

The Basics of Magnetic Resonance Imaging in Horses

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Magnetic Resonance Imaging (MRI) is the newest form of diagnostic imaging to be made available for use on horses. There are fewer than 20 referral centers and university hospitals around the country that are able to offer this new technology. MRI is most often used to image the equine foot, pastern and fetlock, however some machines are able to image up to and including the horse's carpus (knee) and tarsus (hock).



Figure 1. Pictures of the Hallmarq® standing MRI unit at Arizona Equine Medical and Surgical Centre.

The MRI machine creates a powerful magnetic field. Radio frequency pulses are produced within this magnetic field that excite the hydrogen atoms within body tissues and these atoms give off energy as they return to their resting state. The machine detects this energy, interprets the signal strength and location and then uses mathematically based computer software to create a black and white image. There are hundreds of images collected during each MRI scan. These images are usually acquired as sequential “slices” in both the longitudinal (sagittal) and the horizontal (transverse) planes. Tissues containing water and fat have the greatest numbers of hydrogen atoms so these will have the greatest signal strength and therefore look the brightest on the resultant image.

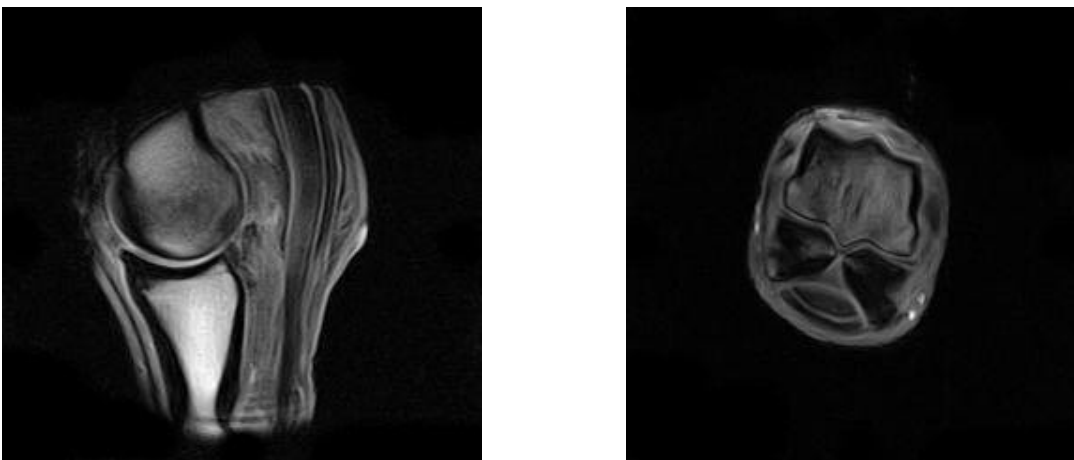


Figure 2. Sagittal and transverse images of the fetlock joint.

Interpreting the images created by an MRI scan is very complicated and requires advanced training in Diagnostic Imaging (usually a Radiologist will read the images). The advantage of MRI is that it can be used to diagnose both soft tissue (tendon and ligament) and bone injuries. An MRI scan is typically not used to locate an unknown or obscure lameness as Nuclear Scintigraphy (bone scan) is often used. The veterinarian must first localize the area responsible for the signs of lameness using nerve blocks, radiographs (x-rays) or other clinical techniques. The MRI is then ordered for, and limited to, the area of suspicion. MRI of the foot and pastern can be performed under standing sedation. If the area of interest is farther up the leg, like the fetlock, hock or knee, then the horse must be placed under general anesthesia and the MRI is performed with the horse lying down.

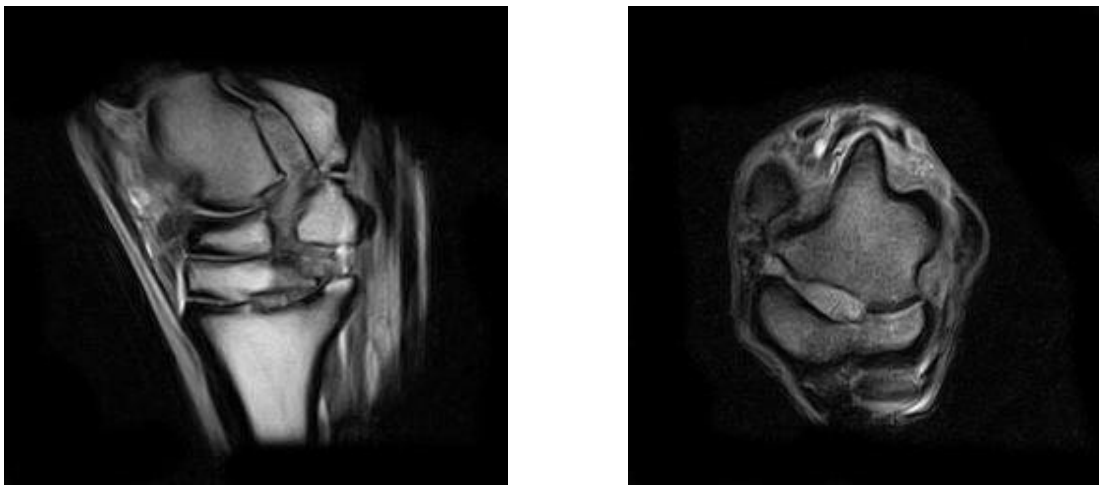


Figure 3. Sagittal and transverse images of the equine tarsus (hock).

MRI is most commonly used for diagnosing soft-tissue injuries in the foot. Some of the conditions that are responsible for “palmar heel pain” often look “normal” on radiographs (which are better for imaging bone) but are in a difficult area to ultrasound (which is commonly used to assess soft tissue injuries). MRI can be extremely helpful in detecting cases of early navicular disease. MRI is also a very good way to diagnose conditions caused by dead bone (osteonecrosis), infection within bone (osteomyelitis), bone bruising and fractures.

MRI is the only imaging modality available to horse owners that can allow the veterinarian to assess all types of tissue (bone, muscle, ligament, tendon, cartilage) in one diagnostic procedure. It is also the most sensitive at detecting abnormalities. MRI, however, is limited to small body parts that will fit into the magnet like the lower leg and sometimes the head and upper neck region.

Resources:

Whitton, Chris, Rachel C. Murray and Sue J. Dyson. “Magnetic Resonance Imaging.” Diagnosis and Management of Lameness in the Horse. Ed. Mike W. Ross and Sue J. Dyson. St. Louis: Elsevier, 2003. 216-222.

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