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RESEARCH PAPER

Comparison of sedation scores and propofol induction doses in dogs after intramuscular premedication with butorphanol and either dexmedetomidine or medetomidine

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Abstract

Objective To compare sedation scores and propofol induction doses in dogs receiving either dexmedetomidine or medetomidine, both with butorphanol intramuscularly (IM) prior to general anaesthesia.

Study design Prospective, 'blinded', randomized, clinical study.

Animals Fifty client-owned dogs scheduled for elective diagnostic imaging procedures.

Methods Dogs were allocated to receive butorphanol 0.1 mg kg^{-1} with either medetomidine (group M) 0.01 mg kg^{-1} or dexmedetomidine (group D) 0.005 mg kg^{-1} IM. Sedation was scored before and 20 minutes after pre-anaesthetic medication using a composite simple descriptive sedation score giving a score of 0 to 15 (0 = no sedation; 15 = profound sedation). Forty-five minutes after pre-anaesthetic medication, propofol was administered in increments of 0.5 mg kg^{-1} over 15 seconds until tracheal intubation was possible. The time required to check intubation conditions between each propofol aliquot was 15 seconds. Total propofol dose required to perform tracheal intubation and the number of dogs achieving a clinically desired sedation score of ≥9/15 was recorded in each group. Sedation score and propofol dose were compared using the Mann-Whitney *U*-test. Results are reported as median (range). Statistical significance was set at $p < 0.05$.

Results The sedation score 20 minutes after pre-anaesthetic medication was significantly higher in group M [11 (2–14)] than in group D [7 (0–14)]. There was no significant difference between propofol dose requirements in group M [1.5 (1–2.5) mg kg^{-1}] or D at [1.5 (1–3) mg kg^{-1}]. Significantly more dogs in group M achieved a sedation score of ≥9/15 than in group D.

Conclusions and clinical relevance Combined IM with butorphanol, medetomidine 0.01 mg kg^{-1} produced effective sedation more frequently than dexmedetomidine 0.005 mg kg^{-1} in dogs undergoing sedation prior to anaesthesia for elective procedures but this did not affect the propofol dose required for induction of anaesthesia significantly.

Keywords dexmedetomidine, dog, medetomidine, propofol, sedation.

Introduction

Alpha-2 adrenoceptor agonists are used widely to produce sedation and analgesia in veterinary medicine for minor surgical and diagnostic procedures, or to provide pre-anaesthetic medication prior to induction of anaesthesia. Medetomidine is a potent and selective alpha-2 adrenoceptor agonist, which produces dose-dependent sedation and analgesia with muscle relaxation (Vainio 1989), and allows reduction of the concentration of inhaled anaesthetic agents when used as a part of balanced

anaesthetic technique (Vickery & Maze 1989; Lerche & Muir 2006).

Medetomidine is comprised of equal parts of two optical enantiomers, dexmedetomidine and levomedetomidine. Experimental studies in dogs receiving intravenous (IV) dexmedetomidine 0.02 mg kg^{-1} have shown clear dose-dependent sedative and analgesic effects, which are similar to those of medetomidine at 0.04 mg kg^{-1} (Kuusela et al. 2000). When administered as pre-anaesthetic medication prior to general anaesthesia in dogs, medetomidine and dexmedetomidine have also been shown to reduce propofol induction requirements significantly in a dose-dependent manner (Gomez-Villamandos et al. 2006). In contrast, levomedetomidine at doses up to 0.08 mg kg^{-1} IV did not cause sedation in conscious experimental dogs, but did significantly reduce sedation associated with subsequent dexmedetomidine (Kuusela et al. 2001b).

It has been suggested that removing levomedetomidine from commercial formulations of dexmedetomidine might permit more predictable sedation compared to the racemic drug (Kuusela et al. 2001b). However, in a multicentre clinical study comparing sedation in dogs, within 30 minutes after IM administration, dexmedetomidine at 0.5 mg m^{-2} produced significantly less sedation than racemic medetomidine at 1 mg m^{-2} (Granholm et al. 2007).

The aim of this study was to identify in dogs significant differences between medetomidine and dexmedetomidine, each combined with butorphanol and administered IM, in the degree of sedation and propofol dose required for induction of general anaesthesia. Our null hypothesis was that IM medetomidine 0.01 mg kg^{-1} and dexmedetomidine 0.005 mg kg^{-1}, both with butorphanol 0.1 mg kg^{-1} would result in a similar sedation score and propofol dose required for induction of general anaesthesia.

Materials and methods

This study was approved by the Ethics committee of the Faculty of Veterinary Science, University of Liverpool (RETH000386) and informed owner consent was obtained.

Animals

Fifty dogs undergoing general anaesthesia for non-invasive diagnostic procedures and physical status I or II according to the American Society of Anesthesiologists classification (ASA) were included. Dogs were classified as ASA I or II based on clinical examination. Exclusion criteria included dogs less than 12 weeks of age, presence of cardiovascular disease, administration of additional sedative agents or sedation and anaesthesia within the previous 48 hours. In all dogs, administration of study drugs, sedation scores, induction of anaesthesia and endotracheal intubation were performed always by a single anaesthetist (JR).

Sedation protocol

Dogs were allocated randomly to receive either medetomidine (Dorbene, Pfizer Animal Health, UK) 0.01 mg kg^{-1} (group M) or dexmedetomidine (Dexdomitor, Janssen Animal Health, UK) 0.005 mg kg^{-1} (group D), both in addition to butorphanol (Torbugesic, Fort Dodge Animal Health, UK) 0.1 mg kg^{-1}. The drugs were mixed together then injected via a 25 gauge needle into the left or right supraspinatus muscle. Sedation was scored before and 20 minutes after pre-anaesthetic medication using a previously published composite simple descriptive sedation score (Gurney et al. 2009), giving an overall score of 0 to 15 (0 = no sedation; 15 = profound sedation) (details in Appendix S1). Dogs were considered adequately sedated for clinical purposes if they achieved a score of ≥9/15. Following injection, dogs were left undisturbed in a cage until 20 minutes after injection, when sedation scoring was repeated. An IV catheter was placed aseptically into a cephalic vein immediately after sedation scoring.

Anaesthetic protocol

Anaesthesia was induced 45 minutes after pre-anaesthetic medication. Oxygen 100% at 4 L $minute^{-1}$ was provided by facemask for 3–5 minutes before and then throughout the induction period, until tracheal intubation was achieved. Propofol (Propoflo, Abbott Animal Health UK) was administered in increments of 0.5 mg kg^{-1} over 15 seconds. After each bolus of propofol, intubation conditions were assessed. The time required to check intubation conditions between each propofol aliquot was approximately 15 seconds. Criteria for assessment of intubation conditions were loss of jaw tone, absence of resistance to protraction of the tongue, an absent gag reflex and successful tracheal intubation.