

Review of “The prediction and prevention of musculoskeletal injury using radiographic measurement of bone shape in Thoroughbred racehorses during training”

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Why was this study done?

The author states that lameness in racehorses is most commonly found in the structures of the lower foreleg. These structures include bones, tendons, ligaments, and joints. **Modifications in bone density, shape, and size take place slowly as bones are stressed by loading.** The cannon bone is often chosen as a monitoring site for bone modification because it is more easily accessed than bones that are encased in layers of soft tissue. This bone also encounters maximum loading as the horse moves, and therefore could be expected to react to exercise by remodeling, becoming painful, or showing both reactions.

In order to determine the amount of change taking place as training progresses, **two areas of the cannon bone are typically measured. The widths of the medulla (central marrow cavity) and the cortex (solid bone surrounding the medulla) are radiographically monitored and compared to find the effect of fast exercise in young Thoroughbreds.** From these measurements a radiographic index (RI) is calculated, and studies have shown that the RI can be used to predict whether a particular horse is likely to develop shin pain in the course of training. **Some studies have indicated that horses that develop pain have greater changes in cannon shape than horses progressing through training without pain.**

This study was designed to determine if cannon measurements taken during training and racing could provide a warning that trainers should modify exercise programs for individual horses, thereby reducing the chance of pain and injury.

How was the study conducted?

The six-year study followed the conditioning and racing program of **104 Thoroughbred racehorses** trained by the same person. Weekly radiographs were taken of each horse to measure **thickness of the medulla and cortex of the cannon bones** in both forelegs. **Absolute sizes** for the cortex and medulla, as well as the **ratio of sizes**, were found. Researchers also recorded the **occurrence and degree of shin soreness** for each horse.

What results were found?

The author says that **in every case of shin pain, specific increases in cortical thickness were observed two to six weeks before the horse showed discernible signs of soreness.** On several occasions, radiographs revealed fracture lines in the cannon bones of horses that had shown no clinical signs of pain or lameness. Shin pain caused by direct trauma (such as from a kick or bump) was found to cause a different radiologic pattern. The report states, "All the diagnosed unsoundnesses in horses in the study over the last 6 years have shown changes in bone shape that may be related to changes in mechanical loading that may be due to the lameness."

According to this study, a common finding in lame horses was a two- to six-week history of **increased medullar width in the painful leg corresponding with a decrease in medullar width and/or an increase in cortical thickness in the opposite leg.** If both front legs were painful, an increase was seen in medullar width in both cannons. This was noticed most often when it coincided with a period of fast growth in the horse.

As the study progressed, the trainer was made aware of these changes and had the **option of temporarily backing off training intensity.** There were no further cases of detectable shin soreness in any of the study horses when this decision was made. In cases where the trainer decided to continue speed training or race the horse in spite of measurements showing that shin soreness was highly likely to occur, the horses did develop shin pain.

A potential problem pointed out by the author was the **difficulty in controlling orientation and placement of the imaging equipment.** Measuring bone width at the same location each time and minimizing image distortion were mentioned as significant challenges.

What do the results tell us about managing young horses in race training?

This study showed that **perceivable changes occurred in cannon bones before periods of shin pain in young horses in race training.** The author concluded that regular monitoring of cannon bone shape could provide trainers with an **early warning of potential problems,** allowing them to modify training schedules to minimize injury.

The full text of this research report is printed in the Australian Equine Veterinarian, Volume 22, Number 2, Winter 2003.