C37 Using CT Scans to Identify the Mechanism for Left-Sided Skull Fracture From a Right- Sided Broadside Collision

Robert D. Anderson, MS, Biomechanics Analysis, PO Box 7669, Tempe, AZ 85281-0023*

The goal of this presentation is to introduce the three-dimensional and scaled information contained within CT scans, and demonstrate how this information can be used to identify the mechanism of injury.

This presentation will impact the forensic science community by showing how the three-dimensional and scaled information contained within CT scans, can be used to identify an injury mechanism.

CT scans provide three-dimensional information of injury patterns skeletal system, which can be used to narrow down or even define the injury mechanism. The use of CT scan images to determine the mechanism of a left sided-skull fracture in a right-sided broad-side collision is presented.

Figure 1, Rear Wheel Area Damage After Partial Repairs

The sedan pictured above sustained a right-sided broadside collision centered about the right rear wheel. Using the vehicle damage and post-impact vehicle motion, the lateral Delta V was estimated to be within the approximate 10 to 12 mph range.

The collision pushed the vehicle side-ways and rotated it clock- wise, as viewed from above. The driver initially continued at the pre- impact speed and direction, as per Newton's laws. As such, relative to the vehicle interior, the driver moved rightward until striking structures to their right and/or until sufficient force supplied by their restraints to limit this relative motion.

With right-sided occupant strikes, the mechanism for injuries from right-sided blunt trauma is clear. However, as shown in figure 2, the driver sustained a left-sided skull fracture. The narrow punch-out type appearance of the fracture confirms that it was caused by forceful contact with a narrow object that was partially penetrated the skull.

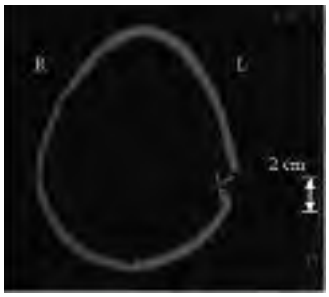

Figure 2, CT Image Showing Left Skull Fracture

Vehicle inspection revealed a lap and shoulder belt with a webbing sensitive emergency locking retractor, pass through latch plate, seat mounted buckles, and an adjustable D-ring. Scratching on the latch plate consistent with habitual seat belt use was found. Seat belt abrasions on

the outboard side of the seat back hinge cover and loading marks on the latch plate confirmed seat belt use during the collision.

Placing the driver in the vehicle, it was noted that due to height, weight and seat position, the shoulder belt was not in contact with the left shoulder. This would contribute to the shoulder belt slipping off the driver's shoulder during the rightward body motions within the vehicle interior. Indeed, the driver described a

 ** Presenting Author*

memory of being face-to-face with the radio during the collision.

Figure 3, Driver Seated in Vehicle

Rebound from the seat belts as well as slowing from the vehicle's lateral motion and rotation evidently combined to produce sufficient leftward body motion within the vehicle immediately following the collision to produce left-sided occupant trauma. As shown in figure 3, this leftward body motion makes a left head to B-pillar strike possible.

Using the scale shown in figure 2, the object that caused the skull fracture was about ¾ inches or 2 cm wide. As shown in figures 3 and 4, the knob for the adjustable D-ring was not only aligned with the fracture site, but it was also about ¾ inches wide.

Figure 4, Width of D-Ring Adjustment Knob

With this evidence it can only be concluded that the driver sustained a left-sided skull fracture from strking the D-ring adjustment knob during leftward rebound-type motions immediately following the right- sided broadside collision.

The three-dimensional scaled information contained in the CT scan images made this type of lock-and-key identification of the injury mechanism possible.

CT Scan, Skull Fracture, Injury Mechanism

 ** Presenting Author*