Effect of High Regional Nerve Blocks on the Thermographic Patterns in the Limbs of Horses

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1. INTRODUCTION

It is often difficult to judge the effectiveness of a high regional nerve block (i.e., anesthesia of the median, ulnar, peroneal, or tibial nerve) in the horse. After a high regional nerve block, skin can be tested for loss of sensation at a specific site on the limb for each nerve, but this method of testing may yield erroneous information for several reasons: (1) the horse may be stoic and show little reaction to noxious stimulation of skin, (2) the region of skin desensitized may vary somewhat among horses, and (3) some horses react violently to the slightest provocation, making a positive reaction to skin testing difficult to interpret. A positive response to a nerve block (i.e., resolution of lameness) is good evidence that the nerve was actually anaesthetized, but a negative response may mean that the source of pain causing lameness was not in the region supplied by that nerve or that anesthesia of the nerve was not achieved; the accuracy of a lameness examination depends upon the ability to make this distinction.

Thermography studies done on the thoracic (front) and pelvic (back) limbs of horses before and after neuroectomies showed that posterior digital nerve neuroectomy had a significant increase in heat patterns in the areas supplied by the nerves. (1, 2, 3) Sensory – sympathetic dermatome patterns of the cervical regions in horses were determined by using 0.5% mepivacaine hydrochloride as a local anesthesia in horses (4, 5). Thermography provided the evidence of the individual cervical nerve block.

The nerves of the skin are mainly divided into two categories: sensory and autonomic. The sensory nerves are for transmission of the sensation of temperature, pain, itch, light, touch, pressure, and proprioception; whereas the autonomic nervous system controls the tone of cutaneous blood vessels and skin glands.

We reasoned that neurological control of blood vessels in skin is interrupted when the nerve supplying blood vessels is anaesthetized and that those blood vessels would dilate in response to nerve block. Dilation of blood vessels increased flow flow to skin, in turn causing an increase in skin temperature, which can be detected on thermography (6). The primary objective of this study was to demonstrate that thermography can be used to accurately predict whether or not a high regional nerve block was successfully performed.

2. METHODS

Six horses ranging in age from 15 to 21 years were selected for this study. A digital infrared camera (Flir B360) was used to record thermal images. Images of the front leg were taken from the forearm and hoof and posterior leg images from the stifle to hoof. The anterior, posterior, and lateral images were taken to provide thermal mapping of the dermatome regions related the specific nerve block. Average temperature of the dermatome regions were determined by using Flir software (Flir Reporter 8.5). A baseline thermographic image was recorded prior to each perineural injection of mepivacaine HCL of the ulnar, median, peroneal, or tibial nerves. A total of 20mL of mepivacaine HCL was administered perineurally using a 20-gauge, 1.5 inch hypodermic needle. Thermography patterns of the all limbs of each horse were obtained immediate post injection and at 15 minute intervals for one hour post injection. A sham treatment, injection of saline for each site was also performed on separate occasions to determine the effect of potential injection site irritation, if any.

3. RESULTS/DISCUSSION

In response to regional nerve block, two responses were produced. First, blocking the sympathetic portion caused increased thermal (heat) patterns due to vasodilation, and second, the area of insensitivity was produced by the sensory portion of the nerve block. Increased thermal gradients were consistent

in all nerve blocked areas. Thermography can be used to determine the accuracy of a high regional nerve block, and the area can be easily demarked. Results of a thermographic evaluation of the limbs is at least as accurate as testing for skin sensation to determine the accuracy of a high regional nerve block and may be a safer method of making this determination.

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