H56 Pedestrian-Motor Vehicle Accident Trauma: Pattern Interpretation and the Promotion of a Multidisciplinary Approach

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After attending this presentation, attendees will have a better understanding of the importance of fracture pattern interpretation in the reconstruction of a pedestrian-motor vehicle accident. The main goal of this research is to illustrate the importance of a multidisciplinary approach to trauma analysis in pedestrian-motor vehicle accidents in a medical examiner/coroner setting.

This presentation will impact the forensic science community by illustrating the anthropological contribution to accident scene reconstruction and fracture pattern interpretations.

Pedestrian-motor vehicle accidents are documented as having the highest mortality rates of all motor vehicle traumas and this type of accident is one of the primary causes of blunt force trauma in the forensic context.[1,2] Additionally, in the case of a hit-and-run accident, anthropological assessment of the fracture patterns may be crucial to the interpretation of the traumatic incident as witness accounts are not always reliable or consistent. The contributions of a forensic anthropologist to accident reconstruction can include, but are not limited to, analysis of the direction of impact, minimum number of impacts, distinguishing between direct and indirect trauma, and interpretation of the victim's stance at the time of impact (i.e., weight bearing vs. non-weight bearing elements).

Previous studies have assessed patterns of traumatic injury observed in pedestrian-motor vehicle victims and have suggested two patterns of skeletal injury demonstrative of a typical pedestrian motor vehicle trauma: the "fatal triad" and the "ipsilateral dyad."[1] The "fatal triad," as coined by Farley in 1965, consisted of simultaneous fracturing of the skull, pelvis, and extremities.[3] The "fatal triad" was subsequently modified by Waddell and Drucker to delimit extremity fractures to the region around the knee.[4] A more recent study by Brainard *et al.* attempted to confirm the work of Waddell and Drucker and found that instead of the "fatal triad," a large percentage of pedestrians struck by motor vehicles exhibited an "ipsilateral dyad" of traumatic injury consisting of fractures of both the upper and lower extremity on the same side of the victim.[1] Additionally, Brainard *et al.* found an association between femoral fractures and corresponding pelvic fractures.[1]

The current study analyzed 28 cases of pedestrians struck by motor vehicles between the years 2003 and 2013. All cases were drawn from the Maricopa County Forensic Science Center in Phoenix, Arizona. Victims ranged in age from 16 years to 84 years old at the time of death. The study included both males and females; however, 26 of the 28 victims in this study were male (93%). Skeletal analysis consisted of an examination of the following elements: femora, tibiae, fibulae, and patella. In addition to the skeletal analysis, data were also drawn from autopsy radiographs and pathology reports. Unlike the previous studies conducted by Farley and Brainard *et al.*, this study consisted of only fatal pedestrian-motor vehicle accidents.[1,3] Therefore, this study represents only a small subset of pedestrian-motor vehicle traumas, being that all individuals included in this study died as a result of their injuries.

In the present study, the most frequently fractured elements were the pelvis and the ribs, which were both fractured in 18 of the 28 victims (64%), followed by the fibulae (63%), skull (61%), tibiae (59%), vertebrae (46%), and femora in 18% of the cases. Noted the presence of Waddell and Drucker's "fatal triad" (head, pelvis, knee) in four of the 28 cases (14%) and the "ipsilateral dyad" in six of the 28 cases (21%).[4] However, when lower extremity injuries were incorporated into the category of knee injuries the "fatal triad" was observed in 10 of the 28 cases (36%). Supporting Brainard *et al.*'s findings, in 90% of the cases involving femoral fractures, associated pelvic fractures were also noted.[1]

In conclusion, 17 of the 26 (65%) cases (with accident reports) were hit-and-runs where the accident circumstances were either absent or conflicting. When the forensic anthropological analysis was incorporated into the forensic pathologist's report, direction of impact was possible to infer in 82% (23/28) of the cases based on fracture pattern interpretation. This finding provides justification for the promotion of a multi-disciplinary approach in the interpretation of pedestrian-motor vehicle accidents.

References:

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Pedestrian-MVA Accidents, Fracture Interpretation, Trauma Analysis

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