

are not used. An unrestrained child becomes a projectile during sudden deceleration and is subject to injury from contact with a variety of objects inside and outside the vehicle. Individuals who use only a lap seat belt restraint are at greater risk of SCI than those who use a combination lap and shoulder restraint. High cervical spine injuries have been reported in children younger than 2 years old who are improperly restrained in forward-facing car seats. Infants who are improperly restrained in an infant car seat may experience cervical trauma in a car crash. Small children may also be severely injured by deploying front seat air bags.

Falling from heights occurs less often in children than in adults, but vertebral compression from blows to the head or buttocks can occur in water sports (diving and surfing), falls from horses, or other athletic activities. Birth injuries may occur in breech deliveries from traction force on the spinal cord during delivery of the head and shoulders. When shaken, infants commonly sustain cervical cord damage, as well as subdural hematoma and retinal hemorrhages; cognitive impairment and death may occur subsequent to the traumatic event. Infants have weak neck muscles, and during vigorous shaking, their large and heavy heads rapidly wobble back and forth. A significant number of adolescents receive SCIs secondary to gunshot wounds, stabbings, and other violent inflicted injury.

Because of the marked mobility of the neck, fracture or subluxation (partial dislocation) is the most common immediate cause of SCI, particularly in the lower cervical region. Although unusual in adults, SCI without fracture is common in children, whose spines are suppler, weaker, and more mobile than those of adults. Therefore, the force is more easily dissipated over a larger number of segments. In infants and small children younger than 5 years old, upper cervical spine fractures and spinal compression are more common, but adolescents tend to have lower cervical and thoracolumbar fracture dislocations ([Pruitt and McMahon, 2016](#)).

The severity of the force, the mechanisms of the injury, and the degree of the individual's muscular relaxation at the time of the injury greatly influence the extent of the trauma. SCIs are classified as either complete or incomplete. In a complete injury, there is no motor or sensory function more than three segments below the neurologic level of the injury ([Mathison, Kadom, and Krug, 2008](#)).