

Low Heel / High Heel Syndrome

Unrecognized Problems & Considerations

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Introduction:

The commonly observed condition where the heel of one front foot is higher than the other has ramifications that extend well beyond the effects on the foot itself. This condition is also observed in the hind feet though less frequently. However, because of limitations and scope, this paper will direct its attention primarily to high heel/low heel of the front feet.

How to best deal with the condition has remained a "hot topic" among farriers and veterinarians. It is the aim of this paper to explore some of the biomechanics and often un-recognized ramifications such as creating muscle imbalance, and changes in posture that result in loss of performance and are a potential source of lameness.

It is necessary to explore how the syndrome alters the shape of the shoulder and the back. Altering the posture and shape of the shoulder and wither area creates problems with saddle fit. The resulting posture of the horse affects not only saddle placement but

also alters the rider's posture and balance and ultimately the rider's soundness.

Awareness of some of the problems came to me about 15 years ago via Moses Gonzales, journeyman farrier, when he demonstrated to me the effects that a low heel/high heel syndrome had on the horse's posture. Farriers and veterinarians, all too often, counter Gonzales's observations with skepticism or antagonism. Healthy skepticism is always appropriate, so let us examine the issues on their merits.

In my career as a veterinarian specializing in muscle tension, imbalance and symmetry since 1990, I deal daily with performance issues, saddle related problems, shoeing related problems and back pain. These problems constitute as much as 90% of my practice. That has afforded me ample opportunity to observe the relationships of high heel, low heel conditions on a first hand basis. I believe that antagonism needs to be challenged and skepticism addressed. At the very least, this subject needs to be revisited with an

open mind. Appropriate trimming and/or shoeing remains the key to soundness.

Postural deviation and effect on joint angles as a result of High Heel/Low Heel:

Let us first discuss the overall postural deviations that are a direct consequence of the lower of the two heels. It should be clarified, at this point, that that it is not the intent to address a true “clubfoot.” This paper is also not addressing an anatomically “short leg” syndrome, (though to a cursory evaluation, the limb with the lower heel may give the appearance of a shorter leg). The low heeled limb is functionally shorter – not anatomically shorter.

A lower heel creates obvious changes in the joint angles at the pastern, fetlock, elbow and scapulo-humeral joint (shoulder joint). Compared to the limb with the higher heel the angles on the low-heeled limb will open (get larger), and the limb will become more vertical than its counterpart throughout its length. The pastern joints and fetlock will be placed in more extension (and possible subluxation). The elbow angle will be more open. As the scapulo/humeral joint (shoulder joint) opens, the “point” of the shoulder will be moved caudally so its position is farther back than on the higher heeled limb. The position of the scapula becomes altered so that it rotates more vertical. This verticality creates a bulging appearance to the shoulder and over-development of the associated muscles on the lower heeled limb. This asymmetry in the shoulder will cause the saddle to not sit straight on the horse. The pressure that a “crooked” saddle places on one side of

the thoracic spinous processes leads to pain and primary chiropractic issues on of the upper thoracic vertebrae as well

Observe that the horse usually has a marked tendency to lean on the shoulder of the lower heeled limb. This may leave some observers to conclude that the measurements that are to be described are “off” only because the horse is leaning on that shoulder and that if one pushes the horse to an equal weight bearing that the measurements tend to even up. However, this point must be addressed and clarified. We must answer, why, given a choice, does the horse choose to lean on that shoulder? It is because of the difference in heel height that the horse returns to leaning on the shoulder of the low-heeled side when allowed to do so. This is the posture that the horse seeks as a compensatory posture.

Assessment of High Heel/Low Heel Syndrome:

Commence assessment of the forelimbs by observing the horse’s posture, its joint positions and angles from several directions. To be meaningful, the horse *must be on a flat even surface*. The horse must be standing “squared up” on all four feet, and allowed to be bearing weight in its chosen posture. Ideally, the assessment is best performed after the horse has been trimmed, balanced and is ready to shoe. Having one hoof placed even 3 to 4 inches ahead of or behind the other can alter the accuracy of the evaluation.

Start the observations from six to eight feet away in a position directly in front of the horse. Observe progressively from

the foot upward the position and relative heights of the joints. The foot with the lower heel will usually be significantly larger – the greater the size difference and the longer the low heel/high heel condition has been present, the more difference that will be evident. Difference in hoof size is a prime indicator that this condition exists. (Also while in this observation position, evaluate the coronary band for possible evidence of medial lateral balance. *Note this is only one factor in medial lateral balancing and may be misleading*)

The fetlock joint on the lower heel side is generally lower than the higher heeled side. Next check the position of the styloid process of the radius. This is the “bump” or “top of the shelf” on the upper medial side of the knee (carpus). It is commonly lower on the low-heeled side. As the next step, evaluate and compare the height and symmetry of the points of the shoulder (scapulo-humeral joint). Generally it will be noted that the joint appears lower on the low heel side, and that there is hypertrophy of the descending pectoral muscles on the side with the higher heel. With practice it can become evident that the shoulder point on the lower heeled side will also be placed more rearward.

For an overall picture of the asymmetry, it can be very helpful to look at the spatial symmetry created by the inner margins of each limb and of the ventral aspect of the chest wall. In other words, look not at the limbs themselves but use them as a “picture frame” of the space between the limbs.

Next, stand several feet away at the shoulder at a 90-degree angle from the

horse’s direction of stance. From this position it is easy to see difference in pastern angle. In many instances, from this position, the pastern axis can be observed to be “broken backwards.” *Broken pastern axis is accompanied by varying degree of subluxation of the pastern joints.* The toe may appear to be longer on the low heel side. The shoulder joint can now often be seen to be anywhere from ½ inch to 2 inches rearward of the limb with the higher heel. The difference in heel height is best seen by positioning one’s self another 45 degrees toward the rear of the horse and from about six to eight feet away.

Next the horse should be evaluated from behind and slightly above the croup. In order for a short person (or when examining a very large horse), to adequately make this evaluation, it helps to stand on a sturdy object of some sort. It will be noted that the shoulder of the limb with the lower heel will usually appear to have a significant lateral “bulge” and it will appear to be higher than its counterpart. This is because the scapula has been displaced or rotated into a more vertical position. The shoulder with the higher heel will often appear to slope or fall away in an exaggerated manner.

Effects of High Heel/Low Heel Syndrome on Vertebral Function:

From a chiropractic standpoint I often find significant subluxation and pain in the 6th and or 7th cervical vertebrae. These subluxations are most often on the side of the higher heel and relate to the animals response of keeping his eyes on a horizontal plane. They often exhibit muscle pain and stiffness and spasm at

the base of the neck. Moreover, because of dural connections, subluxations here also result in tension, dural twist (*twisting of the dural-tube in which the spinal cord is suspended and anchored*) at the level of the poll and at the lumbo-sacral connection.

High Heel/Low Heel Affects Saddle Fit:

Now, let's step back to again consider the consequences of this condition on the fit of a saddle. The larger shoulder tends to exhibit some degree of muscle hypertrophy in the Trapezius muscle. Other involved muscles may include the Rhomboids, Deltoid, Serratus thoracis and Subscapularis muscles. The Trapezius muscle and the Longissimus muscle support the fork or gullet bar in the fork, or head of the saddle. These muscles support the forward part of the bars or panels as well.

Saddles are for obvious reasons built symmetrically, so when placed on a horse with muscle hypertrophy (enlargement) on one side, the tree rotates diagonally into a position in order to establish similar contact pressure on both sides of the "wither pocket." Torque of the saddletree, however, may make contact and place excessive pressure on one side of the lightly covered thoracic spines and leaves more open space on the opposing side. Pressure exerted in areas close to bone (with little muscle covering) result in a significant magnification of the pressure. The result of this unilateral pressure is pain, and loss of ability to perform bending and lateral movements. The pressure can also create chiropractic joint issues in the thoracic vertebrae of the withers. The shoulder that is

"bulged" laterally may strike the edge of the panel or bar as the scapula moves through its range of motion. This can create significant muscle bruising and serves to further twist the saddle.

Because the opposite shoulder typically has more slope, the saddle may tend to fall or slip to the sloping shoulder side of the horse. This is a second reason for pressure on the thoracic spinous processes. The problem of slipping to the side is particularly troubling if the croup is also involved and is lower on the same side. This can occur when a high/low conditions exists in the hind feet as well. More often, however when the horse is observed in motion, one side of the croup raises more on one side than the other it relates to, muscle balance, chiropractic or joint issues in the hind limbs. Regardless of cause, it creates an even worse scenario for slippage when combined with shoulder asymmetry. The resulting hypertonicity can and does lead to lameness via the following biomechanical factors.

High Heel/Low Heel Affects Horse Performance and Soundness as well as Rider Imbalance and Pain:

The consequences for the horse are muscle pain in the shoulder(s) and shortening of gait. When any animal experiences pain the response is to alter the posture. This leads to inappropriate loading of a limb while moving within the required gaits. When the skeletal system support is inappropriate or inadequate the muscles attempt to take on the load. Performance is compromised as the condition will lead to subclinical and finally outright lameness. A rider who must alter his/her

position and posture because of improper position of the saddle will eventually create further performance problems and increase the risk of lameness for the horse.

Most “crooked riders” have slowly allowed their bodies to compensate and are usually quite unaware of their compensation until it is brought to their attention. Additionally, the rider may end up with chronic back, hip or knee pain. The crooked saddle and side slipping saddle causes the rider to place more weight in one stirrup than the other. *This, also contributes to creating a “crooked” traveling horse and, therefore, is a cause of subclinical and eventually clinical lameness.* There are many other postural deviations of the rider that can add to the problem.

Wither vertebral chiropractic problems are one of the most common causes for a horse to react badly to the tightening of the cinch or girth. The subluxations create neuromuscular irritability in muscles of the shoulder and in the area covered by the girth or cinch. The pain from the saddle creating pressure and the neuromuscular stimulation of the shoulder muscles creates a chain of muscle shortening in the posterior shoulder and forelimb muscles that can and does lead to superficial digital tendon strain and suspensory strain and eventual suspensory tears.

As a side note on performance issues, horses, typically, also often experience trouble with a lead or lead change and may tend to cross canter. In cases not complicated by other musculo-skeletal issues, it occurs in the lead on the side of the higher heel.

High Heel/Low Heel Set Up The Likelihood Of A “Long Toe/Low Heel Syndrome”

With regard to the foot itself, the syndrome produces a long toe with the heel becoming under-run. This, as we know from Dr. Robert Bowker’s work at Michigan State University Veterinary School of Medicine, “long toe/low heel syndrome”, leads to inadequate support in the posterior part of the foot and eventually to degeneration of the digital cushion. Digital cushion failure when present, leads to a “broken pastern axis” that is very difficult if not impossible to correct. It is not uncommon to see large, flat and splayed out frogs accompanying the foot with a degenerated digital cushion as the frog tries to compensate and support the posterior portion of the foot. There is an obvious consequence to be recognized with regard to major factors leading to “navicular syndrome.”

For the many reasons presented, I feel quite strongly that it is inadequate to address the foot without looking at the consequences on the topline of the horse. Without seeking and correcting the root cause (in this case the high/low heel syndrome) any other treatment is only palliative. By properly addressing the high heel, low heel syndrome the farrier can be of enormous help to both the rider and the horse.

There have been many theories advanced as to reasons for the low heel. Regardless of the originating factor whether genetic or acquired, we are all aware that the horse, once the condition is established, will typically graze with the lower heeled limb advanced. It is

certainly a reasonable theory that pressure (on the heel), maintained through many grazing periods, distorts the hoof capsule, unbalances the foot, advances the break-over location and causes the heel to become under-run. Pressure over time creates distortion. Distortion equals an unbalanced foot.

Corrective measures for the High Heel/Low Heel Syndrome:

What is the appropriate shoeing for this condition? I feel that a cardinal rule is to work primarily with the foot that has the lower heel. Additional problems are incurred if the heel of a true “clubbed foot” is lowered excessively. Structures in the muscles called spindle cell receptors and receptors in the musculo-tendonous portion called Golgi bodies provide signals from the muscle or tendon to the spinal cord. This data provides information to the central nervous system (CNS) about the tension that exists in the muscles and tendonous structures.

When the heel is lowered on a clubbed foot the receptors in the deep flexor tendon are activated and signal the CNS that there is too much stretch in the tendon. The response from the CNS is to issue a signal to shorten the muscle or tendon structures to prevent injury. This response provides one of the reasons why that by the end of a shoeing period, a clubfoot that has had the heel lowered usually looks as bad or worse as when originally seen. Lowering the heel on a non-clubber foot but one in which the heels have been allowed to be high must be done in small increments over several shoeings. It bears repeating that the

primary focus should be on the low heeled foot.

My experience, until recently, has led to the conclusion that the best course of corrective shoeing is the use of wedges as orthotic devices applied on the lower heel in order to achieve the same heel height and pastern angle as the more upright foot. Sometimes it is necessary to also use a “lift” such as a rim (or full) pad on the same or opposite foot as well in order to create full symmetry. Selection of wedge height or of a rim pad thickness (on the same or opposite foot), is best determined after the horse has been trimmed and balanced. Again, it is emphasized that this evaluation must be made with the horse standing squarely on a firm level surface and reassessing as earlier described

Have the horse stand on the trial orthotics (wedges, or a combination of wedges and rim pads) and evaluate for improvement in symmetry. Use the same examination process as previously described. In review, check factors such as the symmetry of the space between the legs, height and angle of the joints, and the height of the styloid processes, Note whether the “point” of the shoulder now comes into symmetry with the opposite side. Again observe from above and behind to determine the effect on angle and symmetry of the two scapulae. Sometimes the changes observed by this procedure are dramatic. In longstanding cases (especially in older horses) the changes are subtle and immediate results are not as evident, but will show improvement in symmetry and performance over the course of multiple shoeings.

Without proper attention to break-over and heel support, the overall condition of the foot can be made worse with the use of wedges. How can this be ameliorated? When shoeing this type of foot the break-over must be set significantly back to approximately 6 mm ahead of the tip of the coffin bone. (Good quality radiographs with the frog apex marked are very helpful.) An improved heel support, achieved by slight lowering of the heel) should be used to extend the buttress of the heel more rearward. The wedge should then extend roughly 1/8 inch beyond the heel of the shoe. If breakover is set as described the lowering will be compensated and pastern axis will remain correct. If necessary a higher degree of “lift” can be utilized after extending the heel by the lowering. The goal is to maintain proper pastern axis while giving an extended heel support..

Following these precautions helps to prevent the heel from further crushing. If the walls are already rolling under at the heels it is necessary to trim them lower yet to the level where there is sound wall growing in the proper direction and not rolling under. It follows that radical trimming must be followed by using a larger wedge or other means in order to create the appropriate heel height and pastern angle. For most cases, where wedges are used, the author prefers an “open” bar wedge and where indicated, rim pads instead of full pads. Frog supports may be helpful. A technique using an acrylic product such as “Equithane” can be used to build both sole and heel as well as provide an impression material effect to bring the low heel to balance with the high heel and support the digital cushion. Caution

should be used not to carry the material forward of the “bridge” of the frog.

If there is evidence of digital cushion deterioration, it may be necessary to use full pads and impression material as well as a frog support. In younger horses there is a better rate of success in re-directing the hoof wall growth, re-balancing muscle development and maintaining a back that can appropriately accommodate a saddle. Quite a few of such horses may be taken out of all support after a limited number of shoeings. Older horses with very long standing problem and poor quality digital cushion are often best kept in the appropriate amount of orthotic on an ongoing basis.

Other options include using a wedge shoe on the low heel side, swedging the heel, or simply leaving more heel on the low side. In our experience, the latter choice is the least desirable because the frog often loses the contact it needs to assist in any possible restoration of the digital cushion and allows the heels to curve inward putting pressure on the navicular area. If a higher heel is chosen, it should be accompanied by impression material and a frog support on the solar surface.

New Information On A Potentially Valuable Shoeing Technique To Ameliorate The Problems Of High Heel/Low Heel Syndrome:

In the last three months of 2005 until the present, a superb farrier with whom I work suggested that we try just turning the last (approximately) one inch of the heels of the shoe down on the affected foot. This can be very simply done

without requiring a forge or any elaborate equipment. Moreover, the shoe can be turned down to any required degree to match the degree of lift needed to equal the height of the higher heeled side. Breakover and heel length must still be as needed to create appropriate biomechanics.

To date we have had success with a large number of horses (approximately 50 up until time of this revision in Feb 06). To date we have not knowingly produced any untoward effects and have seen a fair percentage of cases show a more appropriate angle of heel growth. We have had no problem with keeping these shoes on during the shoeing period. Shoes used have been of both aluminum and of steel. Shoes of both types have been used with glue-on procedures as well as conventional nailing.

Younger horses may respond to therapy well enough to become fully rebalanced. Older horses may require some form of correction during the remainder of their riding career.

Muscle Rebalancing:

For muscle re-balancing to occur following postural correction, the horse must be in work. There is always concern with how much work is acceptable and how soon should work resume after shoeing corrections have been done. It is, of course, always err on the conservative side and work the horse lightly for the first week or ten days. However, I have seen horses remain in athletic competition immediately after the shoeing changes. Even with no decrease in intensity or schedule of competition, they have suffered no apparent negative effects.

Conclusion:

One last point – if one is not happy with the results it is a simple matter to remove the orthotics or altered shoe at any time. However, I believe that if the farrier considers all the factors and *shoes appropriately according to the principles discussed*, the results will be positive for all concerned.