Trauma and Wound Management

Gunshot Wounds in Horses

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KEYWORDS

• Equine • Penetrating trauma • Gunshot • Bullet wounds

KEY POINTS

- Gunshot injury in horses is classified as a penetrating type of trauma.
- The severity of gunshot wounds depends on the kinetic energy of the bullet on impact, the type of bullet, and the characteristics of the tissue it passes through.
- Elastic and cohesive tissues, including muscle, lung, blood vessels, and nerves, may recover after a gunshot wound, whereas less cohesive or elastic organs, such as liver, brain, heart, and bone, are less likely to survive.
- The bullet is not sterilized by the heat of the impact, so gunshot wounds should be treated as contaminated.

INTRODUCTION

Although gunshot injuries in horses are uncommon, they can result in a diverse array of traumatic injuries because of the indiscriminate nature of where the bullets strike. Bullet wounds are described as a focal, penetrating trauma, and may affect skin and superficial structures, musculoskeletal tissues, as well as internal organs and neurovascular structures. The physical appearance of the entry wound is often oval to circular, with clean margins (**Fig. 1**). There may be a hyperemic ring surrounding the entrance, caused by local inflammation or from direct damage by carbon monoxide released from the gun barrel if the animal was shot at close range. High-velocity impacts are similar to small explosions, causing a vacuum to form in the tissues as the bullet passes through. In these cases, foreign material may be sucked into the exit wound. For close-range shotgun injuries, total tissue destruction is the norm.[1,2]

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Fig. 1. A 12-year old quarter horse hit by a ricochet from a rifle shot in the ventral abdomen. The entry wound is circumscribed and distinct. No exit wound was found, consistent with a low-energy impact. The ventral colon was perforated in 2 sites causing a peritonitis (gunshot wound score from **Table 2**: LE-S, V-3, W-2, F-0, C-3).

CLASSIFICATION OF WOUNDING POTENTIAL

In the past, bullet wounds were categorized by the firearm that discharged the bullet, but this vague classification has been redefined by a better understanding of ballistics, which is the study of the movement of projectiles, as well as the types of weapons commonly available to civilian populations. The wounding potential of a bullet is now described in relation to 3 factors that affect the amount of damaging energy transferred to the tissues. These factors are the energy of the missile on impact, the design of the bullet, and the characteristics of the tissues involved. The practitioner should become familiar with these principles to understand the nature of the injury and to provide appropriate care for the wound.

IMPACT ENERGY

Firearms are traditionally grouped into 3 major types based on the speed of the projectile at the time it leaves the barrel, called the muzzle velocity. This velocity is the sum of the forward and rotational energies that propel the projectile forward.[3] Low-velocity firearms, including handguns, are those that fire projectiles at a muzzle velocity of less than 350 m/s (1148 feet/s). Medium-velocity projectiles are fired at 350–600 m/s (1148–1968 feet/s), and include weapons such as shotguns and magnum handguns, whereas high-velocity weapons, such as military-grade weapons and hunting rifles, fire at greater than 600 m/s (>1968 feet/s) (**Table 1**). A longer barrel imparts a higher velocity to the bullet, by increasing acceleration by expansion of gases; conversely a shorter barrel imparts a lower speed to the projectile.[4] All of these types of weapons have been reported to cause equine gunshot wounds.[5,6]

Although it is tempting to describe the trauma caused by a bullet based on the initial muzzle velocity alone, this is the maximum speed the bullet reaches during flight. Multiple factors, including the bullet's shape and the distance the bullet travels, can slow the speed and reduce the energy of the projectile on impact. The muzzle velocity is significantly reduced at distances greater than 45 m with low-velocity firearms, whereas projectiles from high-velocity firearms are slowed significantly at distances greater than 90 m.[3] Shotguns are particularly susceptible to the effects of distance,