



## About Navicular & Other Inner Hoof Pathologies Caused by Peripheral Loading – Carolyn Myre - 2008

---

### Peripheral Loading

Shoeing and trimming horses “inside the box” has not been proven to help many horses. As discussed at the Dr. Robert Bowker clinic in Toronto, Ontario in late 2007 - Any peripheral loading device (shoe, boot without pads or other non-conforming surfaces) causes **tension** on the hoof walls - this has been proven through research and many studies. Tension on bone causes bone loss and a reduction in bone density! When I speak about bone loss I am talking directly about loss to the coffin bone and to the navicular bone. Bone loves compression (builds bone) but hates tension (loses bone).

Even horses that are barefoot but kept on hard, non-conforming surfaces such as cement and wood floors in barns are under peripheral loading stress on the hooves because the horse's weight is placed directly to the hoof wall. It does not matter if there is a proper trim with a mustang roll to relieve mechanical pressure on the walls. If the horse is under professional barefoot care and the walls are properly trimmed to relieve peripheral loading but the horse is still mainly kept or worked on non-conforming surfaces – it will still suffer tension issues on the walls and the bones. Because the hoof has a degree of concavity (no matter what degree) this causes peripheral loading of the outer perimeter of the soles which in turn causes tension on the bones inside the capsule.

Long-term horse keeping on these surfaces can contribute to frictional or tension related pathologies such as navicular changes for instance. Specifically related to bone loss in the coffin bone and navicular bone areas as well as the development of bone spurs, lesions and calcification of cartilages, ossification of bones and joints, inflammation of soft tissue (sole corium)– ie. Pedal osteitis, ringbone, sidebone etc. When a horse is standing on (non-conforming) concrete or wood, their joints –namely the 2<sup>nd</sup> and 3<sup>rd</sup> phalanges are locked into a fully loaded broken forward pastern axis. This negative palmer angle of P3 sandwiches the navicular bone between the 2<sup>nd</sup> phalanx (short pastern bone) and the 3<sup>rd</sup> phalanx (coffin or pedal bone) and causes a LOT of stress and tension there. Once tissue is damaged or dies off in any of the tendon areas, cartilage areas or the impar ligament which attaches the navicular to the pedal bone, you will begin to see bone loss and calcification in different areas inside the capsule, partly as a result of limited blood circulation to the noted areas via the impar ligament. As further damage to the caudal hoof areas progresses the horse falls further into poor toe-first locomotion on all surfaces sometimes even soft, conforming footing such as grass. Until these damaged areas are built back up with proper locomotion on correct footing surfaces (if those cannot be provided, boots with padding should be used on all surfaces until the horse can move flat or heel first without them).

### Poor Locomotion: Toe First Landing

When horses land toe first in locomotion (as a result of being placed in a peripheral loading device such as a horseshoe or is worked barefoot on a non-conforming surface) or from any other reason that would cause toe first landing including poor trimming and un-natural diet that causes inflammation inside the hoof capsule and even severe thrush infections). The same broken back pastern axis occurs with every step in the fully loaded state (ie. when the heels are slapped down after loading the toe first). When horses land heel first on conforming surfaces there is no broken back axis and therefore no stress on the navicular bone and/or the other tissues which can be involved such as the deep digital flexor tendon and collateral cartilages. Dr. Robert Bowker of Michigan State University and Pete Ramey have suggested that they keep their horses' footing and Bowker's stalls full of pea stone as opposed to traditional bedding materials as it is actually conforming and soothing on sore feet. At the very least they suggest having thick foam padding in stalls and walkways in the barns. Horses with poor inner structures actually seek out this type of footing to rest their hooves in. Being on conforming surfaces eliminates peripheral loading thereby relieving pain from being in a fully loaded broken back pastern axis. The natural dirt plug in the horses' soles helps keep the horses from being peripherally loaded and gives them a huge degree of support as well as to aid in proper blood perfusion to the hoof capsule. So while it is always suggested to keep the hooves clean, at the same time perhaps just keeping in mind that the dirt plug is helpful in certain situations and especially if the footing is not too wet. The walls were not actually meant to take much of any weight bearing thus why in the wild in locations where proper diet and footing is conducive to healthy hooves, the horses have no walls hanging lower than the soles. In my humble opinion as is that of many other Practitioners the hoof walls are much like a human's nails in that they are there to protect the horse and not to play a weight bearing support role. Internally, the coffin bone rides

directly over the center of the frog; thus a large healthy frog, strong bars and thick callused sole are meant to support it from underneath. The walls are not located anywhere directly underneath the coffin bones so this is why I feel they don't serve a weight bearing role. To effect any healing to the inner structures in the back of the foot, the practitioner MUST aim to achieve a heel first landing. A flat landing is acceptable for horses with major pathology until the structures become healthy again – at which time the horse should feel confident enough to return to a heel first landing.

**Compare 2 Local barefoot horses which both were living at the same facilities  
Both are under a sound natural hoof care and diet regimen – Photos courtesy of Ute Hamilton**



**Simply being barefoot does not mean you have healthy hooves – Toe First Landing**



**Proper Heel First Landing – Indicates horse is comfortable on this footing**

When transitioning horses from shoes to barefoot, hoof boots with pads help immensely and provide immediate pain relief to the back of the hoof and to the soles. Horse owners and hoof care professionals do not have to wait until the horse is fully healed to see a heel first landing. Achieving this heel first landing rather quickly would speed up the healing process. The photo below is the same horse as the first photo which showed that he was not comfortable enough even on soft footing to have a heel first landing.



**Same Horse as first photo with boots and pads – Heel First Landing**

### **Important Role of Bars**

Another interesting thing that was discussed at the Bowker clinic was the discovery that bars are not only meant for weight bearing, if you look very closely at a freshly trimmed bar you can see that they have their own laminae. What are laminae designed for apart from attaching the walls to the coffin bone? For growing wall and sole material. Preliminary studies carried out by Dr. Bowker have concluded that wall thickness grows from the laminae somewhere in the center of the wall and migrates upward and downward from there. Dr. Bowker presented microscopic slides illustrating this - most of this research was conducted on unborn and newborn foals and is still in progress. Dr. Bowker showed the results of some of his studies on his own horses' soles, where he and Pete Ramey drilled small superficial holes in the soles and took photos and measurements of their location on a weekly basis, they all migrated forward toward the toe. They have concluded that bars also develop precious sole material to aid in laying down sole thickness. Dr. Bowker's wife actually discovered this prior to their studies as she noticed that the black and white coloration on her gelding's soles had migrated forward when cleaning out the hooves one day. So this means that basically any excess trimming of bars (not just soles) that have been bare for a while and are essentially live material means you are inhibiting the horses' ability to lay down sole thickness. The trick would be to remove just what you think would be logical for that horse's activity level and based on what the horse's career involves, what type of terrain it is living on as well as being worked on and all the while – keeping in mind that the bars are meant for supporting the coffin bone as well.

Back to the peripheral loading issue; which I believe directly affects the lack of proper hoof mechanism (heel first landing allowing proper expansion and contraction of the hoof for circulation and energy dissipation during locomotion and minimizing stress of internal structures). As well it hinders your progress to achieve proper hoof mechanism with proper trimming techniques if the non-conforming living or working conditions are at play on a daily basis. While locked into a broken forward pastern axis during locomotion or standing still, peripheral loading immediately reduces hoof perfusion (blood flow into the hoof capsule). More specifically due to increased pressure, the blood cannot perfuse properly into the smaller micro-vessels located within the lateral cartilage and the digital cushion. This reduces the shock absorbing and energy dissipating effect that the digital cushion has upon loading the hoof capsule.

A great deal of time was spent discussing how to read radiographs for navicular changes way before most professionals actually see anything blatant and how to properly have them taken. Taking radiographs on a flat non-conforming surface such as concrete, cement or wood blocks does not give the attending veterinarian or hoof care professional an accurate reading of the palmer angles as the foot is locked into a slight broken forward pastern axis at the time of the radiographs. This can prove dangerous when veterinarians and hoof care providers begin to trim or prescribe corrective trimming and shoeing to repair these “false” angle readings. It has been proven that decreasing pressure under the bars and frogs by means of raising the back of the hoof with trimming or by applying bar shoes and wedges and pads does not decrease pressure on the deep digital flexor tendon. Basically what happens with respect to ongoing navicular changes is that the foot mal-adapts due to a lack of correct care and use of the caudal foot area, or from increasingly incorrect care of the caudal foot area i.e. raising the heels and “protecting” the back of the foot thus causing atrophy of internal and external structures. These practices further place the horse into a toe first landing which is not conducive to shock absorption and energy dissipation. This is why the various shoeing techniques work for a “while”, because you have just “shifted” old pressure and/or stress points to new ones - thus causing other “new” parts of the back of the foot to “mal-adapt” resulting in more and more pathology as you go along. Navicular and other chronic pathologies related to peripheral loading and diet are unfortunately man made and some are handed down for generations to some unfortunate breed types. These types of pathologies are not seen in healthy wild hooves.

So in concluding this note about inner hoof pathology and attaining proper hoof mechanism, it is imperative to have the back of the hoof as healthy as can be with proper, non invasive hoof trimming, natural diet to keep inner hoof inflammation to a minimum and minor things such as keeping thrush at bay. Rehabilitation methods such as implementing pea stone in loafing areas and stalls, and the use of hoof boots with pads wherever horses do not land heel first and generally increasing movement with proper heel first landing over conforming surfaces will help restore many chronically lame horses to at least a pleasure type working horse again. Keeping the back of the hoof healthy (large callused frog, strong heel and bar structures and hard digital cushions will assist the horse in achieving correct locomotion and thus proper and healthy hoof mechanism.

---

For further reference on research and studies carried out by Dr. Robert Bowker, please see his website at [www.cvm.msu.edu/research/efl/](http://www.cvm.msu.edu/research/efl/). Also see [www.coronavistaequinecenter.com](http://www.coronavistaequinecenter.com) For great articles from Pete Ramey, hoof rehabilitation specialist you can go to [www.hoofrehab.com](http://www.hoofrehab.com)

For other great links on natural hoof and horse care, please see the relevant links section of my website at [www.b2bhoofcare.com](http://www.b2bhoofcare.com)