

# Managing Penetrating Injuries in the Field (AAEP 2012)

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A splintered tree limb or a jagged piece of metal protrudes from your horse's chest. Don't panic--field veterinarians are well-versed in handling penetrating injuries like these in horses, because, yes, nightmares like these are sometimes realized.

Shannon Murray, DVM, MS, Dipl. ACVS, a practitioner at Rhinebeck Equine, LLP, in New York, reviewed how to manage penetrating wounds, from tiny (but insidious) punctures to more obvious impalements, during a series of lectures at the 2012 American Association of Equine Practitioners convention, held Dec. 1-5 in Anaheim, Calif. She covered caring for wounds, with and without synovial structure (joint) involvement.

## Wounds Penetrating Synovial Structures

Puncture wounds involving joints are a common way for bacteria to enter horses' synovial structures, Murray said. These wounds should be considered emergencies and treated immediately and aggressively, as potentially serious consequences can develop. While veterinarians can treat these injuries successfully in the field, she said, referral is generally the best option, if possible.

**Wound Basics**--If a laceration is less than six to eight hours old when the veterinarian arrives, it is still considered acute; bacteria might have entered the synovial structure, but it's unlikely the joint is truly infected yet. If the wound is more than 6 to 8 hours old, it is considered chronic and a true infection in the joint will likely develop. Bacteria in a synovial structure disrupt the joint's homeostasis and cause inflammation, Murray said.

"As the duration of the inflammation becomes chronic, damage can occur within the tendon sheath and/or joint, resulting in a life-threatening disease process or loss of use secondary to permanent lameness," she explained.

Many horses with wounds penetrating synovial structures appear normal on physical exam, Murray said. In some cases horses develop a fever if infection has developed, and if the horse has lost excessive fluids, such as blood or sweat, the veterinarian might need to stabilize the horse's condition by administering intravenous fluids, among other methods, .

**Evaluating Penetrating Wounds to the Foot**--Murray said that while these wounds can appear small and innocuous, they are often deep and disastrous. The synovial structures most likely to be damaged by a penetrating wound to the foot include the coffin bone, distal sesamoid bone (navicular bone), coffin joint, navicular bursa (the sac cushioning the navicular bone from the deep digital flexor tendon), deep digital flexor tendon, impar ligament, or digital flexor tendon sheath, Murray said.

If the penetrating object is still in the foot when the veterinarian arrives (the ideal situation), he or she will take radiographs--at least two different images at right angles to one another--to determine the how deep the object has penetrated and if synovial structures could be involved. She noted that metal objects are easy to identify on radiographs, but wood and other nonmetallic or organic objects might not be as apparent.

If the penetrating object has already been removed, the veterinarian will ensure the foot is thoroughly cleaned before paring and trimming it to find the entry wound. In some cases, she said, hoof testers are required to help locate the opening. Once the practitioner locates and cleans the wound, he or she should insert a sterile metal probe or teat cannula (a small, narrow tube) into the wound and take radiographs to help identify the puncture tract's direction and depth.

Murray cautioned that occasionally deep penetrating wounds can damage the coffin bone without affecting any synovial structures, which can result in a condition called septic pedal osteitis (inflammation of bone beginning in the periosteum, or the bone's surrounding membrane). This condition isn't always apparent initially, she noted. Over time, clinical signs including persistent lameness, drainage, and local bone loss (apparent on radiographs) will arise if pedal osteitis develops.

**Evaluating Wounds Penetrating Other Synovial Structures**--Murray said that in general, a veterinarian should aseptically prepare any wound penetrating a synovial structure not within the hoof before examining it. Clip the hair surrounding the wound, and lavage the wound to reduce foreign debris and bacteria in the penetration tract.

Once the wound is aseptically prepared, she said, the veterinarian can palpate the tract either digitally with a sterile glove or using a sterile probe. She recommended taking radiographs with a probe in place to determine the wound's depth.

At this point it's important to evaluate the wound for potential "communication" with a synovial structure (such as a joint or a tendon sheath) and to collect a synovial fluid sample, Murray explained. Evaluate the fluid sample for certain values, including total protein concentration and white blood cell counts, that could indicate an infection. Additionally, she said, the practitioner can use radiography and ultrasonography to identify signs of synovial structure disease and damage.

**Treatment**--After evaluating the wound, the veterinarian should begin treatment. Therapy for these wounds generally includes a combination of the following:

- Broad-spectrum antimicrobial therapy;
- Intravenous antibiotics, followed by oral antibiotics for at least two weeks after clinical signs resolve;
- Nonsteroidal anti-inflammatory drug (NSAID) administration;
- Curettage (surgical scraping, a procedure used only for penetrating hoof wounds);
- Joint lavage;
- Intra-synovial antibiotic administration; and
- Regional limb perfusion (applying a tourniquet to isolate a vein that supplies blood to the affected region, then injecting medication into that vein) .

Murray cautioned that not every treatment options is suitable for each patient, depending upon the clinical signs or complications involved.

She also stressed that it's essential to continue monitoring and treating patients with synovial structure puncture wounds. Continue treatment until synovial fluid cytology returns to within normal limits. Also monitor how the horse is using the injured limb to gauge treatment response.

When clinical signs subside and cytology returns to normal, practitioners can discontinue joint lavage and intra-synovial antibiotic administration. Intravenous antibiotics should continue until any synovial infection resolves, she said, and at least a 2-week course of oral antibiotics should follow.

**Prognosis**--Murray said the prognosis for horses with wounds penetrating synovial structures depends on the individual injury and ranges from guarded to good, depending on how quickly a veterinary care is provided and the horse responds to treatment.

She cautioned that not all penetrating wounds heal, and the attending veterinarian must be able to decide when to start or continue treatment and when euthanasia is the most humane option.

## Other Penetrating Wounds

Not all penetrating wounds involve joints or joint structures, however. Murray also reviewed how to handle wounds to the thoracic cavity and abdomen, and she described treating gunshot wounds.

**Thoracic Cavity Wounds**--Veterinarians should evaluate these wounds closely to determine their depth, she said.

"With no direct penetration to the chest, the basic principles of wound management should be used," she said.

However, trauma associated with lacerations or penetrating wounds to the axilla (the space between the inside of the upper limb and the body wall) can both cause a variety of complications, including pneumothorax (air in the chest cavity), subcutaneous emphysema (air pockets beneath the skin), hemothorax (pooling of blood in the chest cavity), and pneumomediastinum (air in the mediastinum, or the space in the middle of the chest, between the lungs).

After evaluating such wounds, veterinarians generally debride and lavage them, and they remove any foreign bodies remaining in the cavity, she said. After cleaning the cavity well, the veterinarian should either close the wound by primary intention (sutures) or cover it with a sterile, airtight dressing and allow it to heal by secondary intention (the wound is not closed and allowed to heal on its own, an approach used with chronic, dirty, or infected wounds). She also noted that the veterinarian should prescribe broad-spectrum antibiotics and NSAIDs to help control pain and possible infection.

The prognosis for survival is generally good, unless the horse develops a potential complication called septic pleuritis (inflammation within the chest cavity). In such cases the prognosis for survival drops to 50%, she said.

**Abdominal Wounds**--Murray said that diagnosing wounds to the abdominal cavity can be especially challenging for veterinarians.

"Skin is much more resistant to tearing than are the fascia and muscles underneath it," she said. "Therefore, if the wound is small, it may be necessary to surgically open it so that the deeper layers can be thoroughly examined."

If a wound does not penetrate the abdominal cavity, Murray said, the veterinarian should debride, lavage, and close it; in some cases, apply a belly bandage for support, to help reduce edema (fluid swelling), and encourage more rapid wound healing.

If penetration does occur, the horse must be transported to a clinic for emergency care. But first, the field veterinarian must provide emergency first-aid care to stabilize the patient and, in many cases, he or she will pack and bandage the wound quickly to prevent the intestines from escaping through the wound. However in some cases, the intestines have already fallen out of the wound.

In these scenarios, Murray instructed, "First, take a deep breath. Remain calm and move quickly."

The veterinarian must place the intestines back into the abdominal cavity as quickly as possible, she said. Clean them first to prevent contamination, and sterilize the wound, she said. Then, the wound should be closed and the horse transported to a referral facility for further care.

Many penetrating injuries to the abdominal cavity carry a guarded prognosis, Murray said.

**Gunshot Wounds**--Gunshot wounds require careful evaluation because their depths are often underestimated. If the bullet or projectile has only penetrated the skin and skeletal muscle, she said, the prognosis for recovery is often good. The prognosis for survival generally decreases if organ trauma occurs. Initial treatment generally includes debridement, lavage, establishing drainage, and delayed primary closure.

## Take-Home Message

Despite the fact that some horses with penetrating injuries return to full athletic function, owners and veterinarians should not take these cases lightly. Provide prompt veterinary treatment for horses with penetrating wounds, as early treatment often means better treatment results.

Disclaimer: Seek the advice of a qualified veterinarian before proceeding with any diagnosis, treatment, or therapy.