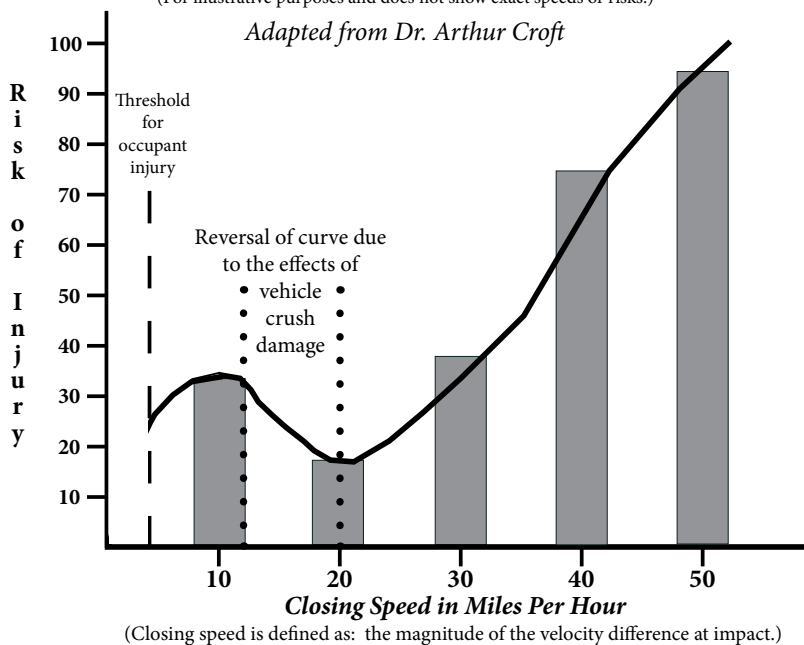


Understanding the Paradox of Low Impact Injuries

It is difficult for many people to comprehend how bodily injury can occur when the victim's vehicle has little or no crush damage. Since the answer lies in the physics of energy transfer, it is no surprise that this issue baffles jurors, insurance adjusters, and attorneys. Presented here is a brief summary of the essential facts surrounding this issue. The graph below was compiled based upon numerous pieces of research and outlined by Dr. Arthur Croft. While the data shown does not represent absolute numbers for all vehicles, it is indicative of the effects of vehicle crush damage on the transfer of energy to the occupant. The crushing of the vehicle absorbs energy that would otherwise be imparted to the occupant and reduces the change in velocity (ΔV). Thus, for example, impact speeds of 5-10 mph may transfer more energy to the occupant than impacts of 15-25 mph. This fact explains the paradox of low impact speed injuries in auto accident cases.

Graph of risk of injury for various closing speeds

(For illustrative purposes and does not show exact speeds or risks.)



Key points from this graph

1. From real-world collision research, it is possible to plot the risk of injury as a factor of the closing speed, even when other risk factors are not controlled.
2. The threshold for injury is around 4-5 mph closing speed. There is a significant risk of injury after this threshold.
3. There is no direct correlation between the speed of impact and the risk of injury **until a closing speed exceeding approximately 20 mph**. Under this speed, the risk of injury is more dependent on the amount of crush.
4. The risk of injury is paradoxically greater at 5-10 mph than it is at 20-25 mph. This is due to the effects of vehicle crush damage and the resultant decrease in the transfer of energy to the occupants.
5. Under 10 mph, there is often relatively little, if any, crush damage. Without the major energy absorption from the crushing of the vehicle, there is a greater *energy transfer* to the occupants at 5-10 mph than there is at 15 to 25 mph. It is the rapid transfer of energy to the vehicle's occupants that correlates with acceleration forces, resulting in a greater risk of occupant injury.

Useful Medical References for Low Impact Injuries

1. Correlating crash severity with injury risk, injury severity, and long-term symptoms in low velocity motor vehicle collisions, Croft AC, Freeman MD. Medical Science Monitor, 2005;11(10):RA316-321. **Key Quote: "Property damage is an unreliable predictor of injury risk or outcome in low velocity crashes. The MIST protocol for prediction of injury does not appear to be valid."**
2. A review and methodological critique of the literature refuting whiplash syndrome. Freeman MD, Croft AC, Rossignol AM, Weaver DS, Reiser M: Spine, 1999; 24(1):86-96. **Key Quote: "As a result of the current literature review, it was determined that there is NO epidemiologic or scientific basis in the literature for the following statements: whiplash injuries do not lead to chronic pain, rear impact collisions that do not result in vehicle damage are unlikely to cause injury, and whiplash trauma is biomechanically comparable with common movements of daily living."**

-- **Useful question to ask the defense:** "Can you name one *peer-reviewed* study that supports the claim that no vehicle damage equals no injury? *Hint: It does NOT exist.*

-- **Useful analogy:** "If a person falls off a tree limb and impacts the ground, what course of action makes more sense for determining the extent of bodily injury? One, to examine the ground for impact damage to determine whether or not an injury has occurred. Or two, to directly examine the patient in order to determine the extent of any injury? Obviously, the rational approach is to examine the patient. Yet, when it comes to auto accidents, somehow the extent of car damage often becomes the determining factor. This approach just doesn't make any sense."