

Dissipating and Transferring Kinetic Energy to the Tissues in Penetrating Trauma

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Description

Penetrating trauma is an open wound injury that occurs when an object penetrates the skin and enters a body tissue, resulting in a wound that is both deep and relatively narrow. A blunt or non-penetrating injury, on the other hand, may cause some deep damage, but the skin over it is not necessarily broken and the wound is still closed off from the outside world. A penetrating injury in which an object enters the body or a structure and passes all the way through an exit wound is called a perforating trauma, whereas the term penetrating trauma implies that the object does not perforate wholly through. In gunshot wounds, perforating trauma is associated with an entrance wound and an often larger exit wound. The penetrating object may remain in the tissues, return to the path it entered, or pass through the full thickness of the tissues.

Development of Temporary Cavitation

Whether it's a foreign object or broken bone fragments, piercing trauma can occur. Gunshots and stabbings are two common causes of penetrating injuries, which can be serious because they can damage internal organs and put a person at risk for shock and infection. Penetrating injuries typically occur in armed conflict or violent crime. The body parts involved, the characteristics of the penetrating object and the amount of energy transmitted to the tissues all influence the severity of the injury. X-rays or CT scans may be used for assessment, and surgery may be used for treatment, such as to repair damaged structures or remove foreign objects. Spinal motion restriction should not be done frequently after penetrating trauma because it is linked to worse outcomes. Mechanism when a missile passes through tissue, it slows down, dissipating and transferring kinetic energy to the tissues. The projectile's velocity is more important than its mass in determining how much damage is done; kinetic energy increases with the square of the velocity. The path of a projectile can be estimated by imagining a line from the entrance wound to the exit wound, but the actual trajectory may vary due to ricochet or differences in tissue density. In a cut, the discoloration and swelling of the skin from a blow happens because of the ruptured blood vessels and escape of blood and fluid and other injuries that interrupt the circulation. Cavitation Permanent Low-velocity items, such as knives and swords, are typically propelled temporary high-

velocity objects are typically projectiles like bullets from high-powered rifles, such as assault rifles or sniper rifles, and this is referred to as permanent cavitation. Slugs classed as medium-speed shots incorporate those from handguns, shotguns and submachine weapons. Medium and high velocity projectiles also cause secondary cavitation injuries to the tissues they hit: A pressure wave that pushes tissue out of the way as the object enters the body creates a cavity that can be much larger than the object itself; this is referred to as temporary cavitation. The temporary cavity is the radial stretching of tissue around the wound track caused by high pressures surrounding the projectile, which accelerate material away from its path. The characteristics of the injured tissue also help determine the severity of the injury for instance, the greater the density of the tissue, the more energy that is transferred to it. Skin, muscles and intestines absorb energy and are therefore resistant to the development of temporary cavitation. On the other hand, organs like the brain, spleen, kidney, and liver, which have relatively low tensile strength, are more likely to split or shatter as a result of temporary cavitation.

Ricochet or Differences in Tissue Density

Flexible elastic soft tissues, such as muscle, intestine, skin the liver may disintegrate if enough energy is transferred. Temporary cavitation can be particularly damaging when it affects delicate tissues like the brain, as in penetrating head trauma. Location head although penetrating head trauma only accounts for a small percentage of all Traumatic Brain Injuries (TBI), it is associated with a high mortality rate and only a third of people who experience it survive long enough to reach a hospital. The majority of TBI-related deaths result from injuries sustained with firearms. Penetrating head trauma can result in arteriovenous fistulas, intracranial hematomas, cerebral contusions, and lacerations. There is a wide range of variability in the prognosis for penetrating head injuries. Penetrating facial trauma can impede breathing and the airway; penetrating eye trauma can cause the globe of the eye to rupture or the vitreous humor to leak from it, posing a serious threat to eyesight. Penetrating chest trauma can injure vital organs like the heart and lungs and interfere with breathing and circulation. Penetrating chest trauma also has a mortality rate death rate of less than 10%. Pulmonary laceration a cut or tear in the lung, pulmonary contusion a bruise, hemothorax an accumulation of blood in the

chest cavity outside of the lung, pneumothorax an accumulation of air in the chest cavity and hemopneumothorax an accumulation of both blood and air are examples of lung injuries that can be caused by penetrating trauma. Sucking wounds to the chest and tension pneumothorax may occur. Penetrating trauma can also result in heart and circulatory system injuries. In pericardial tamponed, blood escapes from the heart but is

trapped within the pericardium, so pressure builds up between the pericardium and the heart, compressing the latter and interfering with its pumping. Rib fractures typically produce penetrating chest trauma when sharp bone ends pierce tissues. If the membrane surrounding the heart, known as the pericardium, is significantly torn, the heart may bleed profusely into the chest cavity.