Other full case

Missile launch pad: an unusual consequence of airbag deployment

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Summary

Vehicle airbags significantly reduce vehicle occupant injuries and fatalities in road accidents. However, a number of injuries are recognised as being directly attributable to airbag deployment. The majority of these are blunt injuries due to the high force of airbag deployment and include ocular injuries, burns, chest trauma and, rarely, fatalities. The authors describe a case of mixed blunt ocular and penetrating facial trauma as a result of airbag deployment.

BACKGROUND

This paper describes an unusual injury from an accidental injury prevention device. The mechanism of injury evokes the image of a successful missile launch against the object of defence. The major sight threatening injuries to the eye are worthy of note. The figures are eye catching. No blunt ocular and penetrating facial trauma as a result of airbag

deployment has, to our knowledge, been reported in literature. Every driver needs to know this is possible.

CASE PRESENTATION

A 42-year-old woman was involved in a head-on collision at 30 mph. She was wearing a seat belt. The airbag was deployed from her steering wheel. She suffered a penetrating facial injury from a pencil that was in her breast pocket (figures 1 and 2). It was extracted under general anaesthetic. Its trajectory was initially in the subcutaneous tissue of her

Figure 1 Pencil penetrating right cheek.

Figure 2 X-ray showing trajectory of pencil in face.

Figure 3 Periorbital exit and entry wounds; conjunctival chemosis.

right cheek, exiting skin through her lower eyelid medial to the lateral canthus but superficial to the tarsal plate (figure 3). It then re-entered the subcutaneous tissue of her upper eyelid, again superficial to the tarsal plate, finishing just short of her orbital rim. There was no rupture of the globe, though she had a tense subconjunctival haematoma. The superficial wounds were debrided, the track washed out and the wounds closed.

Her visual acuity in the affected eye is limited to hand movements and she has temporal intraocular lens displacement. Fundus examination revealed a vitreous haemorrhage and superior retinal detachment, which is being treated by our ophthalmologists.

INVESTIGATIONS

- Soft tissue x-ray of the face
- Funduscopy.

TREATMENT

- The penetrating pencil was extracted, superficial wounds were debrided and the suture was closed
- Intraocular lens repositioning; vitrectomy and laser photocoagulation.

OUTCOME AND FOLLOW-UP

- Facial wounds have healed with inconspicuous scars
- Vision in the affected eye remains blurred but improving.

DISCUSSION

The different constituents of airbags, namely the bag itself, its housing and the chemicals that inflate it, have all been

implicated in injuries.¹ We believe that our case is the first to report injuries that may be due to a combination of these constituents.

Several cases of blunt ocular trauma associated with airbag deployment have been reported in the literature. The worst cases produce injury patterns similar to those seen in our patient. These injuries are believed to be due to the coup, contrecoup and compressive forces on the eye when it is struck by the airbag itself and may be due to being seated too close to the airbag.²

Only one other case of penetrating trauma has been reported. Walz *et al*⁶ reported a case of ocular penetration due to the fragmentation of a tobacco pipe being held by the victim when the airbag was deployed. We propose two possible mechanisms that may explain why the pencil travelled vertically, perpendicular to the direction that the airbag should have travelled.

An airbag inflates in approximately 40 ms. This is analogous to a projectile travelling at 50 m/s and will transfer force to any object that it strikes. Some airbag injuries are associated with the forceful opening of the airbag housing and not the airbag itself.⁴ In fact, the cover opens with a force of 20 kN.⁵ If the patient was sitting too close to the steering wheel, the airbag module cover may have fired the pencil vertically as it opened, hinging in an upward direction.

Sitting too close to the airbag will also restrict the expansion of the lower part of the airbag, leading to greater expansion in the upward direction.⁶ This upwardly expanding airbag may itself have propelled the pencil vertically. The mobility of the adult female breast may also have contributed.

Learning points

- ▶ Drivers should not sit too close to the airbag.
- ▶ Drivers should ensure that their seat belts are tight in order to minimise their forward displacement in a head-on collision.
- ▶ Loose objects should be removed from the field of inflation of the airbag, including jewellery which could penetrate the chest and items in external or internal breast pockets.

The dangers of sitting too close to the steering wheel have been widely reported. The deployment distance of an airbag is 25-30 cm. Drivers are already advised not to sit within this deployment zone in order to avoid injury from the expanding airbag. Even if further from the steering wheel, preimpact braking will propel the occupant closer to the steering wheel before the seat belt locks.

It is clear that safety precautions need to be followed to minimise airbag-related injury. Whichever mechanism was responsible for our patient's injuries, it is most likely that

she was too close to the airbag when it deployed. We recommend that drivers ensure that their seat belts are tight in order to minimise their forward displacement in a head-on collision. Loose objects should be removed from the field of inflation of the airbag, including jewellery which could penetrate the chest and items in external or internal breast pockets.

Competing interests None.

Patient consent Obtained.

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