H60 Intrepretation of Pedestrian Injuries: A Collaborative Research Approach

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After attending this presentation, attendees will be better prepared to identify and document injury and trauma specific to pedestrian/vehicle collisions. Attendees will gain a better understanding of the mechanisms of pedestrian trauma and the anatomic morphomics related to pedestrian trauma.

This presentation will impact the forensic science community by equipping death investigators and forensic pathologists with the tools to identify the unique and subtle injuries associated with pedestrian injuries.

Despite improvements in decreasing automobile injury and deaths, pedestrian/motor vehicle deaths and injuries continue to rise at significant levels, causing an international crisis. In 2013, 4,735 pedestrian deaths and 69,000 injuries were reported in the United States; 8,000 and 300,000 in the European Union; 3,300 and 27,000 in Japan; and 3,600 and 90,000 in Korea, respectively. The National Transportation Safety Board (NTSB) along with major car manufacturers have made an increasing effort to understand the nature of pedestrian crashes and injuries in an attempt to provide saver pedestrian environment and vehicles. The United Nations recently has created a Global Technology Regulation No. 9 to reduce the level of injury sustained by pedestrians in frontal impacts.

The International Center for Automotive Medicine (ICAM), located on the campus of the University of Michigan Hospitals, was one of the founding members of the Crash Injury Research Engineering Network (CIREN) sponsored by National Highway Traffic Safety Administration (NHTSA). ICAM's trifold mission is to foster synergistic *research* between medical specialties, medical treatment and cross-disciplinary *education*, and *policy formulation* regarding federal rules and testing for the automotive industry. ICAM utilizes "analytical morphomics" through the processing of 3D medical images to gain deeper understanding into the cause of injuries so they can be better prevented and treated. This presentation will discuss the ongoing research program into pedestrian/motor vehicular fatalities in Southeastern Michigan between ICAM and the Washtenaw County Medical Examiner Office.

The frequent sites of pedestrian injuries include the adult and child head followed by adult leg regions. Sixty-five percent of fatal injuries occur at speeds less than 40 miles per hour. The highest frequency of contact between the pedestrian victim and the vehicle includes the bumper, grill/hood edge, hood and top fenders, and windshield including the A-pillars. Pedestrian injury data is severely outdated and of limited quantity.

ICAM solicited a number of partners in Southeastern Michigan including medical examiners, trauma centers, Michigan Department of Transportation, and various law enforcement agencies. Cases were selected using the following criteria: pedestrians in upright positions; frontal vehicular impact; no add-on equipment (snowblades, etc.); vehicles must be MY2000 or newer; and limited impacts of less than 40mph. Law enforcement and medical examiner departments contact the senior crash investigator to evaluate the scene of death and schedule a full-body Computed Tomography (CT) scan. A complete autopsy is performed with the prosector initially blinded to the results of the radiology examination. Data analysis includes primary sources of vehicle and road data, exemplar vehicle inspections, medical data and autopsy reports, injury lists, and mapping and CT scan data. The results of the CT and autopsy studies were correlated and developed for the creation of injury lists and overall formal case review. To date, approximately 15 cases have been evaluated.

Preliminary findings confirm the discrepancies between CT skeletal injuries and soft tissue injuries identified at autopsy. CT and autopsy studies are complementary and provide an overall view of the injury patterns encountered in pedestrian collisions. Fractures of transverse vertebral processes and scapula are commonly found in pedestrian injuries. The evaluation of anatomical morphomics such as psoas muscle cross section, Body Mass Index (BMI), rib characteristics, and others provides prediction models for survival. It is anticipated that upon completion this study will provide essential impact/injury and morphomic data that will revolutionize automobile design and improve pedestrian safety.

Pedestrian Injuries, Motor Vehicle Collisions, Analytical Morphomics