Treatment of Dorsal Metacarpal Disease in the Thoroughbred Racehorse with Radial Extracorporeal Shock Wave Therapy

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Radial extracorporeal shock wave therapy was used to treat 50 Thoroughbred racehorses with dorsal metacarpal disease that was unresponsive to conventional therapy. Forty-five of 50 (90%) of these horses successfully returned to racing. When combined with an appropriate training program, radial extracorporeal shock wave therapy seems to be an effective adjunctive treatment for dorsal metacarpal disease in the Thoroughbred racehorse. Author’s address: New Jersey Equine Clinic, 279 Millstone Road, Clarksburg, NJ 08510. © 2002 AAEP.

1. Introduction
Dorsal metacarpal disease (DMD) is a common fatigue injury of bone in young performance horses, estimated to affect up to 70% of Thoroughbred racehorses in training. DMD includes a wide variety of pathologic changes in the third metacarpal bone, including periosteal new bone formation, focal lysis within the dorsal cortex, and fracture. Treatment of DMD may include controlled exercise, nonsteroidal anti-inflammatory drug (NSAID) medication, periosteal scraping, blistering, pin firing, fenestration, or internal fixation. Extracorporeal shock wave therapy is a relatively new treatment for musculoskeletal injury in performance horses. Although high-energy focused and low-energy radial shock wave devices are being used to treat a number of lameness conditions in Europe and North America, there is little documentation of the effects of shock waves on equine tissue or the efficacy of treatment. The purpose of this study was to document the results of treatment of dorsal metacarpal disease in the Thoroughbred racehorse with radial extracorporeal shock wave therapy (RSWT).

2. Materials and Methods
Fifty Thoroughbred racehorses with DMD were included in this prospective study. All horses had a history of persistent lameness associated with clinical and radiographic signs consistent with DMD and had previous treatment for a minimum of 2 mo. Previous treatment protocols included rest, controlled exercise, percutaneous periosteal scraping, osteostixis, and NSAID medication. At the time of admission, a complete lameness examination was performed to eliminate additional sources of lameness. The degree of lameness was recorded (AAEP grades 1 to 5).

Xeroradiographs were obtained of both forelimbs to document the degree of pathologic change present in the dorsal cortex of MC3. For the purposes of classification, grade I DMD was defined as a horse with varying degree of lameness and shins that were painful to palpation with normal radiographic find-
ings. Grade II DMD was defined as a horse with varying degrees of lameness, shins that were painful to palpation, and radiographic evidence of thickening of the dorsal cortex of MC3. Grade III DMD was defined as a horse with varying degrees of lameness, shins that were painful to palpation, and radiographic evidence of multiple oblique fracture lines in the dorsal cortex of MC3. Grade V DMD was defined as a horse with varying degrees of lameness, shins that were painful to palpation, and radiographic evidence of a single oblique fracture line (stress fracture) in the dorsal cortex of MC3. Grade VI DMD was defined as a horse with moderate lameness (grades 3–5), a shin that was painful to palpation, and radiographic evidence of a fracture line that extended through the dorsal cortex of MC3 into the shaft and/or palmar cortex of MC3.

The dorsal aspect of the metacarpus of affected forelimbs was clipped and shaved before treatment. Horses were sedated with xylazine, 0.44 mg/kg, IV and detomidine, 0.01 mg/kg, IV. Additional physical restraint was provided by application of a nose twitch. Contact gel was placed on the treatment area and 2100 pulses (3 bar of pressure at a frequency of 8 Hz) were applied to the dorsal surface of MC3 on either side of the extensor tendons, using a pneumatic shock wave generator and a 15-mm applicator. If a bony callus was present, the applicator was placed over the callus to concentrate energy in that area. Otherwise an effort was made to concentrate the energy in the areas of fracture identified with pre-treatment xeroradiographs. After treatment, the limbs were bandaged for 24 h with a compression bandage. A total of three treatments were applied at 2-wk intervals.

Lameness examinations also were performed before the second and third treatment sessions. Horses were walked during the treatment period and allowed daily turnout if no lameness was evident. After the third treatment, follow-up xeroradiographs were obtained. Provided no lameness was evident at the time of the third treatment and radiographic evidence of fracture healing was present, horses were allowed to gallop for 30 days before a gradual return to regular training. Trainers were encouraged not to begin speed work (breezing) until radiographic examinations indicated complete healing of fractures, if present. Recommended speed work was to begin with short breezes (1/8 mile) once or twice weekly, gradually increasing the breezing distance over a period of 2 mo. Long-term follow-up information was obtained from telephone interviews with trainers, owners, and referring veterinarians. Descriptive statistics were used to characterize the case population and a one-way analysis of variance (ANOVA) was used to evaluate the three lameness scores obtained during the treatment period. Race results were obtained from the Jockey Club Information Service, and the Mann-Whitney test was used to compare median earnings/start before and after treatment with RSWT. Statistical significance was set at \( p < 0.05 \).

3. Results

Fifty Thoroughbred racehorses (30 males and 20 females) were included in this study. The mean age of horses in the study was 2.7 ± 1.0 yr. The grades of DMD present in the horses of this study ranged from grade II to grade V. Four horses had grade II DMD, 22 horses had grade III DMD, 20 horses had grade IV DMD, and 4 horses had grade V DMD. Four horses with bilateral lesions had different grades of DMD in either forelimb. The mean grade of DMD present in these horses was 3.3 ± 0.7. Twenty-five (50%) of these horses had lesions in the left front limb. Eight horses (16%) had lesions in the right front limb, and 17 horses (34%) had lesions in both left and right forelimbs. The duration of clinical signs before treatment of these horses ranged from 8 to 52 wk (mean, 15.1 ± 11.2 wk). The long-term follow-up of the horses in this study ranged from 6 to 27 mo (mean, 13 ± 5.02 mo). The mean lameness grade at time of admission was 0.53 (AAEP scale 1–5). At the time of the second treatment 2 wk later, the mean lameness grade was 0.17. At the time of the final treatment (4 wk after initial treatment), the mean lameness grade was 0.02. These lameness scores were significantly different (\( p < 0.0001 \)).

There were no clinically important complications seen after treatment of DMD with RSWT. In all 50 horses, the skin surface was warm immediately after treatment. In 15 of 50 horses (30%), subcutaneous edema was present after treatment that resolved within 24 h with compressive bandaging. Treatment with phenylbutazone was needed in one case.

When returned to speed work, 40 of 50 horses (80%) resumed breezing and racing without any recurrence of lameness or clinical signs associated with DMD. Four horses (8%) experienced temporary soreness in the affected shin when returned to breezing, but responded to a temporary reduction in speed work to race without further lameness. Four of 24 horses (17%) with grade IV or grade V injuries (stress fractures) experienced recurrence of the fracture within 9–15 mo after the last RSWT treatment. Two horses in this study died of unrelated causes. One horse was euthanized subsequent to surgery for recurrent colic, and the other was euthanized after developing a humeral stress fracture in the same limb as the DMD.

The mean time from last treatment to first race for horses with grade II lesions (\( n = 4 \)) was 9 mo. The median earnings/start of these horses before...
treatment was $0.00 and was $2718.00 after treatment. The change in earnings/start before and after treatment in horses with grade II lesions was not significant (p = 0.25). The mean time from last treatment to first race for horses with grade III lesions (n = 22) was 4.5 mo. The median earnings/start of these horses before treatment was $135.00 and was $2543 after treatment. The change in earnings/start before and after treatment in horses with grade III lesions was significant (p = 0.01). The mean time from last treatment to first race for horses with grade IV lesions (n = 20) was 5 mo. The median earnings/start before treatment was $2373 and was $971 after treatment. The change in earnings/start before and after treatment in horses with grade IV lesions was not significant (p = 0.73). The mean time from last treatment to first race for horses with grade V lesions (n = 4) was 5 mo. The median earnings/start before treatment was $6636 and was $9504 after treatment. The change in earnings/start before and after treatment in horses with grade V lesions was not significant (p = 0.88).

4. Discussion

When combined with an appropriate training program, RSWT seems to be a safe and effective non-invasive adjunctive treatment for DMD in Thoroughbred racehorses, with 45 of 50 horses (90%) returning to racing after treatment. Although a significant decrease in the lameness scores was seen during the treatment period, it is impossible to attribute this observation solely to treatment with RSWT because lameness in horses with DMD will decrease spontaneously when horses are removed from training. Very few of the horses in this study were lame at the time of initial presentation because they had been out of training for a minimum of 8 wk.

As might be expected, the duration of healing of DMD in this group of horses seemed to be proportional to the degree of injury. Twenty-three of 26 horses with grade II or grade III injuries had radiographic evidence of healing within 60 days of treatment. In contrast, only 4 of 24 horses with grade IV or grade V injuries (stress fractures) were healed in that same time period. Most stress fractures healed within 3–5 mo after treatment. As a group, the mean time from last treatment to first race for horses with stress fractures (grades IV and V) was 5.2 mo (±2.17 mo). This interval was considerably shorter than that of the group of Thoroughbreds with stress fractures treated by cortical fenestration and internal fixation (mean of 8 mo to first race). This may have been because of the fact that all of the horses in this study had been previously treated with some other method of treatment before RSWT, and the time interval for that treatment was not included in the calculation.

Comparison of race performance before and after treatment with RSWT indicated that overall these horses returned to the same level of performance as that attained before injury. This finding was consistent with results found in another study of dorsal cortical fractures treated with fenestration and screw fixation. Interestingly, horses with grade III injuries earned significantly more money/start than they did before treatment. This is likely because of the fact that many of these horses became lame during training and were thus unable to race at all before treatment.

One of the most frustrating problems associated with the treatment of DMD is the recurrence of lameness and/or fractures when horses are returned to training. Recurrence of DMD suggests a failure to adequately remodel the dorsal cortex of MC3 to withstand the level of cyclic strain associated with high-speed training and racing. None of the horses with a grade II or III injury experienced any recurrence of lameness when returned to training, nor did they go on to develop a stress fracture. However, the rate of recurrence of stress fractures (grade IV or V) seen in this group of horses was 4 of 24 (17%). In one survey conducted of racetrack practitioners, the recurrence rate of stress fractures treated with internal fixation was estimated to be 67%.

In another study, a retrospective evaluation of the treatment of dorsal cortical fractures with osteostixis found the rate of recurrence to be 4 of 47 horses (8%) that returned to racing, including 2 horses that experienced catastrophic failure of the MC3. In still another study evaluating the treatment of dorsal cortical stress fractures with screw fixation in conjunction with cortical drilling, 2 of 63 (3%) fractures recurred. Variation in the rate of recurrence of stress fractures may reflect a number of factors, including the method of treatment, total time out of training, and more importantly, the quantity and rate of introduction of speed work as the horse is returned to training.

Because all of the horses in this study were previously treated by some other form of therapy, the use of RSWT in this group of horses must be considered an adjunctive treatment for DMD. However, it is noteworthy that none of the horses in this study were able to train successfully before treatment with RSWT. Although none of the horses in this study experienced catastrophic failure of MC3 when returned to racing, owners and trainers must be advised of a potential risk of catastrophic failure of MC3 if horses with DMD are not rested until the fracture is healed, independent of the form of treatment that is administered.

References and Footnotes


*aESWT Contact Gel; EMS Corporation USA, Dallas, TX 75243.
bSwiss DolorClast Vet; EMS Corporation USA, Dallas, TX 75243.