

## **Original Article**

# **Multiple trauma associated with spinal injury**

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## **ABSTRACT**

### **Objective**

To highlight the importance and incidence of associated injuries with spinal cord trauma.

### **Patients and Methods**

Retrospective analysis of 375 spinal cord injury patients admitted to spinal injury unit, from November 2006 to October 2009 was performed. Data were collected from the medical records.

### **Results**

The incidence of associated injuries along with spinal cord injury was 40%. Motor vehicle accident was the most common etiology of spinal injury. The most common level of injury was C5-C6 fracture dislocation. The common associated injuries were chest (24%) abdomen (22.7%), limb (21.3%) head (16.7%) and facial trauma (15.3%).

### **Conclusion**

An associated injury with spinal cord injuries is a common occurrence and may increase mortality and morbidity. (Rawal Med J 2011;36:18-21).

### **Key Words**

Spinal injury, fracture, dislocation.

## **INTRODUCTION**

Spinal injuries usually require a significant deforming force to occur. Injuries to other parts of the body like head, chest and abdomen are often seen in the setting of spinal cord injury. Multiple trauma patients with severe spinal cord injuries have a high mortality rate and survivors can face significant long-term disability<sup>1</sup> with poor outcome.<sup>2</sup> Despite a growing awareness of associated injuries with spinal cord trauma, such injuries can be missed or overlooked and are often underestimated. In the last two decades, there has been an upward trend in motor vehicle accidents and etiology and pattern of spinal injuries with associated injuries have changed significantly. Therefore, there exists a need to be aware of their acute presentation especially for the emergency practitioners at all levels. Early identification and management of major life threatening trauma in spinal injury patients will prevent long-term complications, reduce mortality and morbidity and improve functional outcome in these patients. This paper aims to show the association of spinal injuries with trauma to other body organs which can be life threatening and pose even more immediate management concerns than the spinal injury itself.

## **PATIENTS AND METHODS**

Between November 2006 to October 2009, 375 patients of spinal cord injuries were admitted to the Queen Elizabeth National Spinal Cord Injuries Centre. This centre serves 1.5 million population of Scotland. Out of these 375 patients, 150 (40%) had associated injuries, in addition to spinal cord injury. This retrospective analysis included these 150 patients to determine the etiology, nature and severity of associated injuries in patients with a spinal injury. All patients with or without neurological damage were included in the study.

**Table 1. Etiology of spinal injuries (N=150).**

<b>Etiology of spinal injury</b>	<b>Number</b>	<b>Percentage</b>
<b>Road traffic accidents</b>	<b>56</b>	<b>37.4%</b>
<b>Fall from height</b>	<b>36</b>	<b>24%</b>
<b>Fall from stairs</b>	<b>19</b>	<b>12.6%</b>
<b>Sporting injuries</b>	<b>18</b>	<b>12%</b>
<b>Assaults</b>	<b>12</b>	<b>8%</b>
<b>Cycling accidents</b>	<b>6</b>	<b>4%</b>
<b>Suicide attempts</b>	<b>3</b>	<b>2%</b>

Patient medical records and radiological investigations were used to collect details of age, gender, mechanism of injury, vertebral level and neurological degree of spinal injury and associated injuries. Information was also obtained from the clinical letters. Associated regional injuries identified included head, chest, long bones, pelvic, abdominal and others (eye, facial, vascular, ligamentous, burns, peripheral nerves and amputations). These injuries were classified by the anatomical sites. Mechanism of injury was categorized as motor vehicle accidents, falls, attempted suicides, assaults, sports or others.

The distribution of injuries to the spine in relation to the vertebral level was determined from the radiographs, computed tomography (CT) scan or magnetic resonance imaging (MRI) findings. The bone injury was classified as fracture only or a dislocation with or without fracture. The American Spinal Cord Injuries Association (ASIA) scale was used to classify the neurological impairment following spinal cord injury. The ASIA impairment scale has five grades from A to E with A as Complete neurological injury below the spinal level and E as normal motor and sensory function below the level of spinal injury. Non-parametric statistical methods were used to compare results between different groups of patients.

## **RESULTS**

Out of 375 patients admitted to over a 3 years period, 150 (40%) had radiological evidence of spinal injury along with other injuries. There were 93 (62%) males and 57 (38%) females. The age group ranged from 16 to 78 years (mean 37 years). Motor vehicle accident (Table 1) was the most common etiology of spinal injury sustained by 56 (37.4%) patients (Table 1). Cervical spine injuries were the most common spinal injury (42.6%) followed by lumber (28%), thoracic (25.4%) and sacral (4%) spine (Fig 1). The most common level of injury was C5-C6 fracture dislocation.

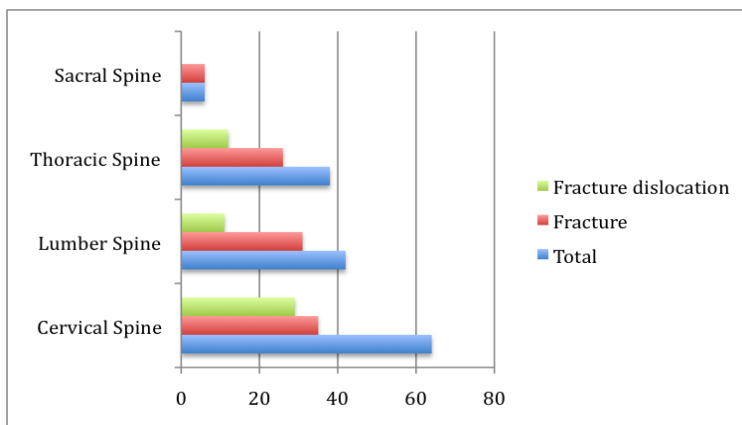
**Table 2. Associated injuries with spinal cord injuries.**

Associated injuries	Cervical spine	Lumbar spine	Thoracic spine	Sacral spine	Total
<b>Chest injury</b>	8 (12.5%)	11 (26.2%)	17 (44.7%)	0	36 (24%)
<b>Abdominal injury</b>	6 (9.4%)	14 (33.3%)	10 (26.3%)	4 (66.7%)	34 (22.7%)
<b>Limb injury</b>	13 (20.3%)	9 (21.4%)	8 (21.1%)	2 (33.3%)	32 (21.3%)
<b>Head injury</b>	19 (29.7%)	5 (11.9%)	1 (2.6%)	0	25 (16.7%)
<b>Facial injury</b>	18 (28.1%)	3 (7.2%)	2 (5.3%)	0	23 (15.3%)
<b>Total</b>	64	42	38	6	150

The most common injury associated with the spinal injuries was to the chest (24%). Abdominal trauma was the second most common associated injury (22.7%) followed by limb, head and face trauma (Table 2). Of the 64 patients with cervical spine injury and associated injuries, 19 (29.7%) had head injury. Moreover this combination of injuries was mainly caused by road traffic accidents and common in age group between 20 to 35 years of age. Facial trauma was found in 18 (28.1%) patients with cervical spine injury. This included both facial lacerations and fractures of the facial bones. Limb injuries were found in 13 (20.3%) and significant chest injures in 8 (12.5%) patients. Chest trauma was associated mainly with

the lower cervical spine injuries. Abdominal trauma was associated in only 6 (9.4%) patients with cervical spine injuries. Combined head injury, chest injuries and abdominal trauma were associated with significantly raised morbidity and prolonged hospital stay. 44.7% of patients with thoracic spinal injuries had severe chest injuries that included multiple rib fracture, hemothorax, pneumothorax, lung injury, and injuries to the heart and great vessels.

**Fig 1. Pattern of spinal cord injuries.**



Major associated injury in lumbar spine trauma was abdominal injuries. 33.3% of patient had significant abdominal and pelvic injuries, which were life threatening and required surgical intervention. The second most common injury associated with the lumbar spine was chest injuries (26.2%) followed by limb trauma (21.4%) and head injury (11.9%). Trauma to the sacral spine was commonly associated with abdominal injuries and to the limbs. 66.7% of patients with sacral trauma had associated abdominal and pelvic injuries and 33.3% were affected by limb injuries. Head, chest and facial injuries were also not seen commonly in this group (Table 2).

## DISCUSSION

The reported incidence of the additional trauma in patients with spinal cord injuries is between 28-67%.<sup>3</sup> The incidence of associated injuries with spinal cord injuries in our study was 40%, with the majority of cases occurring as a result of motor vehicle accident. It was

also found that cervical injuries were the most common among the spinal injuries and associated injuries most frequently involved the head, chest, abdomen, limbs and face. This is similar to the incidence reported by Saboe et al<sup>4</sup> in 1991. They studied 508 consecutive hospital admissions with spinal cord trauma and identified the presence of associated injuries in 240 (47%) cases most frequently involving head (26%), chest (24%) and long bones (23%). Cervical spine injury has been reported to be associated with head injuries in 35% cases.<sup>5</sup> This implies that any injury to the cervical spine especially of the upper cervical spine should prompt investigations looking for intracerebral injury e.g. subdural hematoma, intracerebral bleeds and extradural hematoma. In the unconscious patients, fractures of the spine are easily missed and X-rays of the cervical spine should always be obtained first and only then skull imaging after cervical injury has been determined.

The mechanism of injury is also important as it is clear that motor vehicular accidents and falls are more likely to cause significant injury to the spinal cord and other organs. This again is expected due to the amount of energy transfer in a decelerating car or someone falling from a significant height. In the car, with the patient wearing a seatbelt, the head is unrestrained and therefore continues forward on deceleration. Cervical spine injuries are therefore inevitable. Without seatbelts, we have the addition of facial and head trauma as well as chest injuries. Retrospective analysis of 2718 car occupants involved in road traffic accidents showed an incidence of 14.1% of spinal cord injuries.<sup>6</sup> Similarly, in another study the incidence of spinal cord injury in 1221 motorcyclist involved in road traffic accidents was 11.2%.<sup>7</sup>

Lumbar and sacral spine injuries were strongly associated with severe abdominal, pelvic and lower limb injuries. A retrospective review of 258 trauma patients, with lumbar spine fractures, showed that 10.1% were associated with severe abdominal injuries.<sup>8</sup> Classically, falls from heights with individuals landing on their feet, hips or buttocks, cause wedge

compression fractures where a mobile part of the spine is flexed on another relatively immobile part. Conceivably, this occurs due to the person trying to reduce the force of impact by bending forward on hitting the ground. Notwithstanding this however, the force of impact is in many cases too much to dissipate by this maneuver and fractures of long bones, pelvis, calcaneum, talus, etc. are likely to occur.

The most difficult associated injuries to diagnose in a spinal trauma patient are the abdominal injuries. Loss of pain sensations in paralyzed patient can mask a ruptured viscus and further add to a complex problem. Abdominal rigidity associated with fracture of the lumbar spine may suggest an intra-abdominal injury when none is present. Local bruising, relevant history regarding the specific mechanism of trauma, presence of haemodynamic instability, other major injuries together with appropriate scanning and laboratory findings usually give helpful clues.

With regards to the thoracic spine, it is thought that the intact rib cage and sternum act as a buffer to deforming forces and may even help disperse some energy during trauma. It is thus easy to see that once this cage is broken, the thoracic spine is left vulnerable. This is in keeping with our finding that thoracic spine injuries were strongly associated with severe chest injuries. In cervical cord injuries, with associated paralysis of accessory muscles of respiration, the patient is totally dependent on diaphragm for breathing. If the diaphragm is also injured with associated chest trauma then breathing is severely compromised. Early tracheotomy in these patients is vital and life saving.

Due to high incidence of associated injuries in spinal cord injured patients a standardized diagnostic approach should be employed to evaluate these individuals. The exact diagnostic procedures to achieve this still remain controversial. CT scan is now widely available and considered as gold standard<sup>9</sup> for evaluation of these injuries due to its diagnostic accuracy.<sup>10,11</sup>

It is also considered mandatory in evaluation when the patient present with decreased Glasgow Coma Scale.<sup>12</sup>

## **CONCLUSION**

There is a close relationship between spine and associated injuries. Therefore, a high index of suspicion is required to rule out associated injuries in spine trauma and vice versa. Acute spinal injury victims require prompt assessment and resuscitation and they should be admitted in a centre with all the resources and trained personnel to recognize and treat their associated problems.

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