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RESEARCH PAPER

Alfaxalone for total intravenous anaesthesia in dogs undergoing ovariohysterectomy: a comparison of premedication with acepromazine or dexmedetomidine

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Abstract

Objective To describe alfaxalone total intravenous anaesthesia (TIVA) following premedication with buprenorphine and either acepromazine (ACP) or dexmedetomidine (DEX) in bitches undergoing ovariohysterectomy.

Study design Prospective, randomised, clinical study.

Animals Thirty-eight healthy female dogs.

Methods Following intramuscular buprenorphine (20 μg kg^{-1}) and acepromazine (0.05 mg kg^{-1}) or dexmedetomidine (approximately 10 μg kg^{-1}, adjusted for body surface area), anaesthesia was induced and maintained with intravenous alfaxalone. Oxygen was administered via a suitable anaesthetic circuit. Alfaxalone infusion rate (initially 0.07 mg kg^{-1} $minute^{-1}$) was adjusted to maintain adequate anaesthetic depth based on clinical assessment. Alfaxalone boluses were given if required. Ventilation was assisted if necessary. Alfaxalone dose and physiologic parameters were recorded every 5 minutes. Depth of sedation after premedication, induction quality and recovery duration and quality were scored. A Student's *t*-test, Mann–Whitney *U* and Chi-squared tests determined the significance of differences between groups. Data are presented as mean ± SD or median (range). Significance was defined as $p < 0.05$.

Results There were no differences between groups in demographics; induction quality; induction (1.5 ± 0.57 mg kg^{-1}) and total bolus doses [1.2 (0 – 6.3) mg kg^{-1}] of alfaxalone; anaesthesia duration (131 ± 18 minutes); or time to extubation [16.6 (3–50) minutes]. DEX dogs were more sedated than ACP dogs. Alfaxalone infusion rate was significantly lower in DEX [0.08 (0.06–0.19) mg kg^{-1} $minute^{-1}$] than ACP dogs [0.11 (0.07–0.33) mg kg^{-1} $minute^{-1}$]. Cardiovascular variables increased significantly during ovarian and cervical ligation and wound closure compared to baseline values in both groups. Apnoea and hypoventilation were common and not significantly different between groups. Arterial haemoglobin oxygen saturation remained above 95% in all animals. Recovery quality scores were significantly poorer for DEX than for ACP dogs.

Conclusions and clinical relevance Alfaxalone TIVA is an effective anaesthetic for surgical procedures but, in the protocol of this study, causes respiratory depression at infusion rates required for surgery.

Keywords acepromazine, alfaxalone, anaesthesia, dexmedetomidine, dog, total intravenous anaesthesia.

Introduction

Maintenance of anaesthesia using total intravenous anaesthesia (TIVA) is gaining popularity in small

animal anaesthesia although inhalant agents are still most commonly favoured for anaesthesia maintenance (Brodbelt et al. 2008).

The use of TIVA in human anaesthesia has been associated with improved patient welfare post-anaesthesia and a lower incidence of post-operative nausea and vomiting (Hofer et al. 2003). Propofol, though unlicensed for TIVA in dogs, has been the preferred anaesthetic for TIVA due to its availability, rapid onset and short duration of action and rapid clearance in dogs (Sebel & Lowdon 1989; Branson 2007). Propofol given by continuous rate infusion provides reasonable cardiovascular stability, and a smooth, rapid (albeit context-sensitive) return to consciousness (Andreoni & Hughes 2009). Propofol causes dose dependent respiratory depression and is not analgesic; therefore relatively high doses associated with profound respiratory depression are required for maintenance of anaesthesia when propofol is used alone (Nolan & Reid 1993). Recently alfaxalone solubilised in cyclodextrin has received marketing authorisation in the UK for both the induction and maintenance of anaesthesia offering an alternative to propofol for use in TIVA techniques.

Alfaxalone is a synthetic neurosteroid that causes unconsciousness and muscle relaxation. It has a wide safety margin in dogs, rapid onset and short duration of action, with rapid plasma clearance, resulting in little accumulation following repeat bolus administration (Ferré et al. 2006; Muir et al. 2008). Total intravenous anaesthesia using alfaxalone or propofol has been compared in dogs without concurrent surgical stimulation (Ambros et al. 2008). Ambros et al. (2008) found the physiological effects of alfaxalone were comparable to propofol in this study. At the time of the execution of our study the use of cyclodextrin solubilised alfaxalone TIVA for surgical procedures in dogs had not been described, but very recently a study has been published comparing propofol and alfaxalone for TIVA for ovariohysterectomy in dogs (Suarez et al. 2012). The aim of our study was to describe the characteristics of alfaxalone TIVA in bitches undergoing ovariohysterectomy following premedication with buprenorphine in combination with either acepromazine or dexmedetomidine.

Materials and methods

The study was carried out at Langford Veterinary Services (LVS), University of Bristol, with dogs recruited from different canine rehoming charities and transported to the LVS premises in order to undergo elective ovariohysterectomy via ventral midline laparotomy. In addition to enrolment in this anaesthesia study the dogs were at the same time enrolled in a surgical study investigating teaching of surgical skills (ovariohysterectomy) to final year veterinary students (Bowlt et al. 2011). No power analysis was carried out prior to the start of the study because of the limited number of cases available, and the primarily descriptive nature of data collected. Ethical approval from the University of Bristol Ethics Committee was obtained before the start of the study (UIN UB/10/004) and informed owner consent was obtained prior to enrolment. American Society of Anesthesiologists (ASA) status was assigned following a full clinical examination by the anaesthetist; only dogs of ASA status 1 or 2 were recruited to the study and as such no pre-operative blood analyses were clinically indicated. The animals were allocated randomly to one of two groups, receiving either dexmedetomidine or acepromazine for sedative premedication prior to induction of anaesthesia. Animals in the dexmedetomidine group (DEX) were premedicated with a combination of dexmedetomidine (Dexdomitor; Janssen Animal Health Ltd, UK) and buprenorphine (Vetergesic; Alstoe Ltd, UK) 20 μg kg^{-1} intramuscularly (IM). The dose of dexmedetomidine was adjusted for body surface area (equating to 10 μg kg^{-1} for a 16 kg dog). Animals in the acepromazine group (ACP) were administered acepromazine (ACP injection 2 mg mL^{-1}; Novartis Animal Health UK Ltd, UK), 0.05 mg kg^{-1}, with buprenorphine 20 μg kg^{-1} IM. The dose of acepromazine also was adjusted empirically for bodyweight with 0.04 mg kg^{-1} acepromazine given to dogs weighing between 40 and 49 kg. No dogs heavier than this weight were recruited to the study.

All assessments were made, and data collected, by one of two anaesthetists (GLH or JCM). Prior to the start of the study concordance in using the assessment scales was agreed between the anaesthetists to optimise consistency. Criteria for the determination of anaesthetic depth using a combination of jaw tone, eye position, palpebral reflex, cardiopulmonary trends and movement (voluntary or otherwise) were also agreed.

Once premedicated, animals in the ACP group were left undisturbed for between 30 and 40 minutes prior to induction of anaesthesia. A total of 15–30 minutes were allowed to elapse after premedication before induction of anaesthesia in