

# How to Manage Penetrating Wounds in the Field

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## 1. Introduction

Penetrating injuries to a body cavity such as the thorax or abdomen can result from a horse running into or attempting to jump over a fixed object in the field (fence post, tree, etc.). True penetrating wounds into the thoracic cavity and abdominal cavity are associated with a guarded prognosis due to pneumothorax and infection that develop.<sup>1,2</sup> Gunshot wounds penetrating only the skeletal muscle tend to have a good prognosis.<sup>3</sup> Initial evaluation of a patient with a penetrating injury should focus on patient homeostasis.<sup>4</sup>

## 2. Penetrating Wounds to the Thoracic Cavity

Wounds must be carefully examined to ascertain the depth of penetration. A fence board may enter at the chest, sliding under the skin, creating a long penetrating wound down the side barrel of the horse. With no direct penetration to the chest (or abdomen), the basic principles of wound management should be used. A simple laceration may not appear to penetrate the thoracic cavity. However, the trauma associated with such a laceration may involve the ribs, which in turn can penetrate the pleural cavity, resulting in a pneumothorax.<sup>1,4</sup> A penetrating wound to the axilla can simply cause widespread subcutaneous edema from the "bellows action" of the wound but may also gain access to the thoracic cavity, resulting in a pneumothorax.<sup>2</sup> A

pneumothorax can be classified as either closed (lesion in lung parenchyma) or open (lesion in the thoracic wall). The horse will often exhibit increased respiratory effort, dyspnea, and flared nostrils. Additional findings may include subcutaneous emphysema, hemothorax, and pneumomediastinum.<sup>4</sup> If a pneumothorax is suspected, the wound should be wrapped with a sterile airtight bandage<sup>a</sup> to minimize further influx of air into the thoracic cavity. Thorough auscultation must be performed. In the case of a pneumothorax, auscultation will reveal little to no air movement dorsally. Ultrasound (air echo that does not move with respiration) and radiographs (dorsal edge of the lung margin is apparent) can help confirm the diagnosis.<sup>1,2,4,5</sup>

The severity of the respiratory signs associated with pneumothorax depends on both the cause and the completeness of the horse's mediastinum. Thoracocentesis should be performed to reestablish negative pressure.<sup>2</sup> This can be accomplished by placement of either a teat cannula or chest tube in the upper third of the chest (dorsally in the 13<sup>th</sup> intercostal space along the cranial edge of the rib).<sup>1,5</sup> In either case, the site is clipped and aseptically prepared. A teat cannula or catheter can be attached to a 60-mL syringe via an extension set and three-way stop-cock. The air is removed by active suction.<sup>5</sup>

## NOTES

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Once the horse is relatively stable, the wound should be explored in the standing patient. Local perineural intercostal anesthesia can help facilitate exploration. Routine wound debridement, lavage, and removal of foreign bodies should be performed. Once the wound has been thoroughly explored and cleaned, it should either be closed by primary intention or covered again with a sterile, airtight dressing and allowed to heal by second intention. The horse should be placed on broad-spectrum systemic antibiotics as well as nonsteroidal anti-inflammatories for pleural pain. Prognosis is good for survival if septic pleuritis does not develop and extrathoracic injury did not occur.<sup>5</sup> Development of septic pleuritis decreases the prognosis for survival to 50%.<sup>6</sup> A retrospective study found that horses tended to be euthanized when severe trauma to structures outside of the thoracic cavity was sustained (i.e., damage to the colon, etc.).<sup>6</sup>

### 3. Penetrating Wounds to the Abdominal Cavity

Wounds to the abdominal wall do not commonly penetrate the abdominal cavity. However, such lacerations can offer a diagnostic challenge due to the varying abdominal wall layers in different locations. The area around the wound should be clipped and prepared aseptically. Until peritoneal penetration has been ruled out, aseptic technique should be used.<sup>2,4,5</sup> Skin is much more resistant to tearing than are the fascia and the muscles underneath it.<sup>2,4,5</sup> Therefore, if the wound is small, it may be necessary to surgically open it so that the deeper layers can be thoroughly examined.

Diagnostics that can assist in determining whether the peritoneal cavity has been penetrated in less obvious injuries include abdominocentesis, ultrasound, and rectal palpation.<sup>5</sup> If confirmation is not possible, the horse must be closely monitored for signs of peritonitis.<sup>5</sup>

If the wound does not involve the abdominal cavity, it should be debrided, lavaged, and closed in multiple layers if possible. A drain is often useful in evacuating the dead space. A belly bandage can be placed for support; helping to reduce the edema formation and encouraging more rapid wound healing. It is prudent to mention to the owner that many body wall defects are predisposed to herniation and that the defect may need to be repaired in the future (2–3 months) at a surgical facility.<sup>2,4,5</sup>

If peritoneal penetration has occurred, emergency first aid is required to stabilize the horse for transport due to the risk of intestine evisceration and septic penetration.<sup>5</sup> On arrival, not knowing whether referral is yet an option or not, the wound should be packed and bandaged or closed with towel clamps, suture, or sterile stent bandage to prevent abdominal contents from falling out of the wound. However, if intestines have already gone through the wound and are present on the outside of the abdominal cavity, first take a deep breath. Remain calm and move quickly. The owner is likely to be

quite upset. Your reaction plays an essential role in how the owner will continue to react to the situation at hand. Give them a task (necessary or not) and direct them to allow them to feel as though they have some sort of control (filling a bucket with tap water, grabbing towels from the barn, staying at the head of the horse to “keep the horse calm,” etc.). This will also make your job easier. At this time, the intestines that have spilled out of the wound need to be lavaged and returned to the abdomen as quickly as possible. This can be performed by wearing two sterile shoulder-length reproductive sleeves. The intestines could be handled in the following manner: cradled by the field veterinarian as the owner pours sterile saline over the intestines, or placed on a clean sheet or garbage bag (held by two individuals) as the veterinarian lavages them. In the process of lavaging the intestines, the wound should also be cleaned with sterile fluids so that re-insertion of the intestines does not bring contaminants into the abdomen. Close the wound as previously described. The horse should be referred to a surgical facility for abdominal exploration and lavage as well as for care and determination of whether additional abdominal viscera have been injured.

### 4. Gunshot Wounds

Gunshot wounds can be classified as either low or high velocity. Tissue reacts according to the velocity of the projectile contacting it. A bullet causes damage in several ways. The immediate tissue in contact with the bullet is lacerated and crushed. For high-velocity wounding, a cavity is formed as the soft tissue balloons away from the incoming bullet. As the cavity is forming, a vacuum occurs that serves to draw debris and contaminants into the wound. The trauma to the tissue and contaminants in the wound increases the potential to infection that is dispersed through the associated fascial planes.

When initially evaluating the extent of the soft tissue injury, the depth is often underestimated. Where skin and skeletal muscle are involved, the prognosis is good. However, sufficient velocity obtained by small-caliber ammunition may enter body cavities, injuring vital tissues.<sup>3</sup> One study found that horses injured with low-velocity projectiles (BB gun, etc.) have a better chance of survival.<sup>7</sup> Treatment for these cases of soft tissue infection associated with trauma in the path of the bullet involves thorough investigation of the wound. Initial treatment adheres to the principles of wound management and usually consists of debridement, lavage, establishment of drainage, and delayed primary closure.

### 5. Summary

Penetrating injuries are dangerous to the horse. It is important that the owner is made aware of the seriousness of the injury their horse has sustained.

After initial evaluation has focused on patient homeostasis, thorough examination of the wound is performed. With referral to a surgical facility not an option, the owner will look to the field veterinarian to help guide them in deciding to treat or humanely euthanize their horse.

#### References and Footnote

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<sup>a</sup>Saran™ Wrap, SC Johnson, Racine, WI 53403-5011.