Detection of Articular Pathology of the Distal Aspect of the Third Metacarpal Bone in Thoroughbred Racehorses: Comparison of Radiography, Computed Tomography and Magnetic Resonance Imaging.

Condylar fracture of the distal cannon bone is a common long bone fracture of Thoroughbred racehorses involving the fetlock joint. Recent research concludes that these injuries are articular stress fractures that occur after a period of accumulative damage to the articular cartilage and subchondral plate. Consequently, there is potential that incipient damage to the articular surface can be detected by diagnostic imaging methods, such as digital radiography, computed tomography, magnetic resonance imaging and nuclear scintigraphy, before condylar fracture develops. Our understanding of the condylar fracture disease mechanism would be greatly improved by determining the most suitable imaging modality for detection of damage to the articular surface at the site of origination of condylar fractures. Improvements in fetlock imaging may also enable better prevention of catastrophic injury to the distal end of the cannon bone.

The study we performed was aimed at identifying the imaging modality best suited for detection of damage to the articular surface of the distal end of the cannon bone. We compared digital radiography (DR), computed tomography (CT), and magnetic resonance imaging (MRI). We also wished to determine whether the use of an intra-articular contrast agent would improve detection of cracking of the articular surface. We examined a series of limb specimens obtained from Thoroughbred racehorses that had all experienced a catastrophic injury in the opposite limb, and a control group of nonathletic horses that had been euthanatized for reasons other than lameness. Standard DR, CT, and MRI studies of the fetlock joint were acquired before and after intra-articular injection with a contrast agent. Pathologic features detected with imaging and on visual inspection of cartilage and subchondral bone of the distal aspect of MC3 were graded and compared.

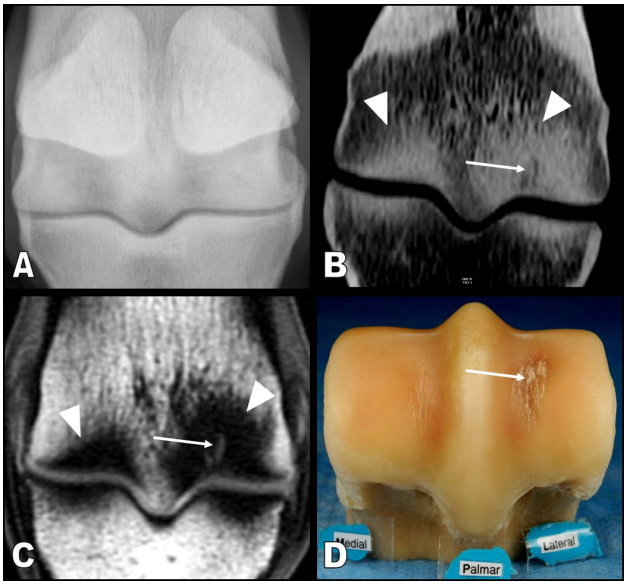

Figure 1. Subchondral cracks (white arrows) can be seen on CT (**B**), MRI (**C**) and on gross inspection of the subchondral surface (**D**), but not on DR (**A**). Subchondral sclerosis (white arrowheads) is visible on both the CT (B) and MRI (C) images. All images in this figure were acquired from the same limb specimen from a Thoroughbred racehorse.

We found that the pathologic changes that precede condylar stress fracture of the distal cannon bone are readily detectable with cross-sectional imaging (CT and MRI). However, DR was not particularly useful for this purpose. In **Figures 1 and 2**, it can be appreciated that both CT and MRI were useful for the detection of subchondral sclerosis, cracking and erosion, while DR was not. While cracking of cartilage was not detected by any imaging modality, cartilage damage was evident on MRI in some horses, as can be seen in **Figure 3**. We also found that contrast arthrography did not improve the detection of articular cartilage or subchondral plate cracking.

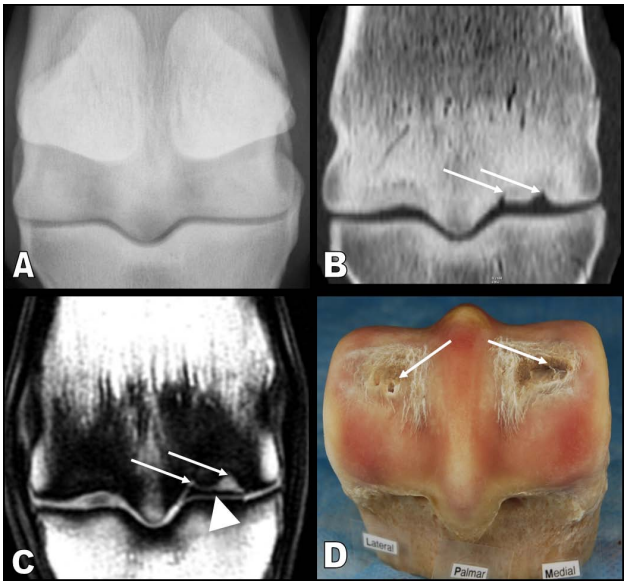

Figure 2. Subchondral erosions (white arrows) can be seen on CT (**B**), MRI (**C**) and on gross inspection of the subchondral surface (**D**), but not on DR (**A**). The large white arrowhead on image C corresponds to an area of cartilage pathology. All images in this figure were acquired from the same limb specimen from a Thoroughbred racehorse.

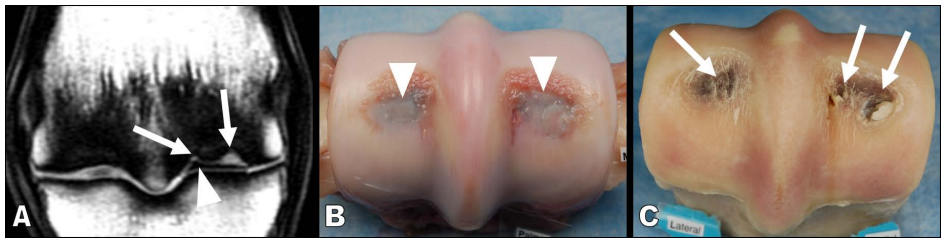

Figure 3. Focal cartilage defects (white arrowheads, **A**) on the palmar aspect of the condyles of distal MC3 correspond to areas of severe cartilage and subchondral bone loss (white arrows, A and **C**) which have been replaced by repair tissue (white arrowheads, Image **B**) on visual examination. All images in this figure were acquired from the same limb specimen from a Thoroughbred racehorse

The results of this study suggest that future work in this field should focus on further development and clinical use of cross-sectional imaging methods (CT and MRI) for identification of Thoroughbred racehorses at risk of condylar fracture. There is a great need for development of a practical cross-sectional imaging technology that could be routinely used in the standing patient. By improved screening of Thoroughbred racehorses to determine those at risk of condylar fracture, it should be possible to identify at-risk individuals and prevent condylar

stress fractures, as well as further understanding of disease progression and response to treatment or altered management of habitual activity.

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