Farriery for the Sport Horse—Principles and Techniques

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There are a variety of shoeing techniques employed for the sport horse. The individual equine disciplines influence the selection of shoe type. It is important for farriers and veterinarians to work in concert and follow some shoeing principles that will optimize performance and support the horse for longevity in their athletic careers. The sport-horse disciplines are generally recognized to include show hunters and jumpers, horse trials and eventing, dressage, and combined driving. Author’s address: Hagyard Equine Medical Institute, 4250 Iron Works Pike, Lexington, Kentucky 40511; e-mail: dpeters@hagyard.com. © 2010 AAEP.

1. Introduction
The sport-performance horse industry encompasses a wide variety of breeds and disciplines, and it places high demands on the physical ability and the athletic skills of these horses. A large focus for maintaining these horses free of lameness is the region of the foot. Optimal performance can be proportional to the attention placed on trimming and shoe placement on the foot. It is therefore apparent that the farrier and veterinarian will both be asked to manage conditions of the feet. Success is achieved when the farrier and veterinarian can work together to develop shoeing schemes that will enable the horse to compete to the best of their abilities and over a long period of time.

Sport horses follow a vigorous schedule of training and competition. They tend to travel to events on a weekly basis or may be based in a competition area for an extended period of time (1–4 mo). They may compete and train on a variety of different surfaces (grass, sand, synthetics, dirt/packed roads, or combinations) and under variable weather conditions. Many horses are maintained at a competition-readiness condition year round. This means that, from a fitness level and foot-care standpoint, these horses are always in a high-maintenance situation and may not get the chance to let down or fully recover from minor conditions. It then becomes necessary to manage these conditions while the horse is still trying to compete.

2. Farrier/Veterinarian Relationships
It is very important that the farrier, veterinarian, and owner/trainer communicate when dealing with a specific foot condition on a horse. A good working relationship and open conversation about specific cases foster creative ideas and practical solutions for the horse and client. It is important to note that the veterinarian, farrier, and even owner/trainer may well have conflicting views and/or ideas, and thus, there needs to be open discussion and ultimately, collaborative decision making.

The veterinarian provides anatomic and physiologic expertise as well as understanding of how it relates to the rest of the musculoskeletal system.
He/she understands the pathophysiology of the disease process that might be occurring, be it a coffin-bone fracture, a medial collateral ligament desmitis, or an insertional deep digital flexor tendonopathy. The veterinarian can provide imaging technology that provides a better understanding of the specific foot-disease process. Digital radiology, ultrasonography, fluoroscopy, thermography, computed tomography (CT), and magnetic resonance imaging (MRI) all have their place for helping to diagnose foot problems. It is essential to base any therapy or management on an accurate diagnosis, thus removing guesswork and increasing success. The veterinarian and farrier can then intelligently exchange ideas on shoeing principles, treatments, and shoe designs that have practical application on the specific clinical case.

My experience with the majority of sport-horse farriers is that they possess a solid knowledge of the anatomy of the foot and how these structures interact to produce a sound, efficient unit during discipline-specific athletic performance. This basic knowledge is essential for any farrier wanting to be successful in the sport-horse industry. Farriers are craftsmen with the ability to take a concept and fashion it into a functional shoe for the specific need. They generally are well-aware of various options for shoes or foot-support systems. Thus, when working in tandem with a veterinarian and factual information regarding a particular problem, the likelihood of successful shoeing management is enhanced.

3. Principles of Shoeing the Sport Horse

The basics of shoeing the sport horse do not vary widely from those of other disciplines and breeds. The potential difference can come with the fact that these horses tend to be shod on a shorter shoeing interval, and some specific needs are required for each discipline. Many sport horses are presently on shoeing cycles of 4–5 wk to keep their feet looking good as well as prevent undue stresses from imbalances or length that occurs normally as feet grow out. Small changes can have a major impact on potential soundness issues when exercising at competitive levels. Devices to provide better traction (heel calks, raised nails, borium, studs, and raised rims) can put additional stress on the foot, bones, ligaments, and tendons. It is also not uncommon to have different farriers trimming and shoeing the same horse because of the travel and calendar of competitions. Most sport horses are managed in very controlled exercise environments with minimal turnout time (if any, it is usually less than 1 h/day). Most actual riding-exercise periods tend to be relatively short (less than 1 h) compared with the time spent in stalls the rest of the day. This confinement housing can lead to inadequate natural stimulation of the feet, resulting in some abnormalities that may affect performance. These may include gradual shrinkage of the heel mass of the foot, contracture of the heels, decreased digital cushion size, lack of adequate sole-plate callous, narrowing of the bars, loss of frog elasticity, and decreased perfusion of the foot because of poor hemodynamic stimulation from movement. The practice of frequent bathing of performance horses can affect the hoof quality because of the abnormal wetting/drying cycle, and this can result in brittle/shelly hoof walls, white-line separation, excessive exfoliating soles, and superficial hoof cracks (Fig. 1).

4. Manage the Breakover

In my opinion, this is one of the most critical aspects of shoeing the sport horse. It is not just the breakover that occurs at the toe, but the breakover that occurs in the approximate cranial one-half of the foot from the toe to the widest part of the foot. The breakover should be placed close to the solar margin of P3, at both the toe and toward the quarters (Fig. 2). This is best accomplished with a beveled outside bearing edge to the shoe. The extent of the bevel is related to the size and shape of the horse's foot. A horse with a wide, flat foot will require a longer bevel, whereas a small, narrower foot may just need a rounded outside edge to the shoe to ease breakover. Other forge techniques to accomplish this same action in a shoe include rolled toes, rocker motion, and use of half-round stock. Some pre-made commercial shoes have this action built into the shoe (Fig. 3). This action of the shoe can reduce tension to the deep digital flexor tendon (DDFT) and the collateral ligaments of the distal interphalangeal (DIP) joint. It also helps to decrease abnormal loading tension on the suspensory ligament of the distal sesamoid bone, primarily on turns. I believe that this is an especially important principle with the advent of the recent synthetic footings that are used in many competition rings. These footings seem to bind together more firmly and thus,
tend to displace less as the horse goes from maximum stance phase to push-off. This provides excellent traction but I believe it also puts greater moment tension on soft-tissue supporting and propulsive structures, increasing the risk of injury.

5. Support the Heels

Proper shoe-heel support is important to form a solid foundation for the foot. It is not unusual that some horses have the tendency for low, forward heels, thus allowing the majority of the foot mass to be cranial to the center of rotation of the DIP joint (Fig.

Fig. 2. Radiograph showing cranial breakover (arrow) placed appropriately at toe region by use of beveled shoe and slight rocker motion incorporated into the shoe.

Fig. 3. Natural Balance PLR shoe. This shoe has a factory built-in bevel in the cranial/caudal direction at the toe (diamond) as well as an outside bearing edge built-in bevel (arrows) around quarters and toward heels to allow for ease of medial/lateral breakover.

The better traction of these footings along with the spirit of competition encourages riders to be more aggressive.

Fig. 4. (A) Lateral view showing the heel of the shoe cranial to the heel bulbs (arrow), thus providing inadequate support to the caudal portion of the foot. (B) Solar view of the foot showing lack of caudal extension of the shoe (thick arrow) and narrowing of the heels (left-right arrow) to limit expansion of caudal hoof structures for normal function.
This can put untoward, increased stress on the caudal soft-tissue structures of the foot, such as the suspensory apparatus of the navicular bone and the distal aspect of the DDFT. Additionally, the heels may start to roll under, decreasing the angle of the bars and narrowing the caudal aspect of the foot. As the caudal aspect of the foot narrows or decreases in size, the mechanical forces on the hoof wall seem to shift forward toward the quarters. This, along with some medial/lateral imbalance of the foot, can lead to flexing and weakening of the hoof wall and may lead to quarter cracks. Caudal heel support implies extending the shoe to approximately the heel bulbs of the foot (Fig. 5). Owners, trainers, veterinarians, and farriers may be reluctant to place shoes this far caudally for fear of the horse stepping on a shoe heel branch and pulling the shoe. In my experience, if the horse is provided adequate ease of breakover, loss of shoes is rare. Adequate spread to the shoe heels should be provided as well to allow the caudal soft-tissue structures of the foot to contact the ground. This can be assisted with some slippering or tapering of shoe heels or some mechanical devices, such as a hinged shoe with a heel spring. If the caudal soft tissues contact the ground properly, they will maximally function to absorb the energy of impact, to optimize hemodynamic perfusion of foot tissues, and to provide desired proprioceptive awareness of the foot position. A variety of bar shoes may provide caudal heel support and further stability. It is not uncommon for many farriers and veterinarians to use a bar shoe for one or two shoeing cycles for a specific condition, such as bruised/sore heels or an acute hoof crack. In terms of addressing the primary need for adequate heel support, my experience has shown that this can generally be accomplished without the use of bar shoes.

6. Attention to Medial/Lateral Balance

Medial/lateral balance is always a consideration for the athletic sport horse (Fig. 6). Proper balance will help to minimize abnormal forces on soft tissues and joint surfaces during the rigors of training and
competition that could lead to injury of these structures. It is also an important consideration as the speeds of competition increase, such as the cross-country phase in 3-day eventing, marathon day in competitive driving, or jump-offs in stadium jumping. It should be the aim of shoeing to attempt to evenly distribute the weight up through the joints of the leg in relation to the conformation of the leg. This will help to minimize abnormal tension on the soft-tissue support structures, especially collateral ligaments of joints as well as branches of ligaments or tendons that may insert parasaggitally on the boney column. I believe this becomes especially important with horses that compete on many of the new synthetic surfaces (polymer-coated sand, sand/fiber combinations, and sand/rubber/polymer) that provide superior traction compared with sand or grass surfaces. Especially while turning, the shear or tension forces on the collateral or parasagittal soft tissues are increased with the increased traction, because the ground surface does not tend to deform as much as would occur with sand or grass. If the medial/lateral balance is not optimal, it is possible that the tissues may exceed their loading capacity and become injured. Maintaining optimal balance can be a challenge because of conformational or acquired aspects of boney alignment that may be present. Radiographic evaluation may be of value in helping to identify any degree of disparity, but it is important to correlate radiographic findings with the conformation of the limb. Imbalances, such as minor sheared heels and hoof wall flares, may be corrected with a consistent approach at the beginning of each shoeing cycle. In the event that more radical correction is required, the farrier/veterinarian team may elect to employ the use of

Fig. 7. (A) Medial aspect of the right front hoof mildly out of balance, in part because of laterally offset hoof-to-pastern conformation. (B) Left front foot (thick arrow) with broken-back hoof/pastern axis and right front mild club foot (thin arrow) in a 3-day event horse. (C) Radiographs may be useful to assess alignment concerns. Normal desired lateral-view alignment.
thickened or thinned branches of the shoe, shim/rim pads on the low side of the foot, or building the low side up with an acrylic or glue-on shoe combination.

7. Consideration of the Width of the Foot
A wide, level base of support, proportional to the horse size, is desirable. If the radial width of the foot is excessively increased in relation to the vertical boney structure of the leg, then a great deal of tension is exerted on the medial or lateral soft-tissue support structures as the horse turns. The stress on the tension side of the joint can further be increased with speed, shortened radius of turns, and firmness of the surface during training or competition. This lever-arm effect increases with the width of the foot and is likely to contribute to soft-tissue injuries. To counteract this effect, the shoe needs to be fit tighter at the widest part of the foot or a slight roller motion needs to be incorporated into the shoe by use of a bevel on the leading edge in that region. From my clinical experience, many horses benefit from a narrower functional foot, with the result being a lower incidence of collateral desmopathy and synovitis of joints of the lower leg, especially in the DIP joint.

8. Align the Boney Structures
Most sport horses are not primarily selected for their conformation. They are selected on their ability to perform at a certain level at a particular stage in their competitive life. The farrier and veterinarian may recognize some of the conformational concerns that could affect performance (Fig. 7). In many cases, the owner/trainer may rely on the veterinarian/farrier team to develop a strategy of shoe support for some of these conformational issues that may help reduce excessive stress on certain structures during exercise load. Some of the conditions that may be addressed include the laterally offset hoof from the pastern, bendy knees, base narrow in the hind legs, toe-in or toe-out lower leg, broken-back hoof/pastern axis, and club foot. The principle is to attempt to shoe so that any ground force reaction up the leg will be born most efficiently and dissipated by the supporting boney column and associated soft tissues. It must be appreciated that a small improvement in this dissipation of forces over the lifetime of the sport horse may be significant and decrease the incidence of lameness. Each conformational variation needs to be addressed individually and must be evaluated as to its potential importance within a specific discipline. A dressage horse may be better able to tolerate a toed-in lower-leg conformation than an event horse working at cross-country speeds in regards to the risk for developing a lameness issue. A variety of shoe designs, attention to shoe placement, and various fillers/ acrylics, glue-on devices, and multiple pads are available tools to assist the farrier and veterinarian in the attempt to best align the skeletal structure. Which specific technique or device is employed can be developed in concert between the farrier and veterinarian with an eye on long-term support for the horse.

9. Protect the Bottom of the Foot
Sore feet tend to be a common occurrence in the competitive sport horse. This is usually caused by inflammation of the underlying sensitive tissues associated with either the sole or the lamina. This may be because of the lack of sole callous/thickness, an environment that does not encourage toughening of the sole, abrasive footings that will wear down the sole, removal of the sole with shoeing, different footing conditions from what a horse routinely trains on, and pathology of the foot (abscess, bruise, and lamellar pain). In many cases, these horses can be made comfortable and work through the soreness if the foot is adequately protected. In the clinical situation, the initial aim should be to decrease the inflammation and pain of these tissues with medication and physical therapy (cryotherapy, poultices, and padding). Management changes concerning exercise, nutrition, and reduction of stress may be necessary to minimize progression to a more serious condition. After the inflammatory process seems controlled, a variety of protective/supportive devices can be used to allow the horse to comfortably return to exercise. In many cases, desiccating and hardening the insensitive sole material by the use of turpentine, iodine, or one of the commercial sole tougheners available is adequate. A wide web shoe may be employed to protect a greater portion of the solar area. If more protection is required, a pad with or without some cushioning material beneath it may be the solution (Fig. 8). Pads are available in

Fig. 8. Wide web shoe (black arrow) and leather rim pad (white arrow) for protection of a portion of the solar surface of the foot.
a variety of materials, from natural leather to synthetic rubbers, plastics, and metal with all types of inserts and support thicknesses.¹ The decision to use a particular pad is usually based on the experience of the individual farrier. There are various pour-in pad materials that adhere to the sole and are available in a variety of firmnesses. They have the advantage of not allowing arena footing to pack under the material (as can happen with pads), and in many cases, they can be removed without having to remove the shoe after the condition seems resolved.

The foot care of the sport horse requires all involved (owner, trainer, farrier, and veterinarian) to be attentive to the functional needs of the horse and any changes in performance that may occur related to the feet. The farrier and veterinarian are in an excellent position to be able to assess both of these areas and offer suggestions to optimize performance. In addition, their ability to work together enhances the possibility of success.

References


