Intraoperative analgesic effects of intratesticular lidocaine in a dog undergoing elective orchiectomy: case report

Efeito analgésico intraoperatória da lidocaína intratesticular em um cão submetido a orquiectomia eletiva: relato de caso

Efecto analgésico intraoperatorio de la lidocaína intratesticular en un perro sometido a orquiectomía electiva: reporte de caso

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Abstract

A 1-year-old male Cocker Spaniel, weighing 10.5 kg, was referred for elective orchiectomy. An intratesticular injection of lidocaine was performed as a part of multimodal anesthetic protocol that also included: acepromazine, meloxicam, tramadol and ketamine. During the intraoperative period the cardiorespiratory parameters (heart rate, respiratory rate, and mean arterial blood pressure), the intraoperative anesthetic (ketamine) and analgesic (fentanyl) consumption, and the presence of autonomous nociceptive responses were evaluated. Increases of baseline cardiorespiratory parameters above 10% or the presence of autonomous nociceptive responses would be considered as indicative of insufficient analgesic coverage, for which 1 µg/kg IV of fentanyl would be employed. The evaluated cardiorespiratory variables were stable, and no autonomous nociceptive responses were observed. For this reason no additional ketamine boluses nor rescue analgesics were administered. It is suggested that intratesticular lidocaine, as a part of the multimodal analgesic protocol employed, contributed to improve the analgesic coverage during orchiectomy in this dog.

Key words: analgesia, canine, castration, local anesthetic, locoregional anesthesia pain management (Source: MeSH, NCBI)

Resumo

Um cão da raça Cocker Spaniel de um ano de idade e 10,5kg de peso foi encaminhado para orquiectomia eletiva. Foi realizada a administração de Lidocaína intratesticular como parte de um protocolo de anestesia multimodal que também incluía Acepromazina, Meloxicam, Tramadol e Ketamina. Durante o período intraoperatório foram avaliados os parâmetros cardiorrespiratórios (frequência cardíaca, frequência respiratória e pressão arterial média), o consumo intraoperatório de anestésicos (ketamina) e analgésicos (fentanil), e a presença de respostas nociceptivas autónomas. Incrementos nos valores basais dos parâmetros cardiorrespiratórios superiores a 10% ou a presença de respostas nociceptivas autónomas foram

consideradas como indicativo de cobertura analgésica insuficiente, para o qual seria usado 1 µg/kg IV. As variáveis cardiorrespiratórias avaliadas se mantiveram estáveis e não se observaram respostas nociceptivas autónomas. Por essa razão não se administrou quantidades adicionais de ketamina nem analgesia de resgate. Sugere-se que a lidocaína intratesticular, como parte do protocolo de anestesia multimodal empregado, contribuiu para melhorar a cobertura analgésica durante a orquiectomia nesse cão.

Palavras chaves: analgesia, canino, castração, anestésico local, anestesia loco-regional, manejo da dor.

Resumen

Un canino de raza Cocker Spaniel de 1 año de edad y 10.5 kg de peso fue referido para orquiectomía electiva. Se realizó la administración de lidocaína intratesticular como parte de un protocolo de anestesia multimodal que también incluyó acepromacina, meloxicam, tramadol y ketamina. Durante el periodo intraoperatorio fueron evaluados los parámetros cardiorespiratorios (frecuencia cardiaca, frecuencia respiratoria, y presión arterial media), el consumo intraoperatorio de anestésicos (ketamina) y analgésicos (fentanilo), y la presencia de respuestas nociceptivas autónomas. Incremetos en los valores basales de los parámetros cardiorespiratorios superiores al 10% o la presencia de respuestas nociceptivas autónomas fueron considerados como indicativo de cobertura analgésica insuficiente, para lo cual se emplearía 1 µg/kg IV. Las variables cardiorrespiratorias evaluadas se mantuvieron estables y no se observaron respuestas nociceptivas autónomas. Por esta razón no se administraron bolos adicionales de ketamina ni analgesia de rescate. Se sugiere que la lidocaína intratesticular, como parte de un protocolo de anestesia multimodal empleado, contribuyó a mejorar la cobertura analgesica durante la orquiectomía en este perro.

Palabras clave: analgesia, canino, castración, anestésico local, anestesia locoregional, manejo del dolor.

Introduction

Orchiectomy in dogs has been related with pain of variable severity, which may vary according to the degree of induced surgical trauma. General anesthesia and preemptive/multimodal analgesia techniques are recommended. There are several options availabe for perioperative pain management in dogs, some of them included the combined employ of various types of drugs such as: opioids, acepromazine, bendodiazepines, propofol, ketamine, alpha$_2$ adrenoceptoragonist, local anesthetics and NSAID's (Tranquili *et al.,* 2007, Gaynor and Muir *et al*., 2015). Despite the availability of pharmacological options, in many cases the analgesic management during castrations is inadequate even in developed countries (Capner *et al.,* 1999). Due to the economic and technical restrictions (limited availability of some analgesic drugs) in which mass sterilization campaigns are carried out in Colombia, our reality could be even more daunting.

Recently it has been described that intratesticular lidocaine administration is considered an economical (VAASG, 2013) and effective (Mcmillan *et al.,* 2012, Huuskonen *et al.,* 2013, Stevens *et al.,* 2013) method to improve the analgesic coverage during orchiectomy in dogs. These studies were carried out using multimodal analgesia protocol that also included opioids and inhaled anesthesia. The purpose of this case report is to describe the analgesic effect of intratesticular lidocaine, in a dog undergoing elective orchiectomy under a multimodal analgesic protocol and dissociative analgesia. This with the aim of evaluate a pharmacological protocol closer to these employed in our medium.

Case report

Anamnesis

An 1-year-old male Cocker Spaniel, weighing 10.5 kg, was referred for elective orchiectomy. The animal was considered healthy based on the results of physical examination and paraclinical tests (complete blood cell count and routine biochemical analyses) (Tables 1,2), and was classified as ASA I anesthetic risk patient. The dog was fasted for approximately 8 h before anesthesia, and water was withdrawn 2 h before induction. The owners were informed about the surgical and anesthetic procedure to be performed.

Table 1. Results of the blood test achieved to the dog evaluated in this case report

Blood cell	Result	Measure unit	Parameter
Leukocytes	9,30	103/dL	6,0-17,0
lymphocytes	2,10	103/dL	0,8-5,10
Monocytes	040	103/dL	0,0-1,80
Neutrophils	6,80	103/dL	4,0-12,6
Eosinophils	0,41	103/dL	0,1-1,25
RBC	7,77	106/dL	5,50-8,50
Hemoglobin	140,0	g/L	110-190
Hematocrit	45,0	%	39-56
Platelets	233,0	103/dL	180-430

Table 2. Results of the biochemical evaluation achieved to the dog evaluated in tis case reported patient

Analyte	Result	Measure unit	Parameter
Creatinine	1,0	mg/dl	0,5-1,3
NUS	9,5	mg/dl	8-33
ALT/GPT	10	mg/dl	6-70
Albumin	3,0	mg/dl	2-5

Anesthetic protocol

The sedation was performed with 0.2 mg/kg IM of acepromazine maleate (Tranquilan® 1%), after 15 minutes the left cephalic vein was cannulated with an intravenous catheter 22G to infuse 10 ml/kg/h of 0.9% saline. Premedication consisted in the administration of 0.3 mg/kg IV of 0.5% meloxicam (Meloxic® 0.5%), 3 mg/kg IV of tramadol (Tramadol® 5%). The scrotal skin was shaved and prepared aseptically. Thirty minutes after acepromazine injection, the anesthesia was induced with 5 mg/kg IV of ketamine (Ketanir® 5%) and maintained with boluses of ketamine (2,5 mg/kg). Five minutes later, a 1 cc syringe attached to a 1"22G needle was employed to administer 2 mg/kg of lidocaine (lidocaine® 2%) via intratesticular. The total volume of lidocaine was divided into three parts that were injected as follows: One third was divided into equal portions and injected under the skin of each scrotal sack incision lines. Then, in each testis was injected a third of the total volume of lidocaine (0.66 mg/kg). For intratesticular injection of lidocaine the needle was introduced into the caudal pole of each testis and then directed toward cranial in direction to the spermatic cord. Once the needle tip was in the cranial pole, negative aspiration test was performed, and then lidocaine injection was performed while the syringe was slowly withdrawn (Figure 1).

Figure 1. Detail of the position of the needle and syringe for the intratesticular injection of lidocaine in the dog evaluated in the present case report.

Intraoperative anesthetic monitoring

Heart (HR) and respiratory (RR) rates were assessed using an iM12E multiparameter monitor (Biocare®). The mean arterial blood pressure (MBP) was assessed using oscilloscope method placing the bracelet on the right hind limb. These physiological variables were registered during the entire surgical procedure, and specifically in the following operative times: T0 (before induction with ketamine), T1 (5 minutes after induction), T2 (left scrotal skin infiltration), T3 (right scrotal skin infiltration), T4 (left testis infiltration), T5 (right testis infiltration), T6 (left scrotal incision), T7 (left testicle shrinkage), T8 (ligation of the left spermatic cord), T9 (clamping and cutting of the left spermatic cord), T10 (right scrotal incision), T11 (right testicle shrinkage), T12 (ligation of the spermatic cord), T13 (clamping and cutting of the spermatic cord right). Increases of baseline physiological parameters above 10% (considering the obtained in T1 as baseline parameter), or the presence of algic movements or vocalization would be considered as indicative of insufficient analgesic coverage, for which 1 µg/kg IV of fentanyl (Fentanex® 0.5%) would be used as rescue analgesia. The bilateral scrotal orchiectomy was performed by a veterinarian with experienced in this procedure and using the technique described by Fossum (2004). No postoperative pain assessment was performed.

Results of intraoperative monitoring

The total operative time was 21 minutes, throughout the procedure the evaluated physiological variables were stable (Table 3): heart rate between 125 and 136 beats per minute, mean arterial pressure between 107 and 118 mm Hg. The respiratory rate was maintained between 19 and 35 breaths per minute, and no algic movements or vocalization were observed. Because of the above described, ketamine maintenance boluses and rescue anesthesia were not used. In the recovery period the patient evidenced vocalizations and disorientation. Tramadol was continued by IM injection every 12 h for 4 days.

Discussion

The intratesticular lidocaine infiltration, as a part of a multimodal analgesic protocol employed here, could contribute to provide an adequate intraoperative analgesic coverage during the orchiectomy in this dog. This technique could be especially useful in clinical settings where the availability of opioids drugs and general anesthesia could be limited.

Table 3. Results of the evaluated cardiorespiratory parameters during of the studied operative times (T1-T13). HR: hearth rate, MAP: mean arterial blood pressure, RR: respiratory rate in a dog undergoing elective orchiectomy.

	HR	MAP	RR
T1	125	107	19
T2	128	109	18
T3	128	107	18
T4	130	107	19
T5	131	109	19
T6	126	108	18
T7	126	108	20
T8	128	114	25
T9	136	118	35
T10	133	115	28
T11	133	112	25
T12	133	113	27
T13	134	115	30

Surgical times: T1 (5 minutes after induction), T2 (left scrotal skin infiltration), T3 (right scrotal skin infiltration), T4 (left testis infiltration), T5 (right testis infiltration), T6 (left scrotal incision), T7 (left testicle shrinkage), T8 (ligation of the left spermatic cord), T9 (clamping and cutting of the left spermatic cord), T10 (right scrotal incision), T11 (right testicle shrinkage), T12 (ligation of the spermatic cord), T13 (clamping and cutting of the spermatic cord right).

Orchiectomy is a painful surgical procedure commonly performed in the clinical practice, and is indicated in cases of benign prostatic hyperplasia, testicular cancer, perineal hernia, and as sterilization method (Boothe, 1994). Unfortunately, in many countries, including developed countries, orchiectomy is performed without an adequate analgesic coverage. A study performed in the United Kingdom showed that only 30% of veterinarians administered analgesics during castrations in dogs. The 27% of them administered NSAIDs, 50% opioids, and 23% administered both NSAIDs and opioids (Capner *et al.,* 1999).

Preemptive/multimodal analgesia and inhaled anesthesia is the "gold standard" protocol for providing analgesia during castration in dogs. This involves the application of various drugs normally NSAIDs, opioids and local anesthetics, which act at different levels in the pain pathway (Hellyer *et al*., 2007, Tranquili *et al*., 2007, Mcmillan *et al.,* 2012, Huuskonen *et al*., 2013, Gaynor and Muir *et al*., 2015). Its use can improve the perioperative analgesic coverage while decreasing the toxicity of the employed drugs (Hellyer *et al*., 2007, Tranquili *et al.,* 2007). Among the drugs used in multimodal anesthetic protocols, local anesthetics are the only ones able to effectively block the transmission of acute pain impulse and thus decreasing the chronic pain presentation (Tranquili *et al.,* 2007, Gaynor and Muir *et al*., 2015). Despite the previously described benefits of the use of lidocaine in multimodal anesthesia protocols (Mcmillan *et al.,* 2012, Huuskonen *et al.,* 2013, Stevens *et al.,* 2013), in Colombia lidocaine would not being applied routinely as an analgesic method during canine orchiectomy.

In Colombia due to economic factors and the limited availability of some analgesics drugs (Baez *et al.,* 2007) during mass sterilization campaigns, the castrations should be made using combinations of drugs such as xylazine, acepromazine, and ketamine (Ruiz *et al.,* 2009) which do not produce sufficient analgesic coverage for this type of surgical procedure. This is contrary to the Colombian Animal Protection Law (Art 84 of 1989), which states that is veterinarians' obligation "to prevent and treat the pain and suffering of animals".

With the aim of reducing the impact of the absence of opioids and general anesthesia during the orchiectomy in this dog, a multimodal anesthetic protocol that included the intratesticular infiltration of lidocaine, plus more accesible drugs such as acepromazine, meloxican, tramadol, and ketamine were employed. Acepromazine is widely used as a sedative in veterinary anesthetic practice; it produces some degree of muscle relaxation but has no analgesic effects. Xylazine alone or in combination with opioid is used in dogs to provide analgesia and sedation during minor surgical procedures (Tranquili *et al.,* 2007, Gaynor and Muir *et al*., 2015). Ketamine is a noncompetitive antagonist of NMDA receptors routinely used as anesthetic in veterinary medicine. However, at doses below to 10 mg/kg would not be sufficient to provide visceral analgesia (Tranquili *et al.,* 2007). A study comparing the efficacy and cardiorespiratory effects of the administration of dexmedetomidine and ketamine in combination with various opioids (buprenorphine, hydromorphone, buprenorphine) and carprofen in dogs undergoing elective orchiectomy showed that some patients within each experimental group required a greater supplementation with isoflurane (Barletta *et al.,* 2011). Regarding the tramadol, a study comparing the analgesic effect of tramadol versus morphine during castration in dogs, concluded that tramadol appears less effective than morphine in preventing nociception during the intraoperative period during this surgery (Kongara *et al*., 2013).

Assessment of pain in animals still remains a challenge for a number of reasons. In non-sedated dogs spontaneous pain behaviors such as reluctance to move, aggressive, vocalization could be indicative of pain status (Tranquili *et al.,* 2007, Gaynor and Muir *et al*., 2015). However, in sedated animals much of these pain behaviors could be depressed or neglected by effect of the anesthesia. Noxious stimuli during lighter stages of general anesthesia will generate autonomic responses such as tachycardia, hypertension, and hyperventilation that could be indicative of incomplete analgesic coverage (Tranquili *et al.,* 2007, Gaynor and Muir *et al*., 2015). Although non-painful stimuli such as hypovolemia and hypercapnia, among others, may produce similar alterations in these autonomic responses (Tranquili et al., 2007, Gaynor and Muir et al., 2015), many studes considered that increases greater than 10-20% in relation to baseline values of HR, RR and MBP could be indicative of insufficient analgesuc coverage (Wenger, 2004, Ca-niglina et al.,, Huuskonen et al., 2013).

In the patient of the present report, the evaluated cardiorespiratory parameters were stable during the entire surgical procedure, therefore was not necessary to employ rescue analgesia or additional maintenance ketamine boluses. Although it is complex to determine the real contribution of a particular analgesic drug when a multimodal anesthesia protocol is used, as was the case of the employed in this patient. It is considered that the intratesticular injection of lidocaine could contribute in an important way to achieve the analgesic coverage in this dog. Similar results have been described in other study evaluating the isoflurane sparing effect after intratesticular administration of lidocaine in dogs undergoing elective orchiectomy. The dogs of that study received a multimodal anesthetic protocol that also included: acepromazine, morphine, carprofen, plus inhaled anesthesia (Mcmillan *et al.,* 2012). The intratesticular lidocaine group received 1 mg kg of lidocaine 2% via intratesticular, and the control group received saline. The results of that study showed that intratesticular administration of lidocaine allowed reducing isoflurane requirements. This reduction was evidenced in the lidocaine group especially during the spermatic cord cutting (which is considered the more painful surgical moment in the orchiectomy), thus indicating that intratesticular can block the autonomic nociceptive stimulus generated in response to the spermatic cord cutting. This also indicated that the sole employ of morphine and carprofen did not allowed achieving an effective analgesic coverage to perform castrations in dogs. In the same study was observed an increase in isoflurane requirements in response to scrotal skin incision. In the patient of the present report scrotal subcutaneous infiltration of lidocaine could contribute to obtain an adequate pain control associated with scrotal skin incision. It is also important to note that in this patient the analgesic coverage achieved was obtained using a lower lidocaine doses (0.66mg/kg) as employed by McMillan *et al.,* (2012). This reduction in lidocaine dosage can decrease the risk of toxicity associated with its employ. Other study describing the analgesic efficacy of included intratesticular lidocaine during castration in dogs has been publicated (Huuskonen *et al*., 2013)

Conclusion

In summary we consider that intratesticular administration of lidocaine under the multimodal anesthetic protocol employed here, was a simple, cheap and effective method for improving the analgesic coverage during elective orchiectomy in this dog. However, controlled clinical studies with larger sample size to validate the results of the present anesthetic protocol are required.

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