The successful non-invasive imaging of articular cartilage in the equine patient is likely one of the most sought after goals in equine veterinary medicine. Articular cartilage may be one of the most difficult tissues to accurately image in its entirety in the in vivo horse. Magnetic Resonance Imaging has proven extremely useful for the successful imaging of articular cartilage in humans. For this reason, MRI has been looked upon as a potential technique to more accurately image articular cartilage in the horse.

The imaging of equine articular cartilage requires good quality images with high resolution to adequately image joint cartilage. It is extremely easy to be misled as to the severity and presence of articular cartilage pathology while using MRI if high quality, accurate images are not obtained. While all types of sequences can detect cartilage abnormalities, fat saturated sequences have proven particularly useful in defining the margins of the articular cartilage and potential lesions. Both proton density fat-saturated sequences and fat-saturated 3d spoiled gradient echo sequences have been used successfully to augment the imaging of equine articular cartilage. Typically, normal articular cartilage has an intermediate to high signal intensity on T1-wighted images and an intermediate to low signal intensity on T2-weighted images. It can be clearly identified from the subchondral bone deep to the articular cartilage by the marked difference in signal intensity between the bone and cartilage with the bone having no signal (i.e. black) as opposed to the signal present in the cartilage. Similarly the high signal characteristics of the synovial fluid on the opposite side of the cartilage will typically be very high (i.e. white) on T2-weighted sequences and low (dark grey) on T1-weighted sequences. This distinct variation between the subchondral bone and synovial fluid allows for both direct and indirect visualization of the articular cartilage. Normal articular cartilage will have a smooth, uniform thickness throughout the joint. Variations in cartilage have been reported to be present in the carpus and hocks of horses. However, care should be taken when interpreting these studies, as it is unclear if these abnormalities were truly normal or sub-clinical problems that had not progressed to clinical entities.

Cartilage injuries can be visualized on MRI as either a change in contour or signal intensity. The most common cartilage abnormality noted is a void in the articular cartilage that is filled with the synovial fluid of the joint. This is seen best on T2 weighted or fat-suppressed images with a high-signal region within the normal intermediate signal articular cartilage. This change in signal is also accompanied by a change in the contour of the normal articular cartilage and is most consistent with a full-thickness defect. Less severe manifestations of cartilage damage may be evidence by more subtle changes in the contour, shape and character of the cartilage itself. Fat-suppressed images show this best by improving the contrast of the cartilage but also highlighting deficiencies in the subchondral bone, which indicate adjacent cartilage injury. More subtle manifestations of cartilage damage are seen as surface irregularities and changes in contour with minimal signal variation. This is typically indicative of cartilage fibrillation and more superficial defects. The earliest changes seen on routine MRI examination in cartilage may actually be thickening of swelling of the cartilage with edema and increased water content. This will result in an increased in signal of the affected articular cartilage on T2
and fat suppressed sequences and a decrease in signal on T1 weighted images. Alternatively a loss of collagen may lead to focal signal loss on T2 sequences while matrix damage may be indicated by increased signal on similar sequences.¹

While detection of cartilage lesions is possible, some recent studies in racehorses with spontaneously occurring metacarpophalangeal articular cartilage lesions has shown that MRI has only a moderate ability to detect all lesions within a joint and that many of these lesions are underestimated.⁴ This emphasizes the fact that while imaging of equine articular cartilage is possible, much work remains to fully be able to elucidate the subtleties of this anatomical region.

References: