Extracorporeal Shock Wave Therapy for Treatment of Osteoarthritis of the Tarsometatarsal and Distal Intertarsal Joints of the Horse

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Extracorporeal shock wave therapy should be considered as a viable treatment for osteoarthritis of the tarsometatarsal and distal intertarsal joints. Application of 2000 pulses at 22 kV to the affected joints decreased the lameness grade by at least 1 in 80% of the horses (59/74). No horses had increased lameness following treatment and there were no serious complications associated with the procedure. Authors' addresses: Interstate Equine Services, Inc., 2536 S. Ladd Avenue, Goldsby, OK 73093-9214 (McCarroll); and Department of Veterinary Clinical Sciences, Purdue University, West Lafayette, IN 47907-1248 (McClure). © 2000 AAEP.

1. Introduction

Osteoarthritis of the tarsometatarsal joint and distal intertarsal joint (bone spavin) is a common cause of hindlimb lameness in horses. Diagnosis of bone spavin is made through a combination of lameness examination, flexion tests, diagnostic anesthesia, and radiographic evaluation. Typically, treatment consists of intraarticular corticosteroids with or without hyaluronic acid and anti-inflammatory drugs. Horses that are refractory to treatment or require frequent treatments with decreasing benefit are candidates for more aggressive treatment.

Treatments that have been developed for horses that are refractory to treatment include cunean tenectomy and facilitated ankylosis by surgical and nonsurgical methods. Stimulated ankylosis is an effective treatment, but requires a surgical procedure or injection of sodium monooiodoacetate.

Extracorporeal shock wave therapy (ESWT) utilizes pressure waves generated by the discharge of a high voltage spark under water that is focused at the site to be treated. Shock waves cause a compressive force as it moves from a region of low impedance to high impedance, such as the bone-soft tissue interface. This large energy release focused at the bone has been shown to cause microfracturing of cortical trabeculae and medullary hemorrhage in long bones of beagles and rabbits. Several weeks following treatment, responses noted in bone included thickening of cortical bone, increased in numbers of trabeculae, and increase in the number of osteoblasts.

The objective of this study was to report on the effectiveness of ESWT for treatment of bone spavin in the horse.
2. Materials and Methods

Case records of horses diagnosed with bone spavin and treated with ESWT at the Interstate Equine Clinic between January 1, 1997 and July 1, 1999 were included in this study. Horses were diagnosed with bone spavin by a combination of lameness examination, flexion tests, diagnostic anesthestia, and radiographs or fluoroscopy. Information was obtained from each medical record including signalment, lameness grade, and joints involved. For horses with both rear limbs affected, lameness grade was based on the more severely affected limb if the lameness was asymmetric. All of the lameness examinations were done by one investigator (McCarroll) and the lameness was graded from 0 to 5 as described by the AAEP.7

Each joint involved was treated by an electrohydraulic shock wave generator while the horses were under general anesthesia. Fluoroscopic guidance was used to administer the ESWT to the appropriate location. Each joint was administered 2000 pulses with the primary focus point at the site or sites of the lesion. Following treatment, horses were stall-rested for 1 week, then limited to hand walking and ground work for an additional 4 weeks before resuming full work.

Followup examination and radiographs were obtained 90 days post-treatment. Further follow-up information was obtained by repeated clinical evaluation of the horse and by telephone and personal interview with the owner or trainer.

3. Results

Seventy-four horses were included in the study. There were 59 Quarterhorses, 13 Paint Horses, 1 Appaloosa, and 1 Thoroughbred. The median age of the horses was 4 years with a range from 18 months to 22 years. There were 47 horses used for Western Pleasure, 9 for Cutting, 6 for Roping, 6 for Racing, 4 for English Pleasure, and 1 each for Reining and Barrel Racing.

The horses included had lameness grades ranging from 1 to 3 when treated. All of the horses had been treated conservatively with intraarticular administration of corticosteroids, in some cases in conjunction with hyaluronic acid prior to ESWT with either unsatisfactory or declining response and shorter intervals between treatments. These 74 horses had a total of 139 joints treated. Nineteen horses (26%) had 1 joint treated, 48 (65%) had 2 joints treated, 4 (5%) had 3 joints treated and 3 (4%) had 4 joints treated. There were 92 tarsometatarsal joints (66%) and 47 distal intertarsal joints (34%) included.

At followup examination 90 days after treatment 80% (59/74) of horses had improved at least 1 lameness grade. There was a one-grade improvement in 38% (28/74) of the horses and 42% (31/74) improved 2 lameness grades. This resulted in 18% (13/74) of the horses being sound (lameness grade 0). All of the sound horses were grade 2 lame at the time of treatment. No horses worsened following treatment. Fifteen horses (20%) showed no improvement following treatment. Of the 15 horses that showed no improvement, 8 returned for a second treatment. Four of these horses improved following the second treatment, however all 8 were considered as no improvement for this study.

Followup radiographs taken at 90 days post-treatment showed no consistent changes when compared to pretreatment radiographs. Radiographically, horses with osteophyte formation on the dorsal or dorsomedial aspect of the tarsometatarsal joint seemed to improve most consistently. Following treatment there does not appear to be an accelerated ankylosis of the joints.

4. Discussion

The mechanism associated with the decreased lameness is unknown. A feasible explanation for decreased lameness is stimulated ankylosis of the affected joints, however this was not supported by the radiographs. There has been a direct analgesic effect reported with ESWT, however it is reported to last only a few days.8 A similar finding of decreased pain with few radiographic changes has been identified in humans with heel spurs.8 Similar to this study, patients that became pain free remained so.

The results of this study compare favorably with the techniques described for facilitated ankylosis of the joints. The 3-drill tract method resulted in 79% of the horses sound or improved following treatment2 and chemical fusion resulted in 80% of the horses being free from lameness.3 ESWT resulted in 80% of the horses improving at least 1 lameness grade without the potential complications associated with surgical or chemical ankylosis of the joints.

A potential explanation for decreased lameness in these horses is strengthening of the subchondral bone. ESWT has been demonstrated to increase osteoblastic activity resulting in thickening of cortical bone.5,6 The subchondral bone must remodel for proper adaptation to loading. Subchondral bone maintains joint shape and contributes to shock absorption which acts to spare the cartilage from damage.9 However, it is important that the adaptive remodeling not be excessive, which would result in osteophyte formation at the joint margins and sclerosis of the subchondral bone. No densitometric studies of the tarsal bones were performed in these horses to support or refute this hypothesis.

The results of this study indicate that ESWT should be considered as a viable noninvasive mechanism to treat bone spavin in the horse. Refinement of technique should improve the expected outcome of horses with bone spavin treated with ESWT in the future.
References


Six normal horses received 3 intra-articular injections of sodium monoiodoacetate (MIA) in the distal intertarsal (DIT) and tarsometatarsal (TMT) joints of one hindlimb. Injections were at three week intervals, and post injection pain was controlled with routine administration of phenylbutazone for five days following each injection. All horses underwent a gradually increasing exercise programme consisting of walking and trotting beginning one week after the first injection and continuing for 24 weeks. We conclude that MIA will produce fusion of the DIT and TMT joints of normal horses in 24 weeks, and may offer a relatively easy, inexpensive and non-invasive treatment for distal tarsal osteoarthritis in the horse. PMID: 1915230. The aim of treatment is to provide pain relief so that the horse may remain in work. It has been suggested that by maintaining the horse in work, the distal hock joints will eventually ankylose and the horse will become pain free. However, progressive radiologic ankylosis is rarely observed and has not occurred in lame horses without intervention. Conservative treatment involves systemic NSAIDs, intra-articular medication with corticosteroids, with or without hyaluronan, remedial trimming and farriery, and adaptation of the work program. Drilling across the distal intertarsal and tarsometatarsal joints is the most frequently used procedure to promote distal tarsal arthrodesis. Initial techniques described a more aggressive procedure, with 60% of the articular cartilage removed. Distal tarsitis is an osteoarthritis and periostitis of the distal intertarsal, tarsometatarsal, and occasionally the proximal intertarsal joints. Although the distal tarsal joints are not essential to normal locomotion of the horse, they are prone to instability. Chronic joint instability results in the development of joint inflammation (i.e. arthritis).