Acupuncture: Is It Effective for Alleviating Pain in the Horse?

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The results of this study indicate that there is evidence to suggest that acupuncture has merit as an alternative source of therapy in the alleviation of equine pain without the use of drugs or chemicals. Because this study used the heart rate as the indicator of pain response, further studies that incorporate additional variables to determine the level of actual pain response as well as the effect of acupuncture on the mediation of that response are needed. Authors' addresses: El Cajon Valley Veterinary Hospital, 560 N. Johnson Ave., El Cajon, CA 92020 (May) and Dept. of Animal and Veterinary Sciences, California State Polytechnic University, 3801 W. Temple Ave., Pomona, CA 91768 (all other authors). © 1997 AAEP.

1. Introduction

Six horses were fitted with specialized shoes on both front feet. Each shoe contained a ¼ in. (≈ 0.6 cm) × ¾ in. (≈ 1.9 cm) (SAE) bar across the apex of the frog, allowing for the insertion of an Allen bolt. A fixed number of rotations into the frog resulted in an unequivocal lameness. Animals were fitted with Polar heart-rate monitors worn throughout each of three trials. Each trial consisted of a pre-exercise period, a Standard exercise test, and a postexercise period.

As a way to control for individual variation, each animal was used as its own control. One trial established a baseline for that animal, whereas a second trial established a baseline with pain. The third trial consisted of the induction of pain, treatment with hemoacupuncture at site 115 medial and lateral, 116 medial and lateral, and filiform needle acupuncture at 117 for 20 min.

Heart rates were compared by using a paired sample t test. The first comparison involved determining the effectiveness of the shoe in establishing pain (p < 0.05 for five of six subjects). Second, the heart rates of these five individuals were compared for the pain trial and the acupuncture trial. In four of the five subjects, heart rates were significantly lower (p < 0.01) in the trial in which acupuncture was used to alleviate pain.

Although the results of this study indicate that there is support for acupuncture as an alternative treatment for pain, it is suggested that future studies incorporate the use of a more robust variable in the determination of pain.

2. Historical Perspective

According to acupuncture theory, qi is the essence of life that is responsible for maintaining homeostasis. Homeostasis is that dynamic equilibrium that is necessary within the body to reduce our susceptibility to injury and disease. Acupuncture is described by the Chinese as the stimulation of certain points that regulate the flow of qi. Although the use of acupuncture in the treatment of horses is relatively
new to the western world, it has been used on horses in China for over 4000 years.1

Although it is questionable whether or not acupuncture originated in China, there is no doubt that the Chinese were responsible for its systemization. It was the Chinese who carefully described the meridians, classified the points, and generally developed the laws of acupuncture.2 It is believed that the concept of acupuncture was discovered when lame horses became sound after being struck by arrows during battle. Indeed, this is the earliest evidence available supporting the use of acupuncture in the alleviation of equine pain.

Scientific interest in acupuncture began in earnest in western cultures around the 1950’s. It was at this time that reports from China indicated that acupuncture was being used to achieve a surgical plane of analgesia. Since that time, much research has been done focusing on the relationship between the acupuncture point and the neuroendocrine system, specifically with regard to its role in pain control.3

3. Structural Basis of Acupoints

Shu xue is the term used to refer to acupuncture points. Loosely translated, it means a hole or outlet in the skin that communicates with one or more internal organs. It accomplishes this communication by way of a meridian (in the Chinese known as jing) or its collateral (luo). The concept that each point communicates with a specific organ and is capable of reflecting the condition of that organ is traditional Chinese medical theory. The related acupoints will show physiologic changes such as altered color or rigidity of skin when the associated organ is suffering a pathophysiologic change. It is believed that when the points are treated with acupuncture, the point and the meridian allow the ready communication of the effect to the affected organ.4

Hemoacupuncture, also known as bleeding an acupuncture point, is considered a conventional method of therapeutic veterinary acupuncture. For this study, hemoacupuncture was used both medically and laterally at acupuncture 115 and 116. These sites were chosen based on their indications for use. Site 115 (qian ti men), or heels of the hoof, is indicated for swelling and inflammation of the frog and bulb, and pain in the pastern or heel. Site 116 (qian ti tou), or toe of the hoof, is indicated for laminitis and painful and swollen hoof.5

Conventional acupuncture using a 4.5-cm filariiform needle was used on site 117 (qian jiu), the central bulb. This site was chosen because it is indicated in laminitis.5

4. Pathway of Pain

Endogenous antinociceptive systems and their anatomic and neurochemical bases are extremely complex. The brain stem and spinal cord perform a major role in the modulation of nociception, although it is obvious that all levels of the central nervous system are involved to some extent.6 An understanding of the central nervous system (CNS) and its relationship to the transmission, perception, and inhibition of pain is necessary toward an understanding of some of the theories of acupuncture. It is generally accepted that pain results from a noxious stimulus applied to pain receptors, which are located in the skin or musculoskeletal or visceral structures. These pain receptors are free nerve endings, which are capable of transmitting information regarding mechanical, thermal, or chemical stimuli.3

The acupuncture points that are used by the acupuncturist are cutaneous areas containing relatively high concentrations of free nerve endings, nerve bundles and nerve plexi, mast cells, lymphatics, capillaries, and venules.7 Afferent peripheral nerves are used to transmit the acupuncture stimulus to the spinal cord from the acupuncture point. The afferent neuron enters the spinal cord and follows similar pathways to those of the pain pathways.7 Pain impulses are transmitted by neurons that are components of the sensory nervous system and are referred to as A-delta and C fibers. The A-delta fibers are poorly myelinated and very thin, whereas the C fibers are one tenth the diameter of A-delta fibers, are unmyelinated, and are ten times slower in transmitting impulses. It is the C fibers that transmit a more unpleasant pain sensation because of their higher threshold for stimulation.

5. Materials and Methods

A. Shoes

Six 3-year-old purebred Arabian horses were fitted with a specially designed shoe on both front feet. A prior pain model used an adjustable heart bar shoe with an Allen screw to apply frog and P3 pressure until a subjective lameness response was reached (Grade I).8 In this study the shoe was modified as a result of problems noted in early exploratory trials. The shoes were fitted with a ⅛ in. × ⅜ in. (SAE) bar across the apex of the frog, which had a ⅛ in. (SAE) hole directly over the apex. This allowed for the insertion of an Allen bolt into one of the shoes. A fixed number of rotations of this bolt (determined independently for each animal) produced an unequivocal lameness (Grade I). This pain model is noninvasive, nonpermanent, reproducible model of musculoskeletal pain.

B. Monitoring of Heart Rate

Previous studies have shown that heart rate seems to be an acceptable indicator of pain.8,9 Each animal was fitted with a Polar heart-rate monitor, and the heart rate was monitored throughout the entire trial period. Each trial was separated into three different time periods: (a) pre-exercise (~1 h), (b) standardized exercise test (5 min on a high-speed treadmill at 3.6 m/s with 0% grade), and (c) postexercise (~1 h). The animals were used as their own
controls, resulting in four different trials. The first trial was with no induction of pain and no treatment and was used to establish a baseline heart rate for the individuals. The second trial was done with the application of pressure from an Allen bolt to the frog, causing an unequivocal lameness. This trial was used to determine the pain baseline heart rate for each horse.

C. Acupuncture

Additionally, each animal went through two trials that involved treatment with acupuncture. Again, one of these trials served as a treated control and the other required treatment with acupuncture 20 min after pain induction. The acupuncture treatment consisted of hemoacupuncture 1 cm deep at acupuncture site 115 (qian ti men), located in the depression at the caudal corner of cartilage of the hoof, on the caudodorsal border of the heel. There are two points on each hoof—medial and lateral. The second site used in the acupuncture treatment was 116 (qian ti tou). This site is located 2–3 cm lateral to the dorsal median line of the toe of the foreleg, 1 cm dorsal to the periople or the junction between the coronary border of the hoof and the skin. A corresponding anatomical point, medially, was also treated. Hemoacupuncture was performed at this site. The third site used during the acupuncture treatment was site 117 (qian jiu). This site is located in the middle of the caudal surface of the front hoof, proximal to the bulb. The method of acupuncture at this site was conventional with a filiform needle of 4.5 cm in length. This needle remained in place for 20 min and was removed immediately prior to the animal working on the treadmill.

6. Results

Heart rates were monitored and recorded every 15 s on all six animals throughout all six trials. These heart rates were analyzed by using a paired sample test. An initial analysis was done to determine if the modified shoe was an adequate design to produce a measurable pain response. This proved to be the case in five of the six animals (p < 0.05). Heart rates for these five animals were then compared to determine if acupuncture was effective in alleviating pain (as measured by a reduction in the heart rate). In four of the five horses tested, heart rates on the pain trials were significantly lower (p < 0.01) when the horses were treated with acupuncture.

7. Discussion

Prior equine pain models for controlled research did not address musculoskeletal pain, in a noninvasive and nonpermanent manner. This model is a modification of an existing pain model that standardized pain by clinically evaluating subjective lameness as a pain response. This model provides a controlled and objective pain stimulus. Additionally, this pain model is a noninvasive, nonpermanent, reproducible model of musculoskeletal pain.

8. Conclusions

The results of this study indicate that there is evidence to suggest that acupuncture has merit as an alternative source of therapy in the alleviation of equine pain. This is an important consideration for many involved in the equine industry. In the United States alone, horses are a multi-billion-dollar industry. Many owners participate with their animals in physically demanding sports such as racing, showring, or endurance riding. This study looked at a method by which pain can be alleviated in these animals without the use of drugs or chemicals that may put them in violation of medication rules and regulations.

It is important to note that although heart rate has been shown to be a reliable indicator of the pain response, the authors realize that other factors such as excitement or fear will also cause an elevated heart rate in this species. For this reason, the animals used in this study were desensitized to the study conditions over a 4-week period prior to data collection. Additionally, each animal was used as its own control to determine the effect of pain and no pain, or treatment and no treatment, on its heart rate.

Future studies in this area should include additional variables to determine the level of actual pain response as well as the effect of acupuncture on the mediation of that response. Videotape would be extremely useful as a visual documentation of the amount of lameness caused in addition to the response to treatment with acupuncture.

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References