Veterinary
Anaesthesia and Analgesia
Formerly the Journal of Veterinary Anaesthesia

Veterinary Anaesthesia and Analgesia, 2013, **40**, 615–622 doi:10.1111/vaa.12064

RESEARCH PAPER

Comparison of postoperative effects between lidocaine infusion, meloxicam, and their combination in dogs undergoing ovariohysterectomy

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Abstract

Objective To compare the postoperative analgesic effects of intravenous (IV) lidocaine, meloxicam, and their combination in dogs undergoing ovariohysterectomy.

Study design Prospective, randomized, double-blind, controlled clinical trial.

Animals Twenty-seven dogs aged (mean ± SD) 16.1 ± 7.5 months and weighing 22.4 ± 17.9 kg scheduled for ovariohysterectomy.

Methods Anaesthesia was induced with propofol and maintained with isoflurane. Dogs (n = 9 in each group) were allocated to receive just prior to and during surgery one of the following regimens: M group, 0.2 mg kg^{-1} IV meloxicam then a continuous rate infusion (CRI) of lactated Ringer's at 10 mL kg^{-1} $hour^{-1}$; L group, a bolus of lidocaine (1 mg kg^{-1} IV) then a CRI of lidocaine at 0.025 mg kg^{-1} $minute^{-1}$; and M + L group, both the above meloxicam and lidocaine treatments. Pain and sedation were scored, and venous samples taken for serum cortisol and glucose measurement before and at intervals for 12 hours after anaesthesia. Pain scores were assessed using a multi-parameter subjective scoring scale (cumulative scale 0–21) by three observers. The protocol stated that dogs with a total score exceeding 9 or a sub-score above 3 in any one category would receive rescue analgesia. Sedation was scored on a scale of 0–4.

Results There were no significant differences in subjective pain scores, serum cortisol, and glucose concentrations between the three groups. The highest pain score at any time was 5, and no dog required rescue analgesia. None of the three regimens caused any observable side effects during or after anaesthesia. At 1 and 2 hours after extubation dogs in group L were significantly more sedated than in the other two groups.

Conclusions and Clinical relevance This study suggests that, with the scoring system used, IV lidocaine and meloxicam provide similar and adequate postoperative analgesia in healthy dogs undergoing ovariohysterectomy.

Keywords analgesia, dog, lidocaine, meloxicam, ovariohysterectomy.

Introduction

All surgical procedures involving tissue injury elicit some degrees of pain. Adequate perioperative pain control is essential for animal welfare and crucial in reducing complications and improving the quality of recovery.

Numerous studies have shown that non-steroid anti-inflammatory drugs (NSAIDs) are effective in

controlling post-operative pain in dogs (Lascelles et al. 1994; Shih et al. 2008). There is clinical evidence suggesting meloxicam may have a superior analgesic effect to the opioid, butorphanol, in some cases. (Mathews et al. 2001). However, NSAIDs may predispose patients to increased perioperative risks including gastrointestinal bleeding and postoperative renal damage due to the inhibition of functional prostaglandins (KuKanich et al. 2012), and therefore they may not be suitable for all animal patients undergoing surgery.

In human medicine, systemically administered lidocaine has proved effective in the treatment of acute and post-operative pain (Cassuto et al. 1985). An earlier observation in dogs showed intravenous (IV) lidocaine treating ventricular arrhythmias also reduced the dosage of opioid required for maintaining analgesia (Lamont et al. 2000). The use of lidocaine in veterinary clinical practice is gaining acceptance with growing evidence supporting its beneficial effects in a range of clinical situations (Ortega & Cruz 2011). However clinical studies regarding analgesic or sedative effects of IV lidocaine in dogs are limited, and indeed in conscious dogs, IV lidocaine does not appear to result in anti-nociception (MacDougall et al. 2009). The process of pain perception involves numerous reactions and pathways. A single analgesia agent, therefore, is unlikely to alleviate pain sufficiently (Corletto 2007) and the concept of multimodal analgesia, using a combination of drugs which have different mechanisms of action, is deemed a more effective method for pain management.

The objective of this study was to compare the analgesic effects in the post-operative period of lidocaine infusion, meloxicam, and their combination in healthy dogs undergoing ovariohysterectomy.

Animals

Healthy intact non-pregnant female dogs presenting to the National Taiwan University Veterinary Hospital for ovariohysterectomy were used in this study. Clients' consent and approval were obtained before the procedure, according to the Animal Protection Act of Taiwan.

All animals were assessed prior to being included in this study by a complete physical examination, blood count and serum chemistry profile. Dogs with preexisting systemic disease (American Society of Anesthesiologists physical status >2), or those which had received any analgesics (including NSAIDs) within the previous 4 weeks surgery were excluded.

Subjective assessments

Subjective pain scores were assessed independently by three trained observers, who were unaware of analgesics administered. The scoring system, based on that of Smith et al. (2004), included the categories of comfort, movement, appearance, behaviour, interactive behaviours, and vocalization (Table 1). The sedation status of the patient was scored on a scale based Savvas et al. (2008) (Table 2).

Anaesthetic and surgical procedure

Dogs were acclimatized to a recovery room for 24 hours before the surgery, and at this time a 22-gauge catheter was placed into the cephalic vein for medication and blood sample collection. Food and water were withheld for 12 hours and three hours prior to anaesthesia, respectively.

On the morning of the surgery, prior to premedication, each dog was assessed, and baseline physiological data and subjective pain scores obtained. The order of assessments were as follows: respiratory rate (f_R) by observing thoracic movement, the sedation score (Table 2), and the observatory part of pain scores (Table 1): these were followed with procedures interacting with the animal, the interactive pain scores, blood collection from catheter, heart rate by femoral pulse palpation (HR) and finally rectal body temperature.

All dogs were pre-medicated with IV acepromazine maleate (0.03 mg kg^{-1}; Acepromazine Maleate Injection, VEDCO Inc., MO, USA) and cephazolin (25 mg kg^{-1}; Cefa Injection, Taiwan Biotech Co., Ltd, ROC) 30 minutes prior to induction of anaesthesia. General anaesthesia was induced with propofol 4–6 mg kg^{-1} IV (Fresofol 1%, Fresenius Kabi Austria GmbH, Austria) as required to enable endotracheal intubation and was maintained with isoflurane (Forane, Abbott Laboratories Ireland Ltd, Ireland) in oxygen. Lactated Ringer's solution (Lactated Ringer's B Injection, Y F Chemical Crop., ROC) was administered at 10 mL kg^{-1} $hour^{-1}$ for the duration of the anaesthesia. Non-invasive blood pressure, lead-II electrocardiograms, f_R, end-tidal CO_2, end-tidal isoflurane, body temperature, and oxygen saturation were monitored using a multifunctional monitor (COLIN BP-88V, Nihon Colin Co., Japan) and recorded every five minutes during