Method for Comparison of Near Side Impact Vehicle Mismatch Cases

Kathryn L. Loftis[1,3], R. Shayn Martin[2], J. Wayne Meredith[2], Joel D. Stitzel[1,3]

[1]Wake Forest University School of Medicine; [2]Wake Forest University Baptist Medical Center; [3]Virginia Tech – Wake Forest University Center for Injury Biomechanics

ABSTRACT

This study investigates vehicle mismatch in severe side-impact motor vehicle collisions. Research conducted by the Insurance Institute for Highway Safety (IIHS) has determined vehicle mismatch leads to severe injuries for occupants in the struck vehicle, because the larger striking vehicle can fail to engage the lower sill, resulting in occupant compartment intrusion. Previous studies analyzed mismatched collisions according to vehicle type, not by differences in vehicle height and weight. The combination of a taller, heavier striking vehicle may result in more intrusion for the struck vehicle and injury for the near side occupant. Crash Injury Research and Engineering Network (CIREN) data was analyzed to study vehicle mismatch and near side occupant injuries. Twenty-three near side impact cases involving two vehicles were investigated. Three of these cases were not mismatched by the difference in vehicle curb weight, and 2 were not mismatched according to the difference in striking vehicle bumper height and struck vehicle sill height. Mismatched CIREN cases had an average difference in vehicle curb weight of 737.0 kg ± 646.8 kg and an average difference in vehicle height of 16.38 cm ± 7.19 cm. There were 13 occupants with rib fractures, 12 occupants with pelvic fractures, 9 occupants with pulmonary contusion, and 5 occupants with head injuries, among other multiple injuries. Average Injury Severity Score (ISS) for these occupants was 27 ± 16. The most serious injuries resulted in an Abbreviated Injury Scale (AIS) of 5, which included 3 occupants. Each of these high severity injuries were to different body regions in different occupants. Analyzing vehicle information and occupant injuries, vehicle mismatch in terms of vehicle height and weight contributed to these injuries and resulted in severe injuries to multiple body regions for the near side struck occupant. Low correlation of vehicle height difference to occupant ISS was shown.