

Thermographic Assessment of Racing Thoroughbreds

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Thermography was very useful in the assessment of racing Thoroughbreds for injuries. Thermography had an excellent correlation between trainer-perceived problems and veterinarian diagnoses and showed increases in heat, in most cases, 2 weeks before the region became a problem clinically. When thermography is used to scan Thoroughbred racehorses on a routine basis, injuries can be identified at an early stage before progressing in clinical severity. Author's address: Department of Clinical and Population Sciences, 225 VTH, 1365 Gortner Ave., University of Minnesota, St. Paul, MN 55108. © 2001 AAEP.

1. Introduction

Lameness is a significant cause of wastage in racehorses. Research has indicated that thermography can predict joint and tendon problems 2 weeks before they become clinically apparent.¹ However, this hypothesis has not been tested in a clinical setting. The purpose of this study was to determine the usefulness of thermography to assess Thoroughbred racehorses in training. Specific objectives were to determine if thermography could predict injuries before they became clinically apparent, to determine how well thermography correlated with trainer's concerns, and to determine how well thermography correlated with the treating veterinarian's findings. In addition, we wanted to ascertain the acceptability of thermography in the racetrack environment, and to develop guidelines for effective future use in the racing industry.

2. Materials and Methods

With permission from the Minnesota Racing Commission, the study was performed at Canterbury Park in Shakopee, Minnesota. Cooperation was

sought and received from one of the principal treating veterinarians to gain access to their racing stables for the first year but for the second year the trainers volunteered their stables to cooperate. The goal for the first year was to examine 30 horses weekly from at least 5 different trainers over a 10-wk period. During the second year, the goal was to examine as many horses as possible on a weekly basis from at least 5 trainers and over the entire time the horses were at Canterbury. Thermography was performed in the barn, away from drafts and out of direct sunlight. Twenty standard thermographic images were made of each horse in order to examine the entire horse including all 4 legs and the back. The thermal images were evaluated and areas of thermographic abnormalities identified. These findings were recorded then independently compared to the trainer's notes and veterinary records on the horse. Further, all weekly training and racing information of the past week on the horse was recorded.

Data was analyzed to compare the trainer's concerns with thermographic findings and to further

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assess these findings and compare these to the attending veterinarian's findings. Any horse injured during racing or training was evaluated to determine if and when thermographic assessment indicated a potential injury. During the second year of the study we analyzed the data, in addition to the above but also according to region and the level of exercise over the 48–72 h preceding thermographic scanning.

3. Results

During the course of the first year study we evaluated 225 thermal studies from 45 different horses. The horses came from 7 different trainers. Trainers had specific concerns about the studied horse in 74 of the 225 examinations. Thermography agreed with the trainer's concern in 65 of the 74 (88%) examinations. Veterinarians were called to examine 20 of the 45 horses. Thermography agreed with the veterinarian's assessment in 19 of the 20 examined horses (95%). Nine of the 45 horses were lost to training because of injury or chronic soreness. Three horses were diagnosed with carpal chips, 1 was diagnosed with a fetlock chip, and 2 horses had tendon injuries. The remaining 3 horses were lost because of poor training due to chronic soreness. In each of the injured horses, the site of injury was identified at least 2 wk before the injury was diagnosed. In the 3 "sore" horses, multiple sites of inflammation were identified and sites were evident 2 to 4 wk prior to removal from training. In each of these cases, the sites of inflammation continued to worsen during the subsequent examinations.

During the second year, 461 thermographic evaluations were made on 50 horses from 10 different trainers. Trainers identified 127 specific problems and thermography agreed in 120 instances (94.5%). Thermography predicted these problems an average of 2.3 wk (median value, 2 wk) before they became clinically apparent. In 18 instances thermography was positive at the same time the trainer became concerned. In 22 instances, thermography was positive 1 week before trainer concern, in 20 instances, 2 weeks; in 10 instances, 3 weeks; 6 instances, 4 weeks; and in 12 instances, scans were positive anywhere from 5 to 13 weeks before the trainer became concerned. Twenty of the horses were examined by a veterinarian. Thermography predicted the site of injury in 19 cases (95%). In the one case, the horse became lame in a carpus immediately following a race, thermography previous to the race did not indicate inflammation but the examination after the injury showed increased heat in the carpus despite the use of corticosteroids.

Horses that were only walked for the 48 h prior to thermographic examination showed an average of 4.6 abnormalities, whereas horses that were galloped 48 h prior to thermography showed 4.8 abnormalities and horses doing speed work prior to thermography showed 5.3 abnormalities. Racing within 72 hours of thermographic scanning caused a

significant increase in thermographic abnormalities, rising to 5.7 abnormalities per horse.

Areas of interest were divided into shins, tendons, fetlocks, carpi, hocks, and hind quarter musculature. The occurrence of abnormal shin thermography correlated to the horse's age with 60% of the scans of 2-year-olds showing abnormalities, 6 of these 8 horses were temporarily retired due to shin (3 horses) or combination of shin and other abnormalities (3 horses). There was a significant drop in shin problems in 3-year-olds (36% of the scans were abnormal) and a further drop in older horses (16% abnormal). Only 18% of the scans of tendons were abnormal. This involved 9 horses, 8 of which subsequently developed clinical problems. The one horse that did not have clinical problems only showed abnormal scans after galloping, whereas the others were noticed after walking. Fetlock thermography indicated concern in 29 horses, 15 of which developed problems. Carpal thermography indicated concern in 15 horses, 10 of which developed problems. Hock thermography was the most commonly abnormal involving 41 horses but only 9 horses ever developed clinically significant problems. One of the most interesting results was with thermography of the hindquarter musculature. During the course of the study we twice saw significant increase in the number of abnormal scans. Between weeks 7 and 8 the occurrence of abnormal thermal findings in these muscles increased from 20% of the horses to 34% and between weeks 10 and 11 there was an increase from 22% to 57%. During the Canterbury meet these were the only two times significant changes occurred and both correlated specifically with the track surface being reworked.

4. Discussion

Thermography is an imaging modality that measures heat emitted from an object. In medical thermography, heat emitted from the skin is measured. The measured heat will be due to either local circulation, local metabolism, or surface contour.¹ Heat is a cardinal sign of inflammation and has been shown to be quite effective in the evaluation of inflammatory processes in the horse.² Lameness in the horse is thought to be the manifestation of an inflammatory process in the musculoskeletal system. One question that arises is how much inflammation must be present in order for a gait anomaly (visual lameness) to be present. Clinically, thermography can be used in one of three methods, as a diagnostic tool, as an enhancer of the physical examination (because the camera is at least 10 times more sensitive than the clinician's hand), or as a method to detect inflammatory (circulatory) change in the training horse before it becomes a problem.³ This final use is based on research that indicated thermographic changes could be detected in the joints and tendons of horses two weeks before there were clinical signs of a problem.^{4–6} Further, in

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human pain studies thermography has been shown to have a specificity of 95% and a sensitivity of 99%.^{7,8}

This two-year study has shown that thermography can be a valuable aid in the assessment of the training racehorse. Not only was there excellent agreement between thermography and soreness in these horses, but thermography was able to detect signs of inflammation before the problem became apparent to the trainer or veterinarian. This finding agreed with research findings indicating that joint and tendon injuries could often be identified 2 weeks before the problem became clinically apparent.⁴⁻⁶ In this study, this finding was not limited to these joints and tendons—dorsal metacarpal disease, splints, hoof and muscle injuries were all identified prior to clinical problems. When utilizing thermography in this manner, the most important objective is to evaluate change in the thermal patterns. We determined that a marked increase in temperature (obvious change in the thermal pattern) is cause for concern. These cases invariably had significant problems (bone chips, stress fractures, etc.). Horses that show mild to moderate changes around areas and sustain these changes for 2 weeks or more are also cause for concern.

The level of work a horse had prior to thermographic examination affected the occurrence of thermal abnormalities. This is most likely related to the stress on these structures. The most significant change was noted after racing. In following these horses, it is our opinion that thermography could be used to better determine racing intervals for these horses. This would appear to help confirm the work of Estberg, who showed the intensity of exercise schedules predisposed horses to fatal skeletal injury.⁹

The veterinary literature has suggested that bandages and liniments should be kept off the horse's leg for at least 2 h prior to thermographic examina-

tion.¹ Although this remains an excellent recommendation, this study indicates that thermography can be accurately assessed despite the use of these. This is of practical importance at a racetrack because thermographic examination will not interfere with the daily care of the horse. Maximal exercise was the greatest problem with performing thermography. Our data suggests that at least 2 h should lapse after maximal exercise before thermographic examination. An incidental finding on these horses was that the feet remained hot for almost 24 h after a gallop. This would be another factor that must be considered when examining the racing horse.

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