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Case Report

Air Bag Injury to the Thoracic Spine: A Case Report and Recommendations for Car Safety Restraint Users

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ABSTRACT

A case of airbag injury with upper thoracic vertebral compression, with no dislocation is presented. This level of injury is unusual, as they mainly occur at the lower level of the thoracic spine. The awareness is required as airbag protection in adults is partial, just as it is in children.

Keywords: Airbag, Thoracic spinal injury

Introduction

Injuries to the thoraco-lumbar spine in head-on motor vehicle collisions remain a persistent concern. As the number of vehicles on the roads has increased, the number of motor vehicle accidents has multiplied. Despite improvements in roads and highways, car safety features such as airbags and the development of improved passenger restraints, they only offer partial protection.

The National Traffic Safety Administration in the USA and the British and Canadian equivalents established a 50% reduction in morbidity and mortality following the introduction of the 3-point seat belt and airbags.

An analysis of vertebral fractures occurring following head-on collisions found that most are located at the cervical and the lower thoraco-lumbar areas. Upper thoracic level vertebral compressions in the presence of a combined 3-point belt and airbag deployment have been rarely reported [1-3].

The following case report intends to emphasize chest compression induced upper thoracic vertebral injury, albeit a mild one.

Case Report

A 71 year old obese but otherwise healthy person was a front seat passenger (on the left hand side in Australia). Despite being protected by a head rest and a 3-point seat belt, he was injured whilst involved in a head on collision. Travelling at moderate speed, the collision activated the airbag. The space between the driver and the front seat passenger was large and free of any prominent objects.

The front seat passenger sustained no immediately recognisable direct injuries; however, within a few days a large subcutaneous hematoma appeared on the chest in the area of the right nipple (Figure 1). The patient was seen one year post injury in the first author's consultative rooms and was exposed to a lateral, erect position, EOS scan that documented a 25% wedge deformity, when measuring the anterior versus posterior vertebral heights at T4 and T5 (Table 1).

Also seen were upper mid-vertebral body cortex depressions (Figure 2). The initial chest x-ray report only commented on the rib cage and failed to recognise the changes at the upper thoracic spine. Seen only faintly on the lateral chest films, there were mild depressions of two vertebral bodies (Figure 3).

The extensive age-related spinal calcifications were asymptomatic and considered as protective against a more severe compression. No adverse neurological findings were detected.

Discussion

The thoracic spinal injuries resulting from head on collisions have been classified in different ways over time. In a Medline literature search, 585 publications reporting air bag injuries were identified. However, there were no reports of vertebral fractures below the T6



Figure 1: Photo of chest area hematoma.

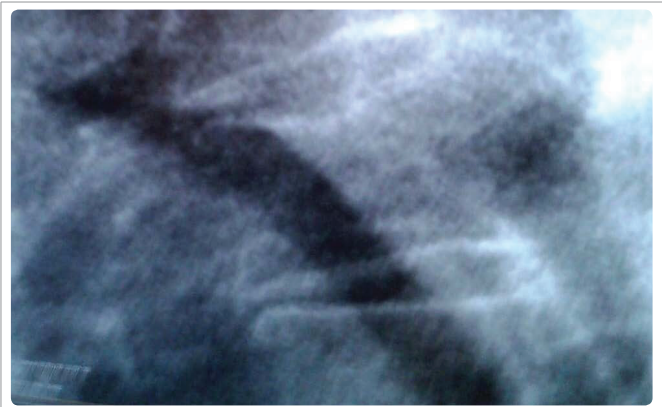


Figure 3: Chest x-ray: note undiagnosed T4 area mid-upper cortex depression.

level of the spine. The Denis classification of vertebral injuries and the Rao modifications remain valid today. The combination of the three point seat belt restraint and air bag is considered protective, preventing contact with the steering wheel and dashboard. These advancements have resulted in significant reduction of morbidity and mortality for adults, albeit in specific positions in the car [4-10].

Reports suggest that children, however, may not be as well protected. Although, the benefit from seat belt and airbag protection has been recognised, children also now experience severe injuries that were not seen before the introduction of these devices; these injuries are rare, less present in adult involved in motor vehicle collision [11-14].

Authorities concluded that children under the age of 12 ought to be seated in the back seat, preferably in the middle seat position, away from the compressing side (curtain) air bags. The large and particularly sensitive bags can produce severe injuries to the head, neck, chest and abdomen in otherwise mild/moderate accidents that would not have been serious or fatal [15].

In this adult case report, while the seat belt and air bag prevented severe injuries, they permitted a high level chest compression with upper thoracic spinal impact. As a mechanism, it is suggested that the large and bulging abdomen reflected the compression force upward towards the chest wall, way above the seat belt level. Secondly, compression of the thorax impacted upon the upper thoracic spine.

Conclusion

Despite seat belt and air bag protection, vertebral compressions at the upper thoracic levels do occur. This report is intended to raise awareness of an injury that may not be immediately obvious to clinicians. This communication reminds readers of car restraint complications in all age groups.

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Table 1: Measurements of vertebral body heights (mm).

Vertebra	Anterior wall	Central body	Posterior wall
T4	14.2	13	19.4
T5	16.8	12	17.2
T6	18	18	18

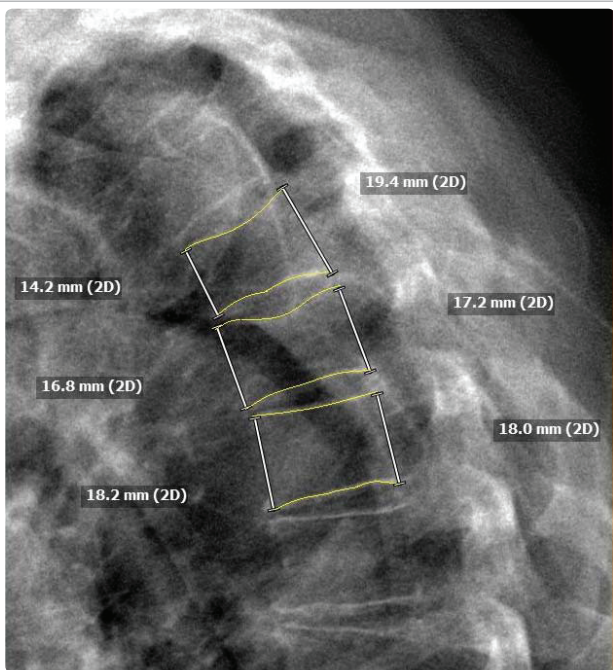


Figure 2: EOS scan of upper thoracic spine: note compression of T4 and T5, and normal vertebral configuration at T6.

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