Ciência Animal Brasileira
Brazilian Animal Science

DOI: 10.1590/1809-6891v26e-80242E

e-ISSN 1809-6891
Veterinary Medicine | Research article

Postoperative analgesic evaluation of intraovarian lidocaine infiltration in female dogs submitted ovariohysterectomy

Avaliação analgésica pós-operatória da infiltração de lidocaína intraovariana em cadelas submetidas à ováriohisterectomia

Thaís Ayumi Stedile Fujimoto[1], **Aracelle Alves de Ávila Fagundes**[1]

1 Universidade Federal de Uberlândia (UFU), Uberlândia, Minas Gerais, Brazil

*Corresponding author: thaisfujimotoo@gmail.com

Received: August 21, 2024. Accepted: April 08, 2025. Published: August 07, 2025. Editor: Luiz Augusto B. Brito

Abstract: The ovariohysterectomy (OHV) is a surgery that causes mild to moderate pain, requiring the use of a protocol that promotes good analgesia during and after the procedure. The lidocaine is a local anesthetic, considered efficient and low-cost. Based on this, this study aimed to evaluate the postoperative period of female dogs that received intraovarian lidocaine during an ovariohysterectomy. Twelve female dogs, aged 1 to 5 years, with body weights between 10 and 35kg, were divided into two groups: animals that received intraovarian lidocaine infiltration (GL - lidocaine group), and animals that did not receive the medication (CG - control group). The animals were evaluated prior to the administration of pre-anesthetic drugs (T0), immediately after the completion of the surgical procedure, as well as after 3 (T3), 6 (T6), 12 (T12), 24 (T24) and 48 (T48) hours, using the University of Melbourne Pain Scale (UMPS). For continuous data, the Tukey test was performed; for qualitative variables, the Kruskal-Wallis test was used. Both groups at no time during the analysis exceeded the minimum UMPS score considered, indicating that none of the animals presented a relevant state of pain. It is concluded that intraovarian infiltration of lidocaine in female dogs undergoing ovariohysterectomy did not provide additional analgesia according to the analysis criteria used, revealing the need for additional studies associating different anesthetic protocols and pain assessment methods.

Key-words: analgesia; sterilization; ovary.

Resumo: A ovário-histerectomia (OVH) é uma cirurgia que gera dor leve a moderada, sendo necessário o uso de um protocolo que promova boa analgesia durante e após o procedimento. A lidocaína é um anestésico local, considerado eficiente e de baixo custo. Com base nisso, esse trabalho objetivou avaliar o pós-operatório de cadelas que utilizaram lidocaína intraovariana durante a ovário-histerectomia. Foram utilizadas 12 fêmeas da espécie canina, com idade de 1 a 5 anos, peso corporal entre 10 a 35kg, divididas em dois grupos: animais que receberam infiltração de lidocaína intraovariana (GL - Grupo Lidocaína), e animais que não receberam o medicamento (GC - Grupo Controle). Os animais foram avaliados anteriormente à administração de medicações pré-anestésicas (T0), imediatamente após a conclusão do procedimento cirúrgico, bem como após 3 (T3), 6 (T6), 12 (T12), 24 (T24) e 48 (T48) horas, por meio da escala de dor da Universidade de Melbourne (EDUM). Para os dados contínuos, foi realizado o teste de Tukey; para as variáveis qualitativas, foi utilizado o teste de Kruskal-Wallis. Ambos os grupos, em nenhum momento de análise,

ultrapassaram a pontuação mínima da EDUM, considerada dor, indicando que nenhum animal apresentou estado de dor relevante. Conclui-se que a infiltração intraovariana de lidocaína em cadelas submetidas à ovário-histerectomia não proporcionou analgesia adicional de acordo com os critérios de análise utilizados, sugerindo a necessidade de estudos adicionais associando diferentes protocolos anestésicos e métodos de avaliação da dor.

Palavras-chave: analgesia; esterilização; ovário.

1. Introduction

Acute pain is usually associated with a traumatic, inflammatory, infectious, or surgical process [1]. Preventing and controlling perioperative pain has become an important aspect of the surgical care of veterinary patients to ensure animal well-being and recovery [2,3].

Adequate pain control can be achieved with an appropriate choice of analgesic protocols, generally including opioids and non-steroidal anti-inflammatory drugs, combined with local anesthetic techniques [1]. Therefore, a suitable protocol is necessary to perform a surgical procedure, combining drugs according to the degree of pain expected to provide effective analgesia and reduce the amount of general anesthetics required, thereby minimizing their side effects [4,5,6].

Analgesics are specific inhibitors of pain pathways, while local anesthetics are nonspecific inhibitors of peripheral, motor, and autonomic pathways, also affecting skeletal and cardiac muscles [7]. The use of local anesthetics has stood out among alternative techniques for improved pain control because these compounds bind reversibly to sodium channels, blocking impulse conduction through nerve fibers [8].

In addition, local anesthesia prevents the transmission of nociceptive impulses, thereby minimizing central sensitization, which reduces the need for systemic analgesics in the postoperative period and is an attractive method due to its high efficacy and low cost [9]. According to Ambrósio and Fantoni [10], lidocaine is an effective anesthetic widely used in infiltrative anesthesia, offering safety and practicality.

The pain generated by ovariohysterectomy (OHE) is considered mild to moderate, with both somatic and visceral components [11]. Pain caused by surgical procedures is usually most intense during the first 24 hours, with a progressive decline thereafter. In animals, pain scales are essential tools that help clinicians assess pain and guide appropriate treatment [1]. Therefore, the literature provides several metrics validated for reliability, sensitivity, and specificity to analyze pain intensity in dogs.

The University of Melbourne Pain Scale (UMPS) is a multidimensional parameter, with categories that assess physiological responses and other behavioral parameters important for verifying whether an animal is in pain [12,13]. Therefore, this study aimed to evaluate the effect of intraovarian lidocaine infiltration during OHE in female dogs, through 48-hour postoperative evaluations using the University of Melbourne Pain Scale.

2. Material and methods

All procedures in this study were approved by the Ethics Committee for the Use of Animals (CEUA) of the Federal University of Uberlândia (UFU), under Protocol No. 110/17, and carried out at the Veterinary Hospital of the Federal University of Uberlândia (HV/UFU).

2.1 Animals and acclimatization

In this experiment, 12 female dogs of no defined breed, aged between 1 and 5 years and weighing between 10 and 35 kg, were used. All animals were considered healthy based on clinical and laboratory examinations (blood count, serum creatinine, alanine aminotransferase, and alkaline phosphatase levels) and were submitted to surgical sterilization. Only animals classified as ASA I by the American Society of Anesthesiologists [14] were included in the study.

The animals used in this study were from the HV/UFU Castration Project, in agreement with the Uberlândia City Hall, with written consent and authorization from their guardians.

The dogs were housed in a kennel for four days before the surgical procedure to allow acclimatization and reduce potential interference from adapting to the new environment during postoperative evaluations. The same evaluator, who also fed the animals, was present to minimize variability. The dogs were housed in individual stalls with access to food and water ad libitum during this period.

2.2 Preoperative and anesthetic procedure

The animals were fasted for eight hours from food and water before the anesthetic and surgical procedures. The abdominal region was also extensively shaved. The preanesthetic protocol consisted of the intramuscular administration of acepromazine (0.05 mg/kg) and tramadol (4 mg/kg) in the same syringe. In addition, antibiotic prophylaxis was performed with intramuscular amoxicillin combined with potassium clavulanate (20 mg/kg), along with subcutaneous ranitidine hydrochloride (2 mg/kg) to protect against possible gastric irritation caused by orally administered drugs.

Fifteen minutes after the administration of the preanesthetic medication, venous access was obtained by cephalic vein catheterization using a catheter with a diameter appropriate for the animal's size. Anesthetic induction was performed with propofol at a dose of 5 mg/kg intravenously until the laryngotracheal reflex was abolished. Orotracheal intubation was then performed using a Magill endotracheal tube of appropriate diameter.

The animals were placed in dorsal recumbency and maintained under general inhalation anesthesia with isoflurane, delivered in 100% oxygen via a universal vaporizer at a flow rate of 100 mL/kg/min in a circular rebreathing circuit, under spontaneous ventilation. Isoflurane administration was adjusted to maintain the animals at the second plane of the third stage of anesthesia according to Guedel [15], confirmed by eyeball rotation and the absence of palpebral, laryngotracheal, and interdigital reflexes.

The following parameters were observed throughout the surgical procedure to monitor the intraoperative period: heart rate in beats per minute (bpm), obtained by auscultation with a stethoscope; respiratory rate in respirations per minute (rpm), determined by directly counting thoracic movements; end-tidal carbon dioxide concentration ($EtCO_2$), measured using a capnograph; oxygen saturation (SpO_2), measured using pulse oximetry; rectal temperature (RT) in degrees Celsius (° C), measured using a digital rectal thermometer; and systolic blood pressure (SBP), measured using a vascular Doppler and a sphygmomanometer positioned on the animal's left thoracic limb.

2.3 Transoperative procedures

The animals received maintenance fluid therapy during the surgical procedure, using Ringer's lactate solution (10 mL/kg/hour) [16]. All procedures were performed by the same team (anesthesiologist, surgeon, assistant, and volunteer). The ovariohysterectomy technique was performed according to MacPhail [17].

The surgical procedures were carried out randomly among the animals in each group, consisting of two groups of six animals each. The first group, termed the lidocaine group (LG), received intraovarian infiltration of 2% lidocaine at a dose of 0.5 mg/kg. The second group, called the control group (CG), received no infiltration. Intraovarian infiltration with lidocaine was performed using a 1-mL syringe coupled with a 25 × 0.70 mm needle, both sterile, with careful extension of the ovarian pedicles (Figure 1). A team member who was not part of the surgical team or postoperative evaluations performed the injection (or omission) of intraovarian lidocaine to ensure that the study was blinded and randomized. During this stage, the other team members left the room, so they remained unaware of whether lidocaine had been administered.

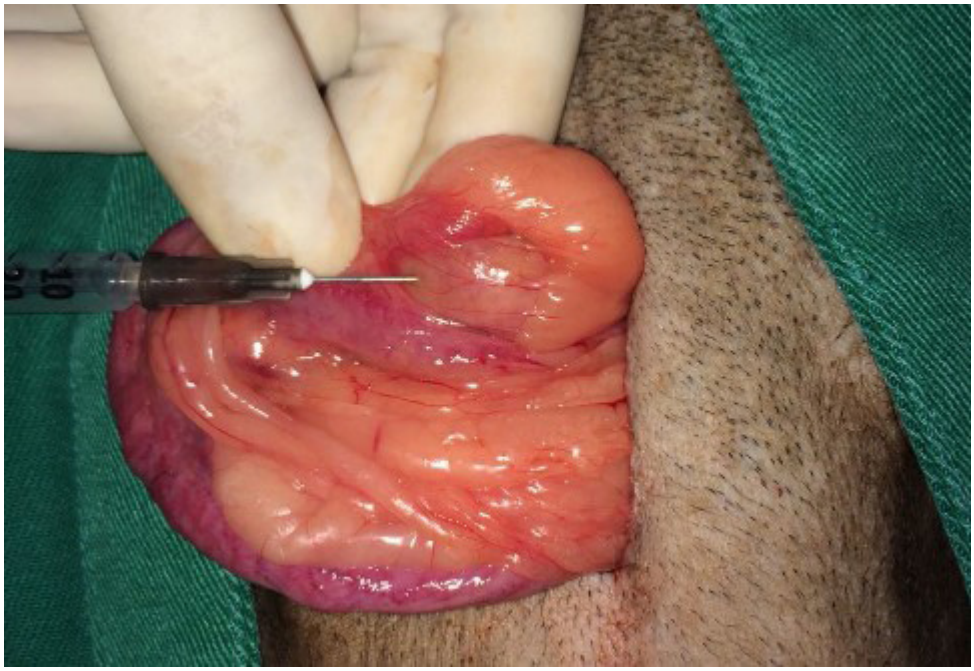

Figure 1. Exposure of the ovarian pedicle and infiltration of 2% lidocaine in the left ovary of a female dog. Source: Small Animal Surgery Department – HV/UFU.

Intraovarian infiltration of lidocaine was first performed on the left ovary after exposure and extension of the ovarian pedicle. Ligation was performed after 3 minutes, followed by excision of the ovarian pedicle. The same procedure was then repeated on the contralateral side. The uterine body was subsequently ligated and excised according to MacPhail [17]. All ligatures were made using 2-0 monofilament synthetic non-absorbable suture (nylon).

Subsequently, the abdominal cavity was inspected for bleeding, followed by closure of the abdominal wall, subcutaneous tissue, and skin using 2-0 non-absorbable nylon with "X," zigzag, and simple interrupted suture patterns, respectively.

2.4 Postoperative care

All medications were administered orally in the immediate postoperative period to avoid any painful stimuli that could interfere with postoperative pain assessments. The animals received dipyrone sodium at 25 mg/kg every 12 hours for 7 days, and meloxicam at 0.1 mg/kg once daily for 3 days.

Postoperative pain was assessed using the University of Melbourne Pain Scale by a blinded evaluator experienced in this method (in scientific research, a blinded evaluator is an individual who performs assessments without prior knowledge of the ongoing study, thereby minimizing bias). The Melbourne Scale assesses and quantifies pain in dogs by observing physiological parameters, such as heart rate (HR), respiratory rate (RR), and rectal temperature (RT), as well as specific behaviors, including body posture, vocalization, interaction with handlers, and response to palpation. A score is then assigned to reflect the animal's level of pain.

The scale ranges from 0 to 23 points. For this study, we stipulated that if any animal scored above 6 (18), indicating pain, the animal would receive rescue analgesia with tramadol [19] (4 mg/kg orally), chosen to avoid painful stimuli.

Pain assessments were carried out before the start of manipulation for pre-anesthetic medication or 0 hours (T0), and at 3 (T3), 6 (T6), 12 (T12), 24 (T24), and 48 (T48) hours after the end of the surgical procedure.

The owners were contacted to retrieve the animals after 48 hours postoperatively, once the evaluations had been completed. They were instructed to continue postoperative care at home, including cleaning and caring for the surgical wound and scheduling suture removal.

2.5 Statistical analysis

The analysis of variance test was used to analyze the HR, RR, and RT data in a completely randomized design with a factorial scheme, followed by Tukey's test to compare means, since these variables were quantitative. Moreover, the Kruskal–Wallis nonparametric test was used to compare means for qualitative variables. All analyses were performed using the SISVAR program [20] and were considered significant when $P < 0.05$.

3. Results

The animals' HR values did not differ statistically when comparing the control group (CG) and the lidocaine group (LG). This equality was also observed when analyzing the time points within each group. The mean RR values were statistically similar between LG and CG. The same occurred at each time point within each group for all measurements.

Furthermore, no statistical differences were observed for RT between the overall means when comparing LG and CG animals (Table 1). However, when analyzing the data obtained for RT in CG animals, the values at 0, 12, and 48 hours were similar, but significantly higher values were recorded at 3 hours. The mean RT at 0 hour in LG animals was statistically higher than at all other time points. Also, the mean at 3 hours was lower than the values at 12, 24, and 36 hours.

Table 1. Mean rectal temperature values (°C) obtained from animals in the lidocaine group and control group at 0, 3, 6, 12, 24, 36, and 48 hours after the surgical procedure.

Group/ Time	0 hours	3 hours	6 hours	12 hours	24 hours	36 hours	48 hours	Overall mean
Control	38.56^{Aa}	37.53^{Ba}	38.06^{ABa}	38.25^{Aa}	38.05^{ABa}	38.03^{ABa}	38.30^{Aa}	38.11^{a}
Lidocaine	38.85^{Aa}	37.50^{Ca}	37.75^{BCa}	38.00^{Ba}	38.10^{Ba}	38.08^{Ba}	38.28^{BCa}	38.17^{a}

Means followed by equal uppercase letters in the rows and equal lowercase letters in the columns do not differ from each other according to Tukey's test ($p > 0.05$).

The animals in both groups showed no signs of salivation and pupillary dilation at any time point, with a recorded score of 0.00 throughout the assessments. CG and LG animals showed no statistical differences when compared, considering the sum of the physiological data (HR, RR, RT, pupillary state, and presence or absence of salivation).

A statistical difference was observed among the various time points for the physiological data within CG, with values at 0 and 3 hours being lower than those at 24, 36, and 48 hours, and the value at 6 hours being lower than at 36 hours. The statistical analysis detected no significant variation in LG (Table 2).

Table 2. Mean scores obtained using the Melbourne Scale for the physiological data parameters in animals of the lidocaine group and control group at 0, 3, 6, 12, 24, 36, and 48 hours after the surgical procedure.

Group/ Time	0 hours	3 hours	6 hours	12 hours	24 hours	36 hours	48 hours	Overall mean
Control	0.00^{ABa}	0.00^{Aba}	0.00^{ABa}	0.00^{ABCa}	1.00^{BCa}	1.50^{Ca}	1.00^{BCa}	0.00^{a}
Lidocaine	0.00^{Aa}	0.00^{Aa}	0.00^{Aa}	0.00^{Aa}	0.00^{Aa}	1.00^{Aa}	0.00^{Aa}	0.00^{a}

Means followed by equal uppercase letters in the rows and equal lowercase letters in the columns do not differ from each other according to Kruskal-Wallis's test ($p > 0.05$).

The means of the response to palpation at the different assessment times for both groups indicated an overall score of 0.00 at all time points. No statistical difference was observed for the animals' activity when comparing CG with LG, either for the overall mean or at each individual time point. However, significant differences were observed within CG among the time points: the score at 0 hours was lower than at 3, 6, and 12 hours; the scores at 6 and 12 hours were similar to each other and higher than at 36 hours; and the score at 12 hours was higher than at 24 hours. Moreover, no significant differences were found for LG animals between time points (Table 3).

Table 3. Mean scores for the activity parameter on the Melbourne Scale in animals of the lidocaine group and control group at 0, 3, 6, 12, 24, 36, and 48 hours after the surgical procedure.

Group/ Time	0 hours	3 hours	6 hours	12 hours	24 hours	36 hours	48 hours	Overall mean
Control	0.00^{Aa}	1.00^{BCa}	1.00^{BCa}	1.00^{BCa}	0.00^{ABa}	0.00^{Aa}	0.50^{ABCa}	0.50^{a}
Lidocaine	0.00^{Aa}	0.50^{Aa}	1.00^{Aa}	1.00^{Aa}	0.50^{Aa}	0.00^{Aa}	0.00^{Aa}	0.50^{a}

Means followed by equal uppercase letters in the rows and equal lowercase letters in the columns do not differ from each other according to Kruskal-Wallis's test ($p > 0.05$).

The mental state of CG animals was statistically different from that of LG animals regarding the overall mean, with CG animals showing higher scores. However, the results for both groups were similar at each analyzed time point. Furthermore, no significant differences were observed within each group across the different time points (Table 4).

Table 4. Mean scores for the mental state parameter on the Melbourne Scale in animals of the lidocaine group and the control group at 0, 3, 6, 12, 24, 36, and 48 hours after the surgical procedure.

Group/ Time	0 hours	3 hours	6 hours	12 hours	24 hours	36 hours	48 hours	Overall mean
Control	0.50^{Aa}	0.00^{Aa}	0.00^{Aa}	0.00^{Aa}	0.50^{Aa}	0.50^{Aa}	0.50^{Aa}	0.50^{a}
Lidocaine	0.00^{Aa}	0.00^{Aa}	0.00^{Aa}	0.00^{Aa}	0.00^{Aa}	0.00^{Aa}	0.00^{Aa}	0.00^{b}

Means followed by equal uppercase letters in the rows and equal lowercase letters in the columns do not differ from each other according to Kruskal-Wallis's test ($p > 0.05$).

No significant differences were found for the assessment of posture between CG and LG animals at the time points. However, the score within LG at 12 hours was lower than the scores recorded at 0, 6, 24, 36, and 48 hours. No significant differences were found within CG (Table 5).

Table 5. Mean scores for the posture parameter on the Melbourne Scale in animals of the lidocaine group and the control group at 0, 3, 6, 12, 24, 36, and 48 hours after the surgical procedure.

Group/ Time	0 hours	3 hours	6 hours	12 hours	24 hours	36 hours	48 hours	Overall mean
Control	1.00^{Aa}	1.00^{Aa}	0.50^{Aa}	0.50^{Aa}	1.00^{Aa}	1.00^{Aa}	1.00^{Aa}	1.00^{a}
Lidocaine	1.00^{Aa}	1.00^{ABa}	1.00^{Aa}	0.00^{Ba}	1.00^{Aa}	1.00^{Aa}	1.00^{Aa}	1.00^{a}

Means followed by equal uppercase letters in the rows and equal lowercase letters in the columns do not differ from each other according to Kruskal-Wallis's test ($p > 0.05$).

Neither group exhibited the vocalization parameter during the entire evaluation period. Therefore, all animals received a score of 0.00, with no statistical differences at any time point.

According to the total scores obtained on the Melbourne Scale (Table 6), no animal in either group exceeded a score of 6 at any time point, and hence rescue analgesia was not necessary. The animals' mean scores were low overall, but CG animals had significantly higher scores than LG animals at 12 and 48 hours, resulting in a higher overall mean for CG.

A statistical difference was observed in CG when analyzing the data within each group across the different time points. In this group, the scores at 0 and 6 hours were lower than at 36 hours, and the score at 0 hours was also lower than at 24 and 48 hours, while the scores at 24 and 48 hours were similar to each other. No significant differences were observed in LG animals.

Table 6. Mean scores obtained on the total Melbourne Scale in animals of the lidocaine group and the control group at 0, 3, 6, 12, 24, 36, and 48 hours after the surgical procedure

Group/ Time	0 hours	3 hours	6 hours	12 hours	24 hours	36 hours	48 hours	Overall mean
Control	1.50^{Flap}	2.00^{ABCa}	1.50^{ABa}	2.50^{ABCa}	3.00^{BCa}	3.50^{Ca}	3.00^{BCa}	2.50^{a}
Lidocaine	1.00^{Aa}	1.00^{Aa}	2.00^{Aa}	1.00^{Ab}	2.00^{Aa}	2.50^{Aa}	1.00^{Ab}	1.00^{b}

Means followed by equal uppercase letters in the rows and equal lowercase letters in the columns do not differ from each other according to Kruskal-Wallis's test ($p > 0.05$).

4. Discussion

Considering that OHE was performed electively on healthy, previously pain-free animals, any postoperative pain must be attributed to the procedure [2]. According to Aguirre *et al.* [21], the Melbourne Scale allows postoperative pain to be assessed by analyzing the animals' physiological and behavioral parameters, revealing changes when comparing the data before OHE, with or without lidocaine infiltration.

No significant difference for the heart rate (HR) data was observed between CG and LG. Moreover, the mean values recorded during the analyses remained within the physiological limits for the species (60–160 bpm), according to Silvestrini *et al.* [22].

The respiratory rate (RR) was similar in both groups, with no statistical differences. However, the values exceeded the normal range reported in the literature (18–36 rpm), including the overall mean at 0 hours, which represents the baseline RR before anesthetic manipulation [23]. The observed tachypnea may be related to anxiety, apprehension, or excitement due to handling [24] since physiological parameters alone are not specific enough to differentiate pain, anxiety, or fear, all of which can influence the sympathetic system [25].

The female dogs in both groups had lower rectal temperature (TR) values three hours after surgery compared to other time points. This slight decrease in temperature can be attributed to the use of acepromazine during pre-anesthetic medication in both groups, as it is a phenothiazine that induces tranquilization, muscle relaxation, and decreased spontaneous activity, along with depression of the hypothalamic thermoregulatory center and peripheral vasodilation, leading to mild hypothermia. The reduction in basal metabolism was also promoted by general anesthesia due to the peripheral vasodilation caused by propofol and isoflurane [26,27].

Another factor that may contribute to this decrease, and which reached statistical significance, is the use of cold chemical agents for skin antisepsis, intravenous administration of cold solutions, and exposure of the abdominal cavity during surgery, all of which can lower body temperature [28]. Despite these variations and the significant differences in TR at some time points, this parameter remained within the physiological limits of 37.5 to 39.2 °C, as also observed by Costa *et al.* [29]. The fact that both groups exhibited similar patterns indicates that intraovarian infiltration of lidocaine did not influence the animals' body temperature.

The animals showed no salivation or dilated pupils during the postoperative period. It suggests that the anesthetic/analgesic protocol was effective in controlling pain, regardless of the use of intraovarian lidocaine. The manifestation of salivation and dilated pupils in this species, as well as tachycardia and sweating, can occur in response to a pain stimulus and represent activation of the sympathetic autonomic nervous system [30].

According to Tsai *et al.* [2], several studies have shown that pain induced by OHE can affect the postoperative behavior of dogs for up to 24 hours. In our study, the animals showed no change in behavior before or during the wound-palpation assessment, nor did they vocalize. This indicates that, based on these parameters, the animals in both groups showed no signs of discomfort, as these behavioral signs are associated with pain. According to Aleixo *et al.* [12], animals display behavioral changes when undergoing moderate pain and vocalize constantly and may even show self-mutilation or abnormal behavior when the pain is severe.

Regarding the activity parameter, the mean values for CG animals showed significant alternation between resting (sleeping, semi-conscious, or awake) and eating behaviors, whereas no significant changes were observed in LG animals. However, the mean values for the posture parameter in CG animals showed no statistical differences. In contrast, LG animals alternated between lateral decubitus, sternal decubitus, sitting or standing with the head up, and moving. In addition, LG animals were friendlier

than CG animals regarding the mental state parameter and obtained higher scores in the final mean. Therefore, we cannot conclude that the animals were in pain based on these parameters alone, as only the combination of several indicators can confirm the presence of a pain stimulus [12].

A significant difference was observed between the final sum of the UMPS scores of CG and LG at 12 and 48 hours and in the overall mean, with higher scores observed in LG animals. However, the animals that received no intraovarian lidocaine experienced more pain, as the values did not exceed the minimum of 6 points [31]. Postoperative pain-assessment scoring systems were developed to provide a systematic procedure to determine whether additional pain control is necessary for patients [24]. In the present study, the sum of all UMPS categories would be considered an indication of pain if a value greater than 6 were obtained. However, no animal exceeded this threshold. Therefore, analgesic rescue was not necessary, as also observed by Pohl [31].

The assessor selected for this study was experienced and had already participated in other pain-assessment studies. In addition, the surgeon—who is highly experienced—was the same for all the minimally invasive sterilization and low-manipulation surgical procedures. These precautions were taken to avoid possible interference and minimize the influence on pain analyses.

The used scale can differentiate between various analgesic treatments [13]. The UMPS provides a valid and reliable assessment of pain in dogs and can be used in a clinical setting [32]. Scales such as the Glasgow Pain Scale currently have greater scientific validation and are recommended by recent literature [33]. However, these alternatives were not yet widely adopted or consolidated at the time of this study, making the Melbourne Scale one of the main references available for assessing pain in dogs [34].

The evolution of scientific techniques and methods is a natural and continuous process, but it is essential to respect the original historical and methodological context. Important methodological precautions were taken to ensure greater reliability, including rigorous training of the evaluator, standardization of the experimental environment, and systematic pain assessment, reducing possible subjective interference. The results obtained in this study remain relevant and contribute significantly to scientific knowledge related to pain management in dogs. The data must be interpreted considering current limitations, but the use of the Melbourne Scale, although currently criticized, does not invalidate the original findings.

The chosen method of pain assessment may not be sensitive enough to detect small differences between groups [2]. It occurs because the behaviors analyzed by UMPS can be influenced by individual factors, and many of the parameters considered by the scale can also be correlated with environmental stress, making the evaluation subjective.

Another possible reason why intraovarian infiltration anesthesia did not show additional analgesic effects is the choice of anesthetic protocol. Acepromazine has no intrinsic analgesic effect but can potentiate other analgesic drugs [35]. The analgesic potential of the protocol employed during the postoperative period was attributed to the use of meloxicam and dipyrone. Possibly, no additional analgesic effect of lidocaine infiltration occurred because of the synergistic analgesic effects of the different components of this balanced anesthesia protocol. Similar findings have been reported in studies evaluating the analgesic effect of lidocaine administered at different sites and by different routes [2,36].

Furthermore, lidocaine, meloxicam, and dipyrone should produce their maximum effects on the degree of pain caused by OHE. Therefore, possible additive or synergistic effects of their combination may not have been noticeable. Administering analgesics to animals in the control group (CG) is mandatory for ethical and animal-welfare reasons, which requires the use of additional drugs. This follows the recommendation that, if there is any possibility of patients experiencing pain during this phase, analgesics should be administered regardless of their clinical signs. Drugs such as opioid agonists, opioid agonist–antagonists, α2-agonists, or nonsteroidal anti-inflammatory drugs (NSAIDs) are indicated in the case of OHE, in which pain is typically mild to moderate [4].

Thus, analgesia in this study was provided with tramadol, meloxicam, and dipyrone, which do not appear to have influenced the comparative results since they were administered to animals in both groups. Kalchofner Guerrero *et al.* [11] observed that the analgesic used for local anesthesia showed no additional effects over the protocol used, as the difference in potential between groups may have been masked by the analgesic protocol. However, that study aimed to evaluate local anesthesia as part of multimodal analgesia, not as a single analgesic technique, as in the present study.

The effect of lidocaine is known to last for approximately 2 hours, and, therefore, its efficacy would already be waning during the first postoperative evaluation, that is, three hours after the surgical procedure, and no additional analgesic response could be ascertained. However, this study sought to verify whether the pain caused during manipulation of the ovarian pedicle infiltrated with lidocaine for ligation was consequently reduced and whether this would influence the pain observed during the postoperative period.

Local anesthetics have long been used as part of multimodal protocols to optimize pain relief, as they interrupt the ascending pain pathway by blocking sodium channels in the nerves. In addition, they are inexpensive and easy to apply and offer a wide margin of safety [37].

5. Conclusion

Intraovarian infiltration of lidocaine in female dogs undergoing ovariohysterectomy provided no additional analgesia according to the analysis method used in this study. The obtained results, based on the Melbourne Scale, remain relevant and contribute significantly to scientific knowledge related to pain management in dogs. Further studies are recommended using different pain-assessment methods, combined with different anesthetic protocols and analyses of trans-operative parameters.

Conflicts of interest statement

The authors declare no conflict of interest.

Data availability

The data will be provided upon request to the corresponding author.

Author contributions

Investigation: T. A. S Fujimoto. Supervision: A. A. A. Fagundes.

References

1. Magdanelo E.L.L.H.B., Rodríguez N.C. Revisão de literatura: uso de gabapentina e pregabalina em cães e gatos na dor aguda e crônica. RVZ [Internet]. 2023; 30:1-10. https://doi.org/10.35172/rvz.2023.v30.1543

2. Tsai T.Y. et al. Comparison of postoperative effects between lidocaine infusion, meloxicam, and their combination in dogs undergoing ovariohysterectomy. Veterinary Anaesthesia and Analgesia. 2013; 40:615–622. https://doi.org/10.1111/vaa.12064

3. Morgaz J. et al. Effectiveness of pre-peritoneal continuous wound infusion with lidocaine for pain control following ovariohysterectomy in dogs. The Veterinary Journal. 2014; 202(3), 522–526. https://doi.org/10.1016/j.tvjl.2014.08.030

4. Aleixo G.A.S. et al. Tratamento da dor em pequenos animais: classificação, indicações e vias de administração dos analgésicos (revisão de literatura: parte II). Revista de Medicina Veterinária (UFRPE). 2017; 11(1):29-40. https://doi.org/10.26605/medvet-n1-1596

5. Bradbrook C.A., Clark L. State of the art analgesia- recent developments in pharmacological approaches to acute pain management in dogs and cats. Part 2. The Veterinary Journal, 2018; 236:62–67. https://doi.org/10.1016/j.tvjl.2018.04.009

6. Gasparini S.S. et al. Anestesia intravenosa total utilizando propofol ou propofol/cetamina em cadelas submetidas à ovariossalpingohisterectomia. Ciência Rural, 2009; 39(5):1438-1444. https://doi.org/10.1590/S0103-84782009005000102

7. Schulman J.M., Strichartz G.R. Farmacologia dos anestésicos locais. In: Golan, D.E. et. al. Princípios de farmacologia: a base fisiopatológica da farmacoterapia. 2. ed. Rio de Janeiro: Guanabara Koogan, 2009.

8. Candemil, R.C. et al. Analgesia infiltrativa na videocolecistectomia: Ensaio clínico randomizado. Arquivo Brasileiro de Cirurgia Digestiva. 2011; 24(4):262-266. https://doi.org/10.1590/S0102-67202011000400003

9. Gurney, M.A. Pharmacological options for intra-operative and early postoperative analgesia: an update. Journal of Small Animal Practice, 2012; 53(7):377–386. https://doi.org/10.1111/j.1748-5827.2012.01243.x

10. Ambrósio A.M., Fantoni D.T. Manual de anestesia veterinária: procedimentos e condutas. Serviço de anestesia da FMVZ/USP. Barueri: Manole; 2024.

11. Kalchofner Guerrero K.S. et al. Intraperitoneal bupivacaine with or without incisional bupivacaine for postoperative analgesia in dogs undergoing ovariohysterectomy. Veterinary Anaesthesia and Analgesia, 2016; 43(5):571–578. https://doi.org/doi:10.1111/vaa.12348

12. Aleixo G.A.S. et al. Tratamento da dor em pequenos animais: fisiopatologia e reconhecimento da dor (revisão de literatura: parte I). Revista de Medicina Veterinária (UFRPE). 2016; 10(1-4):19-24. Portuguese. (https://www.journals.ufrpe.br/index.php/medicinaveterinaria/article/view/1344)

13. Firth A.M., Haldane S.L. Development of a scale to evaluate postoperative pain in dogs. Journal of the American Veterinary Medical Association, 1999; 214(5)651-659.

14. American Society Of Anesthesiologists. ASA Physical Status Classification. In: ASA Relative Value Guide. American Society of Anesthesiologists, Park Ridge, IL, USA, 2010.

15. Tranquilli W.J., Grimm K.A. Introdução à Anestesia e à Analgesia. Uso, Definições, História, Conceitos, Classificação e Considerações. In: Grimm K.A. et al. Lumb e Jones Anestesiologia e analgesia em veterinária. Rio de Janeiro: Rocca. 5. ed. Cap. 1, p. 29-47, 2017. https://doi.org/10.1002/9781119421375.ch1

16. Santos E.A.P. et al.Leiomioma intestinal intrapélvico em cão - desafio diagnóstico e terapêutico. Acta Scientiae Veterinariae. 2021, 49(Suppl1):633. https://doi.org/10.22456/1679-9216.105393

17. Macphail C.M. Cirurgias dos Sistemas Reprodutivo e Genital. In: FOSSUM, T.W. Cirurgia de Pequenos Animais. 4 ed. c.27, São Paulo: Elsevier, 2014. 1314p.

18. Mariussi T. V., et al. Uso da escala de dor da Universidade de Melbourne na avaliação de dois protocolos de analgesia pós-cirúrgica em cadelas submetidas à mastectomia. Pubvet. 2020 14(11):1-8. https://doi.org/10.31533/pubvet.v14n11a694.1-8

19. Trettene L.G. et al.Uso do Tramadol em Cães: uma Breve Revisão. Ensaios e Ciência. 2020; 24(5):469-472. (https://ensaioseciencia.pgsscogna.com.br/ensaioeciencia/article/view/8429)

20. Ferreira D.F. Sisvar: a Guide for its Bootstrap procedures in multiple comparisons. Ciênc. agrotec. 2014; 38(2):109-112. https://doi.org/10.1590/S1413-70542014000200001

21. Aguirre C.S. et al. Anestesia convencional e técnica de tumescência em cadelas submetidas à mastectomia. Avaliação da dor pós-operatória. Arq. Bras. Med. Vet. Zootec. 2014; 66(4)1073-1079. https://doi.org/10.1590/1678-6935

22. Silvestrini A.R. et al. Exame clínico na persistência do ducto arterioso: Relato de caso. Pubvet. 2014; 18(8):1632. https://doi.org/10.31533/pubvet.v18n08e1632

23. Feitosa, F.L.F. Semiologia Veterinária -A arte do diagnóstico. 4. ed. São Paulo. Editora: Roca, 2020. 670 p.

24. Quadros E.A. et al. Segurança e eficácia em campanhas de castração: Análise crítica de protocolos anestésicos em cães e gatos. Peer Review, 2023; 5(25):473–488. https://doi.org/10.53660/1504.prw3046

25. Monteiro, B. P. et al. Diretrizes da WSAVA de 2022 para reconhecimento, avaliação e tratamento de dor. Jornal of small animal practice. British small animal veterinary association, 2022; 64(4):177-254. https://doi.org/10.1111/jsap.13566

26. Grim K.A. Termorregulação peroperatória e equilíbrio térmico. In: GRIMM, K.A et al. Lumb e Jones Anestesiologia e analgesia em veterinária. 5. ed. Rio de Janeiro: Rocca, 2017, p. 1126-1147.

27. Rankin D.C. Sedativos e tranquilizantes. In: GRIMM, K.A et al. Lumb e Jones Anestesiologia e analgesia em veterinária. 5. ed. Rio de Janeiro: Rocca, 2017. p. 577-610.

28. Soares W.A.B., Majer A.P. Assistência de enfermagem em cliente cirúrgico: hipotermia no pós-operatório imediato. Faculdade Sant'Ana em Revista, [S.l.], v.6, n.1, p.88-100, 2022. Disponível em: https://iessa.edu.br/revista/index.php/fsr/article/view/1767

29. Costa, G. L. et al. Effect of levobupivacaine, administered intraperitoneally, on physiological variables and on intrasurgery and postsurgery pain in dogs undergoing ovariohysterectomy. Journal of Veterinary Behavior. 2019; 30:33–36. https://doi.org/10.1016/j.jveb.2018.11.003

30. Kreszinger M. et al. Correlation of pain assessment parameters in dog with cranial cruciate surgery. Veterinarski Arhiv. 2010; 80(5):597-609.

31. Pohl V.H. et al. Correlação entre as escalas visual analógica, de Melbourne e filamentos de Von Frey na avaliação da dor pós-operatória em cadelas submetidas à ovariosalpingohisterectomia. Ciên. Rural 2011; 41:154-159. https://doi.org/10.1590/S0103-84782011000100025

32. Borges, M. P. et al. Using the Glasgow short form composite scale to evaluate two postoperative analgesia protocols in female dogs submitted to mastectomy. PUBVET. 2020; 14(6):1-9. https://doi.org/10.31533/pubvet.v14n6a590.1-9

33. Lima M.T. et al.Validation of the Portuguese Version of the Short-Form Glasgow Composite Measure Pain Scale (CMPS-SF) According to COSMIN and GRADE Guidelines. Animals 2024(14):831-854. https://doi.org/10.3390/ani14060831

34. Comassetto F. et al. Correlação entre as escalas analógica visual, de Glasgow, Colorado e Melbourne na avaliação de dor pós-operatória em cadelas submetidas à mastectomia total unilateral. Arq. Bras. Med. Vet. Zootec. 2017; 69(2):355-363. https://doi.org/10.1590/1678-4162-9075

35. Moura, J. L. et al. Levantamento dos fármacos mais utilizados em protocolos pré-anestésicos no Hospital Veterinário da Upis no período de 2021-2022: Survey of the most commonly used drugs in pre-anesthetic protocols at Upis Veterinary Hospital in the period 2021-2022. Brazilian Journal of Animal and Environmental Research, 2022; 5(3):3036–3041. https://doi.org/10.34188/bjaerv5n3-035

36. Bubalo V. et al. Anaesthetic sparing effect of local anaesthesia of the ovarian pedicle during ovariohysterectomy in dogs. Veterinary Anaesthesia and Analgesia. 2008; 35:537–542. https://doi.org/10.1111/j.1467-2995.2008.00421.x

37. Stevens B.J. et al. Comparison of the effect of intratesticular lidocaine/bupivacaine vs. saline placebo on pain scores and incision site reactions in dogs undergoing routine castration. The Veterinary Journal. 2013; 196(3):499–503. https://doi.org/10.1016/j.tvjl.2012.11.019