D17 If the Shoe Fits, Wear It — Using Injury Patterns, Forensic Science, and Impact Biomechanics to Identify the Driver in a Fatal Vehicle Crash

Billy S. Cox, Jr., Billy Cox Group, PO Box 1699, Navasota, TX 77868*

The goal of this presentation is to raise awareness of the problems of identifying the driver of a vehicle in a fatal crash and to highlight the evidence that should be collected and examined when the identity of the driver is in question.

This presentation will impact the forensic science community by informing attendees that in high-speed motor vehicle collisions that result in one or more deaths, identifying the driver of a vehicle can be difficult in situations in which the occupants are unrestrained and ejected from the vehicle or displaced due to the dynamic behavior of the vehicle, post-crash. This presentation will raise awareness of the problems encountered in identifying the driver of a vehicle in a fatal crash and will reveal the key parameters obtained from analytical and forensic science methods that can be used to identify the driver of a head-on crash resulting in vehicle rollover, displacement of the occupants, and multiple fatalities.

In the subject collision, the left front of a Jeep® Grand Cherokee® struck the left front of a Chevrolet® Cavalier® sedan in a wrong-way freeway collision. There were two occupants (A and B) in the Jeep® (the "wrong-way" vehicle). After impact, the vehicles disengaged and the Jeep® rolled over. One Jeep® occupant was found in the right front seat and the other Jeep® occupant in the rear seat after the crash. A jury found that Occupant A was the driver of the Jeep® and was convicted on two counts of Intoxication Manslaughter.

Review of the injuries sustained by Occupants A and B was straightforward and instrumental in determining the Jeep® driver. The driver floor pan and left front hinge pillar exhibited a high degree of collapse and intrusion. The left shoe of the driver was impinged by this crush damage. There was also evidence of heavy knee impact on the left side of the lower dash.

The mechanism of a complex relative movement with multiple energy transmission is influenced by the deformation characteristic of the dashboard and the foot well space.[1] The crush deformation in the foot well can cause the feet to be fixed in the foot space (i.e., the foot as well as the tibia are subjected to bending and compression forces). Lower extremity injuries from the foot to the pelvis are common in offset frontal crashes.

In a set of 1,189 frontal crashes, 23 were identified with ankle or foot fractures of severity Abbreviated Injury Scale (AIS) ≥ 2.[2] Half of the injuries were caused by direct-force application due to entrapment of the leg by passenger compartment collapse.

Occupant A sustained lower extremity injuries, including midshaft fractures of the right tibia and fibula, a left anterior leg wound, and a closed fracture of the left hallux, distal phalanx (big toe). These injuries were photographed. These injuries and the mechanism thereof are well documented in the literature and in exemplar crash tests for drivers of vehicles involved in off-set crashes with foot well intrusion.

Occupant A also reportedly sustained a cervical fracture at the C6 level. The unrestrained driver of the vehicle would have interacted with the vehicle, such as loading of the steering wheel and head contact with the roof, top of the "A" pillar, or sun visor due to the collapse of the "A" pillar on the driver's side.

The laboratory analysis also determined that Occupant A fit the DNA profile obtained from the driver's side airbag. No blood match was obtained. This is an indicator that Occupant A interacted with the airbag during the initial crash phase and not during the rollover event.

The adverse expert speculated that an abrasion on the right-side neck of Occupant A may be related to a seat belt injury from the passenger side belt. This type of abrasion alone is not an indicator of seat belt usage, absent of any other forensic evidence such as diagonal bruising along the torso, left side rib fractures, and forensic markings on the seat belt. Crash tests with exemplar vehicles demonstrate abrasions characteristic of occupant loading on the drivers "D" ring.[3-6] The investigating officer specifically examined the driver and front passenger seatbelts for evidence of occupant loading and found none.

Reference(s):

1. Otte, Dietmar. Biomechanics of Lower Limb Injuries of Belted Car Drivers and the Influence of Intrusion and Accident Severity. *SAE 962425.*
2. Lestina, Diane C. et al. Mechanisms of Fracture in Angle and Foot Injures to Drivers in Motor Vehicle Crashes. *SAE 922515.*
3. Insurance Institute for Highway Safety. 1999 Jeep Grand Cherokee, *Moderate Overlap Front-into-Barrier Crash Test*.
4. Insurance Institute for Highway Safety. 2005 Chevrolet Cavalier sedan, *Moderate Overlap Front-into-Barrier Crash Test*.
5. Independent Crash Testing, Billy S. Cox, Jr. et al. Test T24113. *Frontal crash Ford Taurus striking Ford Aerostar with airbag deployment.* Feb. 26, 1999."
6. Independent Crash Testing, Billy S. Cox, Jr. et al. Test 030520C. *Frontal crash Pontiac Bonneville striking Chevrolet Lumina*." March 20, 2003.

Biomechanics, Crash, Injury

*Presenting Author