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RESEARCH PAPER

Evaluation of a romifidine constant rate infusion protocol with or without butorphanol for dentistry and ophthalmologic procedures in standing horses

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Abstract

Objective To compare the clinical usefulness of constant rate infusion (CRI) protocols of romifidine with or without butorphanol for sedation of horses.

Study design Prospective 'blinded' controlled trial using block randomization.

Animals Forty healthy Freiberger stallions.

Methods The horses received either intravenous (IV) romifidine (loading dose: 80 μg kg^{-1}; infusion: 30 μg kg^{-1} $hour^{-1}$) (treatment R, $n = 20$) or romifidine combined with butorphanol (romifidine loading: 80 μg kg^{-1}; infusion: 29 μg kg^{-1} $hour^{-1}$, and butorphanol loading: 18 μg kg^{-1}; infusion: 25 μg kg^{-1} $hour^{-1}$) (treatment RB, $n = 20$). Twenty-one horses underwent dentistry and ophthalmic procedures, while 19 horses underwent only ophthalmologic procedure and buccal examination. During the procedure, physiologic parameters and occurrence of head/muzzle shaking or twitching and forward movement were recorded. Whenever sedation was insufficient, additional romifidine (20 μg kg^{-1}) was administered IV. Recovery time was evaluated by assessing head height above ground. At the end of the procedure, overall quality of sedation for the procedure was scored by the dentist and anaesthetist using a visual analogue scale. Statistical analyses used two-way ANOVA or linear mixed models as relevant.

Results Sedation quality scores as assessed by the anaesthetist were R: median 7.55, range: 4.9–9.0 cm, RB: 8.8, 4.7–10.0 cm, and by the dentist R: 6.6, 3.0–8.2 cm, RB: 7.9, 6.6–8.8 cm. Horses receiving RB showed clinically more effective sedation as demonstrated by fewer poor scores and a tendency to reduced additional drug requirements. More horses showed forward movement and head shaking in treatment RB than treatment R. Three horses (two RB, one R) had symptoms of colic following sedation.

Conclusions and clinical relevance The described protocols provide effective sedation under clinical conditions but for dentistry procedures, the addition of butorphanol is advantageous.

Keywords butorphanol, constant rate infusion, horse, romifidine, sedation.

Introduction

Constant rate infusions (CRIs) of α-2 agonists are advantageous over repeated bolus administration when sedation is required for prolonged procedures.

They offer a more stable plane of sedation as a result of constant plasma concentrations, and cardiovascular effects, which are pronounced after a bolus, tend to stabilize during CRI (Bettschart-Wolfensberger et al. 1999; Ringer et al. 2013b).

A bolus of romifidine produces less ataxia than an equipotent sedative dose of detomidine or xylazine (England et al. 1992; Hamm et al. 1995). Used as a CRI, romifidine also shows a tendency to produce less ataxia and less reaction to acoustic stimulation compared to xylazine (Ringer et al. 2013a).

In clinical practice α-2 agonists often are combined with opioids in order to improve quality of sedation, and of these, butorphanol is the most widely used as it has marketing authorization for horse. Sellon et al. (2001) investigated a butorphanol CRI-protocol which provided plasma concentrations within a range associated with analgesia. Behavioural and gastrointestinal tract effects were minimized compared with a single injection.

A romifidine-butorphanol CRI would seem to be promising for prolonged standing interventions in horses based on the reasons mentioned above. Ringer et al. (2012a) developed dose rates for a romifidine, and a combined romifidine-butorphanol CRI under experimental conditions, basing adequacy of sedation on the position of the horse's head (drooped or otherwise). Surprisingly, with this model no significant reduction in romifidine requirements could be detected when butorphanol was added. But in these experiments no stimuli were applied, which does not represent a clinical situation.

The objective of the present study was to assess and compare the quality of sedation provided by the romifidine and romifidine/butorphanol CRIs as developed by Ringer et al. (2012a) under clinical conditions. We hypothesized that, in contrast to studies performed with unstimulated research horses, the addition of butorphanol would improve sedation quality of horses undergoing interventional procedures and reduce requirements for sedation boli additional to the CRI.

Materials and methods

This study was approved by the Swiss Federal Ethics Committee on animal research of the Canton Vaud.

The subjects were forty healthy Freiberger stallions, all from the same breeding station, which were to undergo procedures requiring sedation.

The study design was that of a prospective controlled clinical trial, using a block randomization of treatment, and in which neither the anaesthetist nor the dentist evaluating efficacy were aware of the treatment given. Each horse was assigned randomly to one of two treatments: intravenous (IV) romifidine (treatment R: 20 horses, body weight: mean 540 ± SD 26 kg, age: 9.5 ± 4.4 years) or romifidine combined with butorphanol (treatment RB: 20 horses, body weight: 535 ± 41 kg, age: 10.1 ± 5.5 years). Once sedated the horses underwent either a dentistry procedure (group D 21 horses; R: 11 horses, RB: 10 horses) or a buccal examination (group ND 19 horses; R: 9 horses, RB: 10 horses) using a mouth gag. All the horses (D and ND) underwent an ophthalmologic examination with bilateral cytobrush sampling as part of a concurrent research trial.

Prior to the trial, the horses were weighed and underwent clinical examination. They were then left undisturbed in their stable and observed for 10 minutes to determine their normal head height above ground (100% HHAG) as described by Ringer et al. (2012b). On the day of the trial, a jugular vein was catheterized (14 gauge × 160 mm catheter; Secalon-T, Argon, Singapore) after subcutaneous infiltration with 2 mL of mepivacaine (Mepivacaïne; Kantonsapotheke Zurich, Switzerland).

Loading doses of either 80 μg kg^{-1} romifidine (Sedivet; Boehringer Ingelheim, Switzerland) diluted in saline (NaCl 0.9%) up to 20 mL (treatment R), or the same amount of romifidine with 18 μg kg^{-1} butorphanol (Alvegesic 1%; Virbac, Switzerland) diluted in saline up to the same volume (treatment RB) were prepared. Before taking the horses out of their stable, 75% of the loading dose was administered IV through the jugular catheter. Horses were then walked to a stock in the procedure room. Once in the stock, the rest of the loading dose was administered and a CRI started (t_0). Horses received either romifidine (treatment R) 30 μg kg^{-1} $hour^{-1}$ diluted into Lactated Ringer's solution at a rate of 10 mL kg^{-1} $hour^{-1}$ delivered by infusion pump (Volumed VP 7000; Arcomed, Switzerland), or romifidine 29 μg kg^{-1} $hour^{-1}$ combined with butorphanol 25 μg kg^{-1} $hour^{-1}$ into Lactated Ringer's solution at the same rate (treatment RB).

Instrumentation consisted in a base-apex electrocardiogram (Cardiocap 5; Datex Ohmeda, Switzerland).

Horses were left undisturbed for 15 minutes after starting the CRI. Thereafter (t_{15}), the Haussmann mouth gag was placed and teeth rasping started