



RESEARCH ARTICLE

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TUMESCENCE ANESTHESIA IN A BITCH UNDERGOING UNILATERAL MASTECTOMY: CASE REPORT

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ABSTRACT

This study reports the use of tumescent local anesthesia (TLA) in a bitch undergoing unilateral mastectomy, aiming to evaluate its analgesic efficacy and trans- and postoperative safety. The patient, a mixed-breed female, underwent ovariohysterectomy and excision of the right mammary chain. The tumescent solution consisted of 2% lidocaine, epinephrine, and cooled Ringer's lactate, administered at a dose of 15 ml/kg. The surgery lasted 2h20min, with hemodynamic stability and effective pain control. Recovery was satisfactory, with appropriate healing and positive clinical outcome. It is concluded that TLA is a safe, effective, and feasible complementary method for extensive procedures.

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INTRODUCTION

In recent years, companion animals have come to occupy a central role in Brazilian families, driving the growth of the veterinary sector. This appreciation has increased the demand for preventive and therapeutic care, especially in the management of reproductive and oncological diseases, reflecting a significant change in how these animals are cared for (Silva *et al.*, 2021). Among the main conditions affecting adult female dogs, mammary neoplasms stand out, particularly in those that are unspayed, spayed late, or exposed to progestagens (Rodrigues *et al.*, 2015). The most recommended treatment is mastectomy, which may be partial, unilateral, or bilateral, depending on the severity and extent of the lesions. It is an invasive surgical procedure, involving a large incision area, requiring effective pain control and appropriate anesthetic management (Aguirre *et al.*, 2014). Tumescent local anesthesia (TLA) has proven to be a promising alternative, as

it allows for broad infiltration of the local anesthetic, promoting desensitization of the surgical area, effective hemostasis, and a reduction in the use of systemic anesthetics (Abimussi *et al.*, 2013; Guirro, Cunha & Thomas, 2013). Its application favors intraoperative hemodynamic stability and improves postoperative comfort. Therefore, the present study aims to report the application of the tumescent anesthesia technique in a female dog undergoing unilateral mastectomy, demonstrating its intra- and postoperative effects, and highlighting its applicability as a safe and effective complementary method for surgical pain management (Gomes *et al.*, 2024).

CASE REPORT

Case description: A 12-year-old, 8.400 kg, mixed-breed female dog was admitted to the Small Animal Veterinary Hospital of the State University of Londrina (UEL), located on Celso Garcia Cid Highway, km 380, S/N, University Campus

of Londrina (PR). The owner reported a progressive increase in the volume of a nodule located in the right inguinal mammary gland, with a two-month history, accelerated growth during the last month, and suppuration for the past four days. Initially, the patient was seen by a veterinarian who ruled out the possibility of treatment. After consultation with another professional, surgical treatment was recommended, and referral to the university hospital was made for further examinations. During anamnesis, a history of two episodes of syncope of undetermined cause a few years prior was reported, along with the use of progestagens for approximately three years (without control of interval or frequency), absence of gestation after a single mating, pruritus in the pelvic region and ears treated with antibiotics, and a mixed diet (commercial feed, fruits, and homemade food). The animal had received non-core vaccines only during the first year of life, is dewormed annually (last dose three months prior), has supervised access to the street with the owner, and cohabits with three cats and two healthy dogs. No previous diseases or continuous medication use were reported.

During triage, the animal exhibited agitated and euphoric behavior. On physical examination, the following findings were recorded: body temperature of 38.4 °C, heart rate of 96 bpm, capillary refill time of 2 seconds, adequate hydration, regular arterial pulse, normally colored mucous membranes, alert level of consciousness, normal nutritional status, docile posture and behavior, absence of ectoparasites, incipient cataract in the left eye, bilateral otitis, and preserved cutaneous appendages.

The most relevant clinical finding was an ulcerated nodule in the right inguinal mammary gland, measuring 6.7 cm in width × 8.6 cm in length × 6.3 cm in depth, firm, and not adhered to deeper planes. Additionally, micro-nodules of approximately 1 cm were identified between the caudal abdominal and inguinal mammary glands, which were neither ulcerated nor adhered. Abdominal ultrasonography revealed ovarian microcysts and signs of endometrial hyperplasia, with no evidence of metastasis or lymphadenopathy. Thoracic radiographs in laterolateral and ventrodorsal projections showed no alterations compatible with a metastatic process, only age-related pulmonary changes consistent with the patient's age (Fig. 1). Preoperative laboratory tests were performed, including a complete blood count and serum biochemical profile (Table 1). The blood count revealed red blood cell count, hemoglobin, and hematocrit within reference values for the species, with no evidence of anemia. Erythrocyte indices indicated uniformity in red blood cell size. Total leukocyte count was 13,600/mm³, with a predominance of segmented neutrophils (86%), suggesting neutrophilic leukocytosis compatible with an acute inflammatory process, possibly related to the ulcerated lesion in the mammary gland. Platelet count was elevated (960,000/mm³), without clinical signs of hemorrhagic disorders, potentially reflecting a reactive response to the inflammatory process. In the serum biochemical profile, values were within normal limits, indicating preserved renal function, normoglycemia, total proteins within the reference range, and no relevant hepatic alterations. These laboratory findings were considered adequate for the surgical procedure, with no clinical or metabolic contraindications for the proposed anesthesia and intervention. As part of the therapeutic protocol, enrofloxacin was administered at a dose of 5 mg/kg subcutaneously, and enrofloxacin 50 mg orally, at a dose of 5 mg/kg, twice a day

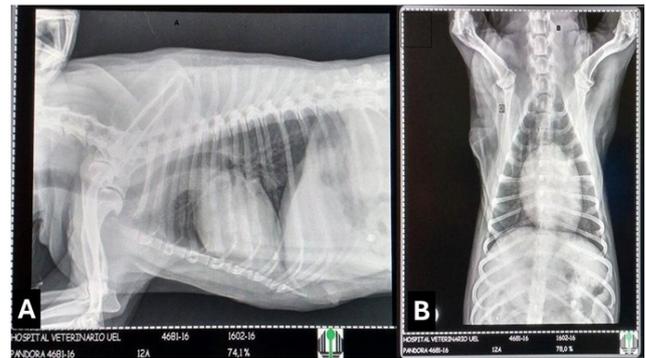


Figure 1. Preoperative radiographic examinations to rule out the possibility of pulmonary metastasis. A: laterolateral projection; B: ventrodorsal projection – Londrina (PR), 2025

Table 1. Preoperative complete blood count and serum biochemical profile of a female dog – Londrina (PR), 2025

| COMPLETE BLOOD COUNT | | |
|--------------------------------|---------|------------------|
| Parameter | Result | Unit |
| Red blood cells | 5,60 | /mm ³ |
| Hemoglobin | 11,7 | g/dL |
| Hematocrit | 34,6 | % |
| MCV | 61,8 | fL |
| MCH | 20,9 | pg |
| MCHC | 33,8 | g/dL |
| RDW | 10,5 | % |
| Total leukocytes | 13.600 | /mm ³ |
| Segmented neutrophils | 86 | % |
| Eosinophils | 5 | % |
| Lymphocytes | 6 | % |
| Monocytes | 3 | % |
| Platelets | 960.000 | /mm ³ |
| SERUM BIOCHEMISTRY | | |
| Urea | 19 | mg/dL |
| Creatinine | 0,7 | mg/dL |
| Glucose | 106 | mg/dL |
| Total proteins | 7,1 | g/dL |
| Alkaline phosphatase (FA) | 66 | U/L |
| Alanine aminotransferase (ALT) | 39 | U/L |

(BID) for seven days, was prescribed. For pain and inflammation control, firocoxib 57 mg, 5 mg/kg, once a day (SID) for five days, and dipyrone 250 mg, three times a day (TID) for three days, were instituted. Additionally, local dressing of the mammary nodule with sterile saline solution and topical antiseptic was recommended to control contamination and promote healing.

Surgical procedure and postoperative care: Two days after the initial consultation, the patient returned to the Veterinary Hospital presenting worsening of the ulcerated wound. The owner reported normal appetite, normal water intake, and normal urination and defecation, with no new complaints. On physical examination, the animal had a temperature of 37.6 °C, heart rate of 112 bpm, rapid breathing, and adequate hydration. The patient had been fasted for 12 hours and deprived of water for 6 hours. Morphine (0.4 mg/kg, IV) was administered as pre-anesthetic medication. After 15 minutes, the patient was taken to the induction room, where trichotomy of the catheterization area was performed and a 22 G catheter (0.9 × 25 mm) was inserted. Anesthetic induction was carried out with propofol (5 mg/kg) and midazolam (0.3 mg/kg), followed by epidural block with morphine (0.1 mg/kg) and fentanyl (2 µg/kg). The patient was intubated with a size 7.0 endotracheal tube and maintained under inhalation anesthesia with isoflurane. In the surgical suite, the patient was

positioned in dorsal recumbency. A Doppler was placed on the left thoracic limb for cardiac auscultation, and a size 3 cuff was used to measure systolic blood pressure, in addition to catheterization of the podal artery in the left pelvic limb for monitoring mean arterial pressure. The surgery was performed in two stages. In the first stage, an ovariohysterectomy was carried out via a pre-umbilical incision, revealing cystic endometrial hyperplasia. Nylon 2-0 suture was used for transfixation of the pedicles and uterine stump, with muscle closure in a Sultan pattern using Vicryl 2-0. In the second stage, unilateral mastectomy was performed with application of the tumescent anesthesia technique. The tumescent solution consisted of 40 ml of 2% lidocaine, 1 ml of epinephrine (1 mg), and 459 ml of Ringer's lactate cooled to 10 °C, administered at a dose of 15 ml/kg (Fig. 2). Infiltration was performed at two points along the right mammary chain, lateral to the linea alba, encompassing the adjacent subcutaneous tissue and caudal to the nodule, as shown in Figure 3. Complete excision of the mammary chain was achieved by blunt dissection of the subcutaneous tissue, followed by approximation suture using the Walking pattern with Vicryl 3-0, subcutaneous Cushing suture with Vicryl 3-0, and cutaneous closure with nylon 3-0 in the Wolf pattern.



Figure 2. Preparation for tumescent anesthesia infusion (A) and infusion of the solution (B) for mastectomy in a female dog – Londrina (PR), 2025



Source: Personal archive.

Figure 3. Surgical incision showing subcutaneous tissue under tumescent anesthesia – Londrina (PR), 2025

During the intraoperative period, the patient received two fentanyl boluses (4 µg/kg and 3 µg/kg, IV) during the gonadectomy stage, and an additional bolus (3 µg/kg, IV) at the end of the mastectomy. A transient episode of hypotension occurred, which was corrected with a fluid bolus (15 ml/kg/15 min) and hypertonic NaCl 7.5% solution (4 ml/kg/5 min, IV). The surgery lasted a total of 2 hours and 20 minutes. Body temperature varied, reaching a minimum of 33.6 °C. In the immediate postoperative period, meloxicam (0.1 mg/kg, SC) and tramadol (3 mg/kg, IV) were administered, followed by transfer to a heated bed until temperature normalization (36 °C). The patient was

hospitalized for 24 hours at the Small Animal Surgery Clinic (CCAC) for monitoring of pain and general condition. During this period, the patient received cephalothin (30 mg/kg, PO, BID), ranitidine (2 mg/kg, PO, BID), tramadol (3 mg/kg, IV, TID), dipyron (25 mg/kg, PO, TID), and meloxicam (0.1 mg/kg, IV, SID). Spontaneous urination and reduced appetite were observed in the ward. The general condition remained stable, and the patient was discharged with instructions on medication administration and surgical wound care. A follow-up was scheduled for 10 days after discharge to remove sutures and perform a clinical reassessment. At the follow-up, the patient presented a good general condition, body temperature of 38.4 °C, heart rate of 148 bpm, and a necrotic right popliteal lymph node. The owner reported mild pain during the first few days, selective appetite, and temporary absence of defecation, all resolved by the day of the consultation. The surgical wound was healed with a superficial crust; cleaning was performed and sutures were removed. Continuation of cleaning with sterile saline and topical antiseptic (Merthiolate) was recommended. The owner was advised regarding the possibility of performing mastectomy of the left mammary chain as a preventive measure, with the decision postponed to a later time.

RESULTS AND DISCUSSION

Application of tumescent anesthesia and intraoperative physiological response in a female dog with mammary neoplasia

The high incidence of mammary neoplasms in female dogs was also observed at the UEL Veterinary Hospital, being strongly associated with the absence of spaying and prolonged use of hormonal contraceptives, particularly in animals older than seven years. This scenario reinforces the importance of early diagnosis and the adoption of effective surgical strategies, such as mastectomy (Pereira, 2024).

In the present case, the tumescent solution was composed of 2% lidocaine without vasoconstrictor, epinephrine (1 mg), and Ringer's lactate cooled to 10 °C, in concentrations consistent with protocols described in the literature. The lower acidity of Ringer's lactate favors anesthetic absorption and reduces discomfort during infusion (Corrêa, 2013). Lidocaine exhibits slow absorption and low toxicity, while epinephrine contributes to local vasoconstriction, prolonging the anesthetic effect and promoting hemostasis (Moreira *et al.*, 2014). However, excessive volumes should be avoided to prevent hepatic overload and hemodynamic disturbances.

During the surgical procedure, the patient developed progressive hypothermia, reaching 33.6 °C, consistent with reports by Abimussi *et al.* (2013), attributed to general anesthesia and infusion of cooled solution. Mean arterial pressure also showed a significant decrease, corrected with fluid therapy and hypertonic solution administration. Analgesia was maintained with fentanyl, and physiological parameters remained stable throughout the mastectomy, confirming the efficacy of tumescent anesthesia in maintaining hemodynamic stability and controlling trans- and postoperative pain.

Advantages of the tumescent anesthesia technique: During the intraoperative period, stability of heart rate and mean

arterial pressure was observed, consistent with the findings of Abimussi *et al.* (2013) and Corrêa (2013). According to these authors, this effect can be attributed to the analgesic action of lidocaine and the mechanical effect of the tumescent infusion, which promotes tissue hydrodissection. The solution forms a colloidal gel in the subcutaneous tissue, facilitating detachment of the mammary chain and reducing delayed absorption of the anesthetic. The technique has stood out for its beneficial effects, such as prolonged analgesia and reduced intraoperative bleeding. Nogueira *et al.* (2025) demonstrated that lidocaine, either alone or combined with tramadol, provides effective analgesia and reduces the need for additional medications in the immediate postoperative period. When combined with inhalation anesthesia using isoflurane, tumescent local anesthesia (TLA) promotes greater cardiovascular stability compared to multimodal protocols with fentanyl, lidocaine, and ketamine (Martins, 2019). Rocha (2022) demonstrated that the use of warmed solution (35–38 °C) reduces the incidence of intraoperative hypothermia without compromising anesthetic efficacy. Furthermore, the technique is simple, easy to apply, and does not interfere with the execution of the surgical procedure (Aguirre *et al.*, 2014). During recovery, the patient showed signs of comfort, light sleep, and lack of attention to the surgical wound. Pain assessment can be performed using validated scales, such as the Glasgow and Melbourne scales, which indicate reduced vocalization and improved disposition upon awakening (Guirro; Cunha; Thomas, 2013), reinforcing the potential of tumescent local anesthesia (TLA) as a safe and effective technique in mastectomies.

Limitations and disadvantages of the technique: In the immediate postoperative period, no formal pain scoring method was used, and monitoring was performed through clinical observation. The animal was kept on a thermal blanket and metallic heater until body temperature normalized (36 °C) after a drop to 33.6 °C. An important limitation of the technique is the theoretical risk of autologous dissemination of neoplastic cells during the infusion of the tumescent solution, especially if performed with needles or cannulas in direct contact with the tumor tissue (Martins, 2019). Since it provides only local analgesia, tumescent local anesthesia (TLA) is not recommended as the sole technique in extensive procedures such as mastectomy, being more suitable as a complementary method or for minor interventions, such as wound care and small excisions.

CONCLUSION

Tumescent local anesthesia (TLA) proved to be an effective, safe, and easily applied technique as a complementary method in extensive surgical procedures, such as unilateral mastectomy in female dogs. In the reported case, TLA provided adequate analgesia during the intra- and postoperative periods, supported hemodynamic stability, and contributed to intraoperative hemostasis without compromising surgical execution. Despite the occurrence of intraoperative hypothermia, attributed to the infusion of cooled solution, thermal control was effective, and no relevant clinical complications were observed. Postoperative recovery was satisfactory, with good wound healing and positive clinical outcome. The technique presents important advantages, such as reduced use of systemic anesthetics, lower intraoperative bleeding, and improved postoperative comfort,

making it a viable alternative in routine veterinary surgery. However, attention must be given to the solution's temperature and the infusion technique, and its use is recommended in association with general anesthesia for invasive procedures. Additional studies are needed to standardize the technique and evaluate its effects in different clinical contexts, contributing to the advancement of anesthetic practices in veterinary medicine.

Conflict of Interest Statement: None.

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ABBREVIATIONS GLOSSARY

°C – degrees Celsius;
ALT – alanine aminotransferase;
BID – twice a day;
Bpm – beats per minute;
CCAC – Small Animal Surgery Clinic;
Cm – centimeters;
FA – alkaline phosphatase;
IV – intravenous;
Kg – kilograms;
Mg – milligrams;
Mg/kg – milligrams per kilogram;
NaCl – sodium chloride;
SC – subcutaneous;
SID – once a day;
TID – three times a day;
UEL – State University of Londrina.

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