Effect of Transcutaneous Carbon Dioxide Therapy on Wound Healing and Skin Graft Acceptance in Horses

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The use of transcutaneous carbon dioxide therapy may be beneficial for the treatment of distal limb wounds healing by second intention. Authors’ addresses: Department of Clinical Studies, New Bolton Center, School of Veterinary Medicine, University of Pennsylvania, Kennett Square, PA 19348 (Gaesser, Torcivia, Stefanovski, Engiles, Levine); Department of Large Animal Clinical Sciences, College of Veterinary Medicine, Michigan State University, East Lansing, MI 48824 (Vanderbroek); Department of Medical Sciences, School of Veterinary Medicine, University of Wisconsin-Madison, Madison, WI 53706 (Kowalski); Department of Pathobiology, New Bolton Center, School of Veterinary Medicine, University of Pennsylvania, Philadelphia, PA 19104 (Engiles); e-mail: agaesser@vet.upenn.edu. *Corresponding and presenting author. © 2021 AAEP.

1. Introduction

One proposed mechanism of exuberant granulation tissue formation is persistent hypoxia. Carbon dioxide therapy (CDT) is thought to cause the release of oxygen from hemoglobin, improving local oxygenation. The objectives were to evaluate the effect of CDT on wound healing and skin graft acceptance in the horse.

2. Materials and Methods

Three wounds were created on the dorsum of each metacarpus of six horses. One forelimb received CDT while the contralateral limb was the control. Twelve treatments were performed after wounding. Skin grafts were performed on the larger wounds on day 7, and graft acceptance rate was determined on day 28. Granulation tissue grade was determined by a blinded observer. Biopsies were obtained on days 7 and 14 and were evaluated for the degree of inflammation, epithelialization, angiogenesis, and fibrosis. Digital images were used to determine wound area over time. Statistical analysis was performed with mixed-effects logistic regression.

3. Results

For the larger central wounds, which increased in area initially, CDT treated wounds did not expand as significantly as control wounds ($p = 0.004$). There was no effect of treatment on granulation tissue grade or histologic scores. There was no effect of treatment on graft acceptance rate.

4. Discussion

Limitations include the two-dimensional nature of wound planimetry and that treatments were only

NOTES

Research Abstract—for more information, contact the corresponding author
administered during the first 14 days. CDT treatment may be beneficial for the wounds healing by second intention by limiting expansion of granulating wounds.

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Declaration of Ethics
The Authors have adhered to the Principles of Veterinary Medical Ethics of the AVMA.

Conflict of Interest
The Authors have no conflicts of interest.