

Injury prevention in Thoroughbred racehorses using safe, high-quality standing CT imaging: The Equina[®] by Asto CT

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INTRODUCTION

Racing exercise can cause major musculoskeletal injury in horses. Risk of catastrophic injury with subsequent euthanasia can be high at certain locations across the world. In the fetlock, fractures of the condyles of the cannon bone and the proximal sesamoid bones are common causes of fatal injury. These fetlock fractures are stress fractures that occur because athletic activity has caused the accumulation of fatigue injury to bone.¹⁻³ In addition to resulting in deaths, these types of musculoskeletal injury can affect racing performance and result in enforced rest and early retirement and are, therefore, of substantial importance across the world.¹ For horse racing to maintain its social license with the public, it is important to avoid injuries occurring in Thoroughbred racehorses. News headlines about horse deaths and welfare concerns involving racetracks as we have seen in recent years are unacceptable to the public. Therefore, improving the welfare, quality of life, and clinical care of Thoroughbred racehorses is of utmost importance.¹

A new computed tomography (CT) system, the Equina[®], (Asto CT, Middleton, WI), has been developed and deployed for imaging of the distal limbs² and head/neck³ of a sedated horse in the standing position. One of the key goals is making equine imaging simple, efficient, and effective so it can be used as part of a proactive injury prevention approach to help minimize risk of serious injuries to Thoroughbred racehorses. In Australia, Racing Victoria has used the Equina imaging system for pre-race screening of horses as part of their new safety measures for increasing welfare of horses during the Spring Racing Carnival in Victoria. The use of this advanced veterinary technology for early detection and management of musculoskeletal injuries can move us towards a new standard of care for Thoroughbred racehorses. In this paper, we provide a brief description of the key features of the Equina[®] system, and its use in pre-race screening.

DETECTION OF PREFRACTURE PATHOLOGY

Fractures of the distal limbs of racehorses frequently result from repetitive stress on the bones of the skeleton due to training and racing.^{4,5} While the limbs are designed for running and bearing the weight of the horse, the demands of a training program may exceed the body's ability to repair fatigue injury and associated bone microdamage. Over time, microdamage may accumulate, leading to macroscopic cracking of bone tissue, and eventually a stress fracture.⁴ Early detection of bone injury is highly advantageous as this enables identification of horses with elevated risk of serious injury. Subsequent modification of training and specific individualized treatment for the horse may enable bone healing, normalizing risk of serious injury during ongoing athletic activity.

Unfortunately, many horses that experience fatal injury during racing do not exhibit clinically detectable abnormalities during standard pre-race veterinary inspection.⁶ Standard digital radiographic imaging can detect fractures once they have begun

to propagate but lacks the diagnostic sensitivity to detect subtle changes in bone associated with accumulation of microdamage and development of an incipient stress fracture.⁷ In a proportion of horses, the analysis of gait data collected during races can provide important clues regarding early development of fatigue injury to bone during,⁸ and help identify horses that would benefit from advanced imaging, such as Equina® by Asto CT.

Equina® is readily available and is being increasingly used for routine lower limb imaging in horses. High throughput low-cost screening of large numbers of horses with standing CT is now possible, which makes it attractive for injury prevention in racing Thoroughbreds. Equina® standing CT imaging has the diagnostic sensitivity required for detection of early signs of fatigue damage to bone and is an ideal tool for detection and monitoring for early bone injury, thereby reducing horse deaths from catastrophic stress fracture.

EQUINA IN USE TODAY FOR PRE-RACE SCREENING

The Melbourne Cup is the most watched horse race in Australia. For many people it is the only race they watch all year so injuries that occur in the race are highly publicized. In recent years international horses have made up an increasing proportion of the field and injuries in these horses have been a particular problem. A cluster of deaths due to catastrophic limb injuries consisting of 5 horses in a period of 10 years resulted in increased veterinary scrutiny of horses competing in the Melbourne Cup and the Carnivals that surround this race. Investigation of these deaths found that a large proportion of the fatally injured horses had pathology that would likely have been detected by standing CT examination before the incident.

For this reason, Racing Victoria introduced mandatory pre-race screening with advanced imaging for horses competing in the Melbourne Cup in 2021 as one of several measures aimed at reducing injury risk. All four fetlocks of each horse entered in the Melbourne Cup, and all international horses in Racing Victoria's quarantine center are scanned. In 2022, this involved a total of 40 horses being scanned, with 38 being scanned in a 10-day period. Three horses (7.5%) were withdrawn based on their CT scan findings.

Standing CT screening will not eliminate risk of injury as not all horses that develop stress fracture injuries have pre-existing pathology at sites accessible with standing CT. However, based on current evidence it is likely to reduce the risk of injury for Melbourne Cup horses by up to 70%. While it is too early to draw firm conclusions, in the two years since the introduction of pre-race screening with advanced imaging there have been no further serious limb injuries in horses competing in the Melbourne Cup and the Melbourne Spring Carnival.

In addition to screening for specific races, Racing Victoria has also introduced a subsidy scheme to reduce the cost of advanced imaging for all racehorses and therefore increase its use throughout the year to further reduce the risk of severe injury. Implementing low-cost screening is particularly helpful for low value horses, as bone fatigue injury commonly affects all grades of racing Thoroughbreds.



Pre-race scan of a Thoroughbred athlete prior to the Melbourne Cup.

TRANSFORMING THE STANDARD OF CARE FOR THOROUGHBRED RACEHORSES BY INJURY PREVENTION

Development of the Equina® imaging system has broad implications across the equine community. By offering standing CT at either a local veterinary clinic or a training center, it can preserve the quality of life, support a successful athletic career, and enhance the financial value of the horses. Equina® can be incorporated into several parts of routine racehorse practice. These include:

- Pre-purchase imaging of yearlings or older racehorses
- Pre-race screening for elevated risk of serious musculoskeletal injury in active racehorses to assess fitness to race. The ability to image a large number of horses in a

short period of time with no disruption of training activity makes the Equina® an ideal imaging system for this type of screening. Racing Victoria in Australia has implemented these safety measures already.

- Evaluation of lameness or gait change, such as reduction in speed or stride length.⁸ Identification of structural changes associated with early bone fatigue injury can enable personalized clinical care, modification of training and prevention of serious musculoskeletal injury.
- Longitudinal monitoring of racehorses with concerning fatigue injury since fracture risk can change rapidly over time.

SUMMARY

Improving the health and welfare of Thoroughbred racehorses through prevention and diagnosis of catastrophic musculoskeletal injury is a critical current need in the Thoroughbred racehorse industry. The evolution of standing CT scanning in the equine veterinary world has moved to wide bore gantries, rugged, quick, easy use, and high throughput performance. The Equina imaging

system is readily available and addresses a current public concern about the health and welfare of the Thoroughbred racehorse. By creating an easy-to-use affordable standing CT system, Asto CT is opening the door for best-in-class limb imaging for all Thoroughbred racehorses.

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