



D18 Follow the Broken Bones — Using Injury Patterns, Forensic Science, and Impact Biomechanics to Identify the Driver in a Multi-Occupant, Double-Fatality Vehicle Crash

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The goals of this presentation are to raise awareness of the problems in 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 outlining the crash investigation methodology, including the biomechanics used to identify the driver in a single-vehicle crash wherein one occupant was trapped in the wreckage and the other was ejected.

In high-speed motor vehicle collisions that result in one or more deaths, identifying the driver of a vehicle can be difficult. In cases where the damage to the vehicle is catastrophic, the occupants may be crushed in the wreckage or scattered along the crash scene if the vehicle breaks apart. Using excerpts from the forensic autopsy, crash scene photographs, and the seat belts from the vehicle, this presentation outlines the crash investigation and the forensic biomechanics used to identify the driver.

The example presented involves a single-vehicle crash wherein a speeding vehicle struck a tree, two persons were killed, and a third was severely injured. The front of the vehicle separated at the firewall and traveled approximately 160 feet. Damage to the occupant cabin was catastrophic. The vehicle struck the tree near the right front passenger-door mirror. The tree penetrated the vehicle approximately 3.5 feet at an angle of about 65 degrees measured clockwise from the centerline. The force of the impact crushed the occupant cabin such that the right front passenger seat was near the normal position of the driver's seat.

The crushed occupant cabin contained one deceased teenage male and one critically injured juvenile male. Another deceased teenage male was on the ground outside the driver's side of the vehicle. The investigating police agency identified the ejected male as the passenger and the deceased male entrapped in the wreckage as the driver.

The medical examiner's report revealed that the ejected teen male had a ruptured aorta and a massive, displaced skull fracture that extended from right front temporal region through the left parietal bone. The fracture pattern matched the Principal Direction of Force of the collision. There was also a deep laceration on left side of his neck. The ejected male also exhibited diagonal bruising and abrasions on his upper torso, consistent with shoulder belt use. The deceased male located in the wreckage had extensive lower extremity fractures, a basilar ring fracture, and an abrasion on right front side of his head with no skull fracture. There was no evidence of seat belt use on the deceased male located in the wreckage.

Analysis of the seat belts revealed that the shoulder portion of the driver's side seat belt was pulled apart during an extreme loading event. The ends of the belt were frayed and the fibers exhibited evidence that the heat generated during the forced separation created small, melted bubbles on the ends of the fibers. The mounting brackets on the driver's side seat belt retractor were bent. The "D" ring on the driver's side B-pillar of the vehicle displayed evidence of a heavy loading event. The passenger side seat belt was intact and hanging in the retracted position against the passenger side B-pillar. The mounting brackets on the passenger side seat belt retractor were pristine, indicating that the passenger belt was not worn. The forensic pathology identified in the postmortem autopsy, along with the understanding of fundamentals of impact biomechanics and crash reconstruction, confirmed that the ejected male was the driver.

After the independent investigation was complete, the investigating police agency changed the report to reflect these findings. The investigation was previously profiled in a Discovery Channel® program entitled *Crash Detectives*.

Biomechanics, Crash, Injury