Hook Norton Veterinary Group

NO FOOT NO HORSE!

By Sally Hodgson BSc (Hons), MA, VetMB, Cert AVP (EM), MRCVS

WHAT DO WE MEAN BY FOOT BALANCE?

Foot balance is a term used by vets and farriers to describe

- the external angles of the hoof capsule
- the relative proportions of different areas of the sole of the foot
- the position of the pedal bone within the hoof capsule, when viewed from the side and from the front

In a normal foot, the dorsal hoof wall should be at the same angle as the pastern; the heel should be parallel to the dorsal hoof wall.

WHY IS FOOT BALANCE IMPORTANT?

The shape of the hoof capsule and the position of the pedal bone affect (and are affected by) the integrity and function of structures within the hoof capsule and in the lower part of the leg. These structures are adapted for mechanical loading in a particular way, and even under normal conditions work at strains close to their point of failure! Changes in foot balance can significantly alter the load applied to these structures, putting them at increased risk of injury.

Research studies have confirmed the link between foot balance and lameness. Negative palmar angle (broken-back hoof pastern axis) in the front foot is associated with injuries to the deep digital flexor tendon, navicular bone and navicular bursa. Long toes are also a risk factor for injury - each 10mm of excess toe length increases the stresses through the leg by the equivalent of an extra 50kg rider weight!

Horses with hindlimb lameness are more likely to have negative palmar angle in the foot of the lame leg. Negative rotation of the pedal bone by just 1 degree increases the pressure across the navicular bursa and onto the deep digital flexor tendon by 4%, increasing the risk of injury.

A normal foot. The dorsal hoof wall is at the same angle as the pastern. The heel is almost parallel to the dorsal hoof wall.

A normal foot. The inside and outside hoof walls each meet the ground at the same angle.

Abnormal hind foot. The pastern is at a steeper angle than the dorsal hoof wall. The heel is collapsed and not aligned with the dorsal hoof wall. This is called a broken-back hoof-pastern axis.

A laminitic foot.

Flexor tendons and suspensory ligaments work at high levels of strain even under normal conditions – look how far the fetlock drops at a normal working trot on the road!

An upright or club foot (right fore). The pastern and dorsal hoof wall form an abnormally steep angle with the ground, and the heel is abnormally high. The upwards curve in the coronary band towards the heel suggests that there is also some abnormal loading of the hoof capsule, causing distortion of the coronary band.

The outside wall of this left hind foot is abnormally upright. This horse had a chronic hindlimb lameness. By altering its posture to compensate for the lameness, the horse has loaded the foot abnormally, causing distortion of the hoof capsule.

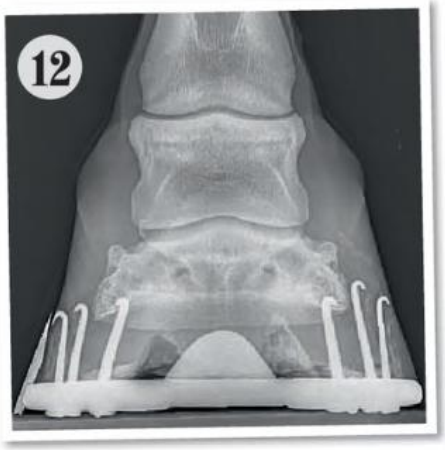
The inside wall of this left front foot is upright. In this case, the foot is rotated outwards (toe-out, a conformation defect), altering the way the hoof capsule is loaded.

The same foot as in 8a. The farrier compensates for the abnormal foot conformation by shoeing with a little extra width on the inside, so the shoe acts to increase the loading angle down the inside of the foot.

The sole of this foot has been marked out to help assess its symmetry. The X on the frog marks the centre, and is where the horizontal line across the widest part of the foot meets the vertical line between the heels and the toe. Ideally, the heel/toe proportions should be between 50/50 and 60/40 after the foot has been trimmed, and the distance from the vertical line to the outside of the foot should be equal on either side of the line.

This is the same foot (left fore) shown in Photo 8a and 8b. The photo on the left is at the end of a 6 week shoeing cycle, before trimming. The photo on the right is the same foot after trimming. After trimming, the heel/toe proportion is closer to 50/50. Trimming cannot correct the abnormal conformation in an adult horse – the inside 'half' of the sole is narrower than the outside 'half', because of the toe-out conformation. It is important to remember that although your farrier re-balances the feet each time they trim and shoe, the foot is a dynamic structure – it is always growing! The shape of the hoof capsule does not always reflect the position of the pedal bone inside it – to assess this we need to take x-rays.

Normal pedal bone alignment (lateral view). The angle between P3 and the ground should be 2-10 degrees.



Normal pedal bone alignment (dorsal view). The pedal bone is parallel to the ground, with the result that the coffin and pastern joints are loaded symmetrically.

Upright or club foot conformation. The angle of the bony column is very steep, increasing the concussion acting through the limb when the foot lands.

Broken back alignment, also called negative palmar angle. The backwards tilt of the pedal bone puts extra strain on the flexor tendons and suspensory ligament even before the horse tries to push off from the ground.

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A laminitic foot, with rotation of the pedal bone creating a broken-forward hoof pastern axis. The pedal bone and dorsal hoof wall are not parallel.

Medio-lateral imbalance. The outside of the pedal bone in this left front foot is higher than the inside, so the pedal bone is not parallel to the ground surface. The lower sides of the joints are compressed, risking overloading injuries to the cartilage inside the joints, and the higher side is stretched, increasing tension in collateral ligaments and other soft tissues, increasing the risk of injury to these structures.

HOW CAN POOR FOOT BALANCE BE CORRECTED?

Foot balance and health is most readily maintained by regular farriery! Most horses should be trimmed every 6 weeks. Some will need attention more frequently, perhaps every 4-5 weeks, because of their conformation, injuries, diseases such as laminitis, or simply because their feet grow quickly. Foot balance x-rays can be very helpful in assessing foot balance and guiding trimming and shoeing, as shown above.

In some cases, poor or abnormal foot balance may be corrected and managed by trimming alone, but the majority will need shoeing as well. Shoeing helps to protect the hoof wall from abnormal wear, and the shape, type and positioning of a shoe can all be altered to support injuries or compensate for poor conformation, as shown in Photo 8b. Some more examples are shown below.

The bevelled toe on this shoe moves the point of breakover closer to the tip of the pedal bone, reducing the functional length of the toe and reducing the strain in the deep digital flexor tendon.

The raised pad over the frog between the heels of the shoe supports the frog and helps to unload the heel. It could be used with heel wedges to help correct a negative palmar angle or to encourage heel growth.

Wedge pads to help correct a negative palmar angle. The green packing provides cushioning and support for the frog in a similar way to the frog pad in photo 17.

There are many different shapes and types of shoe which can be used to help treat or support a wide range of problems. However, applying any type of shoe, no matter how well applied, alters how the foot functions. We shoe horses to help them cope with the demands we place on them. It is very important to be remember that the foot is a dynamic structure, and the support

The heels on this shoe are long and wide, increasing the functional area of the back part of the foot. This type of shoe could be used to support a suspensory ligament or tendon injury, as it reduces the leverage on these structures during weightbearing.

a foot needs will change over time as the foot changes shape in response to loading, injuries, diseases and shoeing. Regular foot balance x-rays can help track changes in the foot to maintain an optimal approach to trimming and shoeing.

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ABOUT THE AUTHOR

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Sally qualified in 2007 and has worked in equine practice ever since, joining the Hook Norton Veterinary Group in 2010. She completed her Certificate in Advanced Veterinary Practice in 2016, which is a modular, online, post-graduate certificate that covers all aspects of Equine. Sally is also the practice representative on the XLEquine Executive Board. Sally has two spaniels, Spudge and Evie, and a driving pony, Ivor.

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