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The Dreaded Founder

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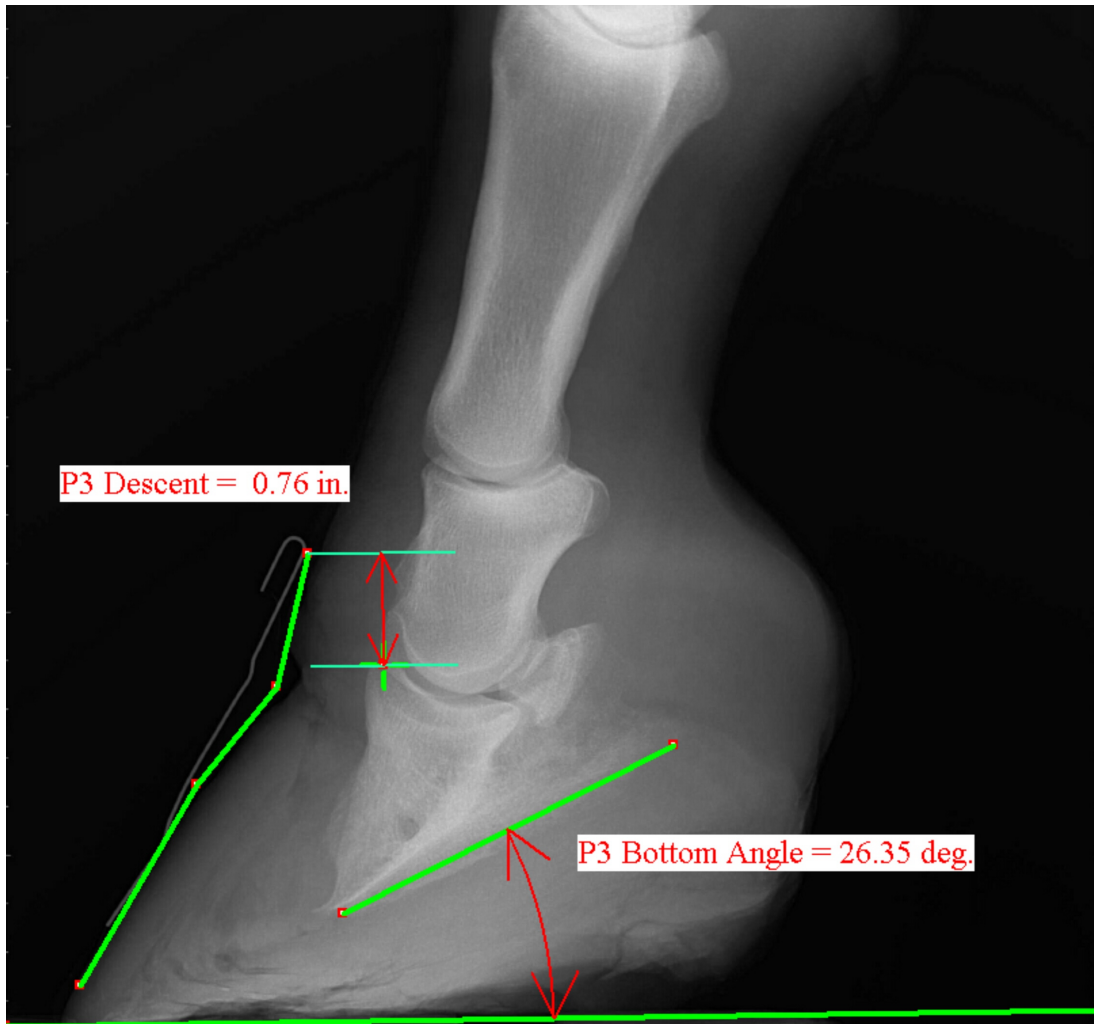


Figure 1: Radiograph of a foundered hoof. There is rotation of the pedal bone along with a 'sinking' of the bones relative to the coronary band.

Most horse owners have heard about founder. Founder is a dreaded word for good reason since it is one of the main causes of equine death. Founder is a generic word that is used sometimes interchangeably with laminitis. To be precise, *laminitis* refers to the inflammation of the sensitive lamina in the

hoof, whereas *founder* can be is a possible end result of the inflammation, when tissue structures begin to fail. Laminitis itself is truly not a disease but a response to a variety of triggering factors. Excessive consumption of lush new grass or grain is a common trigger. In these cases, the start of laminitis can be tracked to the intake of over-rich foods. Metabolic problems, such as insulin resistance, Cushing's disease, and hypothyroidism (under-active metabolism) are also triggers for laminitis. Other triggers can range from an adverse response to drugs, ingestion of toxic materials, hormonal imbalance and to unusual mechanical stress placed on the hoof.

A laminitic episode causes anything from mild to catastrophic failure of the hoof internal structures. The main reason this occurs lies in the complex hoof design and its relationship to blood function. Remember that blood not only supplies oxygen and nutrients to tissues but it also serves to remove waste, to regulate body temperature and to provide normal hydraulic pressure. The sensitive tissues (sensitive lamina, sole dermis, and coronary papillae) of the hoof contain a complex system of micro blood vessels. Any disruption in normal blood function may cause failure in the tissues and blood vessels. The keratinous part of the hoof and the pedal bone can detach from the sensitive tissues as they fail structurally.

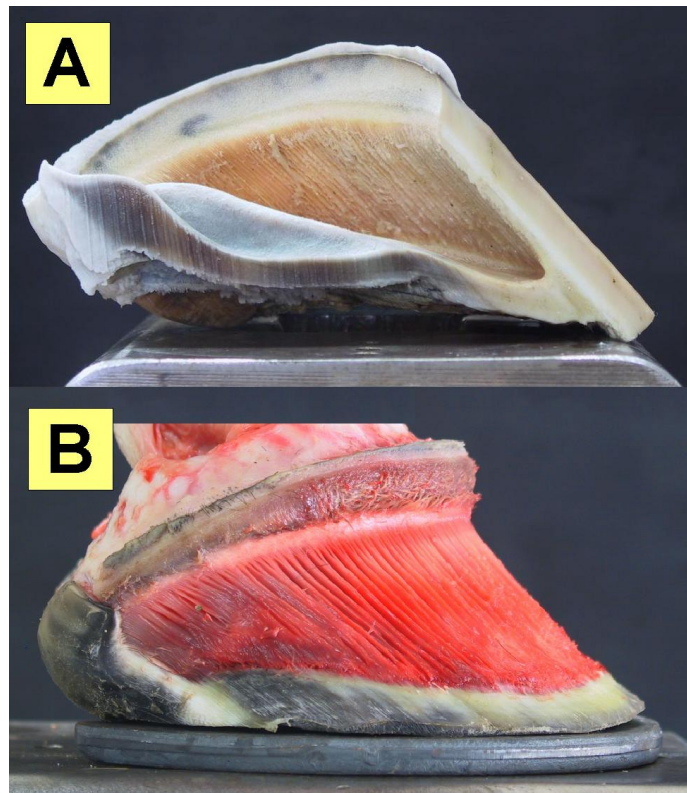


Figure 2: The sensitive lamina (B) attach to the inside of the hoof wall (A).

Damaged blood vessels and soft tissues will also have an effect on the pedal bone. In founder cases, as time goes on, generally the pedal bone may begin to show signs of abnormal demineralization. Unfortunately, in some cases, this can occur quite quickly.

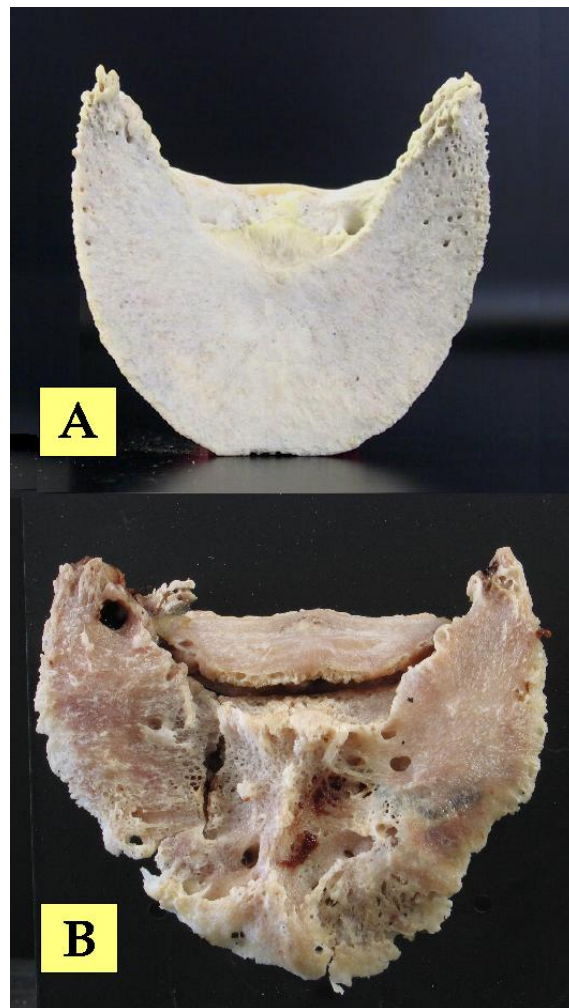


Figure 3: A normal pedal bone (A) viewed from the underside, and a seriously damaged bone (B) from a foundered hoof. In image (B) the navicular bone is also shown. This is an extreme case.

What can you do to avoid having a laminitic episode? The simple answer for many cases is to monitor and restrict food intake. If you suspect that your horse presents signs of metabolic problems such as a permanent heavy coat, crested neck, lack of appetite, or over drinking, a veterinarian should perform appropriate blood tests. As far as the other trigger causes for

founder, they are unfortunately somewhat harder to control. If you suspect that your horse is sensitive to drugs, especially vaccines, try to stagger their administration. Pay attention and try to note any signs of allergic reaction to other drugs. Problems arising from mechanical stresses to the hoof can be due to a wide variety of causes: from riding thin-soled horses on hard abrasive ground (road founder) to having horses trimmed too aggressively. Use common sense if you decide to ride horses barefoot and watch how your farrier/trimmer treats the sole of your horse. Remember that soles play an important role in providing support to the entire bony column and should be treated with extreme care.

What can you do during a laminitic episode? You need to call a veterinarian immediately. Whether you wait for your veterinarian or are about to trailer your horse to a clinic, you should try to support the sole. Do not support the sole with materials that are hard. It can be difficult to lift a hoof to administer to it, as the horse may not want to put all its weight on a single foot. But if you can, you should attempt to support the sole with sponges, Styrofoam pads, cotton, or soft putty. The point is to fill any voids under the foot into which the foot can further sink. After placing one of these types of packing under the hoof, you need to wrap the hoof with some bandaging material to hold it in place. Do not secure the wrap too tightly around the coronary band as this could restrict blood flow. Boots are ok as long as they do not constrict the coronary band or keep the hooves too warm. Too much heat at the hoof will increase the chance of further tissue damage. I like to keep a horse's legs and hooves cool during a laminitic episode. I prefer to keep the hoof dry, so rather than using water for cooling, I wrap the lower legs (just above the hoof) with slightly unfrozen ice packs or commercial leg cooling wraps. You want to keep the legs and hooves cool but not freeze the tissues. Increased moisture can weaken the hoof **keratin** (the hard horny material comprising the hoof wall) and thus create more structural failure at the hoof. Your main goal at this stage is to stabilize the hoof as best as you can while you wait for medical help.

What can you do after a laminitic episode? It is only after the laminitic episode is completely passed that you can start providing orthopedic help to the hoof. You need to involve your veterinarian in the equation. Radiographs are very important. These will help to determine the amount of pedal bone rotation, how much wall separation has occurred, etc. A good farrier or trimmer is essential for success. I would also advise taking follow-up radiographs in order to monitor progress. Although I recommend the help of

a veterinarian, choose one who does not routinely perform deep digital flexor tendon (DDFT) tenotomy nor aggressive resection of the hoof wall. A DDFT tenotomy means cutting the major tendon that connects to the pedal bone – this drastic step should be a last resort surgical procedure. If a pedal bone has rotated, the thinking is that by cutting the DDFT, tension will be removed at the pedal bone, and this will prevent further damage to the lamina and the pedal bone. In recent years, there has been a change in perception towards this procedure and up-to-date veterinarians tend to avoid it. Deep resection of the hoof wall can cause permanent change to molecular structure of the hoof keratin, which means that the biochemical and biomechanical stability of the hoof keratin may become permanently compromised.

Can a horse recover from founder? Except in catastrophic founder cases, undiagnosed metabolic and seriously neglected founder cases, most horses have a good chance to recover. Note that recovery does not always mean return to full riding capacity. This truly depends on the severity of the tissue damage and how much damage was done to the pedal bone during the laminitic episode. Tissues will eventually heal but not necessarily to their former structure and mechanical strength. Currently, a damaged pedal bone cannot be repaired.

How do I approach therapeutic shoeing with founder cases? Most of my founder cases have come to me through veterinarian referrals. I always have current radiographs when I start working on a founder case. My main goal is to make a foundered horse as comfortable as possible so it can resume some reasonably normal motion and exercise. Immobility is very bad for horses, it not only impairs hoof growth but it will also affect the well being of the entire horse. The digestive system can suffer, muscles will lose their tonality, tendons and ligaments will lose their flexibility. Depending on the situation, I will either keep the horse barefoot or choose to use composite shoes to provide complete sole support. If a foundered horse has maintained a good sole and needs to be trimmed by small amounts but often, I will opt for keeping the horse barefoot. Horses with very high heels need to be trimmed to remove heel height by small amounts, but need this done often – perhaps every 2 weeks. It is not advisable to drop heels very fast this may cause damage to tendons and ligaments.



Figure 4. Damaged and separating front hoof wall, and a hoof that appears to be melting like a candle. The radiograph (left) shows some rotation of the pedal bone.

In most cases, I prefer to use composite shoes. They are simply a way of protecting the sole while trying to promote weight bearing on the back portion of the foot (away from the damaged front hoof wall). Compared to a rigid steel shoe, the added flex to the hoof capsule helps circulation and this, in turn, stimulates new hoof growth. The mechanical properties of metal are very different than those of keratin; in contrast, a slightly flexible material that behaves like the natural hoof keratin will not impede the natural function of the hoof. Trimming the hoof to help attain better joint alignment and giving arch and sole support will also contribute to improved circulation and help from further sinking of the pedal bone. Under the right conditions, the hoof capsule can restructure itself very quickly.

Composite shoes are not a miracle cure. They only work if the trimming, the arch and sole support, and the shoe placement are done properly. Remember skillful trimming is the most important ingredient to success.



Figure 5. On the left, below the red line one can see the dead, keratinized lamina frequently observed in the aftermath of founder. A few months later (on the right) the hoof has restored itself quite well.

Not every foundered hoof shows signs of rotation at the pedal bone. A rotation is an above-normal angle of the pedal bone relative to the ground. A 'normal' angle for the underside of the pedal bone relative to ground is approximately between zero to six degrees depending on the hoof morphology of a particular horse. In some founders, the pedal bone may sink towards the sole without signs of rotation, in other cases, rotation is apparent. In foundered hooves, some capsules look like melted candles, some do not show serious external distortions --- this really depends on the gravity of the founder.

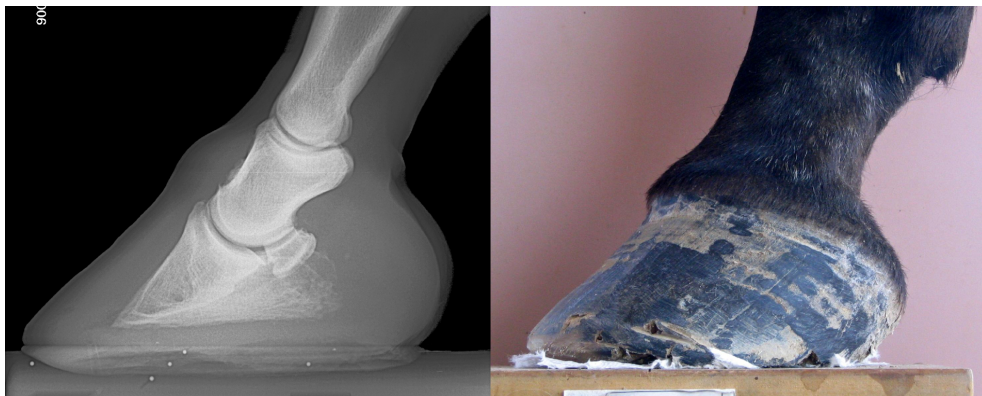


Figure 6. The same hoof as in figures 4 and 5 after about four months. This represents a better than usual outcome because the damage was not severe (unlike the hoof of figure 1 or the pedal bone shown in figure 3B, which were from catastrophic cases).

Finally, I want to stress again the importance of returning a horse to some exercise as soon as possible. It is harder to 'de-rotate' the pedal bone of a foundered horse that does not get sufficient exercise. Tendons and ligaments will lose their flexibility and will return to their atrophied state if not put to work. In the case of tendons, the muscles to which they attach are the real issue – it is these muscles that need to stretch and come back to some normalcy. A good physical therapist can be very helpful in relieving aches and pains the horse body endured during and while recovering from founder.

If you would like to further your knowledge on laminitis, I would highly recommend Dr. Christopher Pollitt's website at www.laminitisresearch.org. Dr. Pollitt is one of the leading researchers on laminitis, and his website contains very complete information on laminitis, insulin resistance, Cushing disease and much more.

Monique Craig is a hoof researcher, farrier, consultant to farriers, rider, trainer, and founder of EponaTech (www.EponaTech.com) and EponaShoe (www.EponaShoe.com).