



Massey University

Veterinary Teaching Hospital

PUNCTURE WOUNDS TO THE FOOT

The horse's hoof is a very complex structure. The tough outer wall surrounds layers of sensitive laminae ('leaves') which support, nourish with blood and, in turn, cover the underlying pedal bone. The sole consists of horny tissue and is similar to the hoof wall in which the outer surfaces are insensitive to pain, but lacks the hardness and strength of the outer layers of the hoof wall. The frog consists of firm rubbery tissue which acts as a cushion to help spread the forces associated with weight bearing. The sole joins the hoof wall at the white line. This marks the zone of transition between insensitive and sensitive tissue in the hoof wall. Punctures to the hoof rarely occur through the hoof wall itself, but punctures to all areas of the sole and frog are relatively common. These puncture wounds can range in significance from none at all to a severe life threatening injury, depending on the site and depth of penetration.

What types of puncture wounds occur?

Most puncture wounds to the hoof are associated with misdirected shoeing nails, shoeing or construction nails which have been picked up in bedding, at exercise or turnout, or pieces of wire. Other causes of penetration include sharp flint stones, pieces of glass, needles, splinters of wood, etc. Simple puncture wounds and nail pricks will result in haemorrhage into the sensitive tissues of the foot but depending on the size of the puncture there may or may not be signs of blood present on the solar surface of the foot.

The area of penetration of the sole is of great importance. If the nail is still in the wound, it is easy to see where the puncture actually occurred. Simple puncture wounds result in bruising and often secondary infection of the tissues and subsequent abscess formation, but deeper structures are usually not involved. The further away from the hoof wall that the puncture occurs, the higher the risk that the injury may have damaged the underlying pedal bone. In some cases this can cause a fracture of the pedal bone, but more often a small site of bone infection (osteomyelitis) develops which results in an area of bone erosion. A piece of infected bone may die, lose its blood supply and separate, forming what is called a sequestrum.

Puncture wounds towards the back of the foot, but away from the frog may result in infection of the softer cushioning structures deep to the frog, in the heel region, and may involve the digital cushion. These infections often result in extensive under-running of these structures at the back of the foot. The most serious foot wounds involve penetrations which occur in the back half of the foot, usually in the sulcus of the frog or through the frog. These may penetrate the navicular bursa and/or may involve the coffin joint. Infection established in either of these structures may result in damage to the deep digital flexor tendon where it runs over the lower surface of the navicular bone. This type of injury must be treated very seriously as it is potentially life-threatening.

What should I do if my horse has a puncture wound to the foot?

The first thing to do if you find a nail or piece of wire or glass in your horse's foot is to pull it out so that the horse cannot tread on it again and cause deeper injury. The site of the puncture wound should be marked so that if further exploration is necessary it is possible to find its site again, especially if it is located in any part of the back three quarters of the sole or frog. If it is not possible to remove the foreign body or if it is obvious that deeper structures are involved, your veterinary surgeon should be called without delay.

If you are satisfied that the puncture is simple and uncomplicated, the sole and hoof wall should be cleaned and a poultice applied. If your horse becomes lame, typically within the next 24-48 hours, particularly if it becomes very

lame, your veterinary surgeon should be called as this is an indication that infection or damage to deeper structures has occurred. If the puncture wound involves the frog or the back half of the foot you should call your veterinary surgeon without delay. A clean dry bandage or a poultice should be applied while you are waiting for your veterinary surgeon to arrive.

Will further treatment be necessary?

If infection has developed as a result of a nail puncture, this needs to be drained before it can be resolved. This involves cutting a hole into the sole to allow pus to drain out. Another poultice may help to 'draw' the infection through the hole. For a simple infection of the sensitive tissues under the sole, these measures are usually all that are required and the condition resolves quite quickly. After drainage is complete it may be necessary for the remaining hole in the sole to be packed, to prevent contamination and re-infection. Your veterinary surgeon or blacksmith will advise you on the best material for packing the hole depending on its size, shape and site. If the infection does not resolve, a larger and deeper hole may need to be cut or other structures may be involved. Infections involving the pedal bone commonly cause a recurrence of lameness, requiring repeated drainage of the site of infection. These may be investigated by radiographic (x-ray) examinations.

If infection has become extensive and deep, it may be necessary for a large area of the sole to be cut away to allow complete drainage of pus and removal of damaged tissue. Long term or permanent resolution can only be achieved by cutting through the sole down onto the damaged area of the pedal bone and scraping away the damaged bone. This is a more complex procedure and necessitates the use of nerve blocks and the application of a special shoe to which a metal sole plate can be attached and detached so that dressings can be regularly changed and kept in place over a long period of time. This is often called a 'hospital plate'.

Puncture wounds to the navicular bursa require immediate surgical treatment to flush the navicular bursa and the coffin joint. This must be performed under general anaesthesia and your horse may need to be referred to a specialist centre for this treatment. Infections involving the soft tissue structures at the back of the foot may require extensive removal of damaged tissue and may require a long time for recovery.

Lameness caused by the development of infection typically occurs 24-48 hours after the puncture wound has occurred and characteristically tends to get worse rather than better over time, due to the accumulation of pus within the inelastic tissues of the hoof. If left untreated the horse's leg will begin to swell and you may find that pus tracks up the inner surface of the hoof wall and 'breaks out' at the coronary band. If this happens it may not be necessary to establish drainage at the sole, but it may help for the horse to receive antibiotic treatment to speed resolution of the infection.

If your horse is immediately quite lame after a puncture wound to the foot, you should call your veterinary surgeon immediately because this will almost certainly indicate damage to the deeper structures.

Vaccination

Any wound can result in contamination with environmental bacteria, which may include *Clostridium tetani*, and your horse developing tetanus. Puncture wounds to the foot are particular risks because they get contaminated with soil, which often contains the tetanus bacteria, which like to grow and produce their toxins in the air-less conditions of damaged tissues within the hoof. Every horse should be fully and regularly vaccinated against tetanus, to reduce the risk of this disease and avoid the worry that minor wounds may result in such unnecessary complications. Tetanus vaccine is initially administered on two occasions a month apart. A third vaccine is given at 12 months and booster vaccinations are given every 24 months. In most cases this vaccination regime can be combined with that for influenza and there are no excuses for not taking advantage of this life-saving vaccine.

If an unvaccinated horse sustains a puncture wound, it is important to ask your veterinary surgeon to administer a tetanus anti-toxin injection. Unlike a vaccine, this provides immediate temporary protection against tetanus, but does not provide long term immunity. Regular vaccination is by far the best policy.