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RESEARCH PAPER

Sedative and analgesic effects of buprenorphine, combined with either acepromazine or dexmedetomidine, for premedication prior to elective surgery in cats and dogs

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Abstract

Objective To evaluate the sedative and analgesic effects of intramuscular buprenorphine with either dexmedetomidine or acepromazine, administered as premedication to cats and dogs undergoing elective surgery.

Study design Prospective, randomized, blinded clinical study.

Animals Forty dogs and 48 cats.

Methods Animals were assigned to one of four groups, according to anaesthetic premedication and induction agent: buprenorphine 20 μg kg^{-1} with either dexmedetomidine (dex) 250 μg m^{-2} or acepromazine (acp) 0.03 mg kg^{-1}, followed by alfaxalone (ALF) or propofol (PRO). Meloxicam was administered preoperatively to all animals and anaesthesia was always maintained using isoflurane. Physiological measures and assessments of pain, sedation and mechanical nociceptive threshold (MNT) were made before and after premedication, intraoperatively, and for up to 24 hours after premedication. Data were analyzed with one-way, two-way and mixed between-within subjects ANOVA, Kruskall–Wallis analyses and Chi squared tests. Results were deemed significant if $p \leq 0.05$, except where multiple comparisons were performed ($p \leq 0.005$).

Results Cats premedicated with dex were more sedated than cats premedicated with acp ($p < 0.001$) and ALF doses were lower in dex cats (1.2 ± 1.0 mg kg^{-1}) than acp cats (2.5 ± 1.9 mg kg^{-1}) ($p = 0.041$). There were no differences in sedation in dogs however PRO doses were lower in dex dogs (1.5 ± 0.8 mg kg^{-1}) compared to acp dogs (3.3 ± 1.1 mg kg^{-1}) ($p < 0.001$). There were no differences between groups with respect to pain scores or MNT for cats or dogs.

Conclusion Choice of dex or acp, when given with buprenorphine, caused minor, clinically detectable, differences in various characteristics of anaesthesia, but not in the level of analgesia.

Clinical relevance A combination of buprenorphine with either acp or dex, followed by either PRO or ALF, and then isoflurane, accompanied by an NSAID, was suitable for anaesthesia in dogs and cats undergoing elective surgery. Choice of sedative agent may influence dose of anaesthetic induction agent.

Keywords acepromazine, cat, dexmedetomidine, dog, mechanical nociceptive threshold, sedation.

Introduction

Most healthy cats and dogs receive sedatives and analgesics for premedication before general

anaesthesia (Brodbelt 2006). Acepromazine is commonly used as the sedative, particularly in the UK (Brodbelt 2006) and synergism between acepromazine and opioids is well recognized (Brearley 1993; Smith et al. 2001). Dexmedetomidine is an alpha-2 adrenoreceptor agonist with reported synergistic sedation and analgesia with opioids (Salmenpera et al. 1994; Slingsby et al. 2010). Common side effects of dexmedetomidine that may have limited its use in small animals include decreased cardiac output and initial hypertension (Bloor et al. 1992). A perceived advantage of dexmedetomidine sedation is the availability of an antagonist, atipamezole, producing rapid recovery from sedation.

Buprenorphine is the most commonly used opioid in small animal practice in the UK (Brodbelt 2006) and is frequently used as the analgesic component of premedication. Buprenorphine has the advantages over full μ agonist opioids of less stringent record keeping requirements and a long duration of action, approximately 5 hours in cats and dogs (Slingsby et al. 2011). Buprenorphine combinations with acepromazine or dexmedetomidine have been evaluated in dogs (Bell et al. 2011), but their effects on perioperative analgesia, when used prior to alfaxalone or propofol and then isoflurane, have not been ascertained in either dogs or cats. The aim of this study was therefore to evaluate the sedative and analgesic effects of dexmedetomidine or acepromazine combined with buprenorphine in cats and dogs. Physiological effects during anaesthesia and recovery characteristics were also studied. The hypothesis tested was that dexmedetomidine – buprenorphine provides more profound sedation and analgesia compared to acepromazine - buprenorphine, regardless of choice of induction agent.

Materials and methods

The cases recruited for the study were 48 client-owned cats and 40 dogs presenting for elective surgeries which, based on clinical experience of the investigators, were likely to cause mild to moderate pain. All animals were healthy based on full clinical examination, were of ASA score one or two (http://www.asahq.org/For-Members/Clinical-Information/ASA-Physical-Status-Classification-System.aspx) and had not received a steroid or NSAID within the past week. The study was performed in two centres; the Small Animal Hospital, University of Bristol (UoB) and Morley Veterinary Centre, Taunton (Morley), a first opinion small animal practice. Two investigators (JH and NG) collected all the data; one was dedicated to each study site, and both were unaware of animals' treatment groups. Written informed owner consent was obtained before recruitment and the study was approved by the UoB local ethics committee (UIN UB/09/019).

Administration of either acepromazine (acp) or dexmedetomidine (dex) for premedication, and alfaxalone or propofol for anaesthetic induction was randomized using a block design calculated separately for both cats and dogs and study centre, producing four groups: dexmedetomidine premedication, alfaxalone induction (dexALF), dexmedetomidine premedication, propofol induction (dexPRO), acepromazine premedication, alfaxalone induction (acpALF) and acepromazine premedication, propofol induction (acpPRO).

Acepromazine (ACP, 2 mg mL^{-1}, Novartis Animal Health, UK) (0.03 mg kg^{-1}) and buprenorphine (Vetergesic; Alstoe Animal Health, UK) (20 μg kg^{-1}) or dexmedetomidine (Dexdomitor; Janssen Animal Health, UK) and buprenorphine (20 μg kg^{-1}) were administered intramuscularly (IM) into the lumbar epaxial muscles following collection of baseline data (see below). Dexmedetomidine was dosed according to body surface area (250 μg m^{-2}), equating to 10 μg kg^{-1} for a 16 kg dog. Body surface area was calculated using the formula BSA (m^2) = $10 \times W^{2/3}$, where *W* is the bodyweight in grams and the value 10 is assigned to a species specific 'shape constant' (Price & Frazier, 1998). In each case the two drugs were mixed together in one syringe before injection. Physiological variables and pain and sedation scores were recorded 30–45 minutes after premedication and an appropriately sized intravenous catheter (Optiva, Smiths Medical, UK) was placed in a cephalic vein. Anaesthesia was induced with alfaxalone (Alfaxan; Vetoquinol, UK) or propofol (PropoFlo; Abbott Animal Health, UK) intravenously (IV) according to treatment group, given slowly until orotracheal intubation with an appropriate endotracheal tube was possible. Although induction agent was randomized the assessor was not kept unaware of this part of the protocol. Lidocaine (Intubeaze; Dechra, UK) was applied to the larynx in cats to facilitate endotracheal intubation.

Meloxicam (5 mg mL^{-1} Metacam; Boehringer Ingelheim Ltd, UK) was administered IV (dogs 0.2 mg kg^{-1}, cats 0.3 mg kg^{-1}) immediately after induction of anaesthesia and before surgery started. Anaesthesia was maintained using isoflurane (IsoFlo; Abbott Animal Health) vaporized in oxygen.