Survey of Horseshoe Characteristics and Their Relationship to Catastrophic Injuries in a Population of Racing Quarter Horses

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There does not seem to be any adverse affect of toe grabs on the rate of catastrophic injury in racing Quarter Horses. Efforts at addressing injury reduction should concentrate on other factors. Authors’ addresses: California Equine Orthopedics, San Marcos, California 92069 (Martinelli); Equine Sports Medicine, Cypress, California 90630 (Overly); and Gail Holmes Equine Orthopaedic Research Center, Colorado State University, Fort Collins, Colorado 80523 (McIlwraith); e-mail: mjmartinelli@cox.net. © 2009 AAEP.

1. Introduction

Catastrophic injuries in racing have drawn significant media attention over the years. Efforts at reducing the number of fatalities in racing have increased because of this attention. Factors causing these injuries have been studied extensively in Thoroughbreds to determine the cause of catastrophic racing injuries and thereby reduce the incidence. Toe grabs on the front feet of Thoroughbred racehorses are one such factor that has been associated with catastrophic injury. As a result, over the last several years, it has been recommended to decrease the length of the toe grab on the front shoe of Thoroughbred racehorses to 2 mm or less. Rules limiting the length of the toe grab have been adopted by many racing jurisdictions, beginning with the California Horse Racing Board in February of 2006.

Factors involved with catastrophic injuries in racing Quarter Horses have not been studied to the same degree as those in Thoroughbreds. Specifically, the topic of toe grabs has not been adequately addressed, leaving racing jurisdictions to extrapolate from the Thoroughbred data when considering any rule changes associated with the length of the toe grab worn by racing Quarter Horses. To produce some objective data regarding the use of toe grabs in racing Quarter Horses, the relationship between the length of the toe grabs and catastrophic injury rate in a population of racing Quarter Horses was studied.

2. Materials and Methods

Horseshoe characteristics were collected from the Quarter Horses that suffered a catastrophic injury over a 2-yr period at a racetrack hosting both Thoroughbred and Quarter Horse racing. During the first year of the study, the length of the toe grab was recorded by consulting the shoeing records of the trainer. During the second year of the study, the toe grab was measured and recorded by track personnel at the time of euthanasia. To establish a
control group for the type of horseshoes worn by the population of racing Quarter Horses at the same track, all Quarter Horses racing during January and June of 2008 were surveyed. The paddock farrier recorded the length of the toe grab worn by each of the Quarter Horses entered in all of the races during those 2 mo.

A generalized z-test was used to test the hypothesis that the distribution of the differing toe-grab lengths in the population of catastrophically injured Quarter Horses was different from the distribution of toe-grab length in the control population of racing horses (p < 0.1). The data was also analyzed using the Kolmogorov-Smirnov test to determine if the two samples were drawn from the same continuous distribution at a significance level equaling 0.1.

3. Results
There were 1314 Quarter Horses whose feet were inspected during the survey of racing horses in January and June of 2008. This represented 34 racing days and 217 races. There were 454 horses wearing flat Queens Plates (35%), 314 wearing a 2-mm toe grab (24%), 432 wearing a 4-mm toe grab (33%), and 114 wearing a 6-mm or “high” toe grab (9%).

Examination of the horseshoe characteristics from the catastrophically injured horses during the racing meet of 2007 and 2008 revealed a similar pattern. There were 23 horses wearing a flat Queens Plates (33%), 20 wearing a 2-mm toe grab (30%), 21 wearing a 4-mm toe grab (30%), and 5 wearing a 6-mm toe grab (7%).

The results of the generalized z-test showed that the distribution of the differing toe-grab lengths in the population of catastrophically injured Quarter Horses was not statistically different from the distribution of toe-grab length in the control population (p = 0.2). The Kolmogorov-Smirnov test confirmed that the two distributions are the same at the 10% significance level. The correlation coefficient between the two sets of data is 0.9585.

4. Discussion
There are many factors to be considered when attempting to make racing safer for the horse and jockey. Some of the most important factors studied over the years include the pre-race veterinary inspection, track surfaces, and medication use. In Thoroughbred racing, the use of long toe grabs on the front horseshoes has also been implicated as an unsafe measure.

The results of this study indicate that toe-grab length had no effect on the rate of catastrophic injury in this population of racing Quarter Horses. The percentage of horses wearing the different lengths of toe grabs within the population of catastrophically injured horses was not statistically different from the percentages in the general population of racing horses. In a study by Balch et al. in Oklahoma, there also did not seem to be any adverse affect of toe grabs on catastrophic injury. In that study, the researchers compared the shoe type of the catastrophically injured horses with those that had been euthanized for reasons unrelated to musculoskeletal injury. This same methodology had first been used by Kane et al. when examining the effects of toe grabs on a population of racing Thoroughbreds. In that study, their findings indicated that Thoroughbreds shod with a longer toe grab were up to 3.5 times more likely to suffer a fatal musculoskeletal injury. It could be argued that the methodology used in our study more accurately reflects the racing population, because a larger control group was used. Surveying the general racing population over 2 mo during the meet resulted in a control sample size of >1300 horses.

There could be several reasons for the difference noted between Quarter Horses and Thoroughbreds in relation to toe-grab use. Quarter Horses are mainly involved in sprinting races of 440 yd or less. Although there are races run at distances of up to 870 yd, they are much less common. In sprint races, the start is much more important than in distance races. The outcome is often influenced by how well the horse leaves the gate, because only the best horses are able to overcome a stumble or slow start. More importantly, however, is the safety of the jockey. A stumble at the start may put the jockey at risk of falling off into the path of another horse. In relation to horse safety, one of the reasons given for the adverse affect of toe grabs in Thoroughbred racing is the detriment to safety when the horse becomes fatigued at the end of the race. Quarter Horses racing up to 350 yd tend to gain speed in each segment of the race, whereas Thoroughbreds gain speed and then fatigue toward the end of the race.

In regard to toe-grab use in general, the question remains as to whether or not horses pull with their forelimbs when racing. Although there have been no scientific studies to the authors’ knowledge that adequately addresses this topic, there are some anecdotal observations that support this theory. Observations taken from slow-motion video at the start of a race show obvious differences between Quarter Horses and Thoroughbreds in the way that the forelimb interacts with the track. In the case of the Quarter Horse starting a sprint race, the toes dig into the track, and the fetlock and carpus remain flexed during the first several strides. Conversely, Thoroughbreds, tend to land flat footed and hyperextend the fetlock within the first stride from the gate. A second anecdotal observation regarding the Quarter Horse racehorse involves the musculature of the shoulder. Unlike other breeds and disciplines, Quarter Horses involved in racing have...
exquisite definition to the muscles of the shoulder, particularly the triceps, deltoid, and latissimus dorsi. The triceps and deltoid muscles act as flexors of the shoulder, whereas the latissimus dorsi acts to drive the body forward over the planted forelimb.\(^\text{13}\) Although not definitive data regarding the “pulling” action of the forelimb while racing, a well-defined muscle usually indicates development through use or overuse.

The safety aspects of racing, for both the horse and jockey, should be of great importance to the veterinary profession. To propose any policy changes in the racing industry, the factors influencing safety must be determined. The results of this study show that toe grabs do not seem to be detrimental to the racing Quarter Horse. These findings indicate that efforts at addressing injury reduction should concentrate on other factors.

References and Footnotes


\(^{b}\)Welfare and safety of the racehorse, in *Proceedings.* Summit Special Committee on Shoeing and Hoofcare 2008.

\(^{c}\)California Horse Racing Board, Rule 1690.1.