Effectiveness of electroacupuncture analgesia compared with opioid administration in a dog model: a pilot study

D. Groppetti1*, A. M. Pecile1, P. Sacerdote2, V. Bronzo3 and G. Ravasio1
1 Department of Veterinary Clinical Science, 2 Department of Pharmacology, Chemotherapy and Medical Toxicology, and 3 Department of Veterinary Pathology, Hygiene and Public Health, Università degli Studi di Milano, Italy
* Corresponding author. E-mail: debora.groppetti@unimi.it

Editor’s key points
- Electroacupuncture was compared with conventional opioid pain relief in female dogs undergoing elective neutering.
- Pain relief was better and more prolonged in dogs receiving acupuncture than butorphanol.
- No dogs receiving acupuncture needed breakthrough pain relief.

Background. Although opioid analgesics are the usual drugs to treat post-surgical pain, acupuncture has also been demonstrated to relieve various pain syndromes. The present pilot study aims to investigate the efficacy of electroacupuncture compared with a conventional opioid compound, butorphanol, for postoperative pain treatment in dogs undergoing elective ovariohysterectomy.

Methods. Twelve dogs were randomly allocated into two groups. Dogs received either electroacupuncture stimulation (16 and 43 Hz) at Shen Shu, Chang Shu, He Gu, Tai Yuan, Zu San Li, Yang Ling Quan, and Bai Hui acupoints, while control dogs were treated with butorphanol. Cardiovascular and respiratory parameters were recorded for both groups during operation. Plasma β-endorphin concentrations were evaluated before surgery (baseline) and up to 24 h later. For each dog, pain was measured according to a dedicated subjective pain scoring system.

Results. Plasma β-endorphin levels in dogs receiving electroacupuncture increased significantly against baseline values after 1 and 3 h after surgery. Moreover, the end-tidal isoflurane concentration needed for second ovary traction was significantly lower in acupuncture-treated dogs than control animals. All animals having electroacupuncture experienced prolonged analgesia, over 24 h at least, while four out of six dogs treated with butorphanol needed post-surgical ketorolac and tramadol supplementation to their pain relief.

Conclusions. The results obtained from the present investigation showed some evidence for electroacupuncture as an alternative technique to provide postoperative analgesia in dogs.

Keywords: analgesia; butorphanol; dog; electroacupuncture; ovariohysterectomy

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Acupuncture is a medical technique experienced in the Eastern world since 3000–5000 yr ago. In Western countries, though its scientific efficacy remained controversial for many years, it was only recognized as a complementary medical treatment by the US National Institutes of Health.1

Endogenous opioids peptides are considered to play a central role in mediating the analgesic effect of acupuncture;2 in fact, many studies have shown that acupuncture can increase endorphin levels in the brain, spinal cord, and plasma.3,4 Electroacupuncture can even be of greater efficacy than dry needles alone as it produces a stronger, more prolonged, and uniform stimulation.5 It has to be noted that different neuropeptides are released according to different frequencies of electroacupuncture.6 In fact, previous studies conducted on a rodent model found that a moderate frequency (10–100 Hz) can produce a significant anti-hyperalgesic effect.6,7 Analgesia induced by a moderate frequency electroacupuncture is mediated by endomorphin (μ-opioid agonist), dynorphin (κ-opioid agonist), enkephalin, and β-endorphin (mixed μ- and δ-opioid agonist) release.8 The present study aimed to compare the postoperative pain relief induced by electroacupuncture (16 and 43 Hz) compared with a conventional analgesic opioid, butorphanol, in dogs undergoing routine elective ovariohysterectomy. In our investigation, we assumed that the analgesic effects of electroacupuncture treatment are mediated by central opioid activity via the β-endorphin system.

Methods
This experiment complied with the guidelines of the Committee for Research and Ethical Issue of IASP.8 The study protocol was approved by the institutional ethical committee of Università degli Studi di Milano, Italy.
Effectiveness of electroacupuncture analgesia

Animals
Consistent with Italian regulations (D.L. 116/1992), due consent was obtained from the owners of dogs in need of ovariohysterectomy to be performed at the Reproduction Unit of the Department of Veterinary Clinical Science, Università degli Studi di Milano, Italy. The dogs were deemed healthy according to the ASA classification I–II, as apparent from physical and haematological examination. Exclusion criteria were the presence of systemic or localized diseases involving cardiovascular, neurological, respiratory, gastrointestinal, or urogenital systems and also the use of any analgesic drug or an alternative analgesic therapy within 14 days of surgery. All dogs in the study were found to be within reference ranges as to their pre-operative haematology and biochemical profiles. Twelve healthy sexually intact bitches of different breeds, weighing from 5 to 41.5 kg and aged from 2 to 8 yr, were enrolled in this study and randomly allocated to either an acupuncture-treated (n=6) or control (usual practice) group (n=6). Mean (range) age of dogs was 4.6 (2–8) and 5.3 (3–8) yr and mean (SD) weight was 25.2 (8.3) and 27.5 (1.3) kg for the acupuncture and control groups, respectively. Before operation, treated dogs had electroacupuncture as the only analgesic support to surgery, while control dogs were given butorphanol (Dolorex®; Recordati spa, Italy) using 100% oxygen delivered via a re-breathing technique through median laparotomy access in supine bitches.13

Anaesthetic common protocol
All animals were fasted from the evening before surgery, and water was allowed until 2 h before surgery. To obtain effective sedation for electroacupuncture procedures, propofol (Propovet, Esteve spa, Italy) was administered i.v. at 2.5 mg kg⁻¹ dose over 30 s followed by a continuous rate infusion of 0.05 mg kg⁻¹ min⁻¹. Control dogs received the same sedative protocol. Forty minutes after the first perfusion, anaesthesia was induced in all dogs within an additional bolus of propofol (1 mg kg⁻¹) to allow tracheal intubation. Anaesthesia was maintained by isoflurane (Isoba, Schering-Plough, Italy) using 100% oxygen delivered via a re-breathing system, at the minimum efficacy dose to obtain an appropriate level of anaesthesia based on clinical assessment. The same surgeon performed all operations.

Analgesic protocols
Electroacupuncture treated
Since analgesia requires an induction period of 30–40 min,10 electroacupuncture was performed 40 min before surgery and maintained until the last skin suture was placed. Frequency and intensity of electroacupuncture and also proper acupoints were selected according to veterinary literature, in agreement with the principles of Traditional Chinese Medicine.11 In our study, we chose the following acupoints: Shen Shu (BL 23), Chang Shu (BL 25), He Gu (LI 4), Tai Yuan (LU 9), Zu San Li (ST 36), Yang Ling Quan (GB 34), and Bai Hui (GV 20). In dogs, GV 20 Bai Hui is located on the dorsal midline of their skull, intersecting the coronal line from both sides of the rostral ear base, at the rostral end of the external sagittal crest.12 Needles (Seirin, soft needle, size 0.30 × 30 mm) were inserted at all acupoint levels to a depth of 15–20 mm. Acupoint GV 20 was stimulated manually every 10 min. Other acupoints were electrically stimulated in pairs using an electronic acupunctoscope [WQ-6F(57–6F), Beijing Haidian, China]. Acupoints LI 4, LU 9, ST 36, and GB 34 were stimulated with 16 Hz and 0.4 V, while acupoints BL 23 and BL 25 received 43 Hz, 0.1 V stimulation. Electroacupuncture needles were glued at their acupoints to avoid being removed by accidental movements of the animals under treatment.

Opioid group (C)
In control dogs, butorphanol (Dolorex®) was administered i.m. at 0.2 mg kg⁻¹, 15 min before surgery.

Surgery
Ovariohysterectomy was performed using a standard technique through median laparotomy access in supine bitches.13 Monitoring included measurement of SpO₂, heart rate, arterial pressure, Et-IF%, IE, sev, temperature, and ECG—all performed by a multi-parametric monitor (Goldway UT 4000F pro; Smithtown, NY, USA). Named parameters were recorded for all bitches every 5 min during anaesthesia and surgery. Statistical evaluations were performed just before skin incision (T1), at skin incision (T2), at the first ovary traction, at the second ovary traction (T3), and at the end of skin suture (T4).

Postoperative pain assessment
Postoperative pain was assessed by three independent trained observers who were blinded to the dogs treatment group, using a modification of Sammarco and colleagues’⁹ subjective pain scoring system, at 0 (T4), 15, 30, 45 min, 1 h (T5), 2, 3 h (T6), 4, 5, 6 h (T7), 8, 10, 12 h (T8), and 24 h (T9) after tracheal extubation (Table 1). This score consists of six behavioural categories represented by the following descriptive expressions: comfort, movement, appearance, unprovoked behaviour, interactive behaviour, and vocalization. Each category is then subdivided into levels in ascending order related to pain intensity, with a maximum pain score of 24. When scores exceeded 6/24 (indicating moderate/severe pain), rescue analgesia was administered by i.m. injection of 0.5 mg kg⁻¹ ketorolac tromethamine (Toradol®, Recordati spa, Italy) and 4 mg kg⁻¹ tramadol chlorhydrate (Altadol, Formevet spa, Italy); after such occurrence data were recorded but excluded from statistical analysis.

Blood analysis
To minimize stress associated with blood sample acquisition, two 18 G i.v. catheters were aseptically placed bilaterally into the cephalic vein of all bitches just 10 min before measuring β-endorphin by a first blood collection (T0). Serial peripheral blood sampling after 40 min (T1), at skin incision (T2), at the second ovary traction (T3), and at the end of last skin suture.
radioimmunoassay as previously described. The method measurement was performed by radioimmunoassay, using a commercial statistical program (SPSS 17.0 for Windows, SPSS Inc., Chicago, IL, USA). All data were analysed using a commercial statistical program (SPSS 17.0 for Windows, SPSS Inc., Chicago, IL, USA).

### Table 1 Cumulative pain score

<table>
<thead>
<tr>
<th>Observation</th>
<th>Score</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comfort</td>
<td>0</td>
<td>Patient asleep or calm</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Patient awake, interested in surroundings</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Mild agitation or depressed, uninterested in surroundings</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Moderate agitation, restless, and uncomfortable</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Extremely agitated</td>
</tr>
<tr>
<td>Movement</td>
<td>0</td>
<td>Quiet</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1–2 position changes min⁻¹</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>3–6 position changes min⁻¹</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Continuous position changes</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Thrashing</td>
</tr>
<tr>
<td>Appearance</td>
<td>0</td>
<td>Too sedate to evaluate</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Normal</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Mild changes (eye partially closed)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Moderate changes (blinking eye)</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Severe changes (eye continuously closed)</td>
</tr>
<tr>
<td>Unprovoked behaviour</td>
<td>0</td>
<td>Too sedate to evaluate</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Normal</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Minimal changes</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Moderately abnormal (less mobile or alert than normal, unaware of surroundings or very restless)</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Markedly abnormal (very restless, vocalization, self-injury, grunting, facing back of cage)</td>
</tr>
<tr>
<td>Interactive behaviour</td>
<td>0</td>
<td>Too sedate to evaluate</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Normal</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Looks at wound and retracts when surgical site touched, mobile</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Vocalizes when wound touched, reluctant to move but will if coaxed</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Violent reaction to touching of surgical site, snapping, growling when approached, will not move when coaxed</td>
</tr>
<tr>
<td>Vocalization</td>
<td>0</td>
<td>Quiet</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Groan</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Crying but stops with quiet voice and stroking</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Intermittent crying, no stop with quiet voice and stroking</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Constant crying, no stop with voice or stroking</td>
</tr>
</tbody>
</table>

(T4), then, after a further 1 h (T5), 3 h (T6), 6 h (T7), 12 h (T8), and 24 h (T9) was collected. Plasma from heparinized blood was obtained by centrifugation at 4°C, and β-endorphin measurement was performed by radioimmunoassay, using radioimmunoassay as previously described. The method sensitivity was 10 pg per tube; intra-assay and inter-assay variation coefficients were 8% and 11%, respectively.

### Results

Time elapsed from initial incision and last surgical action was defined as surgery time. Mean surgery time was similar for both groups [36.6 (5.5) and 34.8 (8.1) min for acupuncture and control animals, respectively). Intra-surgical respiratory and cardiovascular parameters were also similar in both groups (Table 2).

In acupuncture-treated animals, Et-ISF% required was lower than in control animals at any time interval and was significantly different during second ovary traction, P<0.03 (Table 2). Analgesia was evaluated using a subjective pain scoring system at fixed time intervals from tracheal extubation to 24 h after surgery (Table 1).

Figure 1 shows that pain score was significantly lower in dogs given acupuncture than control dogs 0.5–10 h after surgery. Plasma β-endorphin concentrations were higher in the acupuncture group than in control dogs (Fig. 1).

Moreover, statistical comparison between β-endorphin concentration and pain score between the groups was significantly different at T6 (P=0.036), when a high concentration of β-endorphin corresponded to a low pain score.

None of the acupuncture-treated dogs required rescue analgesia during or after surgery, whereas four out of six control dogs needed post-surgical ketorolac and tramadol administration. In particular, control animals 3, 4, 5, and 6 received rescue analgesia at 15, 240, 180, and 120 min after tracheal extubation, respectively.

Vomiting was only observed in four of the six dogs in the acupuncture group, where dogs were treated with metoclopramide (Plasili®, Lepetit Group, Italy) i.m. at 0.3 mg kg⁻¹.

### Discussion

To our knowledge, this is the first time that a scientific investigation has demonstrated the ability of electroacupuncture to decrease anaesthetic and analgesic requirements in dogs during and after surgical neutering. Many models have been proposed to explain the effects of acupuncture on pain control. The use of acupuncture has been received with scepticism. In human patients, the role of acupuncture cannot be true for dogs, since animals cannot understand the intent of medical care. In clinical trials, sham acupuncture is considered necessary to demonstrate how a treatment is effective. However, it was argued that every penetration of a needle through the skin, be it at an acupuncture point or not, produces physiological effects, partly...
due to activation of a pain-suppressing system in the spinal cord (diffuse noxious inhibitory controls).17

The Center for Veterinary Medicine of the US Food and Drug Administration established that ovariohysterectomy in dog is a relatively standardized source of moderate soft tissue pain, making it suitable for clinical studies of analgesia.18 We used this acute pain to ovariohysterectomy in dogs, which involves both somatic and visceral pathways, with the specific goal of evaluating postoperative pain. Incisional pain dominates the early postoperative course of such abdominal surgery, while deep visceral pain is experienced later.19 Response to pain is modulated by circuitry within the central nervous system that is sensitive to the production of endogenous opioids. Electroacupuncture stimulation has proven effective in relieving pain of both somatic and visceral origin in humans and animals.20 21 The ventrolateral column of the periaquiductal gray (PAG) may play a key role in the integration of the physiological responses to somatic and visceral pain.22 Thus, it is reasonable to assume that activation of the ventrolateral column of the PAG induced by acupuncture increased endorphins in dogs receiving acupuncture which then alleviated the noxious somatic

Table 2 Comparison of intra-surgical evaluations. *P<0.05; EA, electroacupuncture group; C, control group; RR, ventilatory frequency (bpm); HR, heart rate (beats min⁻¹); ISF, end-tidal isoflurane concentration

<table>
<thead>
<tr>
<th>RR</th>
<th>Baseline (T0), mean (SD)</th>
<th>Skin incision (T2), mean (SD)</th>
<th>First ovary traction, mean (SD)</th>
<th>Second ovary traction (T3), mean (SD)</th>
<th>Skin suture (T4), mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EA</td>
<td>14 (6.2)</td>
<td>11.8 (3.5)</td>
<td>15.3 (4.5)</td>
<td>15.5 (6.08)</td>
<td>16.5 (5.7)</td>
</tr>
<tr>
<td>C</td>
<td>13.8 (4.2)</td>
<td>12.7 (3.7)</td>
<td>14.2 (2.2)</td>
<td>22 (19.1)</td>
<td>11.7 (2.4)</td>
</tr>
<tr>
<td>HR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EA</td>
<td>95.7 (1)</td>
<td>108.8 (2.05)</td>
<td>112.7 (11.6)</td>
<td>107.2 (8.5)</td>
<td>111.5 (11.2)</td>
</tr>
<tr>
<td>C</td>
<td>105 (20.4)</td>
<td>113 (18.6)</td>
<td>113.2 (6.5)</td>
<td>115.3 (22.3)</td>
<td>108.3 (17.6)</td>
</tr>
<tr>
<td>ISF (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EA</td>
<td>1.6 (0.2)</td>
<td>1.6 (0.2)</td>
<td>1.7 (0.2)</td>
<td>1.6 (0.3)*</td>
<td>1.5 (0.3)</td>
</tr>
<tr>
<td>C</td>
<td>2.4 (1.02)</td>
<td>1.9 (0.5)</td>
<td>2.1 (0.5)</td>
<td>2.3 (0.6)*</td>
<td>1.8 (0.5)</td>
</tr>
</tbody>
</table>

Fig 1 Mean (so) β-endorphin concentrations (pg ml⁻¹) and pain scale score. *P<0.05; RD, rescue drug administration; T0, basal concentration; T1, 40 min after T0; T2, skin incision; T3, second ovary traction; T4, end of surgery; T5, 1 h after surgery end; T6, 3 h after surgery end; T7, 6 h after surgery end; T8, 12 h after surgery end; T9, 24 h after surgery end.
and visceral stimuli. The anti-hyperalgesic effect of acupuncture is mediated mainly by activation of the descending inhibitory system, including opioidergic (endorphins, enkephalins, and dynorphin), adrenergic, and serotoninergic pathways in both the central and peripheral nervous systems. Although the role of plasma β-endorphin in pain regulation is unclear, it has been reported to correlate inversely with pain levels. In our study, we found an increase in plasma β-endorphin in dogs treated with electroacupuncture at moderate frequency (16 and 43 Hz). In particular, the increase was significant at the T4 and T6 time points, corresponding to 0 and 3 h after surgery, respectively. Moreover, we observed a positive relationship between the increase in β-endorphin and the ability to tolerate pain, with high concentration of β-endorphin statistically associated with a low pain score. A mesolimbic circuitry, in which enkephalins and β-endorphins are mainly involved, has been suggested to explain the modulation of pain. The correlation between aversive and appetitive motivational conditions and the state of the mesolimbic loop circuit is increasingly clear; such correlation contributes to adaptive behavioural choice. Release of endogenous opioids induces the secretion of the neuropeptide arginine vasopressin (AVP) and oxytocin, both involved in the modulation of pain and in the regulation of social behaviour in mammals, such as social recognition, social interaction, and comfort. Furthermore, AVP and oxytocin participate in the regulation of antinoceptive mechanisms in acupuncture analgesia. In our study, control dogs were restless, uninterested in their surroundings, uncomfortable, frequently blinking, emitting vocalization and/or reacting to wound touching, and reluctant to move. Conversely, dogs treated with acupuncture were quiet, awake, interested in their surroundings, appeared comfortable, not blinking, not reactive to wound touching, and were mobile. Some authors have reported that levels of AVP after electroacupuncture showed a rapid increase. The normal behaviour observed in acupuncture-treated dogs may be explained by an increase in endogenous AVP and oxytocin. Moreover, electroacupuncture inhibits pro-inflammatory cytokines from producing an anti-inflammatory effect in a surgical trauma stress model, without adrenal gland involvement. Gejervall and colleagues reported that low-frequency electroacupuncture stimulation induces release of β-endorphins and decreases pain. However, naloxone can only block the analgesic effect induced by electroacupuncture at low frequency (4 Hz), but not at high frequency (200 Hz). It is suggested that analgesia produced by high-frequency electroacupuncture stimulation may involve non-opioid-mediated mechanisms such as neuropeptide serotonin (5-hydroxytryptamine, 5-HT) release. Considerable evidence supports a role for 5-HT in the mediation of analgesia and descending spinal inhibition. Moreover, 5-HT plays an important role in specific physical and emotional responses. For example, low levels of 5-HT have been associated with anxiety, depression, and stress. Thus, lower pain scoring and friendliness with observers as recorded in acupuncture-treated dogs may be due to increased acupuncture-induced secretion of 5-HT. Conceivably, inflammatory primary hyperalgesia develops in the injury site due to the onset of inflammatory pain manifested through an increase in pain score associated with interactive behaviour. This could explain the lack of response to wound palpation (vocalization, abnormal reaction, or both) in animals given acupuncture but not control animals.

Furthermore, the muscle incision resulting from a celiotomic approach causes a rapid development of serious pain due to release of cytokines and mediators such as substance P (SP). Immunohistochemical studies have shown that electroacupuncture depressed the pain response and increased SP-immunoreactivity, possibly due to inhibition of its release. Therefore, the inhibition of SP may decrease an early perception of somatic pain, while a late onset of visceral pain can be modulated by the ventrolateral column of the PAG by means of electroacupuncture.

Endocannabinoid and spinal structures activated by acupuncture are also involved in nociceptive processing and play a role in the neuromatrix concept, as proposed by Melzack. According to this theory, acupuncture can be conceived as a conflicting message in the pain neuromatrix, unbalancing it, and thus modifying the perception of pain. This concept could explain the long-lasting postoperative persistence of analgesia (up to 24 h) and could be applied to further studies on chronic pain prevention.

Postoperative nausea and vomiting (PONV) are common effects in surgical patients and represent a frequent and critical cause of morbidity in children. However, PONV can be easily controlled by pre-anesthetic medications and also by a wide range of anti-emetics drugs. In our study, vomiting was present only in dogs treated with electroacupuncture. Also in humans, vomiting and nausea seem to occur in 0.2–0.01% patients after acupuncture. Opioids exert emetogenic effects through multiple mechanisms, primarily involving direct stimulation of the area postrema and stimulation of the vestibular apparatus. Electroacupuncture inducing an increase in plasma opioid concentrations, although beneficial for analgesia, may enhance opioid-related side-effects, such as nausea and vomiting. At moderate frequencies, as used in our study (16 and 43 Hz), electroacupuncture stimulates the production of endogenous opioids that can cause the onset of vomiting. However, when using acupoints other than those applied in our study, acupuncture was found to lessen PONV symptoms. P6 Neiguan acupoint stimulation seems to reduce the risk of PONV.

The rate of treatment failure (defined as the time when rescue ketorolac plus tramadol were administered) in control animals was 66.7% within 4 h after surgery, suggesting lack of analgesia in the control group. All dogs, which received rescue drugs, showed a reduction in pain score to below 6/24 within 2 h. There were no treatment failures in acupuncture-treated dogs.

Conventional laboratory animal models are inappropriate to study pain mechanisms in humans, since pain processes in humans are different in rodents. However, recent studies...
have shown that the companion canine model can be useful in evaluating the efficacy of new analgesic drugs and in assessing stress response to surgery.\(^4^8\) Moreover, dogs, like humans, can communicate via vocalization and body language.\(^4^9\) The absence of verbal communication in dog makes this model very relevant in relation to infant, geriatric, or psychiatric patients.\(^4^8\) Acute and chronic pain are similarly experienced by companion animals and humans, which makes a careful investigation on complementary treatments, for example, electroacupuncture, in pets useful from both a human and veterinary perspective.

In conclusion, electroacupuncture may represent a valid supplementary tool for the control of pain in animals undergoing surgery. As to analgesia, it is important to stress that—though not yet fully understood—the mechanism inducing acupuncture effects seems to prevent the transmission of pain before it reaches the first synapse at the dorsal horn of the spinal cord.\(^5^0\) Electroacupuncture can thus be considered a preventative medical.

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### Conflict of interest
None declared.

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