

Toe and Heel Length

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11-25-06 Pete Ramey Copyright 2006

This article was written to provide additional clarity to the previous article, "Reversing Distal Descent". Please read it first.

If you've read my work before, you know how much I stay away from "always and never"; the horses taught me that. In this article you'll read those words repeatedly. Please know I do not use them lightly.

Most hoof care professionals were taught to trim hooves to certain parameters based on toe length and heel height. The target ranges vary from method to method, but most call for toe lengths from 3 to 3 1/2 inches and heel lengths from near zero to 2 or more inches. The problem with trimming theories that enforce specific hoof lengths based on measurements from the coronet to the ground is that they don't take into account the fact the coronet is highly dynamic and easily moveable. Excess pressure on the walls can quite easily displace it upward. It is the last place we should measure from! I'm going to try to 'spin your brain' into seeing past the coronet and the hoof wall; everyone who cares for horses' hooves needs to see the internal structures first.

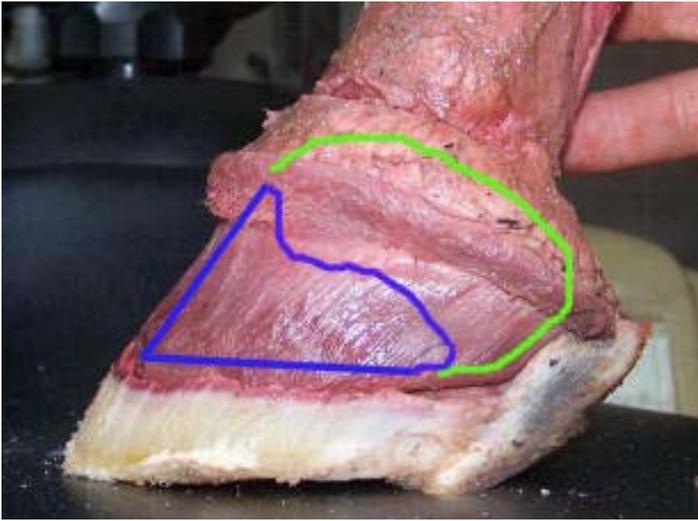
The hoof wall was never intended to bear the horse's weight alone. The sole, frog and bars are supposed to work in unison with the hoof walls to support the impact energy of the horse. It is common, however, for traditional farriers to force the hoof walls to unnaturally bear the entire burden of support. Over time, these unnatural loads on the walls push the coronet to a higher position (relative to the coffin bone). To put it another way, the entire horse drops through the hoof capsule. Traditionally, this is thought of only as an event associated with severe founder, but it is actually very common to varying degrees in domestic hooves that are perceived as perfectly sound. They often get along this way for years before it catches up to them and causes severe lameness.

At the toe, this type of damage is readily visible on radiograph if a toe marker is accurately placed at the hairline (Please see the previous article "Reversing Distal Descent"). The coronet height and the coffin bone height should be very close to level with each other. The foundation for the back of the foot is cartilage rather than bone, so it doesn't show up on radiograph; making it more difficult to interpret. When people debate 'proper' heel height or toe length without considering where the highly mobile coronet currently resides they are missing a critically important point. It is very common for soles to be thinned to dangerous levels in an attempt to achieve certain toe lengths. It is equally common for the sole in the back of the foot to be dangerously thinned to achieve certain heel heights as well.



Every hoof practitioner should do as many cadaver dissections as possible. This is the best way to develop an understanding of the internal structures. Here I have removed the 'skin'; which is precisely what the hoof wall, sole and frog are.

Feral cadaver provided by Cheryl Henderson. Thank you!



Top photo: (please excuse my lack of talent with graphics) Blue line represents the coffin bone; green line represents the lateral cartilages. Both "foundations" are covered by a thin (3/16th inch) layer of living tissue. It is very important to understand the shape of the internal structures. A horse must always have at least 1/2 inch of densely callused sole and frog covering them.

Every situation is different, but every horse needs adequately thick and densely callused sole under the coffin bone and the lateral cartilages. This should be priority #1 in all circumstances. Once that is achieved, if the heel or toe wall length is "too long" the coronet has been pushed into an unnaturally high position by excess wall pressure over time. Providing proper movement, diet and trimming will allow the coronet to relax to a natural position over time, thus shortening the wall length. The flip-side of this is that if you thin the soles to achieve 'correct' wall lengths first, the horse will work overtime to replace the lost armor plating and the 'extra' length you removed will keep coming back indefinitely; often getting worse.

How do you apply this? First, forget about the length of the hoof walls (toe, heel, quarters... everywhere). The top priority is to ensure there is adequate (but not excessive) sole under the coffin bone and lateral cartilages. There are at least two accurate ways to

judge sole depth in the field. First and foremost is sole callusing. Barefoot horses that move correctly tend to callus their own soles very uniformly and in a 1/2 to 5/8 inch thickness and this callus shouldn't be molested with the tools. Look for this callused sole plane and you'll find it is almost always parallel to the internal structures. Exceptions occur when the horse has had it's soles thinned by the previous trimmer, or when the horse is moving incorrectly. A common example is the horse that lands toe-first due to heel pain. The soles at the toe will almost always be worn thinner and the coffin bone will almost always be driven to a very low position in the hoof capsule. Horses with angular limb deformities may also wear the sole on one side to a thinner depth, but this is very rare. It can go the other way as well: Shod horses and sedentary barefoot horses may have false soles or layers of old growth that should generally be removed.

For sorting through these exceptions, plan B is to judge sole depth using the collateral grooves (frog/sole junction). Their deepest point along the sides of the entire frog is consistently around 7/16th inch away from the coffin bone and lateral cartilages so they provide an excellent 'locator'. The more sole depth there is in the outer perimeter adjacent to the white line, the higher the collateral grooves will be lifted off the ground. In a healthy hoof with adequate sole depth, the sole adjacent to the white line should lift the collateral grooves about 3/4 inch off the ground in front, and around an inch off the ground at the back of the foot alongside the bars (This extra height at the back of the foot allows for expansion and a ground parallel collateral groove at peak impact loads). The collateral groove is a very accurate evaluation for sole thickness in the front of the foot, because the coffin bone is rigid, but the flexion of the lateral cartilages makes it trickier to gauge in the back of the foot. For instance, in a hoof with contracted heels the lateral cartilages will be 'bent' up into a higher dome. This may mean 1 1/2 inches of collateral groove height is necessary to provide adequate sole thickness adjacent to the white line. Therefore the callused sole plane is the best guide in the back of the foot and the collateral groove depth adds additional information; the collateral groove depth is the most accurate guide in the front of the foot, with the callused sole plane providing the back-up information (Please read the previous articles, "Understanding the Soles" and "One Foot For all Seasons" for clarity).

So by using this information to judge sole depth covering the internal structures, you can then determine whether the coronet is displaced to an unnaturally high position. If the coronet is in a correct position and adequate sole thickness is present, toe lengths should then fall between 3 and 3-1/2 inches and heel heights should be around one inch in most horses; the shorter the better, really. If the wall lengths are longer, either the coronet is vertically displaced, the toes are flared from the coffin bone, and/or the heels are contracted (raising the vault of the lateral cartilages). In none of these cases is it even remotely correct to thin the sole to achieve "proper" wall lengths. That would just add insult to injury. The wall length (at heel or toe) should be the very last thing we judge or act

upon, but so often people attack it first at the expense of the sole. Why? There are hundreds of different books that teach us to do so!



When you realize how dynamic the coronet actually is, it becomes sobering to think how many rash decisions are traditionally made from the measure of hoof wall length. Here, I am moving the coronet almost an inch with light thumb pressure.

The same information and insight into the internal foundation will help you with the toughest medial/lateral balance problems. First understand no one can balance a foot. It simply isn't possible. If you show me a 'perfectly' balanced foot, I'll lead the horse through a turn and we'll watch the heels collide with the ground out of unison. So what is proper heel balance? Proper heel balance is having the exact same amount of sole covering the lateral cartilages on both sides of the foot, and the same amount of hoof

wall on each side protruding above that sole plane. (Please read the previous article "Heel Height; The Deciding Factor".

The horse needs for both heels to impact the ground simultaneously as often as possible, but varying terrain, the type of movement/work the horse does and the straightness of the limbs makes every impact a little different in the real world. The natural flexion (twisting) of the lateral cartilages conforms to the ground and easily accommodates this, but for additional help they also do an amazing thing. The lateral cartilages semi-permanently adjust their rest position to accommodate the most common impact of an individual hoof. A hoof that usually hits the ground slightly crooked because of an angular deformity or body issue will adjust its lateral cartilages accordingly. Also, a perfectly straight-legged horse can make such adjustments due to its most common work. For instance at the trot, a horse should impact the ground with its hind limbs 'underneath himself' (like a tightrope walker). Horses that usually work at the trot (endurance horses, trotters...) will develop lateral cartilages that are in a lower position on the inside (or from the trimmer's perspective; the hoof will appear longer on the inside) so that both heels hit the ground simultaneously during this movement. This is a good thing and should be allowed and embraced by the trimmer.

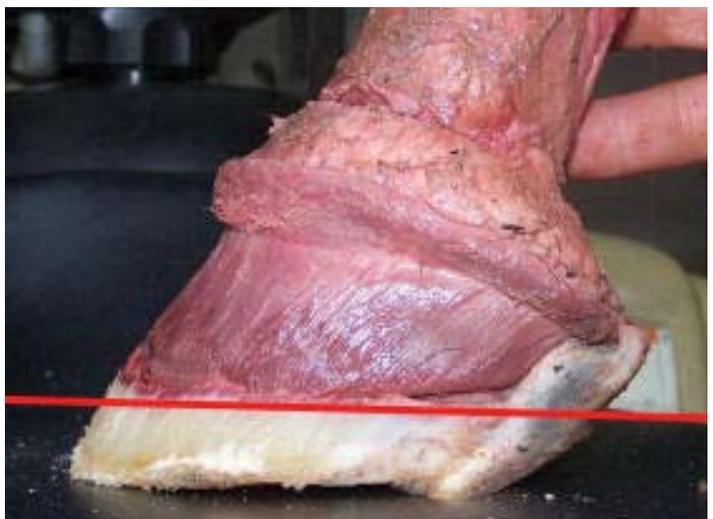
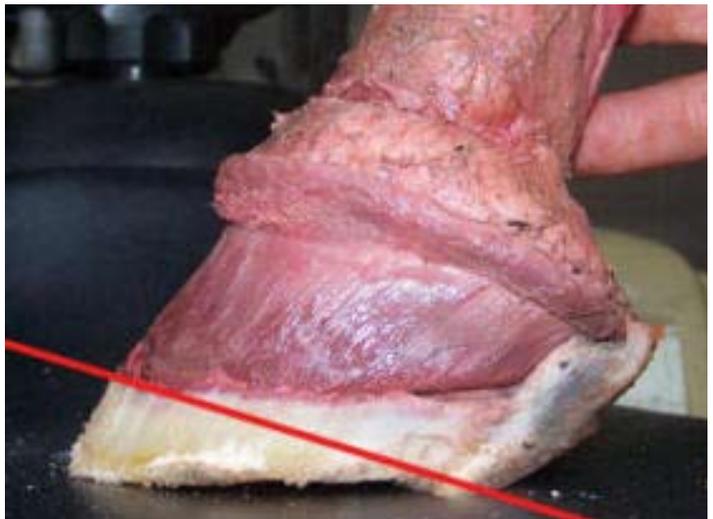
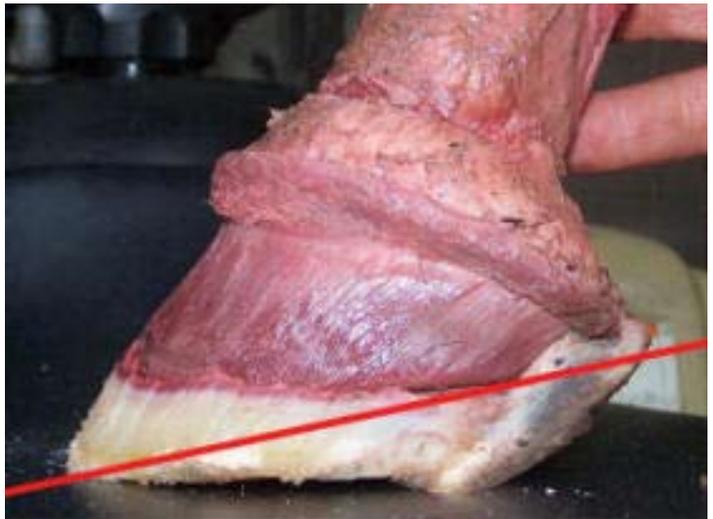
If the trimmer/farrier doesn't consider the movement of the horse and tries to fight this adaptation by forcing the foot to be balanced while standing square, the resulting "excess wall" (from the horse's perspective) will cause the coronet to push upward over time. Again this is very common and again the hairline or coronet balance should be the last thing we evaluate; it is only a view of the past care. I have seen many horses with horrifically displaced/imbalanced coronets, but have **never seen a situation that required one lateral cartilage to be covered with more sole than on the other side of the same foot.**

Therefore, we're right back to the same spot when trying to sort through heel balance issues: Use the callused sole plane and collateral groove depths to ensure you have the same amount of sole on each side and do nothing more than monitor the hairline height off the ground at the heels. The hairline/ground height will equalize over time if the horse is allowed to wear the heel balance that agrees with its movement and the position of the lateral cartilages. [This can be accelerated by putting a more aggressive (steeper) mustang roll/bevel on the side that has the high coronet].

Every horse and every hoof is different. I still run into new situations that leave me "head-scratching" every day, so there is no way to sit down and write about each possible situation you'll encounter in the real world. I can tell you that the more you learn to "see through" the hoof wall and visualize the internal structures, the better you will be at sorting through every hoof issue. The best help for this is by performing as many hoof dissections as possible. Never bury a hoof; you'll be missing out on a chance to make yourself better for the horses in your care.

There are countless factors that affect toe length and heel height. Sensitive and underdeveloped lateral cartilages and digital cushions may cause a need for a higher heel, as may ligament, tendon, joint and muscular issues. Flared or rotated toe walls can dramatically effect toe length measurements. The list goes on and on.

But with all the “if’s, an’s and but’s” we have to sort through every day, at least one thing is consistent. It is simply never desirable to thin the soles beyond their natural thickness. The left photo shows the naturally thick and uniform sole of a healthy horse. The other three (red lines) show very common mistakes I see every day. How is it even possible for a professional to do this? A vast majority of professionals were trained to place top priority in heel and toe wall lengths/angles; sacrificing the sole thickness. Many barefoot trimmers will cut into or near the corium trying to shorten heel walls heels. Many farriers will routinely take much needed sole from the toe, trying to shorten the toe walls or raise toe angles. I hope this article makes this a little less common.



Burn these pictures into your brain and every time you see the sole being trimmed, always ask yourself which of the four pictures is most similar to the end result.



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