Older Patients Really Do Break More Easily: Decreased Collision Energy in Geriatric MVCs

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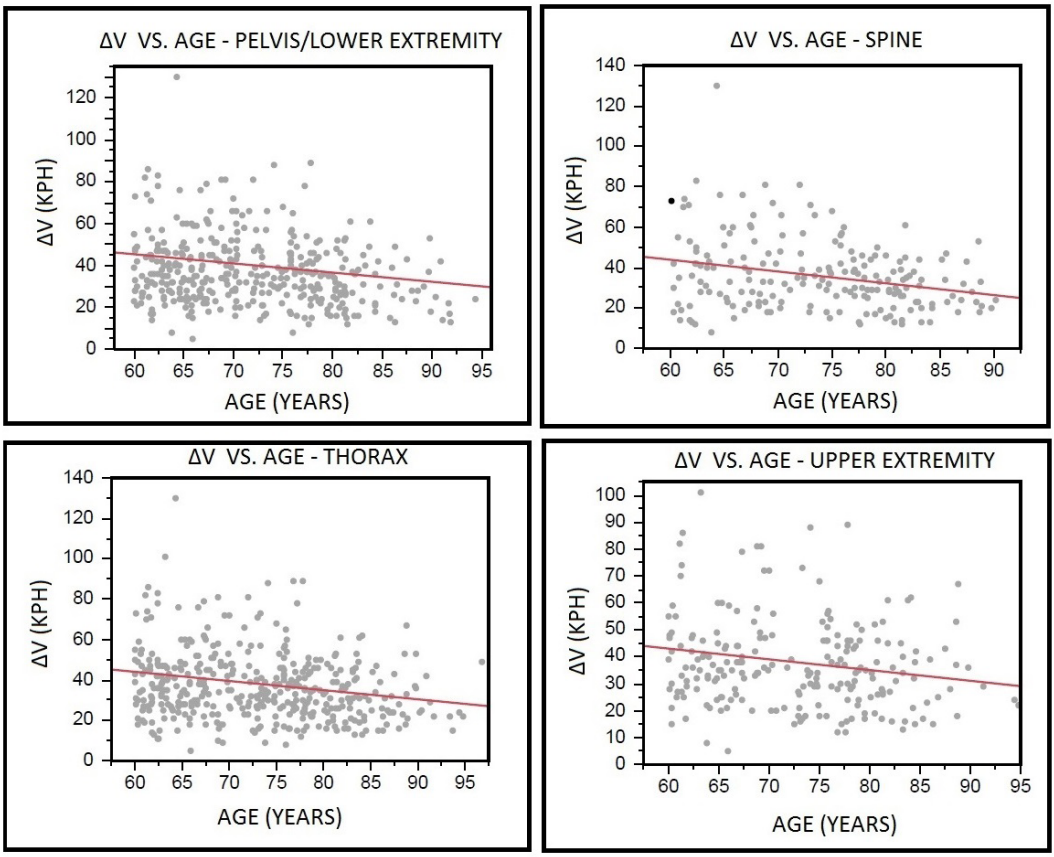
Purpose: As the population continues to age, an increasing number of motor vehicle collisions (MVCs) will involve older adults. This study was designed to examine the association between patient age and collision energy across various fracture patterns seen in older adults involved in MVCs compared to younger adults involved in similar crashes.

Methods: 862 subjects over 60 years of age from the National Highway Traffic Safety Administration's (NHTSA) Crash Injury Research and Engineering Network (CIREN) database were reviewed. Fractures were stratified into five categories: spine, upper extremity, pelvis/lower extremity, thorax, and head/face. For each fracture type, bivariate linear regression analysis was used to determine the association between age and change in velocity during the crash as well as age and absorbed energy level during the crash. The analysis was then repeated, stratified by gender. 900 subjects ages 20-50 from the NHTSA's CIREN database were also reviewed with identical analysis done for comparison.

Results: For adults over age 60, there were 377 men and 485 women, mean age 73 years (range, 60-97). For all fracture types except head/face, age was inversely correlated with both change in velocity (Δv) and absorbed energy. Compared to participants ages 60, the oldest participants had a significant decrease in required energy levels to sustain similar fractures. Specifically, for spine: Δv (53% decrease; $P < 0.0001$), absorbed energy (87% decrease; $P < 0.0001$); upper extremity fractures: Δv (37% decrease; $P < 0.0001$), absorbed energy (61% decrease; $P < 0.0001$); pelvis/lower extremity fractures: Δv (38% decrease; $P < 0.0001$), absorbed energy (37% decrease; $P < 0.0001$); and thorax fractures: Δv (41% decrease; $P < 0.0001$), absorbed energy (23% decrease; $P < 0.0001$). When stratified by gender, significant inverse association between age and energy for each of these four fracture types was seen in both women and in men. For head/face fractures, there was no significant association between age and absorbed energy. The analysis was then repeated in participants aged 20-50. Age was inversely associated with both Δv and absorbed energy for only thorax fractures: Δv (18% decrease; $P < 0.001$). There was no consistent significant association seen in spine, upper extremity, pelvis/lower extremity, or head/face fracture types.

Conclusion: In motor vehicles crashes involving adults, older adults demonstrated an inverse association between patient age and energy levels in all fracture types, except in head and face while younger adults showed an inverse correlation between age and energy levels in only thorax fractures. This study reveals that traumatic fractures in MVCs occur at lower velocities and require less energy with increasing age. Most importantly, it supports emerging data that bone density is an important contributor to fractures in "high-energy" MVCs.

FIGURE 1. ΔV VS. AGE AMONG VARIOUS GERIATRIC FRACTURE PATTERNS



See pages 49 - 106 for financial disclosure information.