

RESEARCH PAPER

Comparison of intratesticular lidocaine, sacrococcygeal epidural lidocaine and intravenous methadone in cats undergoing castration: a prospective, randomized, investigator-blind clinical trial

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Abstract

Objective The objective of this study was to compare three analgesic protocols for feline castration.

Study design Prospective, randomized clinical study.

Animals Forty-nine client-owned cats.

Methods Cats were injected with intramuscular (IM) dexmedetomidine ($15 \mu\text{g kg}^{-1}$) and alfaxalone (3 mg kg^{-1}) and assigned randomly to one of three treatment groups. Group ITL ($n = 15$) received intratesticular 2% lidocaine (0.05 mL each testicle), group SCL ($n = 15$) a sacrococcygeal epidural injection of 2% lidocaine (0.1 mL kg^{-1}), and group IVM ($n = 19$) intravenous (IV) methadone (0.3 mg kg^{-1}), before surgery. Cardiorespiratory variables were recorded. In case of autonomic nociceptive response, IV fentanyl ($2 \mu\text{g kg}^{-1}$) was administered. During recovery, time from IM atipamezole ($75 \mu\text{g kg}^{-1}$, administered at the end of surgery) to sternal recumbency and to active interaction was recorded. Quality of recovery was assessed using a simple descriptive scale. Post-operative analgesia was evaluated using a visual analogue scale and the UNESP-Botucatu multidimensional composite pain scale (MCPS) at return of active interaction and then 1, 2 and 3 hours later.

Results The three analgesic protocols were comparable in terms of intraoperative fentanyl and propofol requirement. Cardiorespiratory variables

stayed within normal ranges in the majority of the cases, although group IVM had the lowest intraoperative respiratory rate ($p = 0.0009$). No significant differences were detected between groups in UNESP-Botucatu MCPS scores ($p = 0.21$). However, group ITL showed higher visual analogue scale score than group IVM ($p = 0.001$). Four cats enrolled in group ITL, as well as three of group SCL and one of group IVM, required rescue analgesics before the completion of pain assessment.

Conclusions and clinical relevance Intratesticular and sacrococcygeal epidural lidocaine injections could be regarded as good alternatives to systemic opioids in cats undergoing castration, although the benefits of these techniques seem to be of shorter duration than IV methadone.

Introduction

Q3 Neutering of client-owned cats is a common procedure in veterinary practice. Traditionally, when performing castration of male cats, the majority of French veterinarians prefer injectable anaesthetic techniques to inhalation anaesthesia. The reasons behind this choice may be a lack of familiarity with feline tracheal intubation, as well as the potential for complications associated with this procedure (Brodbeck et al. 2007).

Ideally, an intramuscular (IM) anaesthetic protocol for castration should be safe for the animal, inexpensive, and provide reliable unconsciousness,

muscle relaxation and analgesia. Combinations of alpha2-adrenoreceptor agonists, induction agents suitable for IM administration and opioids are used for this purpose (Adami et al. 2015).

Systemic full μ -opioid agonists are commonly employed to provide perioperative analgesia. Unfortunately, they are controlled drugs and their use requires detailed record keeping; a drawback which can prevent practitioners from using them on a regular basis (Hugonnard et al. 2004). As an alternative to systemic analgesia, locoregional anaesthesia is becoming increasingly popular in veterinary medicine, and its use is widespread not only by board-certified anaesthetists, but also between general practitioners.

Intratesticular injection of local anaesthetics has been successfully used to provide perioperative analgesia for castration in dogs (Huuskonen et al. 2012), piglets (Haga & Ranheim 2006), horses (Haga et al. 2006), alpacas (Nickell et al. 2015) and people undergoing testicular biopsies (Kamal et al. 2002).

Sacrococcygeal epidural injection of lidocaine is widely used in horses and ruminants to desensitize the perineum and the pelvic organs without a loss of motor function of the pelvic limbs. This technique has also been reported to relieve the pain associated with urethral catheterization in cats with an onset of action of about 5 minutes (O'Hearn & Wright 2011). Both intratesticular and sacrococcygeal epidural injections of local anaesthetics may be used to desensitize the testicles and the spermatic cord in cats.

The aim of this study was to compare three analgesic protocols: systemic administration of methadone, sacrococcygeal epidural lidocaine and intratesticular lidocaine injection, in terms of quality and duration of analgesia in male cats undergoing castration. Our hypothesis was that the three protocols would result in comparable propofol requirements and quality of intraoperative analgesia in cats undergoing elective castration.

Materials and methods

Animals

Forty-nine client-owned male cats undergoing elective castration were included in the study. The number of participants was established on the basis of a sample size calculation using a commercial software program (SigmStat and SigmaPlot 12). It was performed by setting the power at 80%, the level of significance at 5% and the end point as a post-operative visual analogue scale (VAS) pain score

difference between groups of 10 mm with a standard deviation of 5 mm.

Cats underwent a routine preanaesthetic physical examination in order to assess their health status. Exclusion criteria were: presence of systemic disease, impaired cardiovascular function, and age above 8 years. Food, but not water, was withdrawn 12 hours prior to surgery. The study was performed under approval of the ethical committee of the Faculty of Veterinary Medicine of Alfort, France, and informed owner consent.

Procedures

All cats were injected IM into the dorsolumbar muscles with dexmedetomidine ($15 \mu\text{g kg}^{-1}$) (Dexdomitor; Orion Pharma, Finland) and alfaxalone (3 mg kg^{-1}) (Alfaxan; Jurox, Australia) by the anaesthetist in charge for evaluating intraoperative nociception, depth of anaesthesia, postoperative pain and quality of recovery. The drugs were combined in the same syringe and if the total injection volume exceeded 1 mL, it was split into two injection sites. The doses were established on the basis of previous pilot work.

The times from injection to sternal recumbency (defined as a position with the pelvic limbs tucked under the body) and to lateral recumbency (defined as the cats lying on the side) were recorded, as well as the time of induction of general anaesthesia. The latter was defined as absence of righting reflex when the cats were positioned in dorsal recumbency, and unresponsiveness to vocal and tactile stimulation. If general anaesthesia was not induced 30 minutes after the injection, the cats were injected IM with half of the initial doses of both dexmedetomidine and alfaxalone, and excluded from the study.

Vomiting, hypersalivation, tremors, myoclonus and/or increased muscular tone were considered adverse events and were recorded. After induction of anaesthesia, a 22 gauge catheter (Delta Med, Italy) was placed in one cephalic vein. All cats received $7 \text{ mL kg}^{-1} \text{ hour}^{-1}$ intravenous (IV) crystalloids (NaCl 0.9%; B. Braun, Germany) during the anaesthetic. Amoxicillin (Clamoxyl; GlaxoSmithKline, UK), 20 mg kg^{-1} , was administered IV 30 minutes before the start of surgery. A multiparametric module (Monitor BSM-2301K; Nihon Kohden, Japan) was used to monitor cardiorespiratory variables. Electrocardiography was used to detect heart rate (HR), visual observation of the chest movements to detect respiratory rate (f_R), pulse oximetry for pulse rate and arterial oxygen saturation (SpO_2), and oscillometry to

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