

# Curb: A Collection of Plantar Tarsal Soft Tissue Injuries

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Curb is a collection of plantar tarsal soft tissue injuries and not simply long plantar desmitis as has been previously supposed. In fact, only 30% of horses in this study had injury of the long plantar ligament (LPL). Horses with curb are more likely to have swelling and injury of peritendinous and periligamentous tissue and/or superficial digital flexor tendonitis than injury of the LPL. Careful ultrasonographic evaluation is critical in establishing a correct diagnosis and management plan. While curb is primarily an injury of racehorses, and most commonly the Standardbred racehorse, it does occur in non-racehorse sport horses. Authors' addresses: Department of Clinical Studies, New Bolton Center, 382 West Street Road, Kennett Square, PA 19348-1692 (Ross, Reef); Randall Veterinary Hospital Inc., Warrensville Heights, OH 44128-5504 (Genovese). © 2002 AAEP.

## 1. Introduction

The historical definition of curb is enlargement of the plantar aspect of the fibular tarsal bone (calcaneus) caused by inflammation and thickening of the (long) plantar ligament (LPL).<sup>1</sup> However, a recent definition of curb, "desmitis of the plantar ligament. . . characterized by thickening of the plantar distal aspect of the tarsus" refers to a figure showing typical swelling, caused not by long plantar desmitis, but by superficial digital flexor (SDF) tendonitis.<sup>2</sup> Curb is a useful, indelible term, used hundreds of years ago to describe swelling in the "back and lower part of the hock."<sup>3</sup> When used today by veterinarians and laypeople, the term curb aptly describes configuration of swelling but inadequately addresses etiology, since recently, ultrasonographic examination revealed injury to peritendinous/periligamentous tissues (PT/PL), the SDF tendon (SDFT), deep digital flexor tendon (DDFT), or LPL.<sup>4,a</sup> Furthermore, there is considerable variation in clinical signs, and the injury cannot be categorized or a management program and prognosis established

without thorough clinical and ultrasonographic examination. Progress in understanding curb has been hampered by owner and trainer perception, because often they feel curb is an annoying, self-limiting problem that rarely causes lameness or poor performance, has a single treatment that is uniformly effective, and is cured once it is treated. Most racehorse trainers are opposed to resting a horse with curb unless lameness is severe, so veterinarians are often faced with management decisions without an option for even short-term rest or a reduction in training intensity. There are many traditional therapies that have no data to support efficacy. Curb must be differentiated from other tarsal region swellings, including bog spavin, bone spavin, thoroughpin, collateral enthesopathy, capped hock, calcaneal bursitis, gastrocnemius tendonitis, dislocation of the SDFT, and tarsal tenosynovitis.

The purpose of this study was to describe normal and abnormal ultrasonographic examination of the plantar tarsal region, to report the type and distri-

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## NOTES

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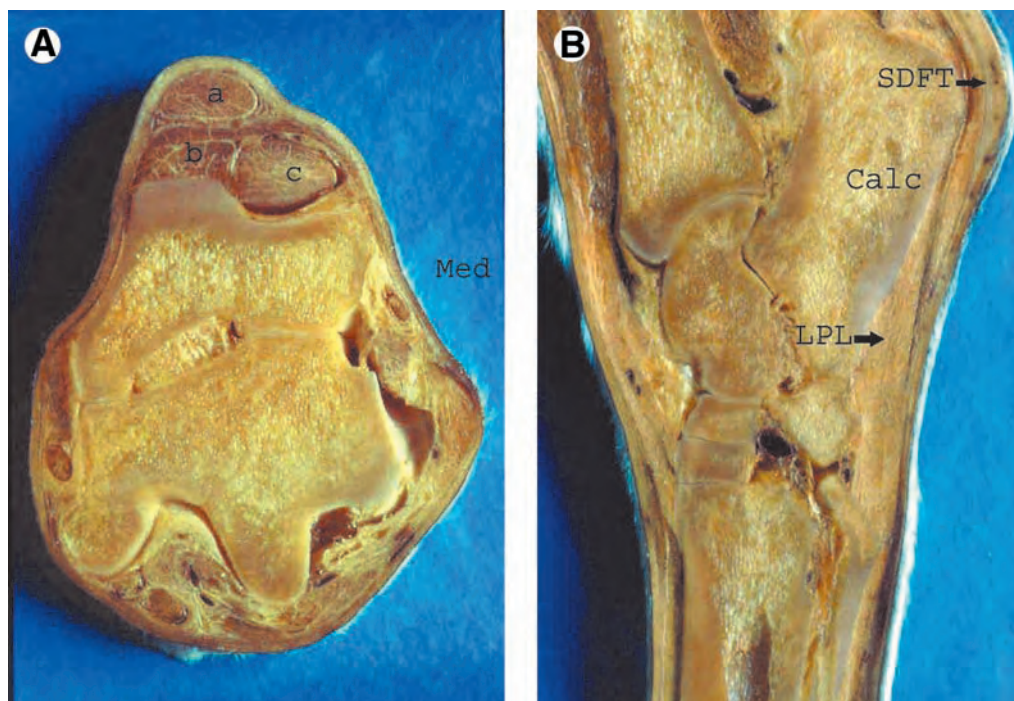


Fig. 1. Cross-section (zone 1B) (A) and longitudinal (B) anatomical specimens of the plantar tarsal region in a normal horse. There is normally only a thin layer of peritendinous and periligamentous tissues (a: superficial digital flexor tendon [SDFT]; b: long plantar ligament [LPL]; c: deep digital flexor tendon [DDFT]; calc: calcaneus; med: medial).

bution of soft tissue injuries that comprise curb, to establish pathogenesis of injury, to establish prognosis based on soft tissue injury, and to attempt to develop management protocols for horses with curb.

## 2. Materials and Methods

Medical records of horses with curb admitted to the George D. Widener Hospital for Large Animals, between March 1989 and February 2002, and the Randall Veterinary Hospital, between December 1983 and February 2002, that had ultrasonographic examination were reviewed. Horses admitted with curb for examination or management, in which ultrasonographic examination was not performed, were excluded. Date of admission, signalment, use, limb(s) involved, results of lameness examination if performed, including palpation findings and lameness score (scale of 0–5, with 0 being sound and 5 being non-weight bearing), assessment of whether curb represented a primary or compensatory lameness issue, diagnosis, etiology, management if performed or recorded, and outcome, if known, were recorded.

After routine skin preparation, ultrasonographic examination was performed using a 7.5-MHz linear array transducer with a standoff pad. In 78 horses, the opposite limb was evaluated to compare cross-sectional area (CSA) data, and bilateral images were obtained in horses with bilateral injury. Transverse and longitudinal images were obtained from the plantar midline, slightly plantarolateral (to

evaluate the LPL) and plantaromedial (to evaluate the DDFT), and images were evaluated qualitatively and quantitatively using CSA measurements. Injuries were classified as involving the following tissues either alone or in combination: PT/PL, SDFT, LPL, and DDFT. In three horses, curb was diagnosed in combination with gastrocnemius tendonitis or tarsocrural collateral desmitis.

## 3. Results

Normal ultrasonographic examination and anatomy is as follows: swelling comprising curb occurs in zone 1 of the tarsal and metatarsal regions but can extend distally into zone 2 if there is progressive and severe SDF tendonitis. Zone 1 is further divided into zone 1A and 1B, but zone 1B is large and recently has been divided into zone 1B1 and 1B2. Alternatively, lesions can be described by distance distal to the point of the hock (POH, proximal aspect of the calcaneus). Plantar to the calcaneus are skin, subcutaneous tissues, a thin fibrous tissue layer, the SDFT, and the LPL. Medially, the DDFT courses distally over the sustentaculum tali within the tarsal sheath (Fig. 1). Normally, the tarsal sheath has a small amount of fluid that can be seen but not felt during ultrasonographic examination. The LPL originates from and is closely adherent to the calcaneus and inserts distally on the plantar surface of the T4 and MtIV. In zone 1A1 (5-cm distal to the POH), midline ultrasonographic evaluation reveals thin subcutaneous fibrous tissue layer

(PT/PL) along the plantar surface of the SDFT. The SDFT is a crescent shape, narrow in a medial to lateral direction, and somewhat thickened from that seen proximally. In the longitudinal scan, the normal SDFT has a dense parallel fiber pattern. Deep to the SDFT, the LPL is at full thickness (plantar to dorsal direction), is rectangular in shape, and is firmly attached to the calcaneus. At this level, the DDFT is out of view medially and must be evaluated by placing the transducer plantaromedially. From the plantaromedial aspect in transverse images, the tarsal sheath surrounds the DDFT. The DDFT is oval, and there is a large central hypoechoic region that is comprised of residual muscle tissue, but this defect could be caused by incident angle artifact. In zone 1B1 (9-cm distal to the POH), the plantar outline of the 4th tarsal bone (T4) can be seen. The LPL is a multi-septated ligamentous structure and has large plantar fiber bundles that are not normally perfectly aligned with dorsal bundles. In transverse images the LPL may normally appear to lack echogenicity, and the size and shape changes at the insertion on T4. The LPL narrows at T4, widens just distal to T4, and then narrows again before inserting on MtIV (longitudinal scan). Distally in zone 1B (14-cm distal to the POH), the LPL is thick in the plantar-to-dorsal direction. A midline image would show the SDFT and DDFT, but at this level, a plantarolateral transducer placement is needed to assess the LPL. In the longitudinal image, the LPL is seen attaching to T4 proximally and MtIV distally.

Included in the study were 110 horses examined at the George D. Widener Hospital (32 horses) and Randall Veterinary Hospital (78 horses). There were 72 Standardbred racehorses (STBs), 15 Thoroughbred racehorses (TBs), and 23 non-racehorse sport horses, including 6 western performance horses, 6 field or show hunters, 4 jumpers, 2 event horses, 2 gaited horses, 2 of unknown use, and 1 dressage horse. Racehorses (STBs and TBs) comprised 79% of the study group, and within racehorses, 83% were STBs. Mean and median ages (range, 1–13 yr) were 3.4 and 3.0 yr, respectively. There were 37 late yearlings or 2-yr-old horses, of which 32 were STBs; 24 of these 32 STBs were examined before or near the time of a qualifying race. There were 24 intact males, 35 females, and 51 geldings. No sex predilection was found. Curb occurred in the left hindlimb (LH) (60 horses), right hindlimb (RH) (37 horses), and bilaterally (13 horses). Of the 13 horses with bilateral curb, 11 were STBs. Within STBs, there were 61 pacers and 11 trotters compared with an expected population (ratio of pacers:trotters is approximately 3:1) of 54 pacers:18 trotters. Curb was thought to be caused by excessive stress or strain from race training (80 horses), direct trauma (11 horses), previous injection (3 horses), associated injuries (3 horses), and an apparent “bad step” or unknown cause (13 horses). The most common reported form of direct trauma

was stall or wall kicking. Curb was the primary reason for admission and examination in 94 horses, a compensatory lameness issue in 10 horses, and an associated injury with other tarsal injury or ipsilateral hindlimb lameness in 6 horses.

Sixty-three horses were observed to be lame, and while lameness score was not always recorded, those that were ranged from 1 to 2 out of 5. Horses with long plantar desmitis, those with SDF tendonitis extending distally into zone 2, those with DDF tendonitis, or those with combined soft tissue injuries exhibited most pronounced lameness. Swelling was most pronounced in horses with recent or combined soft tissue injury or in those with hematoma or abscess formation in PT/PL tissue. Swelling was described as fibrous in many horses, particularly STBs in which curb was chronic, or in horses in which previous management included cryotherapy, topical counterirritation, or thermocautery.

Ultrasonographic diagnosis included PT/PL swelling without evidence of injury to the SDFT, DDFT, and LPL (29 horses) (Fig. 2), PT/PL swelling primarily consisting of hematoma (6 horses), PT/PL swelling primarily consisting of abscess formation (5 horses), PT/PL swelling with SDF tendonitis (32 horses) (Fig. 3), long plantar desmitis alone (5 horses), long plantar desmitis and PL swelling (25 horses) (Fig. 4), DDF tendonitis (5 horses), and combination soft tissue injury of the LPL and PT/PL tissue and gastrocnemius (2 horses) and tarsocrural collateral desmitis (1 horse). In summary, 40 horses with curb (36%) had PT/PL swelling without underlying soft tissue injury, and 32 (29%) had PT/PL swelling and SDF tendonitis. Only 33 horses (30%) had evidence of LPL injury. Of 23 non-racehorse sport horses, 12 (52%) had injury of the LPL, 9 (39%) had PT/PL injury, and 2 (9%) had SDT tendonitis. Of 10 horses in which curb was thought to be compensatory, 6 (60%) had PT/PL injury, 3 (30%) had SDF tendonitis, and 1 (10%) had LPL injury.

Management and assessment of outcome were inconsistent and difficult to retrieve. There was a tendency for clinicians to manage horses with curb that were not lame or those in which curb was a compensatory issue with subcutaneous injections of a corticosteroid-containing solution combined with a brief period of rest. Horses in which curb caused lameness were generally managed with rest and non-steroidal anti-inflammatory drugs, but cryotherapy and topical counterirritation were also recommended or performed. Horses with severe SDF tendonitis, long plantar desmitis, DDF tendonitis, or combined soft tissue injury received long-term rest (>3 mo) and controlled return to exercise, but they were the most likely group to do poorly or to remain lame. Five horses with PT/PL swelling and abscessation underwent surgical drainage and were given appropriate anti-microbial agents; these horses returned to the previous level of exercise. Associated ipsilateral lameness included osteoarthritis of the



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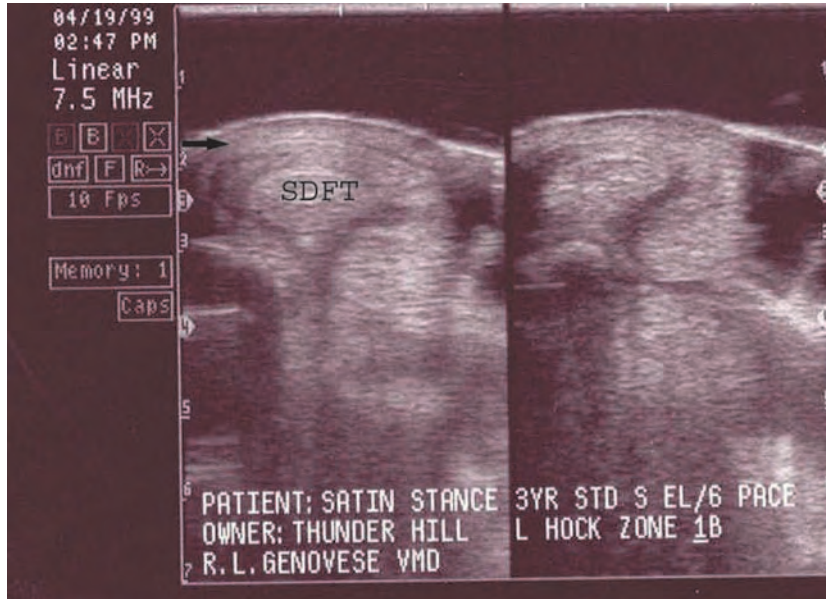


Fig. 2. Midline (left) and plantaromedial (right) transverse ultrasonographic images in zone 1B in a 3-yr-old Standardbred, showing marked peritendinous inflammation (arrow) plantar to the superficial digital flexor tendon (SDFT), a common finding in horses with curb.

tarsometatarsal and centrodistal (distal intertarsal) joints (two horses) and metatarsophalangeal joint lameness (two horses).

4. Discussion

Curb is a collection of plantar tarsal soft tissue injuries and not simply long plantar desmitis as has been previously supposed.<sup>1-3</sup> In fact, only 30% of horses in this study had injury of the LPL. Horses

with distal, plantar tarsal soft tissue swelling are more likely to have swelling and injury of PT/PL tissue and/or the SDFT than injury of the LPL. Horses with curb may have injury restricted to subcutaneous tissues, tendonitis of the SDFT or DDF, long plantar desmitis, or combination injury, making ultrasonographic evaluation critical in establishing correct diagnosis. Whereas not directly studied, useful information regarding CSA can be

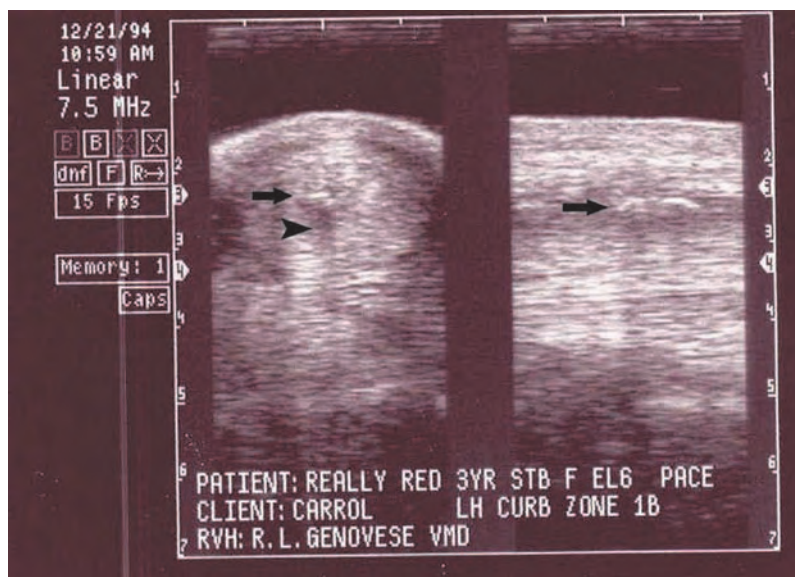


Fig. 3. Transverse (left) and longitudinal (right) ultrasonographic images in zone 1B in a 3-yr-old Standardbred with curb, as the result of peritendinous inflammation and superficial digital flexor tendonitis. The SDFT is enlarged and there is a central hypoechoic lesion (arrow head), calcification (arrows), and thickened peritendinous tissue.

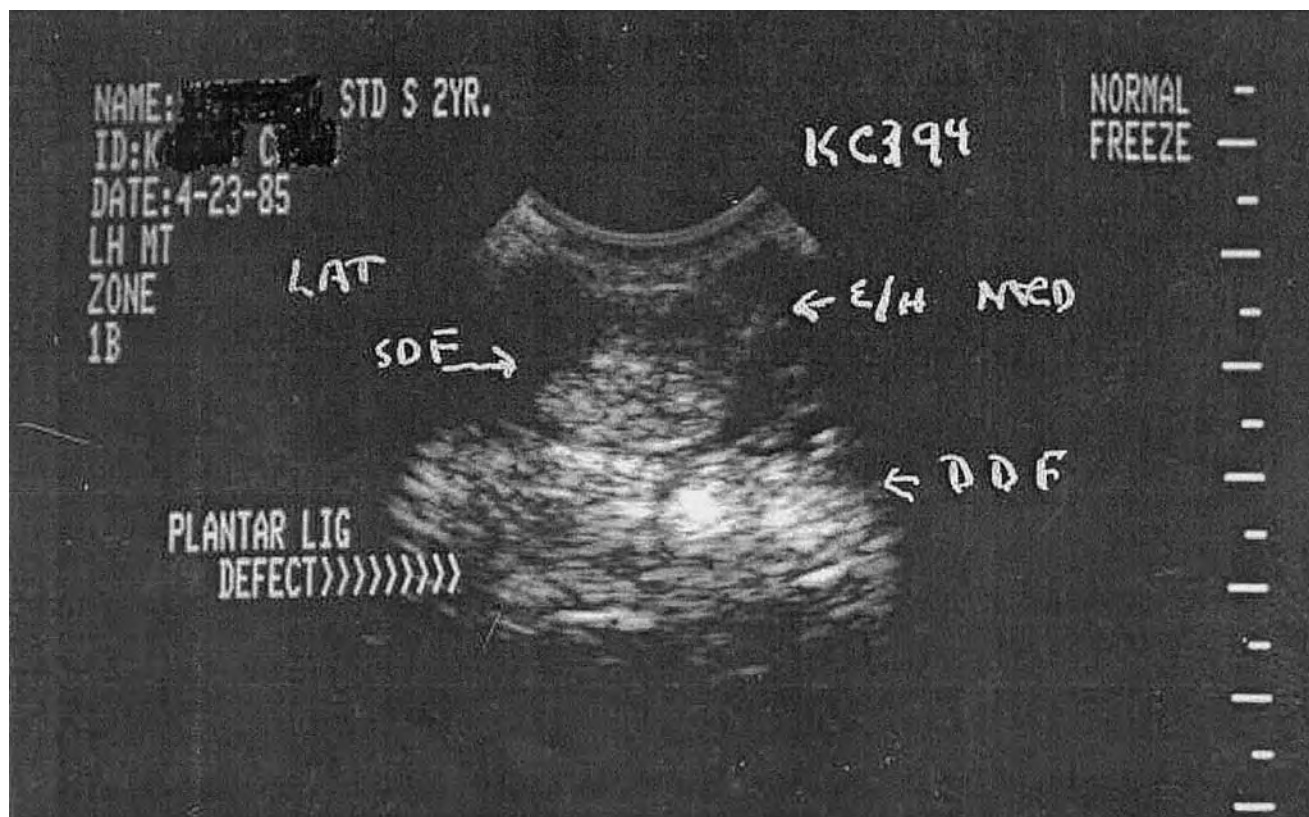


Fig. 4. Transverse ultrasonographic image of the left plantar tarsal region (zone 1B), showing marked peritendinous and periligamentous inflammation (E/H), normal superficial digital flexor (SDF), and deep digital flexor (DDF) tendons, and enlargement and tearing of the long plantar ligament (plantar ligament defect).

obtained by comparing the affected with the contralateral limb, and we suggest this procedure be done routinely. Common forms of SDF tendonitis and long plantar desmitis were often associated with increased CSA measurements rather than by frank fiber tearing and hypoechoic lesions. Adequate ultrasonographic examination requires patience and experience and should include plantarolateral and plantaromedial images as well as those obtained from the plantar midline. Whereas curb remains a useful term to describe the clinical appearance of swelling in the distal, plantar tarsus, curb or "true curb" should not be used synonymously with long plantar desmitis without ultrasonographic confirmation.

Curb is primarily an injury of racehorses but does occur in non-racehorse sport horses. Within racehorses, the STB is predisposed. Gait differences between the STB and TB may account for predisposition, but conformation may play a role. Sickie hock conformation, a condition that was not directly studied here, is more prevalent in the STB breed and seems to predispose horses to the development of curb. Sickie hock conformation may increase abnormal forces in the distal, plantar aspect of the tarsus, causing curb and distal hock joint pain. Interestingly, curb develops frequently in STBs that train and race on a thin, near-hard surface, contrary

to many soft tissue injuries that are the result of work on deep surfaces. Clinical signs developed early in racehorses, even in STBs that were jogging but not formally trained. In some horses, clinical signs were recurrent or progressive, and the development of clinical signs early in training supports a theory that curb develops primarily as a result of overload injury of the plantar tarsal structures. Overload or excessive strain of plantar soft tissue structures would be exacerbated in horses with sickie hock conformation. It is possible that progressive injury of soft tissue structures occurs in a roughly plantar to dorsal direction, because the most common injury seen was PT/PL swelling, and this injury was most common in young racehorses. Furthermore, SDF tendonitis was not seen in horses without PT swelling, a finding suggesting that PT swelling may have preceded SDF tendonitis. Unlike when SDF tendonitis occurs in the forelimb, horses with curb as a result of mild SDF tendonitis seem to be able to train and race successfully with only high-speed lameness or no lameness at all, because some horses in this study had lesions of the SDF without lameness. Only when SDF tendonitis became substantial or extended into zone 2 in the proximal metatarsal region did lameness become pronounced, and in some horses, when this

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occurred, the POH was noticeably dropped. Lameness seemed to be more likely if the LPL and DDFT were injured, or LPL injury accompanied other soft tissue injury such as gastrocnemius tendonitis.

Based on this study, curb is not necessarily a self-limiting problem, and while it can be a compensatory lameness issue, it is a common primary cause of lameness. Horses are more likely to be lame if tendon or ligament damage was seen, but lameness can also result from PT/PL inflammation. Non-racehorse sport horses seem more likely to be lame as a result of curb and to be prone to injury of the LPL. Etiology may be different than that in racehorses because direct trauma was a common etiology in non-racehorse sport horses.

Curb seemed to be more common in the LH than in the RH. Counterclockwise training and racing may stress plantar tarsal soft tissue structures, but in many horses, particularly STBs, LH curb was diagnosed when horses were still being jogged primarily in a clockwise direction and before fast training ensued. Perhaps many slow jogging miles in a clockwise direction, in which the LH is on the outside, may stress plantar tarsal soft tissue structures and predispose the LH in STBs to curb. Bilateral curb occurs primarily in the STBs and may be most common in horses with faulty (sickle hock) conformation. Within STBs, curb was more common in pacers than in trotters even when normal distribution was considered. Difference in gait dynamics or conformation may play a role.

Unfortunately, information regarding management protocols could not be precisely established. Horses with curb as a result of PT/PL inflammation are less likely to be lame unless a large hematoma or abscess is present, and they usually do not require extensive rest; this form of curb seems amenable to

subcutaneous injections or cryotherapy. A combination of methylprednisolone acetate (100 mg) or triamcinolone acetonide (9–12 mg) and Sarapin<sup>R</sup> (20–30 ml) injected subcutaneously along the lateral, plantar, and medial aspect seems effective in horses with PT/PL inflammation. It is often necessary to repeat the injection within 2–4 wk. Horses are often given 7–10 days of light jogging or hand walking before returning to training. Horses with substantial SDF tendonitis or long plantar desmitis are more likely to be lame as a result of the injury and require rest, non-steroidal anti-inflammatory medication, and in many instances, thermocautery. In these horses, rest is most important, but strict recommendations of amount of time off are made based on knowledge of exercise level, structure injured, and degree of injury, and on the ability to re-examine the horse clinically and ultrasonographically during convalescence. Lameness is the most important clinical finding prompting the recommendation of rest or a decrease in exercise intensity. If curb is compensatory, the primary lameness problem must be managed to mitigate the effects of excess loading in the affected hindlimb.

## References and Footnote

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