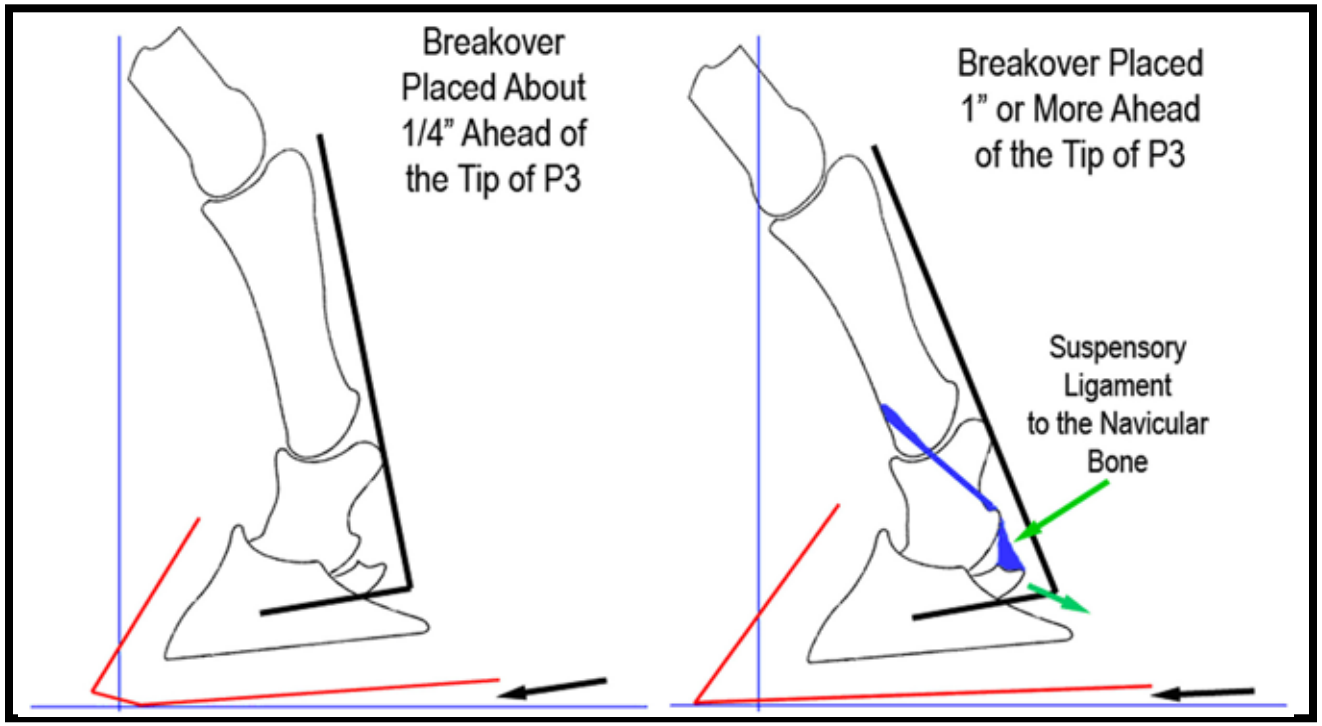

to release from the ground. Even if you disregard the heel height relative to the sole, the length of the toe ahead of the tip of P3 will influence the timing as well. So, if you want a foot to get off the ground quickly, the heel must be trimmed close to the level of the functional sole and the point of breakover must be placed within ¼" to ½" ahead of the tip of the coffin bone. Keep in mind that the front and rear feet have to work together.

These are just a few bits of research over the last 10 to 15 years that offer some answers for dealing with poor hoof function. Additional works such as some recent MRI & Radiography studies continue to show that the widest part of the foot (or more appropriately, the widest part of the sole) is the best reference to seeing and understanding hoof balance and how the biomechanics of the foot are affected by this reference point. Information from Dr. Pollitt's work regarding the terminal papillae, which are the structures that make up the sole beneath the tip of P3, have helped answer some of the questions relating to the sole callus and toe pillars. Moreover, the lamina studies on the bare foot, conducted by Dr. Bowker, have also helped to uncover some of the mysteries regarding the pillars and sole callus, and how they relate to where breakover occurs relative to the tip of P3. Lateral/medial balance is another gray area that is rapidly becoming clear or more easily attained in light of Savoldi's work, as well as other studies regarding sole thickness. When one looks closely at the work of many individuals and combine them in a common sense manner, it become easy to appreciate that hoof maintenance MUST function around recognizing hoof distortions using the static widest part of the foot, sole callus, pillar, and the back of the frog in their efforts to service the foot.

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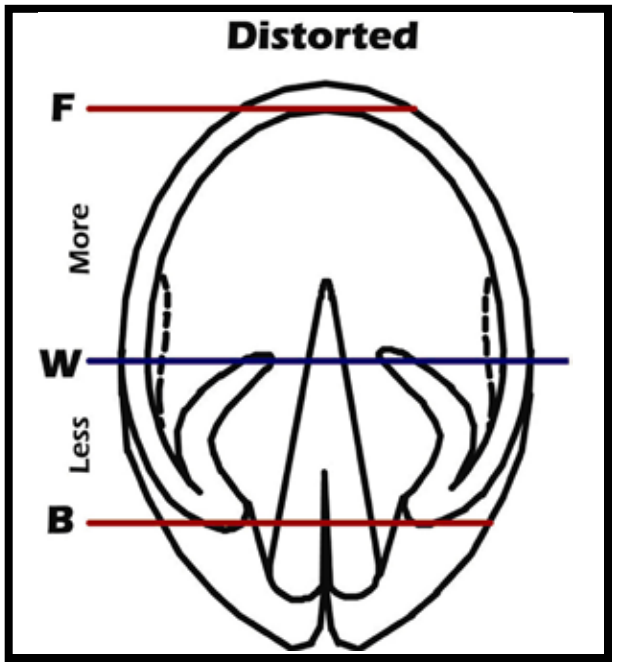
How Hoof Form Relates to Hoof Function

By Gene Ovnicek, GPF - Registered Master Farrier

I think most hoof care practitioners would agree that preventing lameness is much easier than treating lameness. Hoof distortion is shown to be one of the main causes of lower limb lameness. In light of that, with proper information and guidelines to evaluate the horses movement and hoof shape, preventing lameness can be accomplished by early detection of hoof distortion. The latest information available by leading farriers and research scientists has made it clearer to understand how hoof distortion relates to lameness in the lower limbs. Alignment of the distal phalanges is just as important today as it was 50 years ago, especially at the time of ground contact and loading. It's become apparent that much of the work done by Russell, Duckett, Pollitt, Page, Bowker, and Savoldi has moved us closer to answering some of the important questions that concern farriers today. The terms such as pillars, bridge, dot, sole callus, and widest part of the foot, are ones we have become familiar with over the past few decades and serve as land marks to the coffin bone and internal hoof structures. In more recent years, a closer look at these terms and structures has made more sense of what they are and why they are important to the foot.

Caudal frog contact at the time of the foot loading is seen to have a positive influence on dissipating energy, promoting blood flow, and assisting with the alignment of the Distal Interphalangeal Joint at the time when impact forces are the greatest. The buildup of frog at the buttress seems to maintain a presence in healthy frogs, even when trimmed away from one trimming to another. At the same time, dirt and debris are trapped in that region of the foot when heel height extends beyond the sole level or when shoes are applied. In light of the recent awareness of proprioceptors (sensory receptors) located in that very region of the foot, it offers good evidence that the dirt (not manure) may be the



most important link to the optimal biomechanics of foot function.

Alignment of the Distal Interphalangeal Joint at the moment of ground contact is critical, and is facilitated by landing slightly heel-first. It is not difficult for sound horses with well balanced feet to land heel-first. Considering that, horses that are not sound or have poorly balanced feet with hoof distortions can be easy to detect simply by being seen landing toe-first. Even more subtle signs of lameness or hoof distortion are horse that continually stumble or forge. Lameness is usually not apparent at this time, however the hoof distortions relating to these gait faults (meaning feet that have a greater amount of ground surface ahead of the widest part of the foot than behind) are the same ones that quite often are responsible for many foot problems like; contracted heels, long toes, underrun heels, heel pain, etc. Proprioceptive function and/or sensation are suspected to be helpful in promoting a proper "slight" heel-first ground contact. The timing of breakover or when the foot disengages the ground appears to be very important for obtaining a heel-first landing as well. If you consider the fact that normal foot function causes toe wear on all front shoes, you may be able to use deductive reasoning to develop a protocol for the location of breakover on the front foot. For example, normal front shoe wear is created when the body of the horse is leveraged over the toe with each step taken in a forward movement. The deep digital flexor tendon (DDFT) has little-to-no lengthening ability to account for excess leverage during this phase of the stride, in lieu of the inferior check ligament function. Therefore, shoe wear at the toe occurs on every horse. The question that is continually discussed is where breakover should be and is it the same for every foot? Duckett's work with the pillars may offer more answers to the breakover question, as the pillars maintain their relationship to the coffin bone. What is not clearly understood by many of those who have issues regarding breakover, is the placement of the point of breakover is relative to the coffin bone and not to the dorsal hoof wall. What many don't realizing is that the dorsal hoof wall (which is the current landmark for breakover for many farriers), in addition to the sole and frog apex, can migrate forward similar to laminitis but without the lamina wall/sole junction being effected like a foot with laminitis.

Another confusing part of hoof distortion is how it is affected by the back of the foot. For example, if the heels are not kept trimmed close the level of the functional sole or close the widest part of the frog, the heel buttress will eventually become contracted, run forward and migrate closer to the widest part of the foot. The forward migration seems to encourage the toe to continue its stretching of the frog, sole and dorsal wall.

Another misconception about breakover and heel height is the timing of breakover. If you consider the inferior check ligament and how it influences the tension of the deep digital flexor tendon, relative to heel height and where the point of breakover is placed with respect to the tip of P3, it has a profound effect on when breakover occurs. This is explained in research that shows that there is no flexor muscle function to pull the foot from the ground in forward movement of the front limb. It is shown that tension on the DDFT below the inferior check ligament is part of what causes the foot to be lifted. If the heel is lower and trimmed closer to the level of the functional sole, tension on the DDFT will be greater when the leg is closer to the vertical position under the body. With taller heels that have grown much beyond the level of the sole or when a wedge pad is placed on top of tall heels, the leg must stay on the ground longer so the tension on the DDFT will increase enough to cause the foot