When a horse needs shoes

Part 2 - The set-up

by Andrew Bowe, B. App.Sc., Master Farrier

Photos courtesy of Mayfield Barehoof Care Centre - www.barehoofcare.com

Many horses still get shod.

It doesn't matter the ultimate reason for shoeing them (well, hopefully a more meaningful reason other than 'that's what we've always done'), but for any hope of long term soundness, a shoe needs to be attached to a correctly prepared hoof.

As previously discussed, a horse wearing shoes is ultimately up against it when looking at the long term picture, fighting against incorrect weightbearing and needing to accommodate the forces generated by ground contact, especially at speed, that are greatly magnified. Not only are 'metal' shoes hard, but the area of contact is quite concentrated and the concussive forces generated are of high frequency.

For a simple demonstration of concussive shockwave, try holding the end of a shoe farthest from the end that is being struck on the anvil. You'll only do it once!

When a horse wears shoes, the need to obey the laws of physics becomes paramount.

It is easy to get a horse going under saddle today. Just about anyone can tack a set of shoes on. The great challenge is to keep a horse going soundly in the long-term.

Shoeing for lont-term soundness

Shoeing with an eye to long term soundness starts with trimming a hoof to optimum balance before a shoe is put on it. If a hoof is not in optimum balance when a shoe first gets nailed on, the mechanics will start badly and get worse.

Optimum balance (a.k.a. the 'true hoof') is the hoof that would arise if all the fences were removed from a horse's life and it could be the prairie animal it is meant to be, with the greatly increased movement resulting in hoof wear being equal to hoof growth.

The hoof capsule is very simply a hard outer shell that tightly covers the pedal bone and when 'true', closely reflects its shape and its spatial arrangement with the ground surface.

If a shoe is being applied to a previously bare hoof on a horse that has already been working to the extent of its hooves being worn down, the set-up is fairly easy. Such a hoof is likely to already be existing in a state of optimum, working balance. In such a case, setting the hoof up is simply a matter of trimming the hoof wall to a consistent height above the sole plane and then putting the shoe on it.

The sole plane (the outer rim of waxy, functional sole which is in reality the skin on the bottom of the hoof) is a very reliable indicator to the outline and position of the pedal bone and is, therefore, a clear and objective guide to follow.

Unfortunately this easy to follow guide is lost soon after a hoof begins to wear a shoe. Exfoliation of the growing hoof is totally stopped by the shoe and the true hoof quickly gets lost (hidden) in the mass of extra hoof wall and unexfoliated sole material.

There is also the added dimension of hoof distortion that appears soon after hooves are asked to carry the weight of the whole horse above on the hoof walls alone. The hoof is not like a piece of rigid dead timber, rather, it is like a piece of firm but malleable plastic that changes shape when exposed to such incorrect pressure.

When the guiding light of true sole plane is lost, how do we then find the underlying true hoof?

In the 'old days' it was common practice to remove the shoes and ride until the hooves were rebalanced and then put new shoes on.

What is old is new again...

Well known equine scientist Dr Deb Bennett, who understands long-term management of the skeletal structure of horses better than most and is aware of the omnipresent distortion that arises from all shoeing (no matter how good the farrier is), has distilled best management when using shoes down to this same principle of ensuring a hoof is returned to optimum balance before a shoe is nailed on.

She recommends to pull the shoes off and dress the hooves, but then to leave the horse barefoot for a couple of days before reshoeing, not just to reveal the functional sole plane as any unexfoliated sole plane gets abraded off, but to allow the hoof wall to 'let down' from where it will be jammed upwards through the coronet, thus revealing the true hoof in its entirety.

In years gone by (back in the 'shoeing days'), the author had put this idea into practice and took the concept further by having horses ridden, during their time barefoot, to abrade the hooves which wear to the shape and balance required by the skeletal structure above (following a favoured method of harness horse drivers).

Obviously caution and uncommon sense would be required here. Don't ride 100 miles straight after pulling shoes, and avoid too much riding in deep abrasive arena footing which will produce an incorrect wear pattern.

Meanwhile, back in the real world...

Imagine the farrier coming today to take the shoes off your horse and trim the hooves, then come back in three days and readjust the hooves and put the shoes back on?!

Plenty of extra work for farriers, and it is hard enough to get a farrier once every six weeks, let alone the extra cost of having two farrier visits instead of one.

This idea is just not going to happen. Unless the horse owner pulls the shoes and trims the hooves a few days before the farrier arrives. Now there's a thought!

Practicalities and economics dictate that the farrier comes today, removes the old shoes and puts the shoes straight back on freshly trimmed hooves. Farriers are up against it in terms of long-term soundness, so to be successful, they need to be able to read through the ever present hoof distortion and find the 'true hoof' in order to find optimum balance. This is why farriery can't be learnt in five minutes.

Fortunately, there are certain guiding landmarks on the external hoof capsule that are objective and consistent reference points that indicate the position of internal structures, and allow a hoof to be set-up in optimum balance, even if it is distorted to begin with.

The equine hoof is best assessed and managed in its individual dimensions. (See image 1)

Image 1

Anterior / posterior balance

When hooves hit the ground, the descending weight of the horse (and rider and saddle) versus the ground. Every component of the lower leg needs to be able to flex.

For this reason, the pedal bone is not flat to the ground (when viewed laterally), but is raised in the rear, or rotated away from the ground surface. Such an alignment effectively sets up an internal arch in conjunction with the soft tissues in the back of the hoof (frog, digital cushion and lateral cartilages), which flattens out when the hoof reaches full loading during movement. (See image 2).

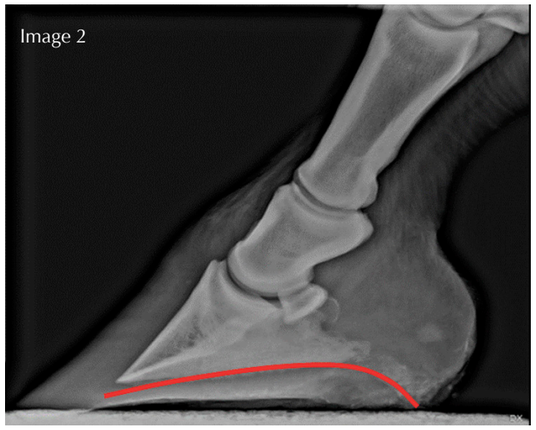
Image 2

There can be no set angles, but consensus suggests 3 to 5 degrees of rotation. In addition, hind hooves need to be steeper than the fronts to accommodate the extra loading that is generated from the hind quarters; the engine of the horse.

The bones are aligned correctly when the angle of the pastern matches the angle of the hoof. (See image 3)

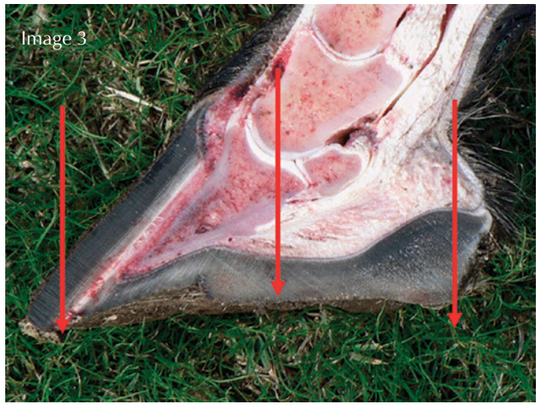
Image 3

> "If a hoof is not in optimum balance when a shoe first gets nailed on, the mechanics will start badly and get worse.

There is, however, more to anterior / posterior balance because the hoof also needs to be balanced relative to the coffin joint above it.

When viewed from the side, horses aren't built straight up and down like pogo sticks. Their lower legs angulate forward from the fetlocks with a spring based on the suspensory apparatus that maximises speed and agility. Such a structure accommodates the effects of their descending body weight, whilst still being able to dissipate impact from the ground.

However, the further the base of support of the hoof moves forward and away from the centre of gravity of the limb, the greater the stresses are that are generated during movement.

A hoof can be considered in balance when the ground weight bearing surface is equally distributed either side of the centre of gravity of the hoof capsule. In other words, the weight bearing hoof should extend as far behind the centre of gravity as it does in front of it. (See image 4)


Image 4

An external reference point is needed to find where the centre of gravity is located on the hoof.

There have been many theories put forward over the years in order to locate the centre of gravity, but the author has found the most consistent and objective method to follow is that of the American farrier and anatomy expert Martha Olivo, who studied many cadaver specimens and found the position on the hoof that is midway between the true point of the frog (where the frog meets the sole), and the termination of the bars (which also happens to be where the central sulcus of the frog finishes), consistently represents the centre of gravity. (See image 5).

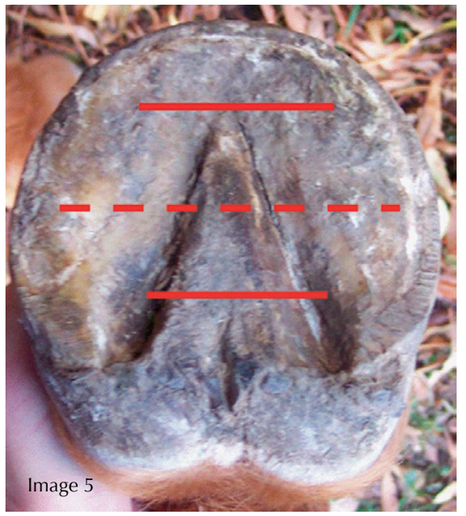
Image 5

Placement of a shoe on a hoof needs to reflect this balance, with the leading edge positioned so no more than one third of the length of ground surface is in front of the frog, and the rear of the shoe should finish near the widest part of the frog. (See image 6)


Image 6

When a hoof leaves the ground, it must first pivot around the forward most weight bearing surface of the hoof, but just prior to heel lift, maximum stress is applied to all of the joints and soft tissues of the lower leg. These forces need to be minimised, so the breakover, which is measured as the distance of weightbearing hoof forward of the frog, needs to be kept short.

How important is a short breakover?

A short breakover perpetuates heel-first landing. For long-term soundness, heel first landing is a non-negotiable requirement.

Professor Bowker from Michigan State University, who is arguably the world's leading hoof science researcher and lectures annually for the Australian College of Equine Podiotherapy, always leaves this parting advice to students – "if there is only one thing you can do for your horse, keep the toes short".

A short breakover is even more important in a shod hoof, because not only does a rigid shoe take away all hoof capsule flexibility, but as soon as a shoe goes on, any wearing at the toe stops, and the breakover begins to get longer. The breakover must start short with new shoes.

When setting a hoof up with a shoe, if in doubt, err on the side of shorter rather than longer. It is rare indeed that a horse has problems arising from the breakover being too short. Long toes on the other hand are possibly the single greatest cause of chronic lameness with domestic horses.

Naturally worn hooves have a 'gentle' roll around the breakover area, so consider using a shoe that has an inbuilt roll in its leading edge, rather than an abrupt square edge. There are various shoes on the market that have this feature. (See image 7).

Image 7

Aluminium is a good option because it is much softer than steel and wears as the toe grows longer, thus keeping the breakover balance somewhat in check.

An important component of biomechanics, often not realised, is that breakover is actually initiated by heel length. It is tension in the flexor tendon that causes heel lift, so it is important that heels are kept suitably short (contrary to popular belief about heels needing to be high). Trimming heels down and back to near the widest part of the frog usually achieves optimum heel height to assist breakover.

.....to be continued in the next issue, when we discuss setting up for medial/lateral balance and the all-important orientation of the hoof print.

Resources:

Dr Deb Bennett – www.equinestudies.org

Professor Robert Bowker – www.coronavistaequine.com