

## MRIs Are Changing The Face Of Equine Diagnostics

*A tool that used to be associated with human medicine is making inroads in treating equine patients as well.*

Jessica R. Smith

When one hears the acronym MRI, it's usually in conjunction with human medicine. But magnetic resonance imaging, commonly known as an MRI, is no longer just for people. Veterinarians are receiving the opportunity to employ this valuable tool on animals, including horses, and they're thrilled with the results.

The MRI is a valuable tool in the human medical field, used to detect health problems and injuries. And MRIs are extremely valuable to view internal organs for the diagnosis of cancer and other diseases, as well as musculo-skeletal diagnosis.

While these scanners are exorbitantly expensive to purchase and maintain, more veterinary hospitals are making the investment, and veterinarians are exploring this option as a significant and useful tool to diagnose sport horse illnesses and injuries.

Currently, the same MRI scanners used on humans can only be used from the knees and hocks down on an average sized horse. However, advances in the medical field are aiding MRI manufacturers in producing a machine large enough to perform routine MRIs on horses.

Large research universities such as Virginia-Maryland College of Veterinary

**Dr. Susan Johns positions the patient's leg for the scan.**

**The MRI magnet, seen around the right hoof, can be positioned around the leg at the site to be scanned.**

Medicine, Texas A&M University and Colorado State University have obtained or are in the process of obtaining MRI units.



### ► Magnets At Work

Magnetic resonance imaging uses the body's natural magnetic properties to produce detailed images of fluids, bones and tissues. The MRI signal varies amongst tissues due to the differences in proton



(Tricia Booker Photo)

density and the status of chemically bonded molecular water. Injuries to bone and soft tissue can manifest by an increase in water content. Therefore, the MRI, which is fluid sensitive, is a great test for detection.

The MRI works by exposing the scanned area to pulses of radio waves. While in the magnetic field, tissues then emit energy in the form of radio waves that are detected to create the image on the computer screen. So, MRI units have to be shielded against radio waves that could pose outside interference.

The strength of a magnet is measured in Gauss. And the magnetic field used with an MRI is in excess of 10,000 Gauss, whereas the Earth's magnetic field is less than 10 Gauss.

An MRI is able to dissect multiple planes within an object, which is especially significant when diagnosing problems within an organ.

The first MRI system designed for use in horses weighs approximately 2,000 pounds and is only available to licensed veterinarians. The technology differs from the standard MRI used on humans in that an open magnet is used to analyze the tissues in standing, sedated horses.

Nathaniel White DVM, Theodora Ayer Randolph Professor of Surgery and interim director of the Marion DuPont Scott Equine Medical Center in Leesburg, Va., has first-hand experience using MRI on horses. White received training at Washington State University in evaluating common lameness using MRI.

"The MRI unit at the EMC, located at Morven Park, is an open magnet, which allows the horse to have MR images made without requiring general anesthesia," said White. "All horses must be sedated prior to being walked into position for the MRI. Once in position, the magnet [which is on a movable gantry] is moved up or down and around the part of the leg to be scanned. The magnet makes very little noise compared to the large electromagnets used for people."

White explains that at least two or three people are needed on hand to perform an MRI study.

"One person runs the computer, which acquires the images. One person, which may be the owner or handler, holds the horse's head—and one helps to position the limbs and a coil which goes

**The Marion duPont Scott Equine Medical Center's Magnetic Resonance Imaging (MRI) system is the first for horses located in the Eastern United States.**

around the part to be examined," explained White.

### ► Hoofing It

Due to the hoof's close association of structures and complex anatomy, the horse's foot is the most difficult area to examine with radiographs, ultrasound or scintigraphy.

White sings the praises of the various uses the MRI will contribute to equine veterinary medicine.

"The MRI, because it can detect these structures in three dimensions, will allow for specific diagnosis for foot problems including tendon, ligament and bone problems," said White. "Damage to the hoof and lamina between the hoof and bone can also be evaluated with better detail than before."

It's because of the advent of using MRIs on horses, that the detection of DDFT (deep distal flexor tendon) lesions in the hoof have become reliably diagnosed.

Navicular disease, or caudal heel syndrome, is one area that's benefited greatly from the technological advances that come with using MRIs on horses. Veterinarians have learned that a wide variety of tissues other than the navicular bone can be involved in creating pain in the heel region. Before the use of this type of equipment, owners and veterinarians may have been quick to simply diagnose the problem as navicular. The MRI visualizes soft tissue structures inside the hoof, a great advance over radiographs, which present many limitations in what can be viewed.

Despite the number of navicular cases among horses, veterinarians still have limited understanding of the disease. Veterinarians believe that there are many things that can go wrong in the hoof that can result in symptoms similar to navicular.

It's common for farriers and veterinarians to use hoof testers over the heels and middle third of the frog to detect navicular. However, MRIs are finding that DDF tendonitis, bursitis and desmitis also test positive with hoof testers in the same area.

MRI findings are helping veterinarians to consider new theories about navicular and are revealing some trends. For example, it's an old theory that navicular disease starts as a bursitis and progresses into the bone. The observation found with an MRI doesn't support this theory. Instead, MRI results have shown many horses that have problems in their navicular



(Tricia Booker Photo)

bone may not have any issues in their navicular bursa.

Using MRI can also help veterinarians target the exact problems and decide whether or not the problem is navicular-related. Early MRI findings have shown that horses with navicular can have more than one predisposing

condition that's caused the disease. The problems diagnosed with MRI support treatment by injecting hyaluronic acid and cortisone into the navicular bursa. MRIs will allow veterinarians to diagnose the specific structure associated with the disease with more confidence.

It's predicted that MRI will become the

## Rewriting Diagnostic Capabilities

Kent Allen DVM, of Virginia Equine Imaging in Middleburg, Va., a leader in diagnostic imaging in the horse, has been using the MRI machine at the Marion DuPont Scott Equine Medical Center in Leesburg, Va., since last spring. Allen studied MRI at Washington State under Robert Schneider DVM; Schneider and Russ Tucker have pioneered MRI on horses in the United States.

Allen's practice shares use of the MRI at the Equine Medical Center. "Virginia Equine Imaging uses the machine two days a week, and the EMC faculty uses it three days," said Allen. "This is a great partnership between a private practice and a university veterinary hospital."

The MRI at Morven Park is an open magnet used for standing horses. Even though the standing machine has a lower Tesla (resolution) rating, the horse only has to be lightly sedated during the imaging.

Allen explained two case studies involving the use of MRIs.

The first was with a Thoroughbred show hunter who was chronically lame. The horse radiographed and ultrasounded normal, yet it repeatedly blocked sound in the heel. This perplexed the owners, so they had an MRI performed by Allen. The MRI turned up normal. There were no structures damaged. So what was wrong with the horse? All it took to make the horse sound was a simple change in shoeing.

"The MRI made the owners happy because it was found that there was nothing wrong with their horse," said Allen.

The second case didn't end as happily. A warmblood dressage horse had a lot of diagnostic work done—radiographs, nuclear scintigraphy and blocking. When Allen performed the MRI, significant pathologies were found. There was a combination of problems involving the navicular bone, flexor tendon and impar ligament.

"Once these problems are identified, we can further direct shockwave therapy, give a better diagnosis, tell the owners a better way to rehab, or the need to give up on an animal," explained Allen.

Allen talked about the benefits of the MRI in the future. "We're going to rewrite our diagnostic capabilities in the foot. It will change what we think, just like how palpating tendons changed after the use of ultrasounds," said Allen. "We will break new ground on what goes on in the foot, then the fetlock and further up the leg."

preferred imaging technique for horses with a clinical diagnosis of navicular or caudal heal pain syndrome.

Employing MRI in horses may also allow veterinarians to better study the underlying bone that damage cartilage and lead to osteoarthritis. Veterinarians are able to better study the serum and joint fluid markers that can signify joint damage. The findings through MRI could potentially lead to the development of osteoarthritis-preventing/treating supplements and medications.

An MRI can detect changes in bones and tissues that radiographs cannot, such as minor changes in small tarsal joints. In regards to detecting joint disease, an MRI can analyze tissue structure and geometry, tissue matrix properties, and levels of inflammation within a joint.

MRIs can also help detect the difference between core lesions from tears and splits in ligaments and tendons. Blood flow, cerebrospinal fluid flow, and contraction and relaxation of organs (both physiologic and pathologic) can also be evaluated with an MRI. The MRI may be a resourceful tool in evaluating intraocular and orbital lesions in the horse's eye.

White said that the MRI at Morven Park will be used mostly for clinical cases.



(Chris Booker Photo)

**Technician Carolyn Smith checks the computer monitor as the MRI scans take place to ensure that the horse has not moved during the imaging.**

healing of injuries by being able to get sequential scans without harvesting tissue. Evaluation of development of bone and cartilage in young animals and treatment of tendon and ligament injuries will be possible with MRI."

Another advantage to the MRI is that hemorrhage, infection, fluid in soft tissue and bone can all be detected. With the MRI's three-dimensional view, limbs can be visualized from the front, the side and in cross sections.

"This technique is superior to ultrasound and radiographs when looking for soft tissue changes and changes in bone, which don't show up on a radiograph," said White.

**Day To Day Operations**

It's crucial that the horse remains still during an MRI reading. Movement during the MRI examination creates an abstraction in the images, making them unusable. Anti-motion software is available, but keeping the horse from moving is essential during the 3 to 5 minutes it takes to perform each image sequence.

There's one major disadvantage to the use of MRIs on horses...the cost. The MRI equipment is expensive and requires maintenance.

"The MRI at the EMC is based on a lease agreement, which requires a fee for each examination," said White. "Currently, the fee for an MRI examination, which includes six to 10 image sequences, each containing 10 to 30 images, on each part of the leg, is \$750. The fee for evaluation of the images is \$450. This fee includes repeating these sequences in the opposite leg as needed for comparison."

White reiterated that though MRI has great advantages over radiographs and ultrasound, it will not replace these methods of examination.

"MRI will also not answer all of the questions about some problems. Like any imaging technique, it has its place as one of the tools used to make a diagnosis," said White.

But as MRIs become more widely used, they'll likely become readily available to veterinarians across the country. And the development of the open sided MRI unit should enable this to become reality.

In the future, advanced imaging techniques such as MRI will provide the next step in evaluating lameness and other musculoskeletal ailments when X-rays and ultrasound fail to give a definite diagnosis. With the ability to achieve a definite diagnosis, every horse will have the opportunity to receive proper treatment for an ailment.



**Centurion THERAPULSE IV**

**BLANKET with PULSATING MAGNETIC FIELDS**

- Backs
  - Shoulders
  - Withers
  - Stifles
- all at the same time*



**3 MONTH RENTALS**

**1-800-387-8326**

[www.centurion-systems.com](http://www.centurion-systems.com)