

PENETRATING WOUNDS OF THE FOOT

Penetrating wounds of the horse's foot are quite common with nails and screws perhaps being the most frequent cause. If a sharp object is able to penetrate the horse's foot, it can potentially cause damage to the sensitive tissues and structures inside. Depending on the site and depth of entry, this can result in very serious disease and therefore penetrating foot wounds should always be carefully assessed.

Anatomy of the Foot

The foot is completely enclosed within the hoof capsule, which is comprised of hoof wall, sole and frog. The hoof wall and the sole are attached to the underlying pedal bone by the sensitive laminae (Fig. 1). Once the hoof wall or sole has been penetrated, the consequences will depend on what structures are damaged. This in turn will depend on which bit of the sole the object enters and how far into the foot the object extends. The frog is the softest part of the foot and is prone to penetrating injuries. As the frog also has deep sulci (or grooves) on either side, sharp objects can easily become wedged in these sulci before potentially being driven further into the foot.

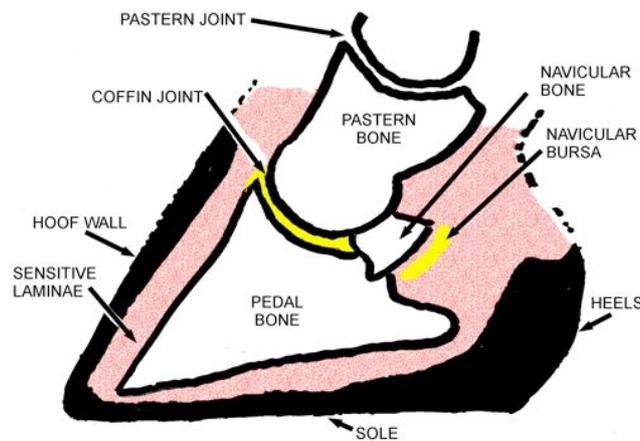


Fig. 1: Cross-sectional diagram of a horse's foot.

The horse's foot contains two important synovial structures, the coffin joint and the navicular bursa. The coffin joint, like all joints in the body, consists of smooth cartilage and joint (synovial) fluid contained within a joint capsule. These structures, when healthy, ensure free and easy movement of the joint. The navicular bursa is essentially a small cushion filled with synovial fluid that allows the deep digital flexor tendon to slip freely over the back of the navicular bone. If these structures are penetrated, potentially life-threatening synovial sepsis (infection) almost always occurs. Prompt assessment of penetrating foot wounds should therefore be performed to assess the site, depth and angle of penetration.

Penetration of the Laminae

A nail that penetrates the sole and extends into the laminae will cause pain and inflammation, especially if the object stays lodged in the sole. The nail will introduce bacteria into the laminae which will multiply. When the nail falls out or is removed, the hole in the sole quickly seals over. Meanwhile the horse's immune system keeps the infection localised, creating an area of pus. Eventually a foot abscess and severe lameness result as the pressure of pus builds up within the rigid hoof structure.

An additional risk is that the penetrating object can introduce the bacteria that cause tetanus. Tetanus is a potentially fatal disease that is extremely difficult to treat, however it is completely preventable by vaccination (see Vaccinating My Horse fact sheet). If your horse is not vaccinated, and it sustains any kind of cut or wound, it is essential that it receives tetanus antitoxin and begins a tetanus vaccination course as soon as possible, as well as any other treatment required.

Penetration to the Pedal Bone

If a nail extends deeper into the foot, it can come into contact with the pedal bone. If there is sufficient force of penetration, the pedal bone can even fracture. More commonly, the pedal bone is damaged and becomes infected (septic pedal osteitis). Bacterial infection can "eat away" at the bone causing serious problems and treatment is not straightforward as antibiotics find it very difficult to reach infected bone. Usually the entire puncture wound tract must be pared away and the pedal bone scraped away back to healthy bone. Obviously, this procedure has a long recovery time as healthy tissue must repair the hole made in the foot.

Penetration of Synovial Structures

The most serious puncture wound is one that penetrates either the navicular bursa or the coffin joint. The navicular bursa, in the average sized horse, is only about 3 cm (just over an inch) from the sole; in a pony it is even less. Therefore, a short nail does not have to penetrate very far to reach the bursa.

If bacterial infection develops in the navicular bursa or the coffin joint (or both) then there can be disastrous consequences. The body's immune system, in its attempt to eradicate the infection, also damages the synovial structures themselves, for example destroying the smooth surface of cartilage. In a matter of just a few days, the combination of bacterial infection and inflammatory response can cause such extensive damage to a synovial structure that a horse will be lame for the rest of its life, even with treatment, and in such situations the horse often needs to be put to sleep. Therefore, penetrating injuries of synovial structures need to be recognised and treated promptly. Treatment consists of flushing the synovial structures with large volumes of fluid to remove bacteria and dirt from the area under general anaesthesia and aggressive antibiotic therapy. Not infrequently, surgery needs to be repeated.

What Should I do if I Find a Nail in My Horse's Foot?

Considering the horrendous consequences, what should you do if you find a nail stuck in your horse's foot? Unfortunately, as ever, there is no one correct answer! The

immediate reaction is to attempt to pull the nail out; however you should only do this if you can be certain the nail has only gone in a short distance. In most situations it is better to leave the nail in place. Keep the horse calm and stop the nail being driven any further into the foot by preventing the horse from standing or walking on the foot.

Call out your veterinary surgeon; they may give you advice on whether it is safe or not to remove the nail before they arrive. From studying the type of nail, its position in the sole and the direction it is pointing, it is often possible to determine what action needs to be taken. Usually, if the nail has only penetrated a short distance, the entry tract is enlarged to ensure any pus can drain from the infected site. A bandage and/or a poultice are then required to keep the wound clean. Tetanus cover might be given and possibly, but not always, antibiotics.

If deeper structures are suspected to be involved, your veterinary surgeon may decide to take radiographs before they remove the nail. This will tell them exactly where the nail has gone and which structures have been damaged. Bony damage may need surgical treatment and prolonged antibiotics. If the navicular bursa or coffin joint are shown to have been penetrated, the horse will need to be referred as soon as possible for an operation under general anaesthesia to flush out the synovial structure. Prevention is essential and vigilance is required to remove nails and other sharp objects from a horse's environment from stable to pasture.