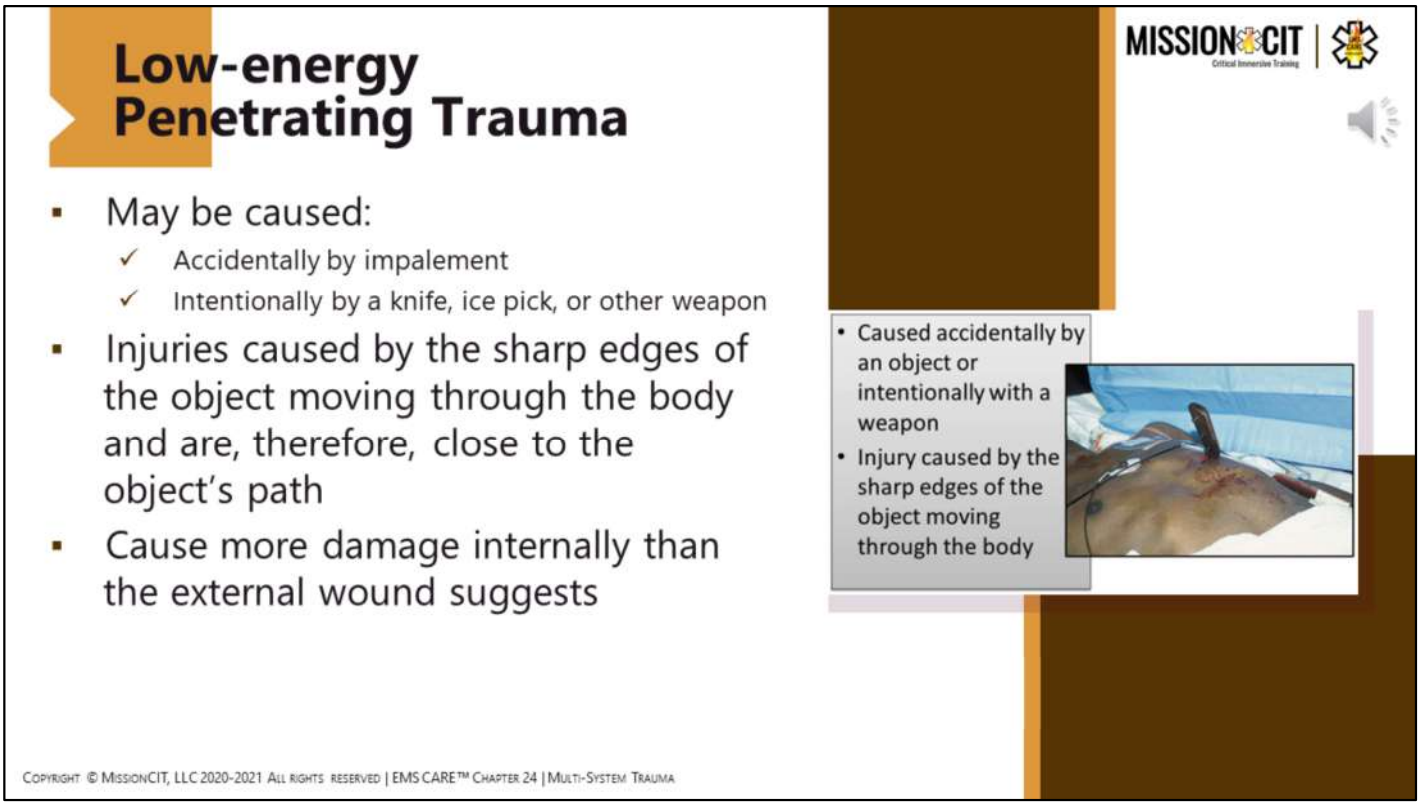



So, in this part of the lesson, we will discuss penetrating trauma which is the second-leading cause of trauma death in the United States after blunt trauma. It is caused by a foreign object piercing the skin, which damages the underlying tissues and results in an open wound. The most common causes of such trauma are gunshots, explosive devices, and stab wounds.

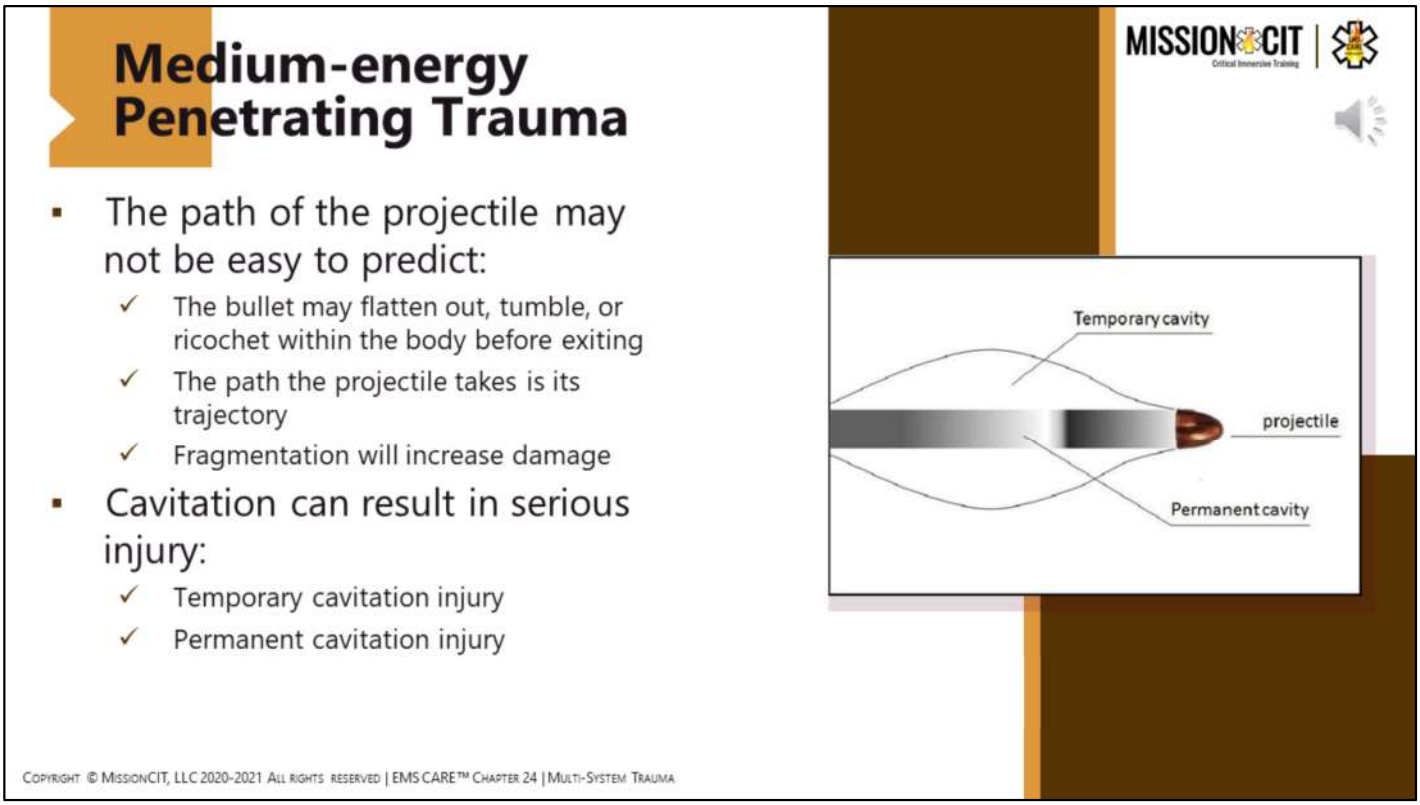
Damage is influenced by:

- Distance from the shooter
- Size of the bullet
- Fragmentation
- Cavitation, and
- Velocity of weapon

Let's discuss this more in detail.

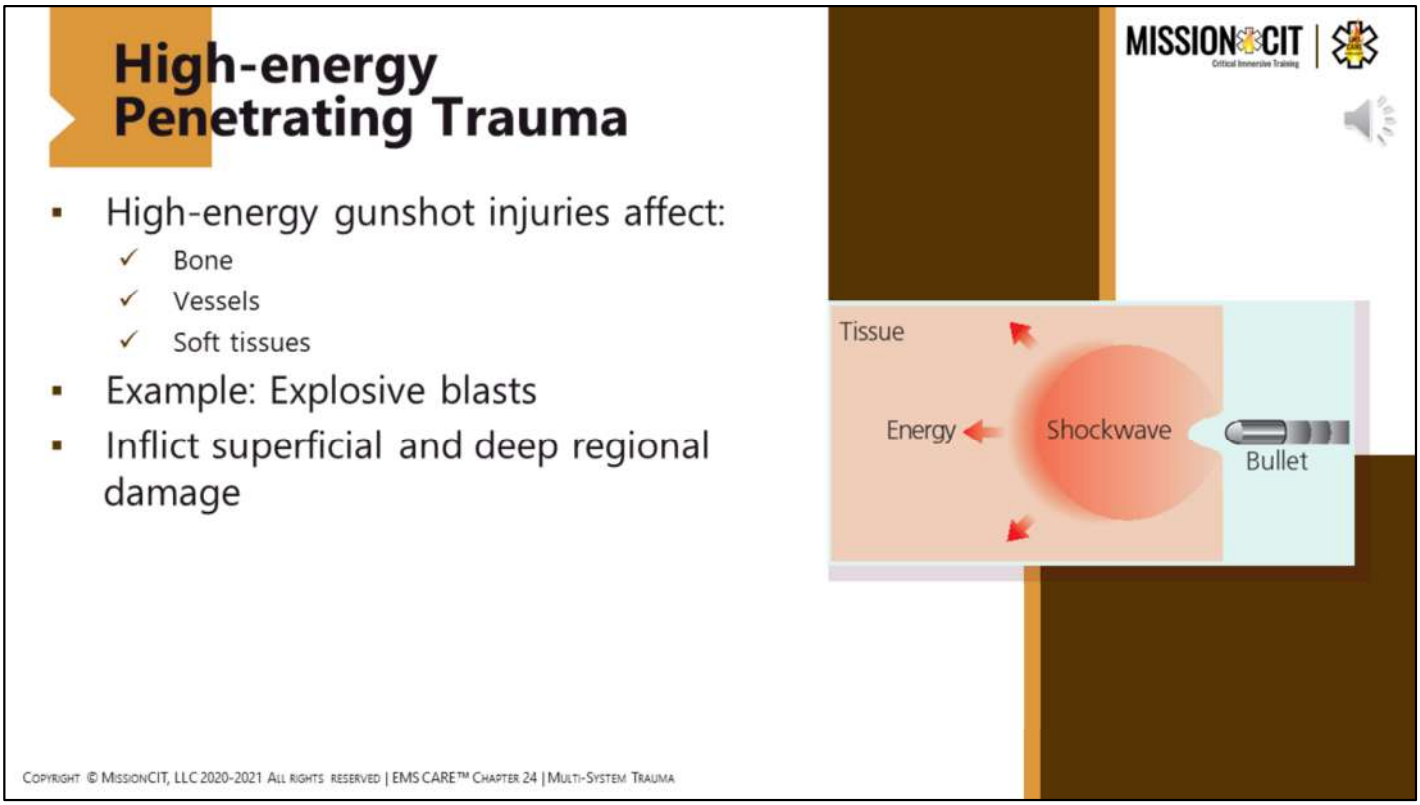



Low-energy penetrating trauma may be caused accidentally by impalement or intentionally by a knife, ice pick, or other weapons. With low-energy penetrations, injuries are caused by the sharp edges of the object moving through the body and are, therefore, close to the object's path. Knives may have been deliberately moved around internally, causing more damage than the external wound suggests.




Medium-velocity injuries include bullet wounds from most types of handguns and air-powered pellet guns, and are characterized by much less primary tissue destruction than wounds caused by high-velocity forces. In medium- and high-velocity penetrating trauma, the path of the projectile (usually a bullet) may not be easy to predict. The bullet may flatten out, tumble, or ricochet within the body before exiting. The path the projectile takes is its trajectory. Fragmentation will increase damage.

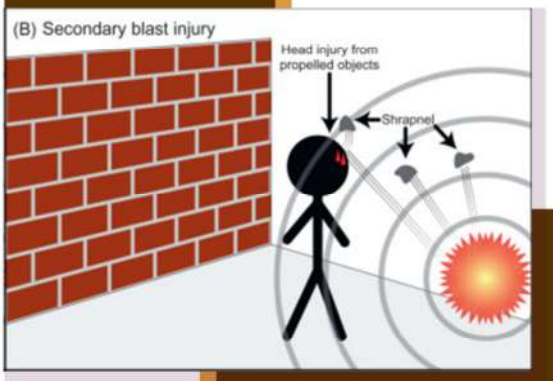
Cavitation can result in serious injury to internal organs distant to the actual path of the bullet. Temporary cavitation injury results from a stretching of the tissues that occurs with pressure changes. Permanent cavitation injury results closer to the bullet path and remains after the projectile has passed through the tissue.




High-energy gunshot injuries can affect bone, vessels and soft tissues. For example, a commonly used firearm such as the shotgun is technically defined as low velocity, yet this device inflicts devastating wounds when fired at close range due to high-energy transfer. Explosive blasts in particular, which are often suffered during military warfare, are key examples of high-energy injuries that cause complex muscle trauma by inflicting both superficial and deep regional damage.

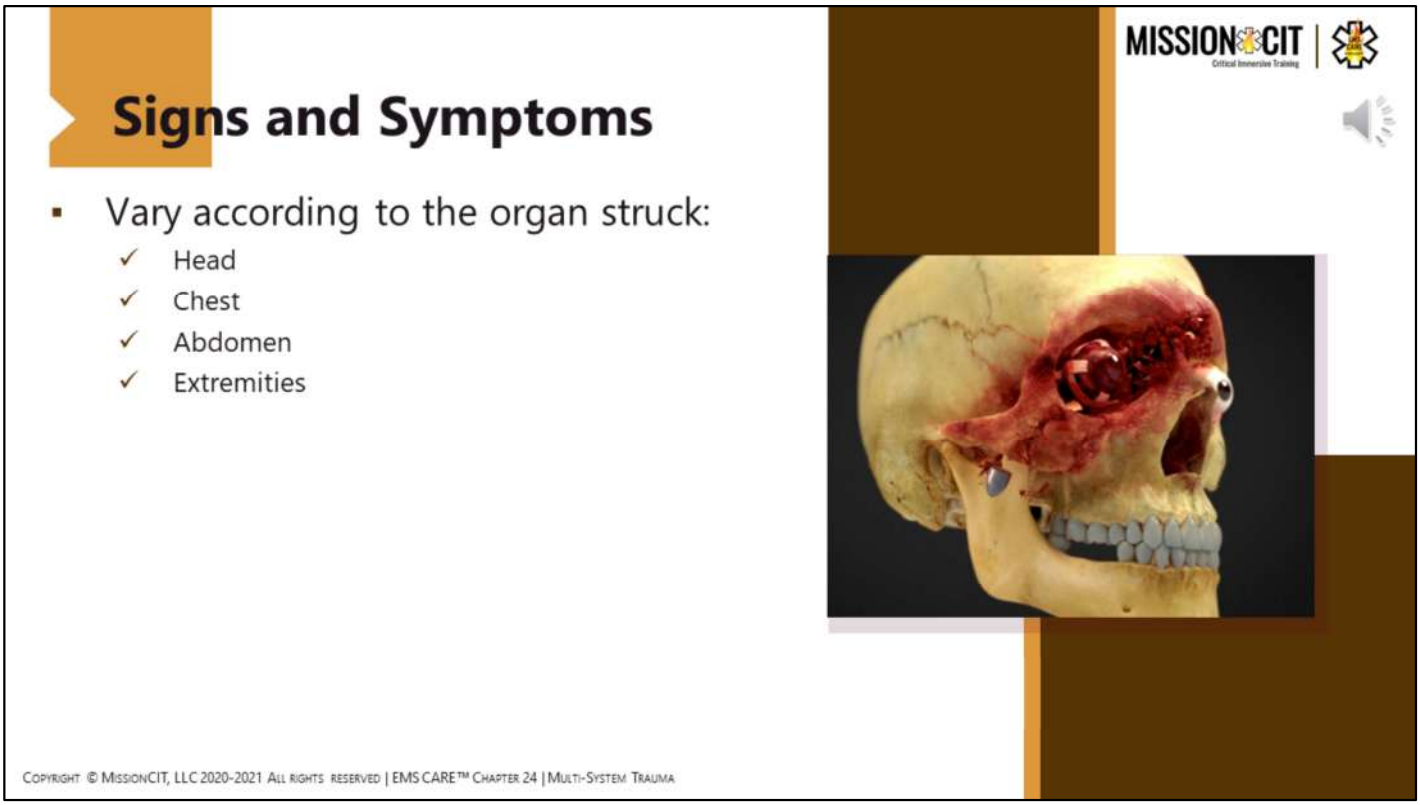
# Penetrating Trauma – Blast Injuries

- Secondary blast injury to the extremities:
  - ✓ Bomb casing fragments
  - ✓ Materials implanted within the bomb
  - ✓ Flying glass
  - ✓ Local materials




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Secondary blast injury to the extremities is marked by penetrating trauma from the bomb casing fragments, materials implanted within the bomb (e.g., nails, screws), flying glass, or from local materials made airborne by proximity to the explosion.




The signs and symptoms of gunshot wounds will vary based on the organ struck.

- Head: Gunshot wounds to the head are the deadliest of all gun injuries. According to literature statistics, the survival rate of patients with gunshot wounds to the head is only 9%. Signs of a serious head injury are severe headache; clear or bloody fluid coming from your nose, ears, or mouth; confusion, drowsiness, or a loss of consciousness; changes in the way you hear, see, taste, or smell; memory loss; mood changes or strange behaviors; slurred speech or recurrent vomiting.
- Chest: A sucking chest wound (SCW) happens when an injury causes a hole to open in the chest. SCWs are often caused by stabbing, gunshots, or other injuries that penetrate the chest. Signs of an SCW include: An opening in the chest, about the size of a coin, hissing or sucking sounds when the person inhales and exhales, heavy bleeding from the wound, bright red or pinkish, foaming blood around the wound and coughing up blood.
- Abdomen: A gunshot wound (GSW) to the abdomen may cause damage to the liver, stomach, intestines, colon, or spine. It may also cause damage to the kidneys, bladder, or other structures in the abdomen. Symptoms include feeling lightheaded, shortness of breath, chest pain, coughing up blood, and trouble breathing.
- Extremities: Penetrating trauma of the extremities (PTE) is considered a difficult injury to manage because artery and nerve injuries can be serious and may significantly impair outcome of the patient. Signs in the case of vascular injuries include arterial active

hemorrhage, expanding or pulsatile hematoma, bruit or thrill over the wound, absent distal pulses, and extremity ischemia. Loss of sensation or function of the affected limb for nerve injuries. And finally, pain, deformity, loss of function, acute compartment syndrome, and crush syndrome in the case of skeletomuscular injuries.