C41 Human Injuries Accompanying Collisions With Wood Plank Fences

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After attending this presentation, attendees will understand how automobile or light truck collisions with wood plank fences can result in human injury due to passenger compartment plank penetration. This hazard is largely unappreciated due to its sporadic publication in isolated case reports. The present study shows that such collisions, even those recorded during a limited time and area, are more prevalent than suspected and that the associated human injuries appear "binary" in severity.

This presentation will impact the forensic science community by discussing how the study of vehicle collisions with roadway signs and guard rails have led to new designs and materials that have reduced motorist injuries, but wood plank fences have not been considered. The

present study offers new information regarding the incidence of motor vehicle – wood plank fence collisions as well as the type and severity of human injuries that can occur. The goal of this presentation is to raise awareness of the hazards posed by roadway adjacent wooden plank fences and motivate additional studies that will result in fence redesign, altered placement, or use of new materials to mitigate injury risk to errant motorists.

Wooden plan fences are commonly used to delimit real estate or constrain the movement of large animals. These fences are typically constructed of three or four horizontally placed oak or hickory boards (~2" thick, 4" – 6" wide, 6' – 16' long) nailed to intermittently spaced (6'-16') vertical round wooden posts (~6" diameter, ~8' long, ~4' of which are underground). Isolated sporadic reports exist of injuries to errant motorists who strike these fences at an acute angle, but this hazard is largely unrecognized. Similarly, the frequency and type of injuries suffered by these motorists are also not well known. The purpose of this study was to quantify the frequency and severity of injuries to motorists due to this mechanism that were observed during more than a decade at a single location.

The databases of a major University Level I Trauma Center and the County Coroner were retrospectively analyzed over the period 1995- 2007. This study was IRB approved. Hospital charts, operative reports, and charges were abstracted retrospectively to confirm fence contact, injury data, subject demographics, and hospital costs. Motorcycle collisions were excluded. Mean values were compared by using Student's t-test; correlation was analyzed by using regression techniques.

One hundred and twenty eight subjects were involved in 127 acute- angle collisions of automobiles or light trucks with wooden plank fences during this period. Of these 128 subjects, 123 were evaluated at this Trauma Center and of these, 35 (27%) had a documented wood fence plank-patient interaction (PPI). Mean subject age was 32.8 years. Males (30 of the 35) were more frequently (86%) represented and 91% of these 35 subjects were in the driver's seat at the time of injury. Fourteen of the 35 (40%) died from injuries related to PPI. Blunt injury predominated over penetrating injury; only one subject had a mortal penetrating head injury from PPI. Survivors of PPI had a lower ($p=0.05$) Injury Severity Score (14.5 vs. 27) than nonsurvivors. Restraint data were available for 87 of the 128; 48.5% were restrained. No correlation was detected between restraint status and level of injury or mortality.

Two-thirds (64%) of the impacts occurred on the subject's right side. The most common body region of plank contact was the head (13/14, 93%) and as expected, brain injury was the most common cause of death in that group. The upper torso (chest and shoulder) was the next most common region of injury; PPI was associated with significant soft tissue, bone and vascular injuries as well as tissue loss. PPI involving the upper extremity was also associated with neurovascular compromise and these injuries required extensive operative intervention for salvage or repair. Near complete amputation of the involved extremity after plank contact was not uncommon. Neck injuries were uncommon but when present, they were associated with significant vascular and soft tissue injury. A single penetrating abdominal injury (fatal) occurred in this group of 35 subjects.

Total mean hospital incurred costs for 13 of the 35 PPI related injuries were $50,530 for those requiring surgery (n=6) and $34,256 for those not requiring surgery (n=7). The latter value was skewed because 4 of the 7 subjects expired shortly after arrival at the hospital.

This study adds new data underscoring the frequency of this injury mechanism and suggests that injuries to motorists who collide with wooden plank fences at acute angles are binary in severity; either none/minor or major/fatal. This conclusion is based upon a limited time and region sample; the national extent of this problem is unknown due to the lack of standardized databases linking this specific mechanism. Engineering initiatives to mitigate injuries associated with PPI are complicated by the absence of wood plank fence construction standards and the lack of information regarding the mechanism by which wooden planks enter the passenger compartment of roadway errant automobiles and light trucks.

Additional studies are needed to quantify the extent of the problem nationally, understand the mechanism of vehicle penetration by wood planks, increase public awareness of the hazards attending collisions with

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these fences at acute angles, and develop injury-mitigating fence construction strategies or new frangible material alternatives.

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