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RESEARCH PAPER

Evaluation of sedation for standing clinical procedures in horses using detomidine combined with buprenorphine

Polly Taylor*, Karen Coumbe†, Frances Henson‡, David Scott§ & Alan Taylor¶

*Taylor Monroe, Gravel Head Farm, Little Downham, UK

†Bell Equine Veterinary Clinic, BEVC, Maidstone, UK

‡Clinical Veterinary Medicine, University of Cambridge, Cambridge, UK

§Isle Veterinary Clinic, Ely, UK

¶Equine Referral Hospital, Royal Veterinary College, Hatfield, UK

Correspondence: Dr. Polly Taylor, Downham Common, Little Downham, Ely, Cambs CB6 2TY, UK, E-mail: polly@taylormonroe.co.uk

Abstract

Objectives To examine the effect of including buprenorphine with detomidine for sedation of horses undergoing clinical procedures.

Study design Partially blinded, randomised, prospective clinical field trial.

Animals Eighty four client-owned horses scheduled for minor surgery or diagnostic investigation under standing sedation.

Methods The effects of buprenorphine (5 μg kg^{-1}) (Group B, $n = 46$) or placebo (5% glucose solution) (Group C, $n = 38$) in combination with detomidine (10 μg kg^{-1}) were compared in standing horses undergoing minor clinical procedures. The primary outcome measure was successful completion of the procedure. The degree of sedation and ataxia were scored using simple descriptive scales. Heart and respiratory rates were recorded at 15–30 minute intervals. Parametric data from each group were compared using ANOVA or *t*-test and non parametric data using the Mann–Whitney *U* test.

Results The procedure was carried out successfully in 91% of Group B and 63% of Group C ($p < 0.01$). Repeat dosing was required in 24% of Group B and 32% of Group C ($p < 0.05$). Sedation was more profound and lasted longer (60 *versus* 45 minutes) in Group B ($p < 0.01$). Ataxia occurred after detomidine, increased after buprenorphine but not glucose administration, was more profound in group B and lasted longer (60 *versus* 30 minutes) $p < 0.001$). Heart and respiratory rates remained within normal limits in both groups and there were no serious adverse events.

Conclusions and clinical relevance Buprenorphine 5 and 10 μg kg^{-1} enhanced the sedation produced by detomidine 10 and 20 μg kg^{-1} with minor side effects similar to other alpha$_2$ agonist/opioid combinations. Detomidine–buprenorphine sedation is suitable for standing procedures in horses.

Keywords alpha$_2$ adrenoceptor agonist, buprenorphine, detomidine, equine, opioid, sedation.

Introduction

Numerous diagnostic and minor surgical procedures are performed on sedated, standing horses because general anaesthesia carries a substantial risk of mortality and morbidity in this species (Johnston et al. 2004). General anaesthesia also requires appropriate facilities and expertise as well as incurring considerable cost.

Acepromazine and the alpha$_2$ adrenoceptor agonists are the most common individual agents used for chemical restraint, but it is well recognized that addition of an opioid enhances their sedative effects without seriously compromising vital function (Clarke & Paton 1988; Taylor & Clarke 2007). Alpha$_2$ adrenoceptor agonist combinations using xylazine, detomidine or romifidine have been described with a number of different opioids given as a bolus injection (Muir et al. 1979; Robertson & Muir 1983; Taylor & Clarke 2007) or by infusion for longer procedures (Hainisch 2001; Ringer et al. 2012a,b; 2013). In the UK at least, detomidine or romifidine with butorphanol are probably the most commonly used for sedation from a simple bolus injection (Taylor et al. 1988; Browning & Collins 1994). Both combinations have UK Market Authorization.

Buprenorphine hydrochloride (Vetergesic Multidose; Alstoe Ltd, UK) has recently received UK Market Authorization for analgesia and as an adjunct to sedation in horses. Buprenorphine is generally regarded as a partial mu (OP3)-agonist opioid and is used widely for analgesia and sedation in cats and dogs as well as laboratory animals and exotics (Roughan & Flecknell 2002). A number of investigations document buprenorphine's effect in horses: in accordance with this class of drug, in normal, pain-free, research animals it produces antinociception and some sympathetic and locomotor stimulation (Carregaro et al. 2006, 2007; Love et al. 2012). Combinations of buprenorphine (4–10 μg kg^{-1}) with sedatives have also been evaluated under laboratory conditions, showing opioid-enhancement of xylazine, detomidine and romifidine sedation similar to that of other opioids (Nolan & Hall 1984; Love 2009; Cruz et al. 2011; Love et al. 2011a,b). One investigation has examined the use of buprenorphine for sedation under clinical conditions (van Dijk et al. 2003). Detomidine (10 μg kg^{-1}) and buprenorphine (6 μg kg^{-1}) were given prior to laparoscopy and sedation was maintained by continuous infusion of detomidine. The combination was effective for the purposes, and there were no adverse effects.

Studies investigating buprenorphine–detomidine sedation after injection only for a range of common clinical procedures have not yet been published. This study describes a field trial which examined the effects of inclusion of buprenorphine with detomidine for sedation of horses undergoing clinical procedures.

Materials and methods

Study design

A prospective, multi-centre, placebo-controlled investigation of buprenorphine's effects on detomidine sedation was carried out in 86 client-owned horses undergoing clinical diagnostic or surgical procedures in general practices in the UK. The study was carried out in accordance with Good Clinical Practice (CVMP/VICH/595/98) under Animal Test Certificate (ATC) as part of the registration process for Market Authorisation. Informed owner consent was obtained in all cases.

Horses

Horses admitted to one of seven participating UK equine clinics were randomly allocated (block randomisation, GraphPad Prism; GraphPad Software Inc., CA, USA) to receive either buprenorphine (group B) or 5% glucose placebo (group C) in addition to detomidine for standing sedation to enable a diagnostic or minor surgical procedure to be carried out. All horses admitted for such treatment were eligible, but were excluded if they had been heavily sedated in the previous week, had cardiac dysrrhythmias, colic, impaired respiratory or liver function, were pregnant or lactating, or were under treatment with sympathomimetic amines, potentiated sulphonamides or drugs causing respiratory depression. Other antibiotics, non steroidal anti-inflammatory agents and intravenous fluids were permitted. Food was withheld at least four hours prior to treatment and was made available again after recovery. Water was available *ad libitum* prior to treatment and after recovery.

Drug treatment

All horses were sedated with 10 μg kg^{-1} detomidine hydrochloride (Domosedan; Pfizer Ltd, UK) given by slow intravenous (IV) injection 3–5 minutes before administration of the test/control substance (BorG): either 5 μg^{-1} buprenorphine (Vetergesic Multidose; Alstoe Ltd, UK) (group B) or an equivalent volume (0.8 mL 50 kg^{-1}) of 5% glucose solution (Baxter Healthcare Ltd, UK) (group C). If, 10 minutes after administration of the BorG, sedation was judged inadequate to carry out the procedure, then the doses of detomidine and BorG were repeated at the same time interval. If, 10 minutes after administra-

