G84 Airbag Injuries in Transportation Pathology

Enrico A. Risso, MD, via Alfredo Catalani 10/26, Genoa, ITALY; and Dragan Primorac, MD, PhD, 471 Wolcott Ln, Orange, CT 06477*

After attending this presentation, attendees will achieve a better understanding of the injuries and the mechanisms of injuries related to airbag deployment.

This presentation will impact the forensic science community by highlighting how airbag injuries can be lethal and, sometimes, they are the only injuries responsible for death.

Airbags were invented more than 40 years ago. The goal of this presentation is to provide a better understanding of the injuries and the mechanisms of injuries related to airbag deployment. Airbags have proved to be a vital restraining device which is able to reduce morbidity and deaths associated with car crashes. The effectiveness of airbags in reducing fatalities and serious injuries is well established. However, due to the dynamic nature of airbag deployment, airbags are themselves a potential source of injuries and it has been estimated that more than 40% of airbag deployments result in a minimum of one airbag-related injury. Unlike other safety devices, airbags increase the amount of energy released during a car crash, thus they have always been regarded to be potentially dangerous to restrained and unrestrained occupants. Once considered very uncommon, airbag injuries are now reported more often, and the industry came to the conclusion that the airbag itself might be harmful and even potentially life threatening. The number of airbag-related injuries has proportionally increased with the number of vehicles equipped with airbags.

The expected pattern of injuries at autopsy can be complicated by airbag deployment. Airbags are intended to cushion the impact between the occupant and the interior structures of the vehicle (steering wheel or dashboard). Lateral airbags protect passengers from impact against side panels. The function of the airbag is to act as a “deformable object” in order to dissipate the greatest amount of kinetic energy possible. The majority of crashes in which airbag injuries occur are those of minor to moderate severity. During these events the seatbelt is regarded as providing a sufficient and adequate occupant protection. However, the unrestrained occupant might be exposed to forces which are greater than 18G.

The “bag slap” caused by the airbag deployment might be more harmful than the vehicular collision itself, especially in belted occupants. Recent studies have suggested a great reduction of fatality risk in belted drivers. However, other studies have linked the causation of some injuries—sometimes fatal—solely to airbag deployment.

Airbags rapidly reach their maximum pressure and dimensions by triggering a pyrotechnic device that inflates the bag in about 0.005 to 0.01 seconds. During deployment the airbag is propelled into the car compartment at a speed ranging between 157 to 338km/h. European airbags, which are designed to protect belted occupants, inflate to a volume of about 30 – 40 liters. They are smaller and deploy with much less force than American airbags, which are designed to protect both belted and unbelted passengers. American airbags deploy much more violently and inflate to a volume of 60 – 70 liters of gas.

All the constituents of the airbag module have been proved to be potentially harmful, comprising the airbag propellant capsule, the chemicals involved in the deployment, the inflating bag, and its covering. The majority of injures are caused by the shearing forces following the rapid deployment of the bag, and are therefore related to blunt force trauma. As a consequence of the “punch out” of the inflating balloon, also known as “bag slap,” the occupants may suffer fatal injuries such as skull fractures, fracture/dislocation of the cervical spine, lacerations of the liver, and severe chest trauma.

Airbag Injuries, Transportation Pathology, Road Traffic Fatalities

 ** Presenting Author*