



4075 Iron Works Parkway • Lexington, KY 40511
Phone: 859-233-0147 • Fax: 859-233-1968
e-mail: aaepoffice@aaep.org

[« Go Back](#) | [Print This Page](#)

By Scott R. McClure, DVM, PhD, Diplomate ACVS

Lameness: Diagnostic Tests - May 19th, 03

Revised May 2008

A shock wave is an acoustic (pressure) wave with very high amplitude and rapid rise time. There are multiple ways to generate a shock wave. The pressure wave can be instituted by vaporization of fluid across a spark gap (electrohydraulic), expansion of piezoelectric crystals (piezoelectric), or pushing a membrane with opposite electrical current (electromagnetic). In all three mechanisms, the pressure wave is brought to a focal point by lenses or a parabolic reflector. This mechanism allows the energy in the wave to aim at a specific point within the tissue.

Discussions continue about differences between extracorporeal shock waves (ESWs) and radial pressure waves (RPWs). Radial pressure waves are created by a pneumatically driven device to strike the surface. This creates a pressure wave, but the parameters of the wave are different, however they continue to be confused and incorrectly lumped together. The waveforms have different energy levels and different depths of penetration. It is important not to assume that the results of using one wave form will be similar to the other. The discussion here will focus on ESWs.

The original use of shock waves to fragment uroliths was expanded to orthopedic applications when, following a safety study, the density of a portion of the pelvis within the treatment area increased. Subsequently, the original musculoskeletal applications were associated with stimulation of nonunion fractures to heal. Multiple studies have documented the effectiveness of ESWs for treating hypertrophic nonunions in people. Investigations into multiple other areas have led to the FDA approval of ESWs for heel spurs and tennis elbow and other FDA trials are underway.

The mechanisms by which ESWs provide a therapeutic outcome are minimally understood. A number of results of the treatment have been identified. Neovascularization following ESW therapy has been shown in tissues ranging from bone to myocardium. Up regulation of cytokines has been demonstrated in a number of tissues and more recently shown through gene expressions. These findings are great strides towards identifying the initiating mechanism.

In vivo studies have shown increased bone formation and healing of nonunions and neovascularization of bone-tendon junctions. In the horse, multiple applications have been tried. One of the first case series completed was in a group of horses with bone spavin where 59 of 74 horses (80 percent) improved at least one lameness grade. Data from

bone-healing studies would indicate ESW therapy would be beneficial in treating fractures in horses. However, it has not been pursued as aggressively as may have been expected. This could be related to case management, where complete fractures are often inaccessible because of the application of casts. Incomplete fractures such as dorsal cortical fractures seem to have only lackluster response. Based on two studies that indirectly could be related to dorsal cortical stress fractures of the metacarpus, one would expect a better outcome. In a pilot study of two horses, there were more double labeled osteons in the dorsal cortex of a shock wave treated horse than the opposite untreated control. Another study showed an increase in osteoblast numbers in the proximal palmar aspect of the metacarpus following treatment. The lower cellularity, thickness of the dorsal cortex and related distance to vasculature could be a factor. Alternatively, it may take a higher energy flux density than is commonly used to stimulate the equine MC III dorsal cortex.

Multiple veterinarians have reported success in stimulating suspensory desmitis to heal and decrease lameness. The first clinical reports from two separate universities indicated seven of eight and five of six horses improved following treatment. Two controlled studies using a collagenase-induced desmitis model found a decrease in lesion size in treated limbs when compared to untreated controls. Histologically there were more new collagen fibrils and increase proteoglycan deposition. Clinical experiences have mimicked these findings and a prospective study of horses with naturally occurring suspensory desmitis reported that fore and rear limb proximal suspensory desmitis treated with ESWT and controlled exercise compared favorably to previously reported treatments.

The move of ESW therapy into “soft tissue” applications in human medicine has shown promise. A 10 year old study that showed improved epithelialization in skin wounds in pigs went largely unnoticed until recently. One laboratory study in rats that found a significant decrease in necrosis of epigastric skin flaps in rats that were treated with shock waves. Initial clinical studies in humans show promise in treating diabetic ulcers with shock wave therapy. A study in distal limb wounds in horses has shown promise in some of the parameters of wound healing evaluated.

While the positives of this therapy are being evaluated, the negatives must be considered. Most importantly there is a period of analgesia following treatment. Humans treated with ESWT report an initial decrease in pain in the area treated, lasting up to a week, then some return of the original pain that gradually decreases as the underlying problem heals. In a study funded by the Grayson Foundation at Iowa State University, we found that in the horse, a period of analgesia appears to be present for about four days after treatment. In a study to evaluate the duration of analgesia associated with ESWs in the horse with naturally occurring lameness, force plate analysis was used serially following treatment. Treatment was performed after obtaining 3 baseline measurements. There was a significant analgesic effect following ESW therapy from 8 hours through 48 hours after treatment. There was not a significant difference between baseline lameness from day three through the end of the study on day seven. Importantly, this study relates only to the use of SWT, and not to the use of RPWs. A previous study involving force platform gait analysis of horses with navicular syndrome following RPWs found no analgesic effects.

These data have been utilized in the formation of regulations concerning ESW therapy. Racing jurisdictions in the United States and the FEI have adopted regulations that require a

5 to 7 day withdrawal period after treatment before the horse is allowed to perform. Additionally, the indications for shock wave therapy would indicate most horses should be on a decreased level of activity while healing.

Dr. McClure is an Associate Professor at the Iowa State University College of Veterinary Medicine and has been a member of the AAEP since 1993.

[« Back](#)

Copyright © 1996-2008 American Association of Equine Practitioners.

All rights reserved.

American Association of Equine Practitioners
4075 Iron Works Parkway • Lexington, KY 40511
Phone: 859-233-0147 • Fax: 859-233-1968

e-mail: aaepoffice@aaep.org