

Side-View Animation of a Traumatic Brain Injury In a Car Crash

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Video Link: <http://www.brainline.org/content/multimedia.php?id=847>

Narrator: TBIs can occur as the result of impacts at varying speeds and from multiple directions. The severity of the TBI does not necessarily correlate with the speed of a vehicle during a collision, but with the unique combination of deceleration and rotational forces that affect the brain during a collision.

The car crash animation sequences show how a sudden deceleration injury typically occurs. For purposes of demonstration, an impact at a speed of 15-35 miles per hour into a sturdy barrier was used. A frontal impact was selected because frontal impacts are one of the most commonly occurring causes of TBIs. The crash depicted in the animation was based on video studies of crashes studies performed by a number of crash test engineers.

The first animation sequence shows the impact and sudden deceleration at a speed that is slightly slower than real time to help demonstrate the violence of the motion. The collision is then repeated in slow motion to highlight the detailed movements of the upper body and head. Prior to the impact of the vehicle, the body and head are traveling at the same rate of speed. At the moment of impact the vehicle suddenly stops but the body and head continue to travel forward.

Next, the body's forward motion is halted by the seatbelt, but the head continues to travel forward. The left shoulder's forward motion is halted by the shoulder harness before the rest of the body. So rotation is added to the upper body and head in addition to the continuing forward motion. The head then comes to a sudden halt as it impacts with the air bag. At the moment of impact, the head violently rotates and begins an immediate reversal of movement. This back and forth motion is sometimes referred to as contra-coup effect.

The head then rebounds into the headrest experiencing yet another immediate and violent impact and change of direction.