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Journal of Acupuncture and Meridian Studies

journal homepage: www.jams-kpi.com

RESEARCH ARTICLE

Successful Practice of Electroacupuncture Analgesia in Equine Surgery

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Available online 24 July 2014

Received: May 27, 2014
Revised: Jul 12, 2014
Accepted: Jul 15, 2014

KEYWORDS
acupoints;
acupuncture;
analgesia;
electroacupuncture;
equine surgery

Abstract
Electroacupuncture analgesia was used for surgery in horses and donkeys. A KWD-808 electrical stimulator was used to incrementally induce a dense, dispersed wave output at frequencies from 20 to 55 Hz, which was maintained at a frequency of 55 Hz, and to change the amplitude of the wave to the best grading number for the suggested operation in each animal. Induction of analgesia lasted for 20—30 minutes, and the effect of analgesia was maintained for 20—45 minutes depending on the type of surgery performed. The exhibited clinical signs, physical examination data, and the responses of all animals were used for evaluating the periods of analgesia. Although the majority of the cases (95%) had no response to strong surgical pain, they experienced significant increases in heart rates and respiratory rates during induction. The lack of pain, relaxed surgical procedures, reduced intraoperative bleeding, and improved healing without complications were all definite benefits of using electroacupuncture analgesia in surgery. Thus, this study has provided surgical evidence supporting the effectiveness of electroacupuncture analgesia, as well as confirming its reliability, in the field of equine anesthesia and surgery.

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pISSN 2005-2901 eISSN 2093-8152
http://dx.doi.org/10.1016/j.jams.2014.07.002

1. Introduction

Veterinary acupuncture was initially practiced in China and later spread to other Asian countries, such as Japan and Korea, about 1500 years ago. In the last 25—30 years, there has been a tremendous growth in animal acupuncture in Europe and the United States [1]. Many types of stimulations, including acupuncture, various peripheral electrical stimulations, vibrations, and electrical stimulations of specific areas in the brain, are able to produce analgesic effects [2]. They activate pathways from the brain to the spinal cord and inhibit incoming pain information in various layers of the dorsal horn of the spinal cord. These pathways involve many neurotransmitters, including serotonin, endogenous opiates, and norepinephrine [3]. Electroacupuncture has stronger effects than other types of acupuncture [4], and acupuncture analgesia has been produced using different types of stimulations at both acupoints and nonacupuncture points [5]. Acupuncture has been proven to be effective for treating pain, geriatric diseases, and exercise-related diseases in horses [6], and results of neuroscience studies have provided a physiological basis for explaining how acupuncture works and how it stimulates the release of painkillers known as endorphins [7]. The acupoints are located throughout the body on meridians and are connected to each other. These points can be stimulated by various means in order to produce physiological functions to treat different diseases [8].

The current work was designed to prove the relevance of electroacupuncture analgesia in the field of equine surgery. The aim was to replace expensive anesthetic drugs with a simple analgesia technique that could maintain the animal's normal physiology during surgery without pain and danger.

2. Materials and methods

The present investigation was carried out on 18 healthy experimental animals (10 stallions and 8 mares); their ages varied from 8 to 15 years, and their body weights ranged from 350 to 450 kg. These horses were cared for and managed during the 1-year study period in accordance with the guidelines of the Animal Ethics Committee of Veterinary Medicine, Cairo University (Cairo, Giza, Egypt). Electroacupuncture stimulation was used for seven clinical cases (2 foals, 1 gelding, 2 stallions and 2 donkeys) treated at our surgery clinic. Surgeries on the head and neck, the chest wall, the thigh, and the abdomen, as well as castration were performed on experimental animals. Each animal, whether clinical or experimental, had an independent acupoints plan. The selected acupoints were exposed to electroacupuncture stimulation throughout the duration of the surgery.

An acupuncture electrostimulator set (9 V; KWD-808 I Multi-Purpose Health Device) with a current frequency range of 1.2—55 Hz made in China. Acupuncture needles of different sizes (0.50 × 40 mm, 0.70 × 70 mm), and electric wires with terminal clips were used in this study. The electrostimulator was checked to ensure that the power was switched off. Needles were inserted at the selected acupoints at the appropriate angles and depths of insertion. The electroacupuncture stimulator, which produced a bipolar waveform (+), and (−) electrodes were connected to the needles by electric wires with terminal clips. The power switch was turned on to establish a frequency of 20 Hz at the beginning, which took 10 minutes; the frequency was then changed gradually for the next 10—20 minutes to achieve a frequency of 55 Hz. Thereafter, for the maintenance of analgesia, the output with the 55-Hz frequency was sustained, and the amplitude of waves was changed to the required grade (from 1 to 10) of the outputs; the analgesic effect was maintained until the end of the surgery. The duration of analgesia varied (from 20 to 45 minutes) depending on the type of surgery performed.

The exhibited clinical signs, particularly after electroacupuncture induction and maintenance, were shivering, tremors, quidding, blinking of the eyelids, nystagmus, abnormal tongue movement, sweating, engorgement of facial blood vessels, muscle contraction, urination, and defecation. The body temperature (°C), mucous membrane color, respiratory rate (breaths/minute), heart rate (beats/minute), and capillary refill time were evaluated before electroacupuncture stimulation (control) and during induction and maintenance of analgesia.

Head and neck operations included cheek wound suturing (Fig. 1), neck wound suturing (Fig. 2), trephining (Fig. 3), and excision of the medial canthus sarcoid (Fig. 4). The acupoints used were bilateral and can be described as Kuang-Xia-Kong (infraorbital foramen), Mian-Shen-Jing (facial nerve), Ting-Gong (auditory palace), Yan-Chi (rock pond), He-Xi (jaw stream) and Xia-Yi-Feng (lower wind shield).

For lateral thoracic wound suturing, the acupoints Qiang-Feng (robbing wind) SI-9 and Qi-Jia (withers) between GV-13 and GV-14 were used and are demonstrated in Fig. 5. For the laparocolotomy, the acupoints Qi-Jia, Bai-Hui (hundred meetings), Wei-Gan (tail base) GV-2, and Da-Kua (greater trochanter) were used as shown in Fig. 6. For thigh wound suturing, the acupoints Bai-Hui, Wei-Gan, Da-Kua, and Han-Gou (sweat groove) BL-37 were used. The procedures are displayed in Fig. 7.

For the treatment of a lateral abdominal hernia in a foal, the acupoints Bai-Hui, Wei-Gan, Da-Kua, Qiang-Feng, and Tian-Men (heavenly gate) GV-16 were used and are shown in Fig. 8. For the treatment of granulomatous swelling in the right side of the abdominal wall in a foal, the acupoints Qi-Jia, Bai-Hui, and Wei-Gan were used, with two needles inserted parallel to both sides of the operation site. These acupoints are shown in Fig. 9.

For the treatment of a long-standing fibroma at the right thoracic wall in a donkey, the acupoints Tian-Men, Qi-Jia, Bai-Hui, and Wei-Gan were used with two needles inserted at both ends of the operation site. In addition, the auricular acupoints Shen-Men (gate of mind), Fei-I, and Xiong (thorax point) were used. These procedures are illustrated in Fig. 10.

For the treatment of an obstructive urolith in the perineal urethra and rupture of the urinary bladder in a donkey, the acupoints Hou-Hai (caudal sea) GV-1, Han-Gou, Da-Kua, Wei-Gan, Bai-Hui, Qiang-Feng, and Tian-Men, with two thin needles inserted at the incision extremities of the urethrostomy site, were used. These procedures are shown in Fig. 11. For castration surgery, the acupoints Bai-Hui, Wei-