Diagnosis of distal limb lesions in the horse using contrast computed tomography

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Introduction

Difficulties in making specific diagnoses of distal limb lesions make optimising therapeutic interventions difficult. Computed tomography (CT) is a 3D imaging modality that uses x-ray attenuation to create images, providing high-level bony detail without superimposition, and increased sensitivity detecting bone density changes in comparison with radiography. Its ability to provide soft tissue contrast resolution has been markedly improved with intra-arterial and intra-articular contrast techniques. This presentation will discuss the indications for CT imaging studies of the distal equine limb. The equipment and procedures used to generate CT images will be described. This will be followed by showing you images from some of the more interesting cases and the CT findings that led to specific diagnoses of distal limb lesions that would otherwise have been difficult to make.

Methods

At Massey University, we have utilised plain and contrast CT to detect lesions localised by nerve blocks to the distal limb for more than 10 years. Specific hardware includes an anaesthetic induction/recovery box with a hoist to move the anaesthetised horse onto a purpose-built equine CT table. This table is custom-designed to attach the manufacturer's human couch, facilitating the computer-controlled precision movement of the limb into the 80 cm diameter stationary CT gantry (Figure 1). Our standard distal limb CT study uses a bone and soft tissue algorithm that is applied from the proximal sesamoids and fetlock distally. A second study is then performed using a contrast CT arteriogram. This involves catheterisation of the median artery immediately proximal to the carpal sheath with ultrasonographic guidance (Figure 2), and controlled contrast injection of radiopaque contrast via an automatic injector that is carefully synchronised with CT image capture. A continuous flow of 180 mg/mL of iodinated contrast agent is injected, and a CT arteriogram captured. Thirdly, radiopaque contrast is aseptically injected into the navicular bursa (a bursogram) and the distal interphalangeal joint (an arthrogram). CT slice width is maintained at 1mm with 0.4 mm overlap. For most patients, imaging is performed bilaterally to improve the sensitivity and interpretation of the significance of lesions. The distal limbs are then bandaged to protect them during anaesthetic recovery. The CT data files are exported to specialist radiographers for interpretation, and a report compiled for the client and veterinarian.

Results

The most common findings detected using this CT protocol are previously undetectable distal deep digital flexor tendon abnormalities. Other common diagnoses include distal interphalangeal abnormalities, navicular bone remodelling, and navicular bursal changes. Distal interphalangeal joint collateral ligament desmitis is also a frequent diagnosis. Less common diagnoses include keratoma and fractures that were not identifiable on radiographs. CT contrast arthrograms provide greater detail of cartilage defects than other imaging modalities, but the influence that this diagnostic information has on patient outcomes required further investigation.

Conclusion

Contrast-enhanced CT imaging protocols provide specific and sensitive diagnostic information for the equine clinician that can be used to aid in the diagnosis of lameness, plan targeted therapeutic regimens, and provide more detailed information for their clients.

Figure 1. Preparation of the forelimb for CT imaging as viewed through the bore of the CT scanner

Figure 2. Ultrasound guided catheterisation of the median artery

Selected references

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