

Farriery for Mismatched Feet

by Stephen E. O'Grady, DVM, MRCVS

The management of mismatched hoof angles remains a controversial subject for both the farrier and veterinarian. Mismatched feet could be defined as forefeet conformation which have a high or upright hoof angle on one foot and a low hoof capsule angle on the contra lateral foot (Figures 1a and 1b).^{2,3}

The difference between the forefeet could range from a high hoof angle with a straight hoof pastern axis to a club foot with a flexural deformity and an overloaded low heel on the contra lateral limb. The mass, integrity and difference in heel height will be the contributing factor to the mismatched dorsal hoof angles (Figure 2). Limb length disparity has been suggested as a cause for mismatched feet although it has not been scientifically proven. Mismatched feet may contribute to poor performance, subtle lameness and a shortened anterior phase of the stride. Traditional farriery seeks to elevate the heel on the low foot and therefore match the forefeet. However, this practice should be discouraged and treatment should be based on farriery principles to improve the structures and function of the individual foot.

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Figure 1 - A Mismatched dorsal hoof angles.

Figure 1a - An upright hoof angle.

Figure 1b - A low hoof angle.



Figure 2 - Note the different conformation of the heel structures present in mismatched feet.



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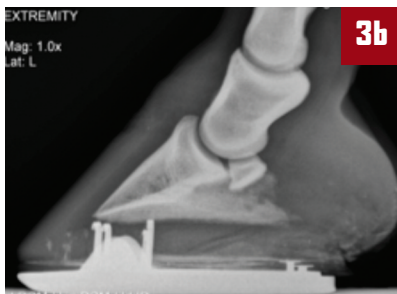
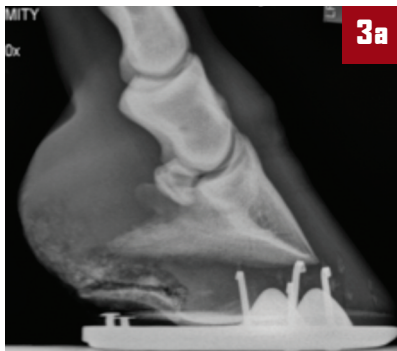


Figure 3a - Upright foot with a straight HPA. Figure 3b - Foot with a low hoof angle with a broken back HPA.

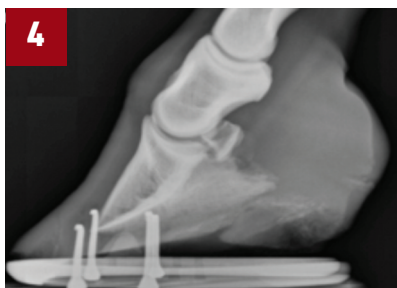


Figure 4 - Upright foot with a broken forward HPA ... defined as a club foot.



Figure 5 - Note the difference in heel height. Also note the frog recessed in the foot with the high heel and the frog prolapsed below the shoe surface in the foot with the low heel.

EVALUATION

Evaluation begins by standing the horse on a firm flat surface. Looking from the front, the hoof with the upright hoof angle will be narrower than the hoof with the low hoof angle. The hoof-pastern axis (HPA) should be evaluated from the side with MC3 (third metacarpal bone/cannon bone) always perpendicular with the ground. It should be determined whether the foot with the high hoof angle has a straight or broken forward HPA and whether the foot with the low angle has a straight or broken backward HPA (Figure 3a and 3b). If the foot with the high hoof angle has a broken forward HPA, it should be considered to have a flexural deformity or a club foot (Figure 4). Looking at the heels from behind, the structures in this area should be evaluated and the difference in the height of the heels should be determined. It is also important to note whether the frog is recessed below the hoof wall on the foot with the high heel and whether the frog is prolapsed below the hoof wall on the hoof with the low hoof angle (Figure 5). Looking at the bottom of the foot, it is helpful to visualize a line drawn across the widest part of the foot and look at the proportions of the foot on either side of

the line. Again, it is important to note if the frog is recessed below the heels of the hoof wall. The frog being recessed causes impaired function in the palmar section of the foot, places the entire load on the hoof wall and increases the opposing forces on the heels when the foot strikes the ground; often leading to a fissure in the base of the frog (Figure 6).



Figure 6 - Frog recessed between the heels of the hoof wall. Note the fissure at the base of the frog from the opposing forces on the heels (red arrows).

The horse should be evaluated in motion at both the walk and the trot. First and foremost it is important to rule out any lameness. It is especially important to evaluate the landing pattern of the forefeet as the foot with the high hoof angle will often land toe first rather than flat. Lastly, the horse should be trotted to note whether the horse has a shortened stride of the high heeled foot. It must be remembered that a shortened stride on one limb will cause the opposite foot to be on the ground longer. Overtime, this can create further damage to the heel structures of the foot with the low heel resulting in a flat "panned out" low angle foot (Figure 7).

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Figure 7 - Note the overloaded heel and the 'panned' out appearance of the heel (short shoe also noted).



Figure 8a - A dorsal view of mismatched feet. Note the difference in size. **Figure 8b** - A lateral view. Note the even growth rings and the straight HPA.



FARRIERY PRINCIPLES

Horses with a disparity between dorsal hoof wall angles will generally have a straight HPA and the hoof wall growth below the coronet from the toe to the heel will be even (Figure 8a and 8b).

In this case, the author suggests using good farriery principles to apply the appropriate trim and shoe each foot on an individual basis.

These principles include:

- *Using the hoof-pastern axis*
- *Using the center of rotation as a guideline for trimming and placement of the shoe*
- *Trimming the heels to the base of the frog or to the same plane as the frog*

Managing horses with mismatched feet where one foot has a markedly high hoof angle or a club foot becomes more complex (See Natural Angle Volume 15 Issue 1). This type of case will often present with a shortened stride on the limb with the upright foot and or a discernible

lameness. Low or compromised heel structures may be noted on the opposite foot from overloading the heel on that side due to the shortened stride placing excess weight on that foot overtime. Managing these horses can be difficult and the proper shoeing protocol may not be inherently obvious. Again it must be emphasized that each foot should be

approached on an individual basis. It is common to see horses with mismatched feet shod with two different size shoes; often a smaller shoe is used on the upright foot. This practice should be avoided as the ground surface on both forefeet should be the same. One of the objectives of trimming the club foot is to redistribute the load to the palmar section of the foot and



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restore functionality. Briefly, farriery for the club foot begins by drawing a line across the widest part of the foot, trimming any loose horn off the frog and then trimming from that line palmarly until the heels of the hoof capsule and the frog are on the same plane.



Figure 9 - Note the space created when the heels and frog are trimmed on the same plane.



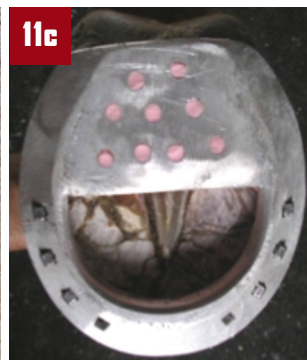
Figure 10 - Club foot following trimming and the addition of a 2 degree wedge insert.

of the frog below the ground surface of the foot. Alternatively, the heels should be trimmed back to the widest point of the frog if possible or an attempt should be made to get the hoof wall at the heels and the frog on the same

plane. The trim can be quite dramatic as the frog is often quite recessed well below the heels of the hoof capsule. The toe length is reduced and any concavity is removed with a rasp from the outer surface of the dorsal hoof wall. If a significant amount of heel is removed, the trimmed foot should be placed on the ground 6-8 inches palmar to the contralateral limb (Figure 9). If a space is present between the heels of the foot and the ground, some form of heel elevation will be necessary. Furthermore, if a toe first foot landing is noted during the initial evaluation, heel elevation will again be necessary in order to load the heels (Figure 10). Breakover is placed well under the foot to decrease the load on the toe and further decrease the tension in the deep digital flexor tendon. When approaching the foot with the low angle, the clinician is often inclined to wedge up the heels to improve the hoof-pastern axis. However, this will place more stress on the already compromised heel structures. Although the hoof pastern axis will appear improved immediately following this type of shoeing, the long term effect is exacerbation of the low angle, further crushing of the heels and prolapse

of the frog below the ground surface of the foot. Alternatively, the heels should be trimmed back to the widest point of the frog if possible or an attempt should be made to get the hoof wall at the heels and the frog on the same plane. As much toe length as possible should be reduced, generally using the dorsal hoof wall as there is usually decreased sole thickness in the foot with a low heel. It should be emphasized that when possible it is extremely important to obtain good quality radiographs prior to trimming to determine the amount of heel and especially sole that can be removed. Breakover such as a rolled toe or a rocker toe if there is adequate sole thickness to allow it to be trimmed into the foot, is very beneficial as it will further decrease the leverage at the toe on the low angle hoof. The center of pressure (COP) on a low angle foot is further palmar than that of the upright or normal hoof, therefore, the shoeing protocol is directed at moving the COP away from the overloaded heels. Additionally redistributing the load or load sharing with the weight bearing structures of the low angle foot may help to decrease the forces directed to the heels. This can be accomplished with impression material, a pour-in pad and a spider plate or a heel plate added to the palmar aspect of the shoe (Figures 11a, 11b, 11c).

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Figures 11a, b and c show the methods to help redistribute the weight on a foot with low heel. Figure 11a - A pad with impression material. Figure 11b - Spider plate. Figure 11c - Heel plate with impression material.

CONCLUSION

A thorough understanding of good trimming techniques, shoe placement and shoeing the hoof to bear weight as evenly as possible over the entire foot is necessary to manage horses with mismatched feet. Often these horses will move better, have an even stride and may remain sound longer. As with all good farriery, the therapeutic measures must begin with the appropriate trim and each foot should be managed on an individual basis (Figure 12). An understanding of the normal form and function of the anatomic elements of the horse's digit, and how these elements may respond to therapeutic changes, is essential to achieving the best possible outcome. Finally, therapeutic farriery for mismatched feet is rarely a one-time effort. Owners and trainers must understand that reevaluation and appropriate correction(s) on a regular schedule are necessary to maintain results. ■



Figure 12 - Mismatched feet showing a spider plate and impression material on one foot and a 2 degree wedge insert on the other foot.

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