

Inside the Club Foot

By R.F. Redden, DVM

A large majority of horses, regardless of breed, have a high-low foot syndrome where one front foot has a higher angle and different shape than the other. A close look at the characteristics of the high foot qualifies it as a club foot.

Club feet are not all born equal. Most are mild grades and go unnoticed by the majority of horse owners or are simply written off as typical high-low syndrome. Regardless of what they're called, to successfully manage the various grades of club feet, we must first recognize the early changes in the hoof capsule, understand the forces at play, have a working knowledge of treatment options, and strive to maintain a healthy, functional foot.

CLUB FOOT GRADES



Grade 1--The hoof angle is three to five degrees greater than the opposing foot and a characteristic fullness is present at the coronary band due to partial luxation (partial dislocation) of P2 and P3 (the second phalanx bone and coffin bone).



Grade 2--The hoof angle is five to eight degrees greater than the opposing foot with growth rings wider at the heel than at the toe. The heel will not touch the ground when trimmed to normal length. (Redden noted that Grade 1 and 2 club foot characteristics can appear very quickly, and that abscesses usually occur between grades 2 and 3.)



Grade 3--The anterior hoof wall is dished and growth rings at the heel are twice as wide as on the toe. Radiographically, P3 exhibits demineralization and lipping along the apex.



Grade 4--The anterior hoof wall is heavily dished and the angle is 80 degrees or more. The coronary band is as high at the heel as at the toe and the sole is below the ground surface of the wall. Radiographically, P3 is rounded due to extensive mineralization and rotation may be present.

IMAGES COURTESY DR. REDDEN

Creation of a Club

A club foot is the result of a problem in that limb. The primary problem is a deep digital flexor contraction syndrome originating in the deep digital flexor muscle located between the elbow and the back of the knee. This muscle tapers into a long tendon that attaches to the bottom of the coffin bone (third phalanx, or P3). When the muscle fibers contract more often than they should, the result is a shorter-than-normal length of musculotendinous unit and a constant upward pull on the coffin bone and internal structures of the heel. The upright, boxy hoof capsule shape is a product of the unrelenting pull of the abnormal muscle contraction.

There can be a wide range of overcontraction of the muscle fibers, which when transferred to the foot via the tendon causes a corresponding large range of response. Unfortunately, we simply do not know the trigger mechanism for the spastic deep digital flexor contraction.

Club Categories

Many years ago I designed a classification system for club feet to help us define them and communicate better when discussing them. Treating and managing the wide variety of club feet is directly related to the severity of deep digital flexor contraction and its effect on the foot. Therefore, it is very important to be specific when discussing a particular foot.

Once the eye is trained for small details, each of these four basic grades can be broken down into a sub grade and high grade. For example, the Grade 2 category can consist of a low Grade 2, standard Grade 2, or high-scale Grade 2. The scale is arbitrary at best, but it defines the unique characteristics of the foot in question. A major cause of misunderstanding in discussing and treating club feet is classifying them all in the same category.

When Do Clubs Cause Problems?

As a rule, newborn foals that walk on their toes most often respond well to a variety of treatments within hours or days of birth. Those that correct very slowly (over days or weeks) often develop a high-grade club very early in life and are a concern from the day they are born. Most other clubs start to show Grade 1 characteristics within a few weeks of birth, but foals are often 3-6 months old before the hoof capsule changes drastically. Grade 2 clubs are often considered common in foals, and they are often treated lightly. But Grade 2 and higher clubs often have very thin soles, wear the toe down, and have toe abscesses that can be major concerns.

Grade 2 clubs are the most common grade, and they cause the most problems. They are not so bad that they can't be made to look much like the opposite foot with a few more swipes of the farrier's rasp, and most can be tweaked to pass the eye of most buyers. Most can go into training with only an occasional flare-up and can be relatively successful as speed and performance horses. But when trimming and shoeing is focused on the cosmetic appearance without regard to the cause and what's happening inside, we greatly increase the risk of causing very serious soundness issues.

As a rule, the foot opposite and the foot behind the club will have a low, underrun heel, a low to negative palmar angle (the angle the bottom of the coffin bone makes with the ground), and once the horse is in full training that foot will have a sore, crushed heel that's prone to quarter cracks. Often this low foot causes problems before the club.

Looking Inside

To see why Grade 2 clubs seem almost normal, but can shut down a good horse's career, we need to understand what's happening inside the foot. Let's consider radiographs of a 5- to 6-month-old weanling with a low Grade 2 club that has been trimmed several times since birth. The fact that the high foot must be trimmed every two weeks to keep it looking reasonably normal should be the first sign that something is wrong internally. If trimming the heel off was the right thing to do (see top right image on page 74), wouldn't it respond in a more favorable fashion?

First look at the bone angle (BA), which is formed by the bottom of the coffin bone and its face at the toe. The BA will be 50-51° in most feet, but in the club foot the BA can be 10° greater than the opposite foot (see X rays on page 74). So not all coffin bones are born equal, and hoof angles on this horse cannot match. When the bone angle is 10° greater on one foot, the hoof angle is automatically 10° greater even when the heel is taken down as low as possible.

Let's consider a Grade 2 club with matching bone angles. The palmar angle of the low foot is 0-1°, while the palmar angle of the Grade 2 club that has been trimmed several times might be 0 to -1°. This makes it look much like the low foot. But set that trimmed club foot down six inches behind the low foot and watch the heel as the limb is loaded. An air space of several degrees will appear under the heel because taking the heel off with a rasp actually raises it when asked to load.

Why would this happen? The deep digital flexor will actually tighten as it resists the tension applied by taking the heel off. This load transfers to the apex (toe) of the coffin bone, pushing it against the sole corium (growth center) beneath it, which compromises the blood flow responsible for sole growth. The thin, soft rim of the coffin bone starts to bend due to the unrelenting force, forming a lip. This load-induced bone remodeling will get considerably worse unless deep digital flexor tension is significantly reduced.

The excessive pull on the bone also pushes the extensor process at the top forward into the coronary band (see the red arrows on the radiographs below), compromising blood flow there and greatly reducing horn growth. As the horn growth slows in the toe, it accelerates in the heel, as the heel is totally unloaded and has adequate blood supply. The vicious cycle is on the way.

The soles become thin and the toes appear beaten up, as they wear quickly when they're carrying the whole load. This foot is very susceptible to abscesses from bacteria entering the disrupted horn. As the weanling matures, the hoof capsule starts to dish, which has to be removed with a rasp at every trim. The heel continues to be the only thing that grows.

As the club foot becomes more severe, the tension in the deep digital flexor can rotate the coffin bone within the hoof. This is seen radiographically as an increased horn-laminar zone (see figure in article #9805 on TheHorse.com); the lower edge of the bone is further from the dorsal hoof wall than the top. This is often mistaken for rotation due to laminitis, although it is most often the horn (H) side of the zone that has widened rather than the laminar (L) side.

Shoeing this foot becomes difficult, as the walls are thin, very straight, and often shelly (brittle with no growth). When we're lucky, the foot looks a bit steep and small, but not too bad. The sole is flat on the ground (no natural cup), two or three visible sets of nail holes indicate no growth, and a yellowish or tan area appears on the face of the hoof like an upside down hoop from the first nail to the first nail. This shows that the toe has been backed up completely through the wall to get rid of the unsightly dish.

Radiographs of this Grade 2 club would be a bit scary. Instead of the 15 mm of sole the foot needs to maintain a healthy blood supply and protect the inner structures, there would be only 5-6 mm. Severe lipping of the coffin bone would be present, and there would be a 3-5° palmar angle even with the heel taken down to its limit. What happened? Cosmetic treatment was chosen over functional treatment. Trimming and shoeing the club foot to make it look normal carries an inherent risk of destroying the careers of potentially great athletes. Form must always follow function.

Good News

We can have both form and function if we reverse the forces that have disfigured the foot rather than resist them. We should address the cause instead of working for cosmetic results. Many treatment options exist from the lowest grade to the highest.

Horses with higher, crippling grades of club feet have hope as brood stock and slow sport athletes. The low- to mid-grade groups have a good prognosis as speed and sport horses, provided the elected treatment regime gives healthy, thick protective soles before irreversible bone and growth center damage have occurred.

Start training your eye to see small details that indicate changes in the feet, so you can identify problems brewing and manage them to maintain soundness.

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