

RESEARCH PAPER

## The effects of acupuncture point Pericardium 6 on hydromorphone-induced nausea and vomiting in healthy dogs

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### Abstract

**Objective** To evaluate the effect of needling at acupuncture point Pericardium 6 on hydromorphone-induced nausea and vomiting.

**Study design** Randomized controlled clinical study.

**Animals** Eighty-one mixed-breed, healthy dogs aged  $1.8 \pm 1.6$  years and weighing  $14.5 \pm 5.6$  kg, admitted for elective ovariohysterectomy ( $n = 75$ ) or castration ( $n = 6$ ).

**Methods** Dogs were randomly assigned to one of three groups: acupuncture at Pericardium 6 (AT,  $n = 27$ ); alternative acupuncture at Lung 5 (ST,  $n = 27$ ), and no acupuncture (CT,  $n = 27$ ). During time 0–30 minutes (baseline), occurrences of hypersalivation, vomiting and licking were recorded. At 30 minutes, subjects were administered hydromorphone ( $0.1 \text{ mg kg}^{-1}$ ) in combination with acepromazine ( $0.03 \text{ mg kg}^{-1}$ ) intramuscularly. During time 30–45 minutes (post-injection), occurrences of hypersalivation, vomiting and licking were recorded by an observer unaware of group assignment. Groups were compared using a Kruskal–Wallis test followed by a Dunn's post-test, or Fisher's exact tests when appropriate.

**Results** There were no significant differences in age, weight or baseline observations among groups. Vomiting incidence post-injection was higher in the CT (20/27, 74.1%) and ST (22/27, 81.5%) groups than in the AT (10/27, 37.0%) group ( $p = 0.0129$  and  $p = 0.002$ , respectively). The number of vomiting episodes [median (range)] after opioid administration was higher in the ST [1 (1–6)]

than the AT [0 (0–2)] group ( $p = 0.0040$ ). There were no differences in the median number of vomiting episodes between the ST and CT [1 (0–3)] or AT and CT groups. There were no differences in hypersalivation or licking among groups after hydromorphone–acepromazine administration.

**Conclusions and clinical relevance** Pericardium 6 acupuncture reduced the incidence of hydromorphone-induced vomiting in healthy dogs. This cost-effective technique can improve patient well-being and comfort during the perioperative period.

**Keywords** acupuncture, dog, hydromorphone, opioid, vomiting.

### Introduction

Acupuncture is the art of stimulating specific and previously defined loci. The classic acupuncture point is a locus located beneath the skin that reaches the surface and is formed of a neurovascular and lymphatic bundle encompassed by a sheath of connective tissue (Mittleman & Gaynor 2000). Acupuncture points or loci may also lie along meridians, which can follow major nerve, vessel and fascial cleavage planes (Mittleman & Gaynor 2000). Perioperative acupuncture has been effective in enhancing sedation, in the treatment of acute and chronic pain, and in decreasing systemic opioid use, minimizing cardiovascular complications, and managing postoperative nausea and vomiting (Kotani et al. 2001; Chernyak & Sessler 2005; Streitberger et al. 2006; Hayashi et al. 2007; Gakiya et al. 2011; Schliess-

bach et al. 2011; Vickers et al. 2012; Cheong et al. 2013; Lee et al. 2013; Fry et al. 2014).

Acupuncture point Pericardium 6 (PC6) has been used in humans and dogs to treat and prevent nausea and vomiting and is considered the most effective anti-emetic point (Streitberger et al. 2006; Hosbach 2008; Lee et al. 2013; Alizadeh et al. 2014; Koh et al. 2014). The anti-emetic effect of acupuncture can be an important part of anesthetic management as vomiting can lead to aspiration pneumonia, increased intra-abdominal and thoracic pressure, arterial hypertension, increases in intracranial pressure and patient discomfort (Eberhart et al. 2007; Tart et al. 2010).

Acupuncture point Lung 5 (LU5) follows the lung meridian and is termed *Chi Ze* (Hwang & Limehouse 2001). It is indicated for use in canine patients with elbow pain, paralysis of the distal thoracic limb and respiratory disorders (Hwang & Limehouse 2001). In humans, points along the lung meridian were shown to affect heart rate, body temperature, consciousness, asthma and laryngospasm, but to have no effect on vomiting or nausea (Hosbach 2008).

Opioids such as hydromorphone are commonly used perioperative analgesics in small animal anesthetic protocols and have an analgesic mechanism of action mainly as agonists on  $\mu$ -opiate receptors at both the spinal and supraspinal levels (Schafer 2011). A disadvantage associated with the intramuscular (IM) administration of these opioids in healthy dogs is vomiting and nausea (Valverde et al. 2004; Wilson et al. 2005; Johnson 2013).

The primary objective of this study was to determine if single-point acupuncture at PC6 affects occurrences of hypersalivation, self-licking and vomiting in healthy dogs administered hydromorphone and acepromazine for elective procedures. The primary hypothesis was that acupuncture at PC6 will reduce the occurrence of hypersalivation, licking and vomiting in these patients. The secondary objective was to determine if acupuncture at LU5 has significant effects on opioid-induced nausea and vomiting in comparison with no acupuncture therapy. The secondary hypothesis was that acupuncture at LU5 will have no effect on opioid-induced nausea and vomiting.

## Materials and methods

All aspects of this research were approved by the Ross University School of Veterinary Medicine (RUSVM) Institutional Animal Care and Use Committee. Own-

ers provided written consent for the participation of the dogs enrolled in this study but were not aware of which treatment (acupuncture, sham or control) would be administered to their animals.

The study population consisted of 81 healthy, mixed-breed dogs assigned American Society of Anesthesiologists (ASA) class I status presenting to the RUSVM community practice for elective surgical procedures. Physical status was determined by history, physical examination, complete blood count, total protein, blood urea nitrogen and serum glucose. The study population consisted of 75 females and six males undergoing ovariohysterectomy and castration, respectively. Mean  $\pm$  standard deviation (SD) age and weight were  $1.8 \pm 1.6$  years and  $14.5 \pm 5.6$  kg, respectively. Patients were fasted for 12 hours prior to the procedure. Water was available *ad libitum* until the morning of the procedure.

According to a prospective, randomized, controlled study design, the 81 dogs were randomly assigned using computer software ([www.randomizer.org](http://www.randomizer.org)) to one of three treatment groups: group AT, acupuncture at PC6 ( $n = 27$ ); group ST, alternative acupuncture at LU5 ( $n = 27$ ), and group CT, control or no acupuncture (CT,  $n = 27$ ).

## Baseline measurements and experiment protocol

Each patient was placed in a quiet isolated room for observations. Patients in AT were administered acupuncture by a certified veterinary acupuncturist (EMS) at point PC6 on both thoracic limbs. PC6 (*Nei Guan*) is located within the muscular groove at about one-sixth of the distance from the carpus to the cubital fossa between the flexor carpi radialis and superficial digital flexor muscle intersection with the corresponding tendons (Hwang & Limehouse 2001). Acupuncture point PC6 was identified by palpation of the defined anatomical landmarks. Patients in ST were administered acupuncture by the same acupuncturist on both thoracic limbs at point LU5 (*Chi Ze*) located on the cubital fossa of the thoracic limb, in a depression lateral to the biceps brachii tendon and medial to the extensor carpi radialis (Hwang & Limehouse 2001). Acupuncture point LU5 was also located by palpation of the defined anatomical landmarks. Patients in CT were not administered acupuncture stimulation.

Acupuncture needle selection was based on the size of the patient. The needles used in this study included needles measuring  $0.18 \times 15$  mm and

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