THE EVOLUTION OF THERAPIES FOLLOWING MAGNETIC RESONANCE IMAGING OF THE EQUINE LIMB

Robert K. Schneider, DVM, MS, DACVS
Washington State University, Pullman, Washington

Magnetic resonance (MR) imaging was first used to evaluate the distal limbs of live horses with lameness problems at Washington State University in 1997. Since that time, more than 2000 horses have been evaluated with this imaging modality in our hospital. MRI has proven to be a valuable diagnostic tool that allows specific diagnoses to be made. With the evolution of improved diagnosis and recognition of specific lameness problems came new, better, or more specific treatments. Simply stated, knowing the cause of the problem affects everything that we do. MRI diagnosis affects rest and rehabilitation programs, where to inject horses with anti-inflammatory medications, and surgical treatment that would not have been considered prior to MR imaging.

**Cartilage and subchondral bone damage**

MR imaging has allowed us to find bone and cartilage abnormalities that cannot be diagnosed with other imaging modalities.\(^1\)\(^2\) Finding these abnormalities in locations that are accessible with arthroscopic surgery has allowed us to debride abnormal bone and cartilage. Surgical treatment has allowed some of these horses to successfully return to athletic performance without requiring further treatment with anti-inflammatory medications. Articular cartilage and subchondral bone have been removed from joint lesions in the distal interphalangeal joint, proximal interphalangeal joint, metacarpo-metatarso-phalangeal joints, carpal joints, and tibiotarsal joints after identifying abnormalities with MR imaging.

MR imaging has allowed us to diagnose acute bone injuries like bone bruises or chronic bone response to repetitive use trauma (palmar condyle of the distal third metacarpus in thoroughbred race horses). Knowing that the horse has a bone injury affects the rest and rehabilitation program; the horse is treated based on the time required for bone healing and remodeling rather than a soft tissue injury. Horses are rested for 90 days to allow time for the bone to heal when there is an acute bone bruise. In horses with bone remodeling problems, the horse is sometimes turned out much sooner to continue to stimulate the bone to remodel and build the strength required to withstand high speed exercise.

MR imaging has also allowed us to find partial thickness articular cartilage damage, especially in the distal interphalangeal joint. Knowing that the horse has osteoarthritis and articular cartilage damage in a joint allows us to direct treatment to the affected joint. Injecting the appropriate joint is crucial when trying to keep horses in performance.

**Ligament/Tendon Injuries**

MR imaging detects even small areas of inflammation within a tendon or ligament.\(^3\)\(^-\)\(^5\) Knowing which ligament or tendon is injured and where the injury is located allows treatment to be directed to the site. Anti-inflammatory medication can be injected into synovial structures that are next to the soft tissue injury, allowing medication to be absorbed by the ligament or tendon.

For example; injecting the digital flexor tendon sheath to get medication to the distal straight sesamoidean ligament or to an injured deep digital flexor tendon, or injecting the metacarpophalangeal joint to get medication to an injured branch of the suspensory ligament. Again, knowing which synovial structures to inject is important when trying to return horses to
performance.

Knowing where the injury is in a ligament is necessary if a surgical procedure is used as part of the treatment. Ligament/tendon splitting, surgical debridement or desmotomy can only be considered if the location and severity of the injury are known.

More biologic treatments are being developed and evaluated. MR imaging is necessary in some horses to accurately locate and diagnose the problem. Bone marrow derived mesenchymal stem cells have shown some potential to improve ligament or tendon healing in outcome oriented analysis of clinical cases. MR imaging allows us to accurately inject the cells into the area that is injured. In some cases, MR imaging is critical to making an accurate diagnosis. For example; it does not help to direct surgery or stem cell treatment to the proximal suspensory ligament when the horse’s problem is in the inferior check ligament. No matter what biologic treatment is being used, knowing where to treat the injured tendon or ligament is an essential first step.

**Metacarpal/metatarsal splint exostosis**

Because of its transectional imaging capabilities, MR imaging can determine the significance of splint exostosis in lameness problems in performance horses.6 Surgical removal of the exostosis is necessary in horses that have adhesions between the reactive bone and the suspensory ligament. Failure to recognize that the splint exostosis is contributing to a suspensory ligament desmitis sets the horse up for recurring lameness when the horse returns to work following rehabilitation. On the other hand, splint exostosis is extremely common and surgical removal does not really help a horse that does not have an adhesion. MR imaging can accurately determine which horses need surgery and which horses do not.

**Arthrodesis of the proximal interphalangeal joint**

MR imaging has lead to arthrodesis of the proximal interphalangeal joint in a small number of horses. MR imaging was able to demonstrate bone and cartilage damage in the joint that could not be seen on radiographs, or severe ligament or tendon injury to the palmar/plantar supporting soft tissues. Stabilizing the pastern joint can help decrease biomechanical forces on an injured superficial digital flexor tendon branch injury. At least two horses with severe injury to the plantar supporting soft tissue of the pastern joint have been able to return to performance following fusion of the proximal interphalangeal joint. Neither of these horses were sound following a rest program to try to heal the ligament.

**Penetrating wounds to the foot**

Early experience with MR imaging of horses clearly demonstrated the value of this imaging modality in being able to assess the depth, direction, and involvement of deeper structures following foreign body penetration of the foot. A discussion of evolving treatments would be incomplete without pointing out the value of MR imaging in these cases. MR imaging not only determines the need to perform surgery, but also helps determine the best approach for the individual horse.

It is not possible in an abstract to describe all examples where MR imaging has helped direct treatment. MR imaging continues to improve our understanding of lameness problems in performance horses every day, and to improve the treatment of the horses.
References


2. Barrett MF, and Zubrod CJ. Use of magnetic resonance imaging to detect and direct therapy of an osseous cystic lesion at the solar surface of the third phalanx of a horse. Eq Vet Educ 20, 1: 19-23, 2008.


