Imaging

ERICA LARSON

MRI for Localized Lameness Diagnosis

Your performance horse is lame, and while your veterinarian has narrowed the problem down to the animal's fetlock, no abnormalities are visible on radiographs (X rays). Magnetic resonance imaging (MRI) has long been used as a diagnostic tool for lameness and performance issues, and your veterinarian says it's an option. Could MRI help uncover something in the fetlock that radiographs couldn't? According to one research team, it's likely.

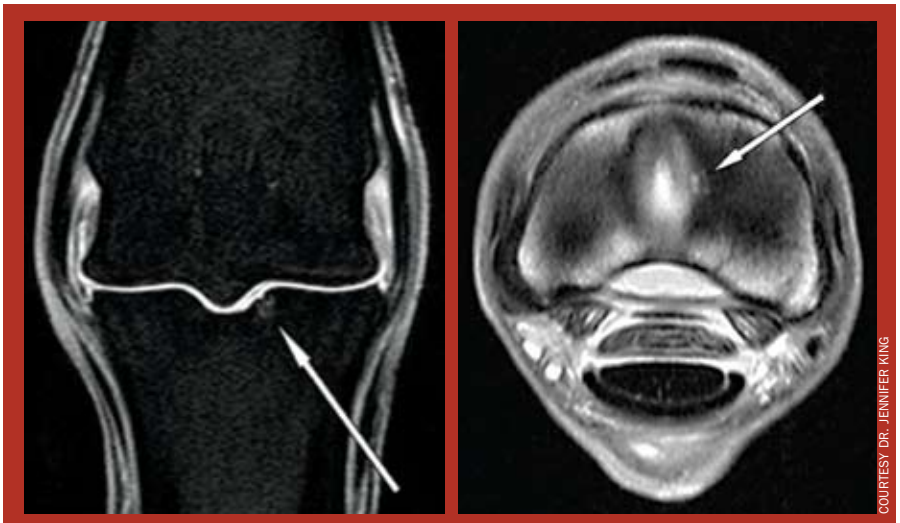
Jennifer King, DVM, a former equine orthopedic sports medicine fellow at the Washington State University Department of Veterinary Clinical Sciences, and colleagues completed a retrospective study on MRI findings in localized lameness cases.

"Recently results were compiled from a group of horses (that underwent an MRI procedure either) at Washington State University from 1997 to 2009 or Oakridge Equine Hospital in Edmond, Okla., from 2004 to 2009," King explained.

King et al. reviewed records of 244 horses with lameness localized to the fetlock using clinical signs or local diagnostic anesthesia (nerve blocks). Each horse underwent MRI examination so the clinicians could determine a definitive diagnosis. King also noted each horse's breed and riding discipline.

Key findings included:

- The most common injuries diagnosed on MRI were oblique distal sesamoidean ligament injuries (31%; the distal sesamoidean ligaments include four ligaments—straight, paired oblique, paired cruciate, and paired short distal sesamoidean ligaments—that comprise the distal suspensory apparatus), bone and cartilage injuries (23%), and straight distal sesamoidean ligament injuries (21%);
- Straight distal sesamoidean ligament injuries were more commonly diagnosed in Warmbloods than in Quarter Horses or Thoroughbreds, while bone and cartilage injuries were least common in Warmbloods;
- Straight distal sesamoidean ligament injuries were most commonly seen in dressage horses;
- Fractures and bone and cartilage injuries were more commonly observed in Thoroughbreds than in Quarter Horses or Warmbloods;
- Deep digital flexor tendon injuries were detected more commonly in Quarter Horses than in Warmbloods or Thoroughbreds; and
- Fractures were most commonly seen in Thoroughbred racehorses.



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The arrows on these MRIs show a defect in the articular cartilage and subchondral bone on P1 (the long pastern) in the fetlock joint, a defect that was not visible on radiographs. Following diagnosis with MRI, veterinarians performed arthroscopic evaluation and debridement.

So what does this mean for the horse owner? King stressed that MRI is invaluable for diagnosing leg lamenesses correctly, especially considering that a number of injuries might appear similar to one another clinically (during lameness exam).

"It is also important to mention that there was a group of horses not included in the study that had abnormalities on radiographs and additional injuries were observed on MRI," she noted, which indicated that in some cases MRI, when used in conjunction with radiographs, can allow visualization of more injuries or abnormalities than can radiographs alone.

"The wide variety of abnormalities observed points out the value of MRI for making an accurate diagnosis in performance horses with lameness localized to the fetlock region," she concluded. "A correct diagnosis means that we can offer treatment options that address those issues."

When to Choose MRI Although MRI might seem like a costly option that could be avoided, King advised that owners consider it sooner rather than later when trying to pinpoint a difficult lameness.

"MRI is currently the best option for imaging bone and soft tissue injuries once the lameness has been localized," she explained. "While some people choose to wait until they are at 'wit's end' to pursue MRI—either because they waited due to financial constraints or the option of MRI was not offered to them—there can be significant disadvantages at this point."

"Horse owners may have spent well over the cost of an MRI (typically around $2,000, depending upon what part of the country the horse resides in, she estimated) on other diagnostic imaging modalities

or treatments that were aimed at a diagnosis that was not accurate," King continued. "Furthermore, acute injuries may be chronic at this point, thereby decreasing the effectiveness of treatments and perhaps decreasing the prognosis depending on the injury."

While MRIs were previously limited to a few select facilities throughout the country, King noted that now there are several traveling MRI units that allow U.S. horse owners and veterinarians in most geographic regions access to this technology.

"If your horse's lameness has been localized to a region and does not have a definitive diagnosis, you should ask your veterinarian about MRI," King concluded. "An accurate diagnosis is the first step in developing a specific treatment plan and getting a horse back into performance."

MRI to Detect Wobbler Syndrome?

In most cases—if not all—a clearer picture is better. One would be hard-pressed to find a person who would walk into a store and ask for a television with a fuzzy picture. So when it comes to disease diagnosis, such as that for cervical stenotic myelopathy (CSM, also known as cervical vertebral stenotic myelopathy), it would seem that a clearer picture revealing more information would be beneficial.

Jennifer Janes, DVM, of the University of Kentucky, presented a study supporting the use of magnetic resonance imaging (MRI) in diagnosing spinal cord compression and CSM (more commonly known as wobbler syndrome).

Spinal cord compression due to misaligned or malformed cervical (neck) vertebrae damages spinal cord nerves responsible for the horse being able to sense the position of his limbs. This leads to clumsines, incoordination (especially in the hind limbs), and the distinctive "wobble."

Traditionally, CSM has been diagnosed via standing cervical radiographs and/or a myelogram in association with clinical history and neurologic deficits on physical exam. But while standing cervical radiographs and myelography can detect narrowing of the vertebral canal, they limit visualization of the spinal canal to two dimensions from the side.

Conversely, MRI allows for spinal canal assessment in three dimensions, as well as an evaluation of both soft tissue and bone structures, Janes noted.

To compare the efficacy of current diagnostic imaging techniques with the potential effectiveness of MRI in confirming spinal cord compression, Janes et al. studied 20 Thoroughbred horses with CSM ranging in age from 6 months to about 4 years, and nine control horses ranging in age from 6 months to about 5 ½ years old.

All of the horses underwent a neurologic examination and standing cervical radiographs. The researchers calculated sagittal (i.e., space from front to back) ratios from the third to seventh cervical vertebrae (C3 to C7) on the radiographs. Postmortem, they scanned each horse's intact cervical column using an MRI unit. Finally, the team performed a histologic examination of each spinal cord to definitively localize compression sites.

After reviewing the results, Janes con-

cluded that "MRI, with its ability to visualize the vertebral anatomy in three dimensions, allows for valuable additional measurements of the vertebral canal. For example, vertebral canal area and circumference among other parameters can be evaluated at each cervical vertebral joint. Specifically, canal area was found to more accurately identify sites of compression in CSM horses."

Janes noted, of course, that today's MRI machines are not yet large enough to evaluate the entire length of cervical columns in live adult horses (antemortem). "However, when this technical issue is resolved, the ability to image vertebrae in multiple axes will substantially enhance evaluation of CSM patients," she concluded.

Starry Sky Ultrasound Pattern: A Review

Although one of Vincent van Gogh's most famous paintings, Starry Night, might have a peaceful and familiar air to it, the starry sky pattern seen on some equine hepatic (liver) ultrasounds is everything but van Gogh. It's more obscure and less preferred because it often points to a horse health problem.

To help equine practitioners gain a better understanding of this uncommon finding, Kelly Carlson, DVM, Dipl. ACVIM, presented a review of this pattern and associated findings.

"The starry sky pattern is an unusual and dramatic ultrasonographic appearance of the equine liver characterized by numerous small hyperechoic foci (white spots), some of which cast an acoustic shadow," explained Carlson, of Rood & Riddle Equine Hospital, in Lexington, Ky.

In their retrospective review, Carlson and her colleagues aimed to better characterize all aspects of the ultrasonographic pattern. They reviewed the case records and ultrasonographic images of 18 adult horses (of mixed ages and breeds) in which the starry sky pattern was found.

Key findings included:

- Weight loss and anorexia were the most common associated clinical signs;
- The size of the liver and the echogenicity (solid matter visible as white; fluid appears black) were normal in most horses;
- The patterns resulted from hepatic granulomas (chronic inflammatory lesions), of unknown cause; and

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Black found that administering nerve blocks in the digital flexor tendon sheath prior to MRI exams caused excess synovial fluid accumulation in the digital flexor tendon sheath, which could be interpreted as joint swelling.

- Fifteen of the 18 horses evaluated were diagnosed with additional ailments believed to be the primary cause of the clinical signs horses were exhibiting.

"Practitioners should recognize this dramatic ultrasonographic pattern and its association with hepatic granulomas," Carlson concluded, adding that the pattern seems to be associated with an additional disease process in most cases.

Additionally, she noted, a growing body of recent research from Texas A&M University indicates that the hepatic granulomas might be due to infection with *Heterobilharzia americana*. In dogs, raccoons, and other mammals in the Southeast, migration of *H. americana* eggs into the liver results in parasitic granulomas.

More research is needed to further understand the starry sky ultrasound pattern and *H. americana* infection in horses.

Nerve Blocks' Effect on Foot MRIs

Certain things just don't mix: oil and water, or wearing metal during X rays, for instance. But what about diagnostic anesthesia (nerve blocks) and magnetic resonance imaging, a combination that sometimes occurs because a horse undergoes an MRI study soon after nerve blocks (with local anesthesia) in a lameness exam? A team of researchers recently examined whether diagnostic anesthesia could skew the results of equine foot MRIs.

"The effect of diagnostic anesthesia on the interpretation of MRI is unknown," explained Belinda Black, BVMS, a resident at the University of Guelph's Ontario Veterinary College. "Our objective was to determine if mepivacaine injection in the distal (lower) limb would cause variation detectable with MRI."

Black explained that she and colleagues performed a baseline MRI (with horses under general anesthesia) up to six days prior to administering mepivacaine injections in 15 sound adult horses. They injected the local anesthetic into each horse's navicular bursa, digital flexor tendon sheath, or the coffin joint—all textbook areas for nerve blocks. They also performed a palmar digital nerve block in each horse.

The team then repeated the MRI procedure at 24 and 72 hours post-injection. The horses were also under general anesthesia for these MRI procedures.

Key findings from the study included:

- Images taken at 24 and 72 hours post-injection in the coffin joint and the navicular bursa did not differ significantly from pre-injection images;
- Images taken at 24 and 72 hours post-injection in the digital flexor tendon sheath showed a significantly increased amount of synovial fluid in joints than the pre-injection images (this could be interpreted as joint swelling); and
- No changes were noted in the palmar digital nerve block pre- and post-injection images, although needle tracts were often evident from the navicular bursa injection.

Black concluded it remains unclear how long the mepivacaine in the digital flexor tendon sheath will skew results; however, she stressed, it's important for veterinarians to take these findings into consideration during MRI evaluation.

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