MAGNETIC RESONANCE IMAGING OF THE EQUINE STIFLE
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Imaging of the equine stifle in clinical cases has traditionally been limited to radiographic
evaluation, ultrasound examination, diagnostic arthroscopy and nuclear scintigraphy. Each
technique has its benefit and limitations. Magnetic Resonance Imaging (MRI) is the gold
standard in imaging human orthopedic conditions and is becoming increasingly used in the
evaluation of lameness in the equine athlete. MRI provides a noninvasive technique to
evaluate both the soft tissue and bone of a given anatomical region.

Patient and Scanner Preparation:
Imaging of the equine stifle is not for the faint of heart. It requires utilizing the available
equipment at the edge of its design specifications. It requires positioning of the patient within
the confines of a relatively small gantry (70 cm) and placing the stifle within the useful magnetic
field. Many horses will not be able to be imaged due to limitations of the currently available
scanners.

Prior to anesthesia and imaging, horses are screened by weight, “femur length” as
measured from the apex of the patella to the greater trochanter of the femur, “tibial length” as
measured from the apex of the patella to the point of the hock, and “pelvic measurement” as
measured from tuber coxae to tuber coxae over the dorsum. A review of successful MRI
examinations revealed that all horses with femur lengths greater than 44 cm, tibial lengths
greater than 44 cm and pelvic measurements less than 62 cm have the best results. Partial
examination of the stifle is possible if one of these measurements is non-compliant, but if more
than one is outside these parameters, imaging of the stifle has not been possible.

Currently MRI images are obtained using a Siemens Magnetom Espree with a field
strength of 1.5 Tesla. Prior to introducing the horse into the magnet, the attached MRI table with
integrated spine coil is pre-positioned into the bore of the magnet. The center of the
magnetic field is noted. The horse is anesthetized into general anesthesia and placed in lateral
recumbency with the stifle to be imaged on the down side (i.e. if the right stifle is to be imaged
then the horse is placed in right lateral recumbency). The horse is placed on a separate MRI
compatible movable table and placed adjacent to the bore of the magnet. The horse is then
manually positioned into the magnet as far as possible. Ropes and padding are used to stabilize
the limb to prevent further movement. A body matrix coil is placed medially over the stifle to
be imaged to create a parallel imaging array with the integrated spine coil within the MRI table
that was pre-positioned (Pictures 1 & 2). Use of the integrated body coil is possible, but image
quality is compromised.

Imaging Sequences:
A combination of a body matrix coil and the integrated spine coil are used in parallel to
acquire the signal. Images are obtained in multiple planes using multiple acquisition sequences -
Proton Density and T2 weighting dual echo, T2 FISP (coherent gradient echo), T2 STIR (Short Tau
Inversion Recovery), T1-weighted VIBE (Volume Interpolated Gradient Echo) fat saturation, T2 medic water excitation (Multi-Echo Data Image Combination) and T2 CISS (True
FISP dual excitation) sequences.
The average time required to produce 14 sequences is 45 minutes for one stifle. Currently imaging of a single stifle is performed since imaging the opposite stifle would require a change in recumbency and would compromise the anesthetic condition of the patient.

**Example Diagnoses:**

Imaging of the stifle with MRI has provided further insight into the pathology of this anatomic region. Examples of abnormalities that have been found include:

- Medial meniscal tearing.
- Bone edema – tibia, femur, and patella.
- Osteochondral fragmentation
- Cranial cruciate desmitis
- Caudal cruciate desmitis.
- Synovitis
- Patellar ligament desmitis
- Collateral ligament desmitis
- Synovial effusion
- Cartilage erosions / tearing

**Discussion:**

Imaging of the equine stifle has long been a difficult proposition. In human orthopedics, MRI has become the “gold standard” to image the human knee. In the horse, radiographs and ultrasound have been useful in identifying bony and some soft tissue injuries. Nuclear scintigraphy has been helpful in identifying inflammatory conditions, but lacks the anatomical detail. Diagnostic arthroscopy gives excellent visualization of structures that are visible with the procedure, but lacks in its ability to see the entire joint and deeper into the bone. All of these techniques evaluate limited portions of the equine stifle and do not allow for a complete examination. MRI allows a relatively noninvasive technique to evaluate the structures of the equine stifle. Historically MRI has not been considered feasible due to magnet size restrictions. With the advent of a wide bore (70 cm), ultra-short length bore (125 cm), and the ability of the magnet table to handle larger weights, it has become feasible to image select equine patients. This technique is evolving and has shown great promise in imaging horses whose problems went previously undiagnosed.

**Conclusion:**

Imaging of the equine stifle is feasible using a high field MRI scanner. Limitations remain present and are determined by the relative size of the patient. The images derived in clinical cases provided information not possible by other imaging techniques.

**References:**