

## Standing Magnetic Resonance Imaging (MRI): Use in Diagnosing Equine Lameness

Find out why standing MRI is useful for identifying complex issues in horse hooves and limbs

Your veterinarian already has the ability to localize subtle lameness in your horses: tools to perform effective diagnostic and therapeutic nerve blocking, digital radiographs (X rays), and ultrasound. So why bother considering magnetic resonance imaging (MRI) as well?

Just as physicians use MRI to evaluate human athletes for injury, veterinarians can use it to closely examine an area of concern on a horse and gather invaluable information about injuries that is unobtainable with any other technique or technology.<sup>1</sup>

### WHAT IS AN MRI?

MRI uses a magnet, radio waves, and computer software to produce highly detailed images of body parts without the use of radiation. In equine medicine MRI is particularly valuable for viewing “hard-to-reach” body parts encased in bone or other tissues.<sup>2</sup> For example, veterinarians usually can’t evaluate the soft tissues in the foot using traditional imaging options, such as radiographs and ultrasound.

Recent advances in equine MRI technology now allow veterinarians to recognize many more abnormalities than they could previously.<sup>2</sup> MRI also allows veterinarians to pinpoint the exact anatomic location and nature of injuries that were previously grouped into “syndromes,” such as “navicular syndrome,” to improve treatment options and clinical outcomes.<sup>1</sup>

MRI examinations require little or no patient movement during the scan; thus, veterinarians previously conducted these exams only on horses under general anesthesia. Now practitioners can take MRI images of lightly sedated horses’ limbs because of the advent of certain MRI units and specialized software devoted to digitally “erasing” motion artifacts. These examinations are performed using low-field magnets, which produce lower resolution images than traditional high-field MRI units. The trade-off is that standing MRIs are less risky for horses and less expensive for owners, because a general anesthetic is not necessary.<sup>3</sup>

### MRI OF THE FOOT

The horse’s foot is encased in the horny hoof capsule, which makes diagnosing lesions within it challenging. In addition, foot anatomy is quite complex, with many small but important structures (such as ligaments) capable of causing lameness. With increased MRI use, as well as veterinarians’ improved ability to accurately interpret MRI findings, treatment strategies and clinical outcomes continue to improve. In fact, some specialists believe MRI is the only means by which veterinarians can image all of the structures within the hoof capsule, including the following:<sup>1</sup>

1. **Deep digital flexor tendon (DDFT).** The DDFT runs along the back of the horse’s cannon bone and inserts at the distal phalanx (also known as the “coffin bone,” third phalanx, or P3), which is located within the foot. Due to the DDFT’s length, placement, and job function, injuries to this structure are common. MRI can reveal an injury’s exact location; the severity of



Standing MRI gives an inside look at hoof structures without the horse going under general anesthesia.

the damage to the tendon; whether the abnormality is limited to a single region of the tendon (e.g., a core lesion) rather than a widespread/diffuse disease; and if so-called “sagittal splits” are present. MRI can also detect abrasions, enlargement, and mineralization.

2. **Collateral ligaments.** Collateral ligaments are fibrous structures that connect one bone to another, such as on the inside and outside of each lower-limb joint. An MRI’s sensitivity makes it an excellent tool for assessing these structures in high detail. Additionally, veterinarians can use MRI to evaluate the entire navicular apparatus and small associated structures, including the chondrosesamoidean, chondrocoronal, and distal sesamoidean impar ligaments.<sup>4</sup>

In some cases, veterinarians can also assess the cartilages in the foot, as well as fluid accumulation in the navicular bursa and coffin joint.

### MRI HIGHER IN THE LIMB

Working up from the foot, MRI can help veterinarians evaluate the integrity of the fetlock (ankle), carpus (knee), tarsus (hock), the bones between those joints, and even the stifles in some cases.

As with the foot, veterinarians can use MRI to image a large variety of the equine limb’s soft-tissue structures (primarily tendons and ligaments in and around the joints), as well as the bones themselves. Therefore, they can identify a multitude of distinct lesions.

Some of the most commonly identified changes in the forelimb include suspensory ligament (which originates from the top and back of the cannon bone and continues to the fetlock region) inflammation and concurrent inflammation in the adjacent area of the cannon bone, as well as abnormalities on the carpal bones themselves. Interestingly, veterinarians and researchers note

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HALLMARK VETERINARY IMAGING

This MRI shows a split in the DDFT (arrowed). MRI can show injuries and abnormalities missed using other conventional imaging methods.

Additionally, in cases where lesions identified using radiographs or ultrasound do not explain the severity of the lameness or appear to offer the whole answer, veterinarians can use MRI to check for injuries to related structures. A common example of this is the horse whose navicular bone looks abnormal on X ray, but MRI reveals previously unseen damage to the DDFT. A similar situation occurs when suspensory ligament damage is seen using ultrasound, but the changes in the bony attachment of the ligament are only apparent under MRI examination.

that many injuries they have identified using MRI were located on the medial (middle) aspect of horses' knees and ankles.<sup>5,6</sup>

## MRI'S BENEFIT

MRI is useful in cases when veterinarians are unable to identify the exact cause of lameness using conventional techniques, such as nerve blocks, ultrasound, and radiography. Other subtle lesions, such as small fractures, might go unseen on conventional examination but are readily imaged via MRI.

Gaining a full picture of all the structures involved in a lameness case enables veterinarians to formulate a comprehensive treatment plan that can allow for a faster and more complete resolution of the problem. However, MRI is limited to imaging one area at a time, so the veterinarian will want make sure the location of the lameness (e.g. foot, pastern, fetlock etc.) is well identified to allow the MRI team to focus only on the area of interest, thus reducing the time a horse must spend in the magnet.

## TAKE-HOME MESSAGE

MRI has become a valuable tool for diagnosing various injuries in horses, especially in the foot and distal (lower) limb. Consider using it in lameness cases when more conventional techniques fail to give an exact answer. 🐾

### Key References

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