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Letter to Editor

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Letter to the editor: should law enforcement officers wear seat belts in vehicles equipped with airbags?

Abstract

Airbags represent an important passive safety measure in motor vehicles, designed to protect occupants in the event of a collision. This article recounts a case where a law enforcement officer suffered injuries from the airbag deployment in a car accident while not wearing a seatbelt. This article provides a brief historical overview of airbags, from the first prototypes to their large-scale implementation, and opens up space for discussion regarding cases of police cars and security personnel equipped with airbags and the non-use of seat belts by occupants.

Keywords: Air bag, road accident, seat belt, law enforcement officers

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About the topic

Routinely, Brazilian police officers, as well as security agents, routinely do not use seat belts when on duty.

The excuse for not using this Personal Protective Equipment (PPE – seatbelt) is the violence faced daily by these officers, who are often the target of shots fired directly at their vehicles, forcing them to disembark quickly. If they were wearing seat belts, the time spent unbuckling them could be the difference between life and death.

To understand how airbags work, we refer the reader to the article published in PERSPECTIVAS Magazine (official publication of the Brazilian Association of Legal Medicine and Medical Expertise), VOL. 9, 2024.[1]

Not wearing a seatbelt increases the chance of suffering serious injuries or even being killed by an airbag

One of the most common excuses people give for not wearing seat belts is the mistaken belief that car airbags offer sufficient protection in the event of an accident. However, they are wrong. Airbags are designed to work in conjunction with seat belts to reduce injuries and deaths.

Below is a simplified explanation of how airbags work in conjunction with seat belts.

Seat belts and airbags are the first line of defense for protection in a car accident. The seat belt restrains you, preventing the occupant from literally flying forward into the dashboard or out of the car.[2]

Of the deaths caused by front airbags, more than 80% involved people who were not wearing seat belts or who were not wearing them correctly.

Children and infants are particularly vulnerable to airbag fatalities if they do not wear seat belts correctly.

Explaining

Collision scenario

In the event of a head-on collision, when a vehicle equipped with airbags is involved in an accident, the initial impact can be quite significant.

Not wearing a seat belt

If the occupant is not wearing a seat belt at the time of the collision, they will not be adequately restrained in the vehicle seat.

Forward throw

Without a seat belt to hold them in place, occupants may be thrown violently forward at the moment of collision.

Airbag impact

The airbag is designed to inflate rapidly in a frontal collision, providing an impact-absorbing surface for occupants.

However, if the occupant is being thrown forward due to not wearing a seat belt, they may collide with the inflated airbag with great force and speed.

Studies and research

Several studies in the specialized literature address this phenomenon.

In motor vehicle accidents that result in airbag deployment, drivers and passengers who do not wear seat belts are at greater risk for cervical spine (neck) fractures and other spinal cord injuries, according to a study published in the journal Spine.[3]

Using a Pennsylvania trauma database, researchers identified accidents that resulted in injuries to drivers and front-seat passengers from 1990 to 2002.

The study included approximately 12,700 patients with spinal injuries—8,500 drivers and 4,200 passengers. Of these, 5,500 patients had cervical spine fractures.

The rate of cervical spine fractures was 54% in drivers who used only an airbag, compared with 42% in drivers who used both an airbag and a seat belt. After adjusting for other factors, the relative risk of cervical spine fracture was 70% higher for drivers who used airbags without seat belts, compared to drivers who used both protective devices. This was even higher than the 32% increase in the risk of cervical fracture for drivers who did not use airbags or seat belts.

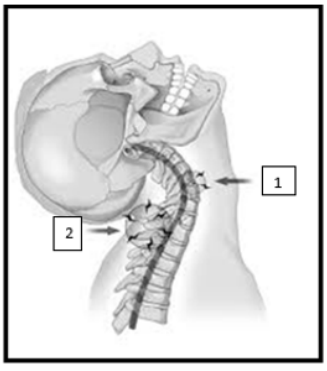
Airbags are specifically designed to be used with seat belts—serious injuries can result when victims who are not properly restrained by seat belts are thrown "out of position" when airbags deploy.

Airbag use without the concomitant use of a seat belt is associated with a higher incidence of cervical spine fractures with or without spinal cord injury. Improper use of airbags is also associated with a higher injury severity score, a lower Glasgow Coma Scale score, and longer stays in the intensive care unit and hospital, indicating that these patients suffer worse injuries than those who use airbags correctly.

The image below shows the consequences of a head-on collision involving vehicles equipped with airbags and drivers who do and do not use seat belts (circled in red).

On the left is an example of a driver who is not wearing a seat belt (circled in red), being thrown against the airbag as it inflates, and on the right is an example of a driver who is wearing a seat belt and has their speed reduced, thus being protected by the airbag.

In the image below, we show how the airbag acts on the cervical spine, causing injury



In the image on the right,[3] the arrow marked with the number 1 shows the direction of the airbag's action on the cervical spine of someone who is not using the airbag at the moment of collision.

The arrow marked with the number 2 shows the action of inertia, which keeps the body of the person who is not wearing a seat belt at the moment of the collision in place.

Other injuries that may occur due to the action of the airbag

Many parts of the body can be exposed to the airbag, causing various possible injuries during the deployment process. The most common are:

I. Facial Injuries: Due to the positioning of airbags, the face is the most common target during a collision. The airbag prevents your face from coming into contact with the windshield; however, the force of the airbag can hit your eyes or fracture fragile bones in the face. Eye injuries are possible, including temporary or permanent blindness. Concussions can also occur if the impact is strong enough.

II. Chest Injuries: For the same reason, if the airbag collides with the passenger's body, the chest area may be vulnerable to injury.

III. Cervical and dorsal injuries: The cervical spine is also vulnerable to the impact of an airbag. Although your body is prevented from being thrown forward as it otherwise would be, damage to soft tissues can still occur.

IV. Upper limb fractures: The proximity of the forearm to the airbag module door is related to most of the fractures identified. Airbag deployments in the steering wheel can throw the hand-forearm against the dashboard, rearview mirror, or windshield.

V. Burns: The speed at which the airbag deploys can cause abrasions or burns to the skin. The face and upper limbs are most prone to this type of injury.

VI. Allergic injuries: Chemicals released during airbag inflation can irritate the lungs or even cause asthma attacks. The skin can also become irritated, causing a condition known as airbag dermatitis.

VII. Internal organs: In addition, sufficient pressure on the abdomen can cause damage such as lacerations to organs, including the liver, spleen, lungs, and heart.

Case presentation

The case presented here is that of a security guard who was involved in a car accident while not wearing a seatbelt and whose vehicle was equipped with an airbag.

In the photograph provided alongside, we can see the severity of the accident in question.

The colors of the vehicle and its identification have been altered.

The security guard suffered several injuries, all listed in the previously presented list and available below.

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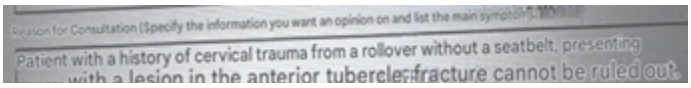
Reason for Consultation (Specify the information you want an opinion on and list the main symptoms.)

Patient with a history of cervical trauma from a rollover without a seatbelt, presenting with a lesion in the anterior tubercle; fracture cannot be ruled out.

Above, we provide part of the hospital document that demonstrates the cause of the hospital treatment.

Cervical spine CT scan: Rectification of the physiological curvature of the cervical segment. Image of discontinuity aligned in the topography of the anterior tubercle, which cannot rule out the diagnosis of fracture. Correlate with clinical data and, at the clinical discretion, complement with Magnetic Resonance Imaging.

Above, we provide part of a hospital document that shows cervical injury.

#DR. THAIS, OPHTHALMOLOGIST, EVALUATED IN PERSON AT HMMR: 3+/4+ PALPEBRAL EDEMA MAKING IT DIFFICULT TO OPEN THE EYES, 1+/4+ ECCHYMOSIS, 1+/4+ CORNEAL EDEMA, CONJUNCTIVAL LESION, CENTRAL DEEPITHELIUM. RECOMMENDS OCCLUSIVE DRESSING WITH REGENCEL + ICE. AND RECOMMENDS THAT THE PATIENT HAVE A NEW EVALUATION TOMORROW AND CONTACT DR. GUSTAVO GUERRA FOR RE-EVALUATION. ALSO RECOMMENDS URGENT OCULAR ULTRASOUND.

Attached is part of a hospital document showing the ophthalmic injury.

Attached is a photograph showing the aforementioned ophthalmic injury.

TC
Fractures of the right middle third of the face (zygomatic and nasal bones)

Attached is part of a hospital document showing facial bone fracture injury.

X-ray of a proximal phalanx fracture of the left ring finger with displacement.

Attached is part of a hospital document showing an injury with a fracture of the left ring finger phalanx.

Above, we provide a photograph of a 3D tomography exam, showing the fracture that affected the phalanx of the left ring finger (circled in red).

Discussion

Law enforcement officers on duty do not routinely wear seat belts, a measure adopted because of the common belief that wearing a seat belt can delay disembarking in the event of an attack, and this delay can be the difference between life and death.[4]

However, the use of vehicles equipped with airbags, without the use of seat belts, can also mean the difference between life and death or, as described in the literature, in the occurrence of cervical injuries, associated with neurological injuries and many other injuries presented here.

In view of what is found in the specialized literature and in the case presented here, we call for discussion on whether or not to use seat belts in vehicles equipped with airbags when used by law enforcement officers.

Conclusion

The non-use of seat belts by law enforcement officers when on duty in vehicles equipped with airbags can pose a danger equal to their use when rapid disembarkation is necessary. It should be noted that to avoid the non-use of seat belts in these vehicles, the ideal solution would be the use of armor, which would give officers enough time to remove their seat belts and disembark when under attack.

Acknowledgments

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Conflicts of interest

The authors declare that there is no conflict of interest and that they have authorization.

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