Anesthesia of Horses Immediately Following Strenuous Exercise

Stephen A. Greene, DVM, MS; David C. Rankin, DVM, MS; Robert D. Keegan, DVM; Ann B. Weil, MS, DVM; Robert K. Schneider, DVM, MS; and Warwick M. Bayly, DVM, MS

A protocol for anesthetizing horses immediately following high-speed exercise was developed. Strenuous treadmill exercise followed immediately by anesthesia with detomidine (40 µg/kg IV) and Telazol (1 mg/kg IV) was associated with mild cardiopulmonary, electrolyte, and acid-base changes. A similar protocol was applied successfully to horses breezing on a racetrack. These anesthetic protocols may be suitable for use in horses severely injured while racing or breezing, or who are in transport accidents. Authors’ address: Dept. of Veterinary Clinical Sciences, College of Veterinary Medicine, Washington State University, Pullman, WA 99164-7060. © 1998 AAEP.

1. Introduction
A protocol for consistent, safe, and effective induction and maintenance of anesthesia in horses severely injured during exercise has been needed. Exercise-induced changes in cardiovascular function, acid-base balance, muscle physiology, and plasma electrolyte concentrations may lead to the development of problems, such as myopathy or hypoxemia, that are of concern to the anesthetist. We sought to develop a protocol that could be effectively used in the immediate postexercise period to anesthetize horses injured while racing or participating in similarly stressful events.

2. Materials and Methods
Six Thoroughbred horses with a mean weight of 511 kg (range of 448–640 kg) were studied. Horses were trained to run at high speed on a 10% inclined treadmill, and the VO2 max was determined prior to the study. The exercise protocol consisted of a 3-min warm-up (4 m/s) followed by a gallop for 90 s at the speed calculated to elicit VO2 max and then at 115% of VO2 max for 90 s. Induction protocols using combinations of xylazine, detomidine, medetomidine, ketamine, Telazol, propofol, and atracurium were evaluated in a pilot study. Based on the ease of administration and the quality of anesthetic induction and recovery, the combination of detomidine (40 µg/kg IV) and Telazol (1 mg/kg IV) was selected for further in-depth study. Arterial blood pressure, cardiac output (by thermodilution), heart rate, pulmonary arterial pressure, temperature, arterial pH and blood gas tensions, and plasma lactate, electrolyte, and creatine phosphokinase concentrations were measured in each horse before (baseline), during, and after exercise; after the induction of anesthesia; and 15, 30, 45, 60, 75, and 90 min after beginning maintenance of anesthesia with isoflurane in oxygen. Detomidine was administered after stopping exercise while the horse was standing on the treadmill.
Telazol was administered 5 min after detomidine at a site near the treadmill. During inhalation anesthesia, ventilation was controlled by using a mechanical ventilator. Each horse was anesthetized twice: once following treadmill exercise and once following sham exercise (control), in which the horse stood on the treadmill. A similar protocol, medetomidine (15 µg/kg IV) and Telazol (1 mg/kg IV), was subsequently applied in a field situation. Six horses galloped 1 mile at top speed on a dirt racetrack and were anesthetized within 5 min of stopping, and they were transported to our veterinary hospital without supplemental anesthetics. Data were expressed as mean ± SEM and were analyzed by using a one-way analysis of variance for repeated measures. When significant, the F statistic for individual means was compared by using the Bonferroni post hoc test. Significance was set at p < 0.05.

3. Results

For exercised horses just prior to detomidine administration, the mean heart rate was 134 beats/min; temperature was 39.7°C; arterial pH was 7.23; and plasma lactate concentration was 21.4 mmol/L. Cardiac output was greater in exercised horses than it was in control horses immediately postexercise. Compared with the baseline, cardiac output and arterial blood pressure were significantly decreased during anesthesia in both groups. Heart rate rapidly and significantly decreased in both groups following detomidine administration (from 143 to 47 beats/min in exercised horses and from 44 to 20 beats/min in control horses). Arterial blood pressure was greater in exercised horses than in control horses after 15 min of isoflurane anesthesia. Arterial pH in exercised horses was decreased when compared with both baseline and control group values after exercise through 30 min of isoflurane anesthesia. Significant increases in Na⁺ and K⁺ and decreases in Cl⁻ and ionized Ca²⁺ were observed following exercise; however, there were no differences between groups (except Cl⁻) after the induction of anesthesia. For horses anesthetized at the racetrack, the mean time of transport to the hospital was 14.7 min and the mean time to standing was 81.9 min after the induction of anesthesia. Recovery from anesthesia was good for all horses.

4. Discussion

Twice the standard preanesthetic dose of detomidine was required to achieve adequate sedation in the exercised horses. The anesthetic protocols we selected for study offered the advantage of requiring small volumes (2–6 ml) for each injection. Mild physiologic changes occurred during subsequent isoflurane anesthesia in the exercised horses. We conclude that detomidine or medetomidine combined with Telazol provides a consistent, safe protocol for inducing anesthesia in horses immediately following strenuous exercise.

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References and Footnotes


Telazol, Fort Dodge Laboratories, Fort Dodge, IA 50501.