D14 An Overview of Physical Evidence to Assist With Driver Identification in Vehicle Collisions

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The goal of this presentation is to illustrate, by way of examples, how witness marks observed on vehicle interior surfaces and seat belt assemblies and the associated occupants' injury patterns may be collectively used to determine who was operating the vehicle at the time of collision.

This presentation will impact the forensic science community by providing a list of vehicle surfaces to be examined, the physical evidence commonly observed, and the general body regions and injury sites involved in collisions where driver identification is unclear. This presentation will further demonstrate how aligning physical evidence created during frontal, rear-end, lateral, and rollover collisions with observed injury patterns or types may be vital in correctly identifying the occupant's seating position. This presentation will also provide a useful list of vehicle interior components and the associated body regions regularly examined for physical evidence confirming the corresponding impacts. While this list is not intended to be complete, it presents a useful compendium upon which the forensic investigator may rely.

Vehicular collision forces and the resulting occupant motion will often produce impacts between the occupant and vehicle interior surfaces. Impact forces applied to the human body during contact with the vehicle interior may cause injury. An analysis of the resulting interfaces and location of corresponding injuries may be used to correctly identify the driver in a motor vehicle collision. Specifically, an occupant's initial motion during a vehicle collision is toward the velocity change vector. Knowing the collision type (frontal, rear-end, side, or rollover) will help the investigator correctly identify and examine the potential surfaces of interaction. In frontal collisions, these typically include forward surfaces such as the sun visor, header, windshield, roof pillars, steering wheel, airbag fabric, dashboard, glove box, knee bolster, and center console. In rear-end collisions, the surfaces exposed to occupant contact are the front seat assembly, head restraint, rear seat, rear roof pillars, package shelf or cargo area, rear window, and roof header. In side impacts, potential contact evidence may be observed on the door panels, window glass and frames, roof pillars, and center console. In rollover collisions, the headliner, passenger handles, and dome lights must be examined.

Physical evidence often observed on vehicle interior structures includes blood stains, tissue and hair deposits, makeup, fractured glass, steering wheel rim deformation, seat back deformation, and plastic trim deformation, as well as scuffs, abrasions, and cracks on various vehicle surfaces. Close-up examination of interior surfaces may reveal striations to the plastic. Striations are caused by clothing with a coarse fabric weave, such as denim. In these circumstances, knowledge of occupant clothing may be useful in the analysis.

Regions of occupant injury include feet, lower extremities, knees, hips, abdomen and upper torso, neck, head, forehead, face, shoulder, upper extremities, and hands. Commonly observed occupant injuries include abrasions, pattern bruises, lacerations, and fractures, along with a host of internal injuries. The location of these injury sites may be aligned with corresponding vehicle interior evidence of human forcible contact. Medical records may reveal notations of a knee abrasion or a femur or hip fracture. This may be indicative of forcible knee impact into the knee bolster, and this may be verified by vehicle inspection. Abrasions may also result in tissue or hair deposits. The search of the vehicle interior for such a deposit may be instrumental in evaluating the seating position of this occupant. Coloration of hair fibers in particular locations may assist in determining which occupant struck the particular vehicle area.

If the seat belt is worn during the collision, the webbing presents an additional surface of interaction. Restraining forces are applied to the occupant by the seat belt webbing and examination of such webbing may reveal tissue, clothing fiber, or metal transfers arising from the application of these forces. Bruises from the webbing are often observed, though not always expected, when the seat belt is worn during a crash. A diagonally oriented shoulder belt bruise is a telltale indicator of restraint use. The direction of these bruises, crossing upper-left to lower-right or vice versa, is helpful in determining seating position.

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