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SHORT COMMUNICATION

Comparison of anesthesia with a morphine–lidocaine–ketamine infusion or a morphine–lidocaine epidural on time to extubation in dogs

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Abstract

Objective To evaluate and compare the time to extubation in two commonly used methods of analgesia in dogs undergoing elective pelvic limb orthopedic procedures.

Study design Prospective, randomized, double-blinded clinical study.

Animals Twenty-five adult, client-owned, healthy dogs aged 4.4 ± 1.6 years and weighing 38.5 ± 3.5 kg.

Methods All dogs were premedicated with dexmedetomidine (5–10 μg kg^{-1}) intramuscularly (IM) and anesthesia was induced with propofol (2–6 mg kg^{-1}) intravenously (IV). Atipamazole (0.05–0.1 mg kg^{-1}) was administered IM after instrumentation. Anesthesia was maintained with isoflurane in oxygen. Dogs were randomly assigned to one of two groups. In one group, morphine (0.1 mg kg^{-1}) and lidocaine (2% lidocaine added to a total volume of 0.2 mL kg^{-1}) were administered epidurally and a saline placebo constant rate infusion (CRI) was administered IV (group EPI). In the other group (group MLK), morphine (4 μg kg^{-1} $minute^{-1}$), lidocaine (50 μg kg^{-1} $minute^{-1}$) and ketamine (10 μg kg^{-1} $minute^{-1}$) were administered as an IV CRI and a saline placebo was administered by epidural injection. Temperature at the discontinuation of isoflurane, temperature at extubation, time to extubation, duration of inhalation anesthesia and duration of surgery were recorded.

Results No significant differences between the groups were found in time to extubation, temperature at the end of surgery, temperature at extubation and total surgical time. Total anesthesia time was significantly longer in group EPI.

Conclusions and clinical relevance Administration of MLK at the doses reported in this study did not prolong the time to extubation in comparison with a morphine–lidocaine epidural nerve block. The results indicate that concern over prolonging the time to extubation is not a reason to avoid the administration of MLK.

Keywords analgesia, constant rate infusion, epidural, MLK.

Introduction

Drug administration before and during inhalation anesthesia can have a significant impact on the return to consciousness and the return of reflex activity, such as the swallowing reflex observed at extubation (Sinclair & Faleiro 2006). In humans, delayed extubation is most commonly reported with reference to patients being weaned from cardiac bypass machines (Wong et al. 1999), a context that is distinct

from that of any other anesthetic procedure. Therefore, in human and veterinary patients, there is no set standard for a delayed extubation or return to consciousness in the literature. The veterinary literature has previously focused on the respective influences of the surgical procedure (Burns et al. 2014), the anesthetic induction agent (Maney et al. 2013) and intraoperative hypothermia (Redondo et al. 2012) on time to extubation.

The combination of morphine, lidocaine and ketamine (MLK) as an intravenous (IV) constant rate infusion (CRI) in maintenance fluids has gained popularity as a multimodal approach to analgesia. However, anecdotal reports suggest that veterinarians perceive that MLK administered during anesthesia results in a delay to extubation. Consequently, MLK may not be chosen, may be used at a decreased dose rate or may be stopped before the end of surgery. In such cases, the MLK infusion is not being used as previously described (Muir et al. 2003).

The purpose of this study was to evaluate the time to extubation in dogs administered an MLK CRI for cruciate ligament repair and to compare this with that in an established analgesia protocol, a morphine–lidocaine epidural. The hypothesis was that MLK would not prolong the time to extubation.

Materials and methods

The Institutional Animal Care and Use Committee at the University of Wisconsin approved the study prior to its beginning.

Animals

Twenty-five client-owned, healthy adult dogs, with American Society of Anesthesiologists (ASA) class I or II status, scheduled for tibial plateau leveling osteotomy (TPLO) or tibial tuberosity advancement (TTA) for cranial cruciate ligament injury were eligible for inclusion in the study. Additional information was obtained for another study, which required the exclusion of dogs undergoing additional surgical procedures, or with an ASA status of greater than class II or a body condition score of >7 out of 10, and northern breed dogs. Owner consent, obtained after the delivery of thorough descriptions of the treatments, was obtained before dogs entered the study.

Anesthetic management

Food, but not water, was withheld for 12 hours prior to anesthesia. Dogs were administered dexmedetomidine (5–10 μg kg^{-1}; Dexdomitor; Zoetis, Inc., MI, USA) intramuscularly (IM) in the epaxial muscles for sedation and an IV catheter was placed. Anesthesia was induced with propofol IV (2–6 mg kg^{-1}; PropoFlo; Abbott Animal Health, IL, USA). The dogs were orotracheally intubated and anesthesia was maintained with isoflurane (Piramal Critical Care, Inc., PA, USA) in oxygen using an out-of-circle isoflurane vaporizer and a circle system. After instrumentation for monitoring, the dexmedetomidine was antagonized with atipamezole (0.05–0.1 mg kg^{-1}; Antisedan; Zoetis, Inc.) IM in the epaxial muscles (at a volume equal to that of the dexmedetomidine) to eliminate the effect of dexmedetomidine on recovery. Ventilation was spontaneous or controlled to maintain normocapnia. Routine monitoring was performed as per the standard of care for any clinical patient, and included pulse oximetry, capnography, and noninvasive blood pressure and rectal temperature measurements. Circulating warm water tabletop heating pads and forced warm air heaters were used for the duration of surgery. Isoflurane delivery was adjusted to maintain an anesthetic depth adequate for the surgical procedure.

Groups

Block randomization, in groups of 10 dogs, was used to randomly assign dogs to either of two groups. All anesthesia personnel involved were unaware of the assigned group. All drugs and placebos were prepared by pharmacy personnel and provided to anesthesia personnel in syringes labeled for epidural or CRI administration. All treatments were administered by the same individual (EW-H). The IV fluid infusion rate was regulated using a fluid pump (Vet/IV 2.2; Heska Corp., CO, USA).

Group MLK

Dogs in the MLK group were administered a CRI of morphine (24 mg L^{-1}; Hospira, Inc., IL, USA), lidocaine (300 mg L^{-1}; Hospira, Inc.) and ketamine (60 mg L^{-1}; Hospira, Inc.) in crystalloid fluid (PlasmaLyte A; Baxter Healthcare Corp., IL, USA) at a rate of 10 mL kg^{-1} $hour^{-1}$ (0.17 mL kg^{-1} $minute^{-1}$; morphine 4 μg kg^{-1} $minute^{-1}$, lidocaine 50 μg kg^{-1} $minute^{-1}$, ketamine 10 μg kg^{-1} $minute^{-1}$). A placebo (0.9% NaCl; 0.2 mL kg^{-1} total

