RESEARCH PAPER

Effect of premedication with butorphanol or methadone on ease of endoscopic duodenal intubation in dogs

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Abstract

Objective The effect of premedication with butorphanol or methadone on ease of endoscopic duodenal intubation.

Study design Prospective, randomized, blinded clinical trial.

Animals A group of 20 client-owned dogs.

Methods Dogs were assigned randomly to be administered intravenous (IV) premedication with either butorphanol (0.4 mg kg^{-1}) or methadone (0.3 mg kg^{-1}). General anaesthesia was induced with propofol to effect and maintained with isoflurane in 100% oxygen. Sedation score 20 minutes after premedication administration and induction dose of propofol were recorded. Heart rate, mean arterial pressure, haemoglobin oxygen saturation, respiratory rate and end-tidal isoflurane concentration were recorded every 5 minutes. Spontaneous lower oesophageal and pyloric sphincter opening, presence of gastro-oesophageal and duodeno-gastric reflux, antral peristaltic contractions and response to endoscopy were recorded as yes or no. Ease of duodenal intubation (EDI) was graded on a scale ranging from 1 (immediate entry with minimal manoeuvring required) to 4 (no entry after 2 minutes). Time (seconds) from the start of pyloric intubation to successfully entering the duodenum was recorded.

Results Median EDI score [3 ± 1 (butorphanol), 4 ± 1 (methadone), $p = 0.035$], time [65 ± 36 seconds (butorphanol), 120 ± 38 seconds (methadone), $p = 0.028$] and number of dogs with spontaneous pyloric sphincter opening [7/10 (butorphanol), 2/10 (methadone), $p = 0.035$] differed between groups. No other significant differences were found.

Conclusions and clinical relevance In these clinical cases, duodenal intubation was performed with greater ease, shorter time and more frequent spontaneous opening of the pyloric sphincter after premedication with butorphanol in comparison to methadone. The use of butorphanol facilitated the passage of the endoscope and is therefore recommended for premedication prior to upper gastrointestinal tract endoscopy.

Keywords butorphanol, canine, endoscopy, methadone, pylorus.

Introduction

Endoscopic examination of the gastrointestinal tract is a commonly performed procedure in dogs. The ability to obtain biopsies and visualize the mucosal surface of the intestines without the need for an exploratory laparotomy has advantages in animals, especially those with comorbidities (Zoran 2001; Simpson 2005). General anaesthesia, however, is still a necessity not only for the safety and comfort of the animal and operator but also for protection of the equipment (Zoran 2001).

The pyloric sphincter can impede the passage of an endoscope from the stomach into the duodenum (Donaldson et al. 1993). The aim of pharmacological manipulation of pyloric sphincter tone is to optimize conditions to allow easy passage of the endoscope into the duodenum. The use of morphine (0.5 mg kg^{-1}) in combination with atropine (0.04 mg kg^{-1}) administered intramuscularly (IM) results in conditions that make the passage of an endoscope through the canine pyloric sphincter more difficult than premedication with acepromazine (0.05 mg kg^{-1}) plus atropine or atropine used alone (Donaldson et al. 1993). Therefore, it is often recommended that

opioids be avoided as part of the premedication prior to general anaesthesia for endoscopy (Zoran 2001; Hall 2008). To the best of our knowledge, no studies have compared the use of methadone and butorphanol for premedication prior to upper gastrointestinal tract endoscopy despite the recommendation that μ opioid agonists be avoided and butorphanol be used for this indication (Kerr 2016).

Butorphanol is a synthetic opioid partial agonist; its low efficacy at μ opioid receptors leads to its classification as a κ opioid receptor agonist and a μ opioid receptor antagonist (WHO 2006). Butorphanol produces mild sedation when used alone and analgesia inferior to that of the full μ agonists (Kerr 2016). Therefore, it is best reserved for minor elective surgical and diagnostic procedures.

Methadone is a synthetic opioid agonist with a high affinity for μ opioid receptors and a similar potency to morphine. The dextrorotatory enantiomer of methadone is an NMDA receptor antagonist, an additional property that is not possessed by other μ opioid receptor agonists or butorphanol. When used alone for sedation, methadone produces only mild sedation and is associated with a high prevalence of panting, but less vomiting than morphine (Monteiro et al. 2008, 2009). The lower prevalence of retching and vomiting in dogs premedicated with methadone compared with morphine makes it a good choice for gastrointestinal endoscopy.

The purpose of this study was to compare the influence of butorphanol and methadone on the ease of passing an endoscope from the stomach through the pyloric sphincter into the duodenum of dogs anaesthetized with propofol and isoflurane. We hypothesized that butorphanol would result in conditions that better facilitated the passing of the endoscope than methadone.

Materials and methods

Ethical approval was obtained from the Animal and Welfare Ethical Review Board of the University of Bristol, UK (VIN/15/021). Informed owner consent was obtained for each dog recruited to the study. Based on previously published work (Donaldson et al. 1993), it was calculated that we would require 10 dogs per group to detect a difference of one point with a standard deviation of 0.4 using the scale published by Matz et al. (1991) on the ease of performing endoscopic duodenal intubation at a 95% confidence level with 80% power (http://www.stat.ubc.ca).

Animals

A group of 20 dogs scheduled for upper gastrointestinal endoscopy involving examination of the duodenum were recruited for this study. All dogs considered eligible for the anaesthetic protocol were included. Exclusion criteria included dogs that were unsuitable for the anaesthetic protocol and dogs suspected of having gastric or lower gastrointestinal tract disease alone and therefore not scheduled for examination of the duodenum.

Study protocol

A prospective, randomized, blinded clinical trial was designed. Patients enrolled in the study were assigned randomly to one of the two groups using an online randomization programme (www.sealedenvelope.com). Dogs of group M and B ($n = 10$ each) were to be administered methadone and butorphanol, respectively, as intravenous premedication.

All dogs underwent physical examination by the same anaesthetist on the day of the scheduled procedure and were judged to be suitable for the anaesthetic protocol. Dogs were assigned an American Society of Anesthesiologists (ASA) score (I–V) and a body condition score (BCS) using a 9-point scale. Food, but not water, was withheld for 24–48 hours prior to general anaesthesia dependent on whether lower gastrointestinal endoscopy would be performed. If required, dogs were administered three per oral doses of a bowel cleansing agent (25 mL kg^{-1} $dose^{-1}$, KleanPrep; Norgine, UK) with the last dose $\geq$ 12 hours before, and a warm water enema 2 hours before general anaesthesia. A 20 gauge catheter (Jelco; Smiths Medical, UK) was placed into a cephalic vein. Group M dogs were administered 0.3 mg kg^{-1} methadone (Comfortan; Dechra, UK) and group B dogs 0.4 mg kg^{-1} butorphanol (Alvegesic; Dechra, UK) intravenously (IV) as premedication. Treatments were prepared by a second anaesthetist to ensure the anaesthetist performing the study remained unaware of group allocations. All treatments were diluted to a total volume of 0.05 mL kg^{-1} using sterile water for injection (Water for Injection; Hameln Pharmaceuticals, Germany).

Dogs were taken to a quiet room and allowed to acclimatize for 10 minutes before administration of treatments. Dogs were kept in the same room and monitored for signs of adverse reaction to the treatments. After 20 minutes, the level of sedation was assessed using a composite sedation scale ranging

