Bowker: Navicular Issues Begin Earlier Than We Think

Initiating rehab methods earlier might promote healthier foot structures and reverse tissue degeneration.

Posted by Stephanie L. Church, Editorial Director | Nov 20, 2019 | 2019 NEAEP Symposium, Article, Hoof Care, Hoof Problems, Horse Care, Navicular Problems, Sports Medicine

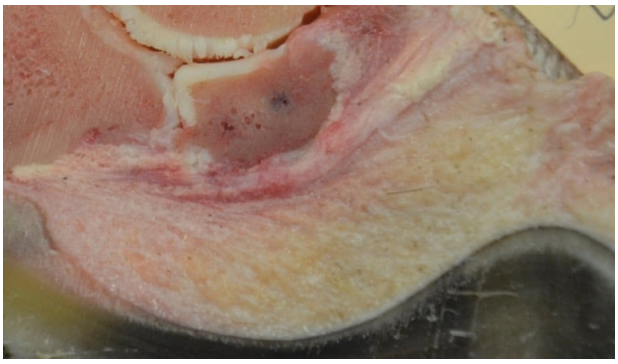

Figure 1: Foot section of navicular-syndrome-affected horse showing an adhesion between the navicular bone and the deep digital flexor tendon. Damage is also present within the tendon, impar ligament, and frog and digital cushion. | Photo: Courtesy Dr. Robert Bowker

"To me, navicular (syndrome) is a man-made thing," said Robert Bowker, VMD, PhD, longtime podiatry researcher and former professor and head of the Equine Foot Laboratory at Michigan State University's College of Veterinary Medicine, in East Lansing. He believes incorrect trimming and shoeing methods, along with other environmental factors, lead to early damage to the frog and digital cushion in the rear of horses' feet, both of which are designed to protect this area of the foot and the navicular bone therein.

Bowker spoke to veterinarians and farriers about his perspectives on and solutions to navicular problems at the 11th annual Northeast Association of Equine Practitioners (NEAEP) symposium, held Sept. 25-28 in Saratoga Springs, New York.

Veterinarians usually diagnose navicular syndrome (also known as podotrochlosis) based on bilateral forelimb lameness confirmed with digital nerve blocks and/or with radiographic evidence of damage to the navicular apparatus. But in these horses Bowker believes damage occurs in different areas of the foot long before it's apparent on radiographs.

Figure 1 shows a cut foot section of a horse with advanced foot pathologies associated with navicular syndrome.

"Rather than thinking of navicular disease as a focal lesion site only associated with the navicular apparatus," he said, "I find a collection of damaged sites present beyond the navicular apparatus that exists in many active horses older than 3 years of age and in all navicular-syndrome-diagnosed horses." (See Figure 1.)

Because he's found damage to the fascia (connective tissue around muscles), nerves, and vasculature (blood vessels) in these non-navicular areas of the frog, digital cushion, and dermal tissues, Bowker believes it might—and probably does—contribute to the clinical signs.

He holds that this damage and degeneration is the earliest evidence of navicular syndrome in the horse's foot and will progress through "many tissues of the entire foot until the damage will culminate in the well-known and often-reported degenerative signs in the tissues associated with the navicular apparatus," he said.

"Early damage to these other tissue areas can also lead to clinical signs of forelimb lameness in the horse even without radiographic evidence," he said. "Retrospective evaluations of feet using other modalities (such as ultrasonography and MRI) and histological examination of foot tissues revealed varying damage to many tissue elements of caudal (rear) foot and within the dermis ventral to (underneath) the coffin bone.

"I see degenerative changes," he continued, "in the frog, digital cushion, and even in the

dermal tissues under the coffin bone in different cases. I believe the caudal foot, including the frog and digital cushion, is one of the initial areas affected to undergo degenerative tissue changes, which can then radiate through other foot areas to progress toward the navicular apparatus."

Bowker said he has also observed that horses' coffin bones can begin to elongate and remodel at a very early age. (He's seen evidence in 3-year-old racehorses, Figure 2). He believes that typical trimming techniques have encouraged horses' hoof wall at the toes to get longer, along with causing the frog and digital cushion to atrophy.

Figure 2. Cut midline section of 3-year-old racehorse showing the long toe and underrun heel conformation. By having a perpendicular line from the short pastern bone (P2) to the ground surface, many hoof care professionals believe the front part (this line to the toe) of the foot should be equal to the rear portion (the perpendicular line to the heels at ground contact), creating a 50:50 ratio. In this foot the ratio is closer to 70:30. This long toe, underrun heel conformation results in internal damage of the frog and digital cushion, as well as other areas. | Photo: Courtesy Dr. Robert Bowker

"The long hoof at the toe in turn promotes the elongation of the actual coffin bone over time," he said. "Together these changes will alter the impact loadings and biomechanics of the feet."

He said this change and remodeling of the coffin bone is usually gradual, as the soft tissues and bones within the foot adapt to the altered loads.

Bowker explained that in comparisons of morphological features of nearly 40 bones of 3-year-old Quarter Horse cadaver distal limbs, little variation occurred among them, which he said indicates a homogeneous population in terms of their anatomical features.

"However, as the horses age and begin to be trimmed by different farriers on a regular basis, the … hoof and internal bone structures began to change morphologically," he said, likely because of varying trimming, shoeing, and training methods.

"The horse's foot is very adaptable to the many subtleties in the trimming methods, including the trimming frequencies, shoes or barefoot, shoe types, which part of the hoof wall is trimmed, extent of a toe bevel or not, etc.," he said. "Most trimming methods will usually result in a long hoof wall at the toe, a broken-back hoof-pastern axis (when the pastern is more upright than the toe), an atrophied frog, and underrun heels (Figure 3), to name only a few."

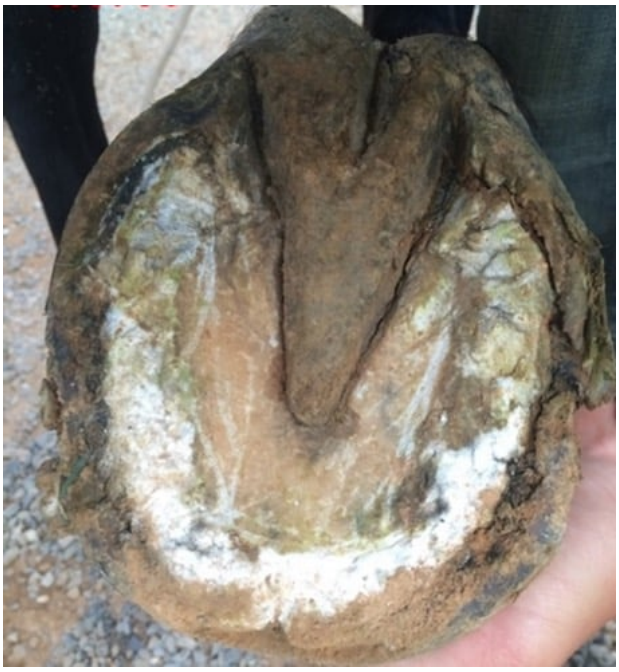

Figure 3 shows the solar foot of horse with navicular syndrome. The toes are long, as well. The heels are underrun, along with a narrow frog and the central sulcus is through the heel bulbs. | Photo: Courtesy Dr. Robert Bowker

Such foot changes, he said, can accentuate "vibrational and shearing" forces on the foot and pastern as the biomechanics within the digit and foot undergo changes because of our trimming practices.

"The inner structures have also adapted and responded to the loading forces upon the foot," he said. "Tissues of the deep digital flexor tendon and the caudal foot usually will have early detectable damage and degeneration prior to that within the navicular bone (Figure 1)."

Ultimately, Bowker said, this altered loading through vibratory concussions in the rear part of the foot compromise the integrity of the usually supportive and energy-dissipating frog and digital cushion. "This degenerative damage to these caudal foot tissues, including the lateral cartilaginous tissues, reduces their physiological abilities to function properly and protect the navicular apparatus," he said.

"I used to think (navicular) horses never had a chance to develop a good foot, but it dawned on me these tissues of the frog, digital cushion, and even the lateral cartilages of young horses are in a progressive state of degeneration until the navicular apparatus is finally involved due to our husbandry practices," he added. "Pathologies with this disease are not like a light switch. They're going to be progressive, and they're eventually going to tip the cart over."

The Solution

Because Bowker maintains that hoof care and management cause horses' navicular problems, he posed that we can also prevent and even reverse them in some cases. Prevention starts with proper hoof trimming. He recommended keeping the toes short and bringing the heels back, along with minimal to no trimming of the sole and frog (Figure 4). "Both farriers and veterinarians agreed to such a trim back in the late 1800s," he said. "Keeping the toes short enough will require more frequent trimmings, especially during the warmer months when growth is more rapid, i.e., at three- to four- and maybe five-week intervals."

Bowker also recommended periodically trimming inside the white line by rasping through portions of it from the solar side of the foot—something that will probably cause many hoof professionals to balk, he said, because they avoid trimming inside the white line.

"A lot of people think the wall is a major loading structure—I don't think this way," he said. "You have to go (trim) inside the white line to get the toe back. If you just trim it at the edge of the hoof wall, the toe is going to gradually continue to get longer."

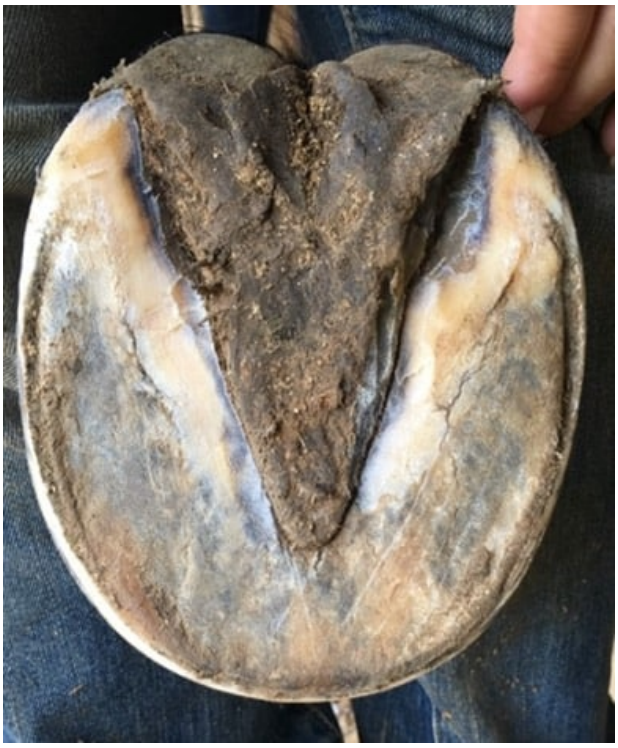

Figure 4 shows the same foot as in Figure 3 after proper trimming of shortening the toe and backing up the heels without trimming the frog and sole of the foot. This foot is the result of trimming frequently (one to two times per week) until the foot was under the front leg of the horse (trimming period in this case occurred over a six- to seven-month period. | Photo: iStock

Bowker listed potential factors he believes might contribute to horses having long-term soundness:

1. Short toes;
2. Healthy, untrimmed frog (it needs to be doing more than just occupying space);
3. Dense coffin bone;
4. High vascularity to frog and tissues beneath it and the sole; and
5. Thick lateral cartilages and fascial sheets within the frog.

"Navicular syndrome has no specific pathology," he said. "There's nothing that's diagnostic … there's so much pathology that occurs with it … and they eventually get to the point where there's clinical signs. But the treatment is all the same, i.e., short toes, heels backed up, and frog slightly making ground contact."