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INCIDENCE OF ARRHYTHMIAS IN DOGS ANESTHETIZED WITH XYLAZINE AND INDUCED WITH PROPOFOL

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ABSTRACT

Objective: To analyze the incidence of arrhythmias in dogs anesthetized with xylazine and induced with propofol, highlighting the clinical repercussions of this association, as

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well as the underlying physiological mechanisms and monitoring strategies. Veterinary anesthesia is essential for performing surgical and diagnostic procedures, but the combination of agents such as xylazine, an α2-adrenergic agonist, and propofol, an intravenous hypnotic, can significantly impact cardiovascular function. Xylazine causes sedation and pain relief, but may also lead to bradycardia and atrioventricular blocks. On the other hand, propofol causes myocardial depression and reduced blood pressure. The interaction between these drugs increases the probability of arrhythmias, making constant supervision through electrocardiogram (ECG) and other hemodynamic indicators essential. The implementation of individualized anesthetic protocols, combined with rapid strategies to correct cardiac alterations, is crucial to minimize risks. The review highlights the need for further studies on safe alternatives to anesthesia in dogs, seeking to reduce cardiovascular adverse effects.

Keywords: Cardiac Arrhythmias. Veterinary Anesthesia. α2-adrenergic agonists. Intravenous Hypnotics. Hemodynamic Monitoring.

INTRODUCTION

Anesthesia is a fundamental practice in veterinary medicine, allowing surgical and diagnostic procedures to be carried out in a safe and controlled manner. However, the selection of the anesthetic protocol should be made with caution, taking into account the physiological impacts and possible complications related to the drugs used. Among the commonly used sedatives, xylazine stands out for its agonist action of α2-adrenergic receptors, promoting sedation, analgesia and muscle relaxation. However, this drug can cause cardiovascular side effects, such as bradycardia, atrioventricular blocks, and decreased cardiac capacity, due to increased vagal tone and reduced norepinephrine release (Almeida & Souza, 2023).

Propofol is an intravenous anesthetic frequently used in the induction of anesthesia due to its rapid action and rapid recovery. However, its use is linked to cardiovascular depression, manifested by hypotension, bradycardia, and ventricular arrhythmias, especially when combined with drugs that interfere with the autonomic nervous system (Costa & Oliveira, 2021). Research suggests that the combination of xylazine and propofol can intensify negative cardiovascular effects, increasing the number of arrhythmias and impairing the patient's hemodynamic stability (Borges & Lima, 2022).

Therefore, the administration of anesthesia in dogs requires constant monitoring to detect and minimize possible complications resulting from the use of these medications. The electrocardiogram (ECG) is a crucial instrument in this scenario, enabling the early identification of arrhythmias and assisting in clinical decisions to ensure anesthetic safety (Silva & Freitas, 2020).

Therefore, the aim of this study is to examine the occurrence of arrhythmias in xylazine-anesthetized and propofol-induced dogs, examining the possible clinical consequences of this drug combination.

METHODOLOGY

The present study was based on a narrative review of the literature, with the selection of scientific articles, dissertations and books that address the occurrence of arrhythmias in dogs submitted to anesthesia with xylazine and propofol. Sources were selected from databases such as PubMed, Scielo and Google Scholar, using terms such as "veterinary anesthesia", "xylazine", "propofol" and "cardiac arrhythmias". The

selection criteria included studies published between 2006 and 2023, written in Portuguese, English, or Spanish, that provided data on the cardiovascular impacts of these drugs. Studies with insufficient samples or without a clear statistical analysis were excluded. The evaluation of the data was descriptive, emphasizing the rates of arrhythmias and the physiological processes involved, in addition to the suggested cardiac monitoring strategies.

RESULTS AND DISCUSSIONS

PHARMACOLOGICAL ASPECTS OF XYLAZINE AND PROPOFOL

Anesthesia in dogs is a complex process that involves the interaction of several drugs with varying effects on physiological systems. Among anesthetic agents, xylazine and propofol are widely used, each with particularities that directly influence the cardiovascular stability of patients (Silva & Freitas, 2020).

Xylazine is an α2-adrenergic agonist that acts on depolarization of the central nervous system, resulting in sedation, pain relief, and muscle relaxation. However, its administration can cause bradycardia, hypotension and atrioventricular block, increasing the probability of arrhythmias during the application of anesthesia (Silva, 2006). Such arrhythmias can range from simple ventricular extrasystoles to atrioventricular blocks of different degrees, according to the dose and individual sensitivity of each animal. Research indicates that xylazine may increase the PR interval on the electrocardiogram, indicating a delay in atrioventricular conduction. In addition, it can intensify the release of catecholamines, which can worsen arrhythmias (Vasconcelos & Clark, 2012)

Propofol, on the other hand, is a fast-acting, short-acting hypnotic agent used for anesthetic induction. It promotes central nervous system depression by enhancing the action of gamma-aminobutyric acid (GABA), resulting in deep sedation. However, propofol can also cause hypotension and myocardial depression, leading to changes in heart rhythm (Rosa, 2015). Its ability to decrease cardiac output and peripheral vascular resistance makes close monitoring essential, especially in patients prone to heart problems. In addition, there is information that propofol can cause a temporary decrease in heart rate, especially at high doses, which emphasizes the importance of its cautious administration (Silva, 2006).

ARRHYTHMIAS IN ANESTHETIZED DOGS

Arrhythmias are frequent complications in anesthetic procedures, especially when agents that directly affect cardiac activity are used. The combination of xylazine and propofol can intensify such effects, as the former causes bradycardia and atrioventricular blockade, while the latter causes hypotension (Vasconcelos & Clark, 2012).

Research indicates that the occurrence of arrhythmias during anesthesia is affected by several elements, such as the concentration of the drugs, the patient's health condition, and the period of administration. According to Silva (2006), during the procedure, some anesthetized with xylazine present arrhythmias, while those that received medetomidine instead of xylazine have a reduced incidence of these alterations.

On the other hand, Rosa (2015) observed that the administration of propofol with opioids and ketamine leads to the stability of the cardiovascular system, but with occasional episodes of arrhythmia, especially when combined with lidocaine. This effect is attributed to the arrhythmogenic capacity of opioids and the effect of ketamine on the release of catecholamines, which may favor the occurrence of arrhythmic events. In comparative terms, xylazine shows an increase in the occurrence of ventricular arrhythmias when combined with propofol, as opposed to combinations that employ medetomidine (Silva 2006).

Furthermore, the clinical differences between supraventricular and ventricular arrhythmias are notable and important to be exemplified: while the former are usually linked to problems in the sinoatrial node or atrioventricular conduction, the latter usually involve ventricular ectopias that can lead to more serious conditions, such as ventricular tachycardia or fibrillation (Vasconcelos & Clark, 2012).

IMPORTANCE OF CARDIAC MONITORING

Cardiac monitoring during anesthesia is critical for the early detection of arrhythmias and other cardiovascular complications. The use of ECG, non-invasive blood pressure and pulse oximetry allows a continuous assessment of the patient's clinical status, which is essential to adjust the dose of drugs and avoid serious adverse events (Silva, 2006; Vasconcelos & Clark, 2012). Capnography is also suggested, as

sudden changes in carbon dioxide levels at the end of expiration (EtCO2) can signal significant hemodynamic changes (Vasconcelos & Clark, 2012).

In addition, anesthesia protocols must be personalized, taking into account aspects such as age, health condition, and cardiovascular history of patients. It is essential to act quickly in case of arrhythmias identified during anesthesia to prevent progression to more serious events, such as ventricular fibrillation or asystole. Immediate therapeutic actions include the application of anticholinergics, such as atropine, to treat severe bradycardias, and the use of vasopressors, such as ephedrine, in situations of severe hypotension (Rosa, 2015).

In short, the combination of xylazine and propofol in anesthesia protocols for dogs requires prudence and constant monitoring, due to the direct impact of these medications on cardiac function. Research conducted in general emphasizes the importance of personalized protocols and improvement of anesthetic safety to reduce risks.

FINAL CONSIDERATIONS

The combination of xylazine and propofol in dogs demonstrates a significant impact on cardiovascular function, with an increased incidence of arrhythmias, especially bradycardia and atrioventricular blocks. Continuous monitoring is essential for the early detection of these complications, reinforcing the importance of individualized anesthetic protocols. The study highlights the need for future research to investigate alternative strategies that reduce the risks associated with this combination of drugs.

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