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Managing the Adult Club Foot

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Take Home Message—Management of the adult club foot depends greatly on the severity of the flexural deformity of the deep digital flexor musculotendinous apparatus and the chronicity of the deformity. With proper farriery, horses with less severe club feet can maintain athletic soundness.

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I. INTRODUCTION

A true club foot is hoof capsule distortion as a result of shortening of the deep digital flexor musculotendinous apparatus and a resulting flexural deformity of the distal interphalangeal joint (DIPJ).¹ A flexural deformity in the young horse can be categorized as congenital or acquired.² Congenital deformities are present at birth and acquired deformities are recognized between 6-8 months of life.³ However, the horse may suffer from a flexural deformity and subsequent club foot throughout any point in its life.² An acquired club foot as an adult is most likely secondary and may be the result of a chronic lameness or injury.² The author prefers to use a grading scale of,¹⁻⁴ with 4 being the most severe, to categorize the severity of the club foot.⁴ A grade 1 club foot has a hoof angle 3-5 degrees greater than the opposite foot and a characteristic pronounced coronary band (Fig. 1). A grade 2 club foot has a hoof angle 5-8 degrees greater than the opposite foot with wider growth rings at the toe. The hoof-pastern axis is incongruent and slightly broken forward (Fig. 2). The dorsal hoof wall of a grade 3 club foot is flared and growth rings at the heel usually twice the width of those at the toe (Fig. 3). The dorsal hoof wall of a grade 4 club foot is severely concave with an angle of greater than 80 degrees. The coronary band at the toe is parallel with that at the heel⁵ (Fig. 4). Severe club feet are typically dealt with while the horse is young. However, some less severe club feet are overlooked when the horses is young and maintains this flexural deformity as an adult. The objective of this article is to discuss the management of farriery for the adult club foot.



Fig. 1. Grade 1 club foot.



Fig. 2. Grade 2 club foot.



Fig. 3. Grade 3 club foot.



Fig. 4. Grade 4 club foot.

II. DISCUSSION

Flexural deformity of the DIPJ and an associated club foot has been linked to lameness in the horse.⁶ Overloading of the toe resulting in reduced sole depth, solar bruising, pedal osteitis, and coffin bone remodeling are all sequelae of a club foot.³ The hoof capsule as any other anatomical structure responds to force. As a result of the increased tension placed

on the shorted deep digital flexor musculotendinous unit, more force is placed on the toe and less on the heel region of the hoof. This results in capsular distortion; typified by a concave dorsal wall and more growth at the heel versus the toe. Consequently, the club foot is unable to load and dissipate energy well and the vibratory forces are transferred directly to the bony structures of the digit. Due to the incongruent alignment of the middle and distal phalanx at the DIPJ, chronic inflammation of this structure is often seen in club feet.⁷ Additionally, inflammation of the suspensory ligaments of the navicular bone has been noted with upright or club feet.⁷ These horses are prone to toe first landing and commonly develop toe cracks and quarter cracks. As a result of the dorsal wall flare, horses with club feet are more likely to develop hoof wall separation, white line disease and some even become laminitic.

Obtaining good quality radiographic images of the feet is of great benefit to the veterinarian and farrier. Ideally, the minimum standing lateral-to-medial and horizontal dorso-palmar views are taken. This allows for identification of bony structures within the capsule and helps with a guideline for trimming.³

The objectives of farriery for the club foot are the same in every case. First, improve upon or achieve normal congruent articular alignment of phalanges. Second, achieve normal orientation and loading of distal phalanx relative to the ground.³ A common misunderstanding when trimming the adult club foot is that the heels are trimmed as far back as possible and the toe is left long or an extension is added to the toe. This is often done in an effort to correct the flexural deformity and even the foot conformation. Unfortunately, this does not work to the benefit of the adult horse. The result of this is more tension is placed on the deep digital flexor musculotendinous unit. Consequently, this added tension might lead to further hoof capsule distortion, separation or tearing of the dorsal lamellae, loss of sole depth, and possibly pedal osteitis.⁸

Trimming the adult club foot is the most important element to successful outcome. When dealing with a mild to moderate club foot, it may be difficult to determine the exact amount of heel to remove. The author suggests trimming the heel in small increments until the horse is full weight bearing and the heel is just touching the ground. Any dorsal wall flare is dressed down with a rasp within reason. The toe is trimmed with a gradual rocker beginning just before the apex of the frog. It is very important to obtain radiographs of the feet prior to trimming severe club feet to ensure adequate sole depth. The shoe is forged with a rocker in the toe to accommodate the trim in the foot. The rocker provides decreased break-over and decreases the tension placed on the deep digital flexor tendon caused by lowering the heels.

When trimming the more severe club foot, the heel is still trimmed to the widest point of the frog. However, elevation of the heel with the shoe following trimming is necessary to

accommodate for the tension of the deep digital flexor tendon. Typically, the height of heel removed is roughly equal to the height of wedge added to the shoe. The concept of trimming the heels back just to wedge them up again is not always grasped. When the heels are trimmed to the widest point of the frog, the load bearing surface of the foot increases. This is necessary for normal hoof function. Conversely, if the heels are not elevated with the shoe, excessive tension will be placed back onto the musculotendinous unit. Additionally, a rocker toe or heavily rolled toe shoe will help decrease the tension of the musculotendinous unit. When artificially elevating the heels with a shoe, the load sharing and surface area contact of the solar structures of the hoof are changed. In the author's opinion, it is beneficial to add some type of impression material to the sole to help reestablish a more normal load distribution. The purpose of this is to prevent the heels from becoming overloaded, which may lead to quarter cracks and contracted heels. Fitting shoes of club feet will ample heel expansion is important to promote widening of the heels and prevent heels from becoming further contracted. This however is not always as easy as it sounds due to the difficulty farriers experience keeping shoes successfully nailed in place on club feet. Often the walls of club feet are poor quality and difficult to accept nails and hold shoes. In those instances, alternative methods of shoe application can be used. Gluing techniques will not be fully covered in this article; however, it is important to understand what is available. The method of direct gluing is when an adhesive is used to attach a shoe to the solar surface of the hoof. Aluminum shoes are most commonly used because of the porous nature of the material and the bond created to adhere to the foot. The downside to direct gluing aluminum keg shoes is that the heels are locked in place and not allowed to expand under normal load bearing. This can cause heel contracture if repeatedly glued in this fashion. Unfortunately, club feet commonly have contracted heels to begin with. As an alternative, polyurethane shoes intended for gluing have evolved and are now widely available. The benefit of the polyurethane shoe is that it allows the hoof to expand under load as it normally would and prevents contracture of the heels. To take this idea of expanding the foot a step further, the hinge shoe has been in use since the 1600's. The concept of the shoe has recently been modified and fashioned with aluminum branches and a heavy gauge spring to encourage spreading of the hoof. These shoes are glued into place in the quarters and promote contracted heels to spread.

III. SUMMARY

The equine club foot is a complicated and often difficult deformity to manage. Identifying the underlying cause of the club foot, if acquired, is beneficial to improving the deformity. Using the guidelines outlined within this article will help the veterinarian and farrier to improve and maintain the adult club foot. Identification of hoof and lameness issues early is helpful to a positive outcome. Encouragement of veterinarian and farrier interaction is the key to promoting good hoof care.

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