more important etiological factors are road traffic accidents and falls from height. Studies concerning only operatively treated patients with spinal fractures show selective and biased data that might be useful for capacity planning in hospitals or evaluating results of operative treatment, but not for epidemiological purposes.

Methods: Among 86 consecutive patients with thoracic or lumbar fractures attending the out-patient department or Emergency department of Sree Gokulam Medical College, Trivandrum were enrolled in the study. All patients with fractures of the thoracic or lumbar spine were enrolled in this study.

Results: Flexion distraction injuries are the second commonest unstable thoracolumbar spine injuries.

Conclusions: This study is a prospective cohort study of the epidemiological aspects and pattern of injury and treatment in thoraco-lumbar spine fractures at a tertiary care referral center. A total of 86 patients were enrolled in the study. The most common fracture pattern seen in this study was compression fractures (24.4%) which are stable. This was followed by stable burst fractures (23.2%), unstable burst fractures (18.6%), translational injuries (fracture-dislocations) (16.3%), flexion-distraction injuries (13.9%) and chance fractures (3.5%).

Keywords: ASIA Grading, Flexion distraction, McAfee Classification, Tomography

INTRODUCTION

Thoraco-lumbar spine fractures form majority of spine fractures and is an important cause of morbidity. However, comprehensive data regarding epidemiological pattern of trauma patients with spinal fractures are scarce.¹ Many epidemiological reports about spinal fractures focus on osteoporosis as an etiologic factor.^{2,3} But in Indian population more important etiological factors are road traffic accidents and falls from height. Studies concerning only operatively treated patients with spinal fractures show selective and biased data that might be useful for capacity planning in hospitals or evaluating results of operative

treatment, but not for epidemiological purposes.^{4,5} Epidemiological evaluation of subgroups like pediatric cervical spine injuries, spinal fractures in aviators, sports-related spinal injuries give important information, but only about these subgroups, for example in the field of risk evaluation or specific after treatment.⁶⁻⁸ The present study examines the etiology, fracture patterns and treatment of thoracic and lumbar fractures at a tertiary care hospital.

METHODS

This study was conducted from January 2015 to February 2016 in the Department of Orthopaedics, Sree Gokulam

Medical College, Trivandrum. 86 consecutive patients with thoracic or lumbar fractures attending the out-patient department or Emergency department of Sree Gokulam Medical College, Trivandrum were enrolled in the study. Thorough neurological examination and classification according to ASIA impairment scale was done. Charting of motor power of muscle groups was done according to the Medical Research Council grading system Plain Anteroposterior and Lateral radiographs were obtained for suspected areas of Spine fracture. When a fracture was identified, further imaging was done with Computed Tomographic scans of the fractured region to aid in classifying the fracture. In cases with neurologic deficits, MRI scan of the affected region was obtained to ascertain the status of the neural elements. Based on the findings on plain radiographs and CT imaging, the fractures were classified according to McAfee's classification.

Inclusion criteria

All the patients with spine injury attending the emergency department of Sree Gokulam Medical College, Trivandrum are included in the study.

Exclusion criteria

Spine injuries associated with the severe head injury and patients with poly trauma and severe multi system involvement and patients of extremes of age are excluded in the study.

Statistical analysis

Microsoft office 2007 was used for statistical analysis. Mean and percentage were used to interpret data.

RESULTS

Flexion distraction injuries are the second commonest unstable thoracolumbar spine injuries the results of the data analysis is given below.

A total number of 86 patients enrolled in the study, more than two-thirds (68.6%) were males (Table 1 and 2).

Age distribution of these fractures show a more or less "bell shaped" distribution with the number of patients in the extremes of age progressively decreasing (Table 3 and 4).

Table 1: Fracture pattern distribution.

	Male	Female	Total
Compression	11	10	21
Stable Burst	16	4	20
Unstable Burst	10	6	16
Chance	3	0	3
Flexion Distraction	7	5	12
Translational injury (Fracture Dislocation)	12	2	14

Table 2: Gender distribution.

Male	59(68.6%)
Female	27(31.4%)
Total	86

Table 3: Age distribution.

	<20 yrs	21-40 yrs	41-60 yrs	61-80 yrs	>80 yrs
Male	2	17	15	15	10
Female	2	4	5	10	6
Total	4 (4.6%)	21 (24.4%)	20 (23.2%)	25 (29.0%)	16 (18.6%)

Table 4: Etiology of injury.

	Total	Male	Female
Road Traffic Accident	34	24	10
Domestic Fall	20	8	12
Fall from Tree	15	15	0
Fall from Height	17	12	5
Total	86	59	27

Two peaks are particularly observed. First peak is in the 21-40 years age groups represents the young and physically active individuals sustaining fractures primarily due to high velocity trauma like fall from height and road traffic accidents. The second peak in the age distribution is in the 60-80 years age group. These patients sustained the injury as a result of low velocity trauma like fall at home. In this age group the bone strength is predictably low. Majority of these low velocity trauma resulted in the stable type of spine injuries, mostly compression fractures (Table 5, 6 and 7).

Table 5: Fracture classification.

	Male	Female	Total
Compression	11	10	21
Stable Burst	16	4	20
Unstable Burst	10	6	16
Chance	3	0	3
Flexion Distraction	7	5	12
Translational injury (Fracture Dislocation)	12	2	14

Compression fracture involves only injury to the anterior column with the middle and posterior columns intact. 21 cases (24.4%) presented with this pattern of fractures. None of these patients had neurological deficits. Next common fracture type were stable burst fractures 20 cases (23.2%). Stable burst fractures involve fracture of anterior and middle column and the mechanism of injury is usually vertical compression as in the case of fall from height. Both these columns fail in compression. These are considered stable because of the intactness of the posterior tension band. None of these 20 patients had neurological deficit.

Table 6: Distribution of neurological deficits.

	Total	ASIA A	ASIA B	ASIA C	ASIA D	ASIA E
Compression	21	0	0	0	0	21
Stable Burst	20	0	0	0	0	20
Unstable Burst	16	3	0	3	3	7
Chance	3	0	0	0	1	2
Flexion Distraction	12	4	0	0	2	6
Translational injury (Fracture Dislocation)	14	13	1	0	0	0

Table 7: Fracture classification.

	Anterior	Middle	Posterior
Wedge compression	Compression	intact	Intact
Stable Burst	Compression	Compression	Intact
Unstable Burst	Compression	Compression	Rot/Shea/ Compr.
Chance fractures	Distraction	Distraction	Distraction
Flexion Distraction	Compression	Distraction	Distraction
Translational injuries	Shear	Shear	Shear

Unstable burst fracture are, as the name suggests, are mechanically unstable. Here, the anterior, middle and posterior columns fail in compression. In our study, 16 cases (18.6%) presented with unstable burst fracture pattern of which 9 cases had neurological deficits. 3 cases had complete neurological deficit (ASIA A) while six had partial neurological deficit.

Next common injuries were translational injuries (fracture-dislocations) which were present in 14(16.3 %) patients. In our study all patients had paraplegia (13 ASIA A and 1 ASIA B). Most of them sustained injury due to fall from height (building) or fall from tree.

Flexion distraction injuries accounted for 13.9% of cases with 12 patients presenting with these injuries. 50% had neurological deficit of which 4 presented with complete paraplegia and 2 presented with ASIA D neurology. Flexion Distraction injuries are highly unstable injuries as evidenced by the high incidence of neurological deficits. In this type of injury, anterior column fails in compression and middle and posterior columns fail in distraction. Most of these injuries resulted from road traffic accidents. The sudden deceleration from the vehicle impact throws the body forward with a flexion moment resulting in this type of injury. The axis of rotation passes through the anterior column. This is in contrast to the chance fracture where the axis of rotation is anterior to the anterior column. In our study, three patients presented with chance fractures making it the least common type of fracture in our study.

DISCUSSION

According to the description by Denis, the anterior column is defined by the anterior longitudinal ligament, the anterior annulus fibrosus and the anterior part of the vertebral body.¹ The posterior column consisted of all structures posterior to the posterior longitudinal ligament including the osseous posterior elements and the posterior ligament complex (Figure 1). The middle column was defined anatomically as the posterior half of the vertebral body including the annulus fibrosus and the posterior longitudinal ligament.^{2,3} Denis argued that the middle column is the key to the stability of the fracture. This concept was based on the understanding that the anterior third of the vertebral body or the anterior column normally transmits only 30% of the body weight, and posterior column transmits only 20% of the body weight. But combined with the middle column, the anterior column resists 70 to 80% of the body weight in flexion, whereas together with the middle column, the posterior column may resist as much as 60% of the body weight in extension. Although Denis is credited for introducing the three-column theory, this has been described previously by others.^{4,5}

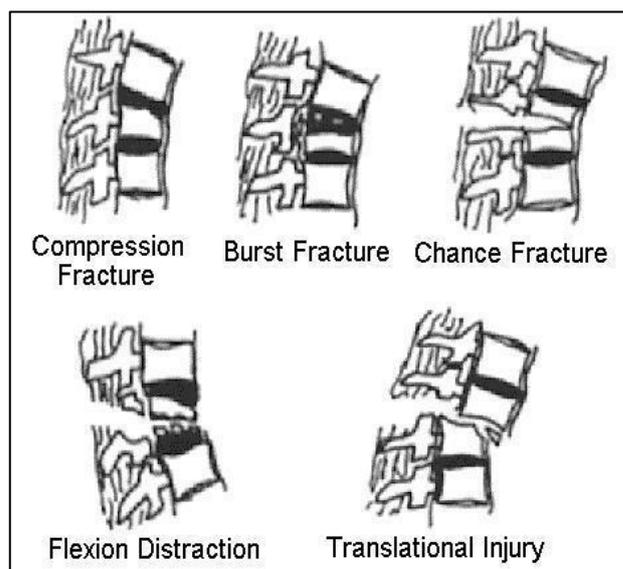


Figure 1: McAfee included the mechanism of injury and mode of failure of the three columns to propose a useful classification system.

McAfee pointed out that one of the major deficiencies of the weight-bearing column concepts is that it does not consider the mechanism of failure of the columns.⁶ He proposed a further modification to the Denis classification by introduction of mechanism of failure of the middle column.

According to McAfee, there are three modes of failure of the middle column; axial compression, axial distraction and translation. This was a very important contribution by McAfee, introducing the concept of “mechanism of injury” together with “morphology of the fracture”

Mechanisms of failure of columns in McAfee classification

Out of the 12 patients with flexion distraction injuries, 11 were managed surgically using pedicle screws.^{7,8} Patients were mobilised early using TLSO in patients without neurological deficits and wheel chair for patients with deficits.⁹ Surgical stabilization aims at restoring the biomechanical integrity by realigning the spine, allowing load bearing without risk of further neurological damage and maintaining such position until healing occurs.^{10,11} Surgical stabilization allows the patient to be mobilized early. In our study, pedicle screw stabilization was used for fixation. Pedicle screws allow three column purchases and its insertion is familiar to most surgeons.¹²⁻¹⁴

CONCLUSION

This study is a prospective cohort study of the epidemiological aspects and pattern of injury and treatment in thoraco-lumbar spine fractures at a tertiary care referral center. A total of 86 patients were enrolled in the study. The most common fracture pattern seen in this study was compression fractures (24.4%) which are stable. This was followed by stable burst fractures (23.2%), unstable burst fractures (18.6%), translational injuries (fracture-dislocations) (16.3%), flexion-distraction injuries (13.9%) and chance fractures (3.5%) Flexion distraction injuries constitute of 1/3rd of unstable fractures (13.9%).

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Ethical approval: The study was approved by the Institutional Ethics Committee

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