G78 "Goodness Gracious Great Balls of Fire": Genital Thermal Injuries From Airbag Exhaust

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After attending this presentation, attendees will understand the potential for thermal injuries from airbag exhaust.

This presentation will impact the forensic community by expanding the investigators knowledge of airbag induced injuries, in particular second and third degree burns.

Burns, thermal and chemical, from the hot gases and chemical by- products of deploying airbags account for approximately 7-8% of all airbag-induced injuries. Three mechanisms for thermal injuries have been described: (1) the direct skin exposure to hot gases expelled from the airbag vents; (2) the melting of fibers or burning of clothing from exposure to the hot gases; and, (3) direct contact with a hot airbag.

A 25-year-old restrained driver was transferred to an urban trauma center from a suburban emergency department for evaluation of thermal injuries to his penis, scrotum, thighs and arm. The patient reported that he was involved in a single-vehicle collision on his way work after a deer ran into his path. He stated he turned his steering wheel 180-degrees to the right when the front of his vehicle impacted the rear of a parked vehicle at approximately 20 mph. Moments later he noticed two areas of flames coming from his pants, one in the area of his upper left thigh and the other over his groin. The driver quickly removed his seat belt and attempted to smother the flames with his hands and arms. He exited the driver's door, dropped to the ground and rolled to smother the remaining flames. He stated he was not wearing any underwear.

Examination of the patient's skin revealed first and second degree thermal injuries to the following areas: left forearm, left thigh, left inguinal area, scrotum and penis. Blisters were noted on the glans, scrotum and medial aspect of the left thigh. Arm and pubic hair were also burned to the skin level in some areas. The patient's pants demonstrated two areas with melted and charred fibers over the groin and left anterior thigh.

The vehicle, a 2009 Dodge Charger was examined within hours of the event. The airbag vents are located at the 1 and 11 o'clock position when the steering wheel is in a straight ahead position and in the 5 and 7 o'clock position when the wheel is turned 180-degrees. Examination of the airbag vents revealed melted nylon airbag fibers around both vent openings and charred material, presumed to be fibers from the pants, around one vent.

Hot gas is generated within an airbag from an exothermic reaction that occurs when sensors within the vehicle are activated during a sudden deceleration. The gas, principally nitrogen that is a byproduct from the rapid burning of sodium azide, is exhausted from inside the airbag through vent holes in the airbag. The temperature of the exhaust gases has been measured to be between 200 and 500 ˚C.

The 180-degree rotation of the steering wheel at the time of impact resulted in the vents and the associated hot exhaust gases being discharged directly toward the driver's pants in the area of his groin and left thigh. The synthetic composition of the pants, 75% polyester and 25% rayon, melted and produced a flame based upon the patient's history and confirmed from inspection of the clothing. The melting point of Rayon is 120 to 170 ˚C and 225 ˚C for polyester.

The extremely hot gases associated with airbag deployment pose a risk of burns to vehicle occupants. Thermal injuries to the male genitals and inguinal area from the exhaust gases have not been reported in the medical literature. Consideration of modifying the direction of hot vented gases from the airbag by the automotive industry and airbag manufactures maybe warranted in light of the severity of injuries sustained in this patient.

Airbag, Thermal Injury, Airbag Exhaust

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