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COMPARATIVE STUDY OF INHALATIONAL AGENTS (ISOFLURANE VS. SEVOFLURANE) IN ANESTHESIA OF ELDERLY CATS

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ABSTRACT

Objective: To compare the effects of isoflurane and sevoflurane on anesthesia in elderly cats, evaluating their advantages and disadvantages in relation to cardiovascular stability, recovery time, and intra- and postoperative complication rate. Progress in veterinary medicine has extended the life expectancy of domestic felines, making anesthesia in elderly patients a challenge, because of the physiological changes that can affect hemodynamic stability and recovery after anesthesia. The use of inhaled anesthetics, such as isoflurane and sevoflurane, is extensive due to their predominantly pulmonary metabolism, minimizing hepatic and renal overload. Isoflurane has reduced

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hepatic metabolism and predictable cardiovascular effects, and is recommended for critically ill patients. On the other hand, sevoflurane offers more agile anesthetic induction and recovery, favoring brief procedures and reducing the likelihood of complications after surgery. However, its hepatic metabolism is higher than that of isoflurane and the risk of nephrotoxicity requires caution in cats with liver or kidney problems. The choice of anesthetic should consider the patient's clinical condition, prioritizing hemodynamic stability and safe recovery.

Keywords: Veterinary Anesthesia. Perioperative complications. Hemodynamic stability. Geriatric Felines. Anesthetic Recovery.

INTRODUCTION

The progress of veterinary medicine has allowed a longer life for domestic felines, leading to a significant growth of elderly patients in the clinical routine. However, aging causes physiological changes that directly affect anesthesia, making these patients more prone to complications in surgical and anesthetic procedures (Figueiredo, 2005). Therefore, the correct selection of the anesthetic agent is crucial to reduce hazards and ensure a safe and efficient recovery.

Among the available alternatives, inhalational anesthetics stand out for providing greater control over the intensity of anesthesia and rapid excretion by the respiratory system, minimizing hepatic and renal overload, organs commonly affected in elderly animals (Fantoni & Cortopassi, 2010). Isoflurane and sevoflurane are commonly used in veterinary anesthesia, and are recognized for their effectiveness and safety in various clinical scenarios. However, there are significant differences between these agents that may affect the selection of anesthetic protocol, particularly in elderly patients, who require greater hemodynamic stability and rapid recovery (Carpenter *et al*., 2005).

Isoflurane, due to its reduced hepatic metabolism and its predictable effects on the cardiovascular system, is frequently used in critically ill patients (Medeiros, 2011). In contrast, sevoflurane provides more agile anesthetic induction and recovery, which may be beneficial for short-term procedures and for patients who are more sensitive to long periods of anesthesia (Scarparo, Gorczak, & Valandro, 2020).

In this context, the present study aims to compare the effects of isoflurane and sevoflurane in the anesthesia of elderly cats, analyzing their advantages and disadvantages in terms of cardiovascular stability, recovery time, and intra- and postoperative complication rate.

METHODOLOGY

The research was conducted through a literature review, in which scientific articles, books and other academic sources that discussed the application of isoflurane and sevoflurane in the anesthesia of elderly cats were analyzed. The search was carried out in databases such as PubMed, SciELO and Google Scholar, using terms such as "inhalational anesthesia in felines", "isoflurane in cats of advanced age" and "sevoflurane in veterinary medicine". We chose studies that address the pharmacological effects, cardiovascular stability, induction and recovery time of

anesthetic, as well as the effect on vital organs and the possible complications during and after surgery linked to these anesthetics. The data analysis compared the advantages and disadvantages of each agent, considering the anesthetic safety and the adequacy of the anesthetic protocol according to the clinical condition of geriatric patients.

RESULTS AND DISCUSSIONS

Choosing the ideal anesthetic agent for senior cats is a challenge that involves the analysis of multiple factors, such as cardiovascular stability, anesthetic induction and recovery time, impact on vital organs, and intra- and postoperative complication rate. The comparative analysis between isoflurane and sevoflurane presents pros and cons that need to be taken into account according to the patient's clinical condition and the type of intervention to be performed (Scarparo, Gorczak & Valandro, 2020).

CARDIOVASCULAR STABILITY

Cardiovascular stability is one of the main factors to be considered in the anesthesia of geriatric patients, since senility can lead to a decrease in the functional reserve of the heart and a lower capacity to respond to stressful stimuli, such as anesthesia (Affiune, 2006). Due to its peripheral vasodilator action, isoflurane can cause a reduction in blood pressure, but without a relevant effect on heart rate. This is because the agent does not stimulate the myocardium to react with catecholamines, decreasing the likelihood of arrhythmias (Carpenter *et al*., 2005).

On the other hand, sevoflurane has similar effects on peripheral vascular resistance, but tends to cause a smaller decrease in myocardial contractility compared to isoflurane (Gough & Thomas, 2004). This characteristic makes it a safer choice for senior cats with a history of heart disease, particularly those with congestive heart failure or hypertrophic cardiomyopathy, conditions that are quite common in senility (Scarparo, Gorczak & Valandro, 2020).

On the other hand, some research indicates that sevoflurane may cause an increase in the rate of reflex tachycardia due to peripheral vasodilation, which may increase myocardial oxygen consumption, an important aspect for patients with previous heart problems (Medeiros, 2011). So, while isoflurane is seen as safer for cats

prone to arrhythmias, sevoflurane may be the perfect option for those who need greater hemodynamic stability.

INDUCTION TIME AND ANESTHETIC RECOVERY

The time of induction and anesthetic recovery has a direct impact on the safety of the procedure, particularly in older cats, which often have a slower metabolism and a reduced ability to eliminate medications (Pypendop, 2016). Due to its higher blood/gas partitioning coefficient, isoflurane offers slower anesthetic induction and recovery when compared to sevoflurane (Figueiredo, 2005).

On the other hand, sevoflurane has a lower blood/gas partition coefficient, allowing for more effective anesthesia and considerably faster recovery (Souza & Amorim, 2008). This is beneficial for brief procedures, as it decreases the duration of anesthetic exposure and reduces complications after anesthesia, such as prolonged respiratory depression, hypothermia, and delay in recovering normal central nervous system function (Scarparo, Gorczak & Valandro, 2020).

However, rapid recovery of sevoflurane may be detrimental in certain clinical situations. In cats with severe pain or that have undergone prolonged procedures, the rapid recovery of consciousness can generate discomfort and intensify postoperative stress, requiring strict control of multimodal analgesia to prevent negative reactions (Medeiros, 2011).

IMPACT ON VITAL ORGANS

The selection of the anesthetic should also consider its effect on vital organs, particularly the liver and kidneys, whose functions may be impaired in elderly patients. Isoflurane has a reduced hepatic metabolism (approximately 0.2%) and is eliminated mainly by the lungs, which considerably decreases the danger of liver toxicity and makes it the safest option for cats with liver failure (Souza & Amorim, 2018).

Sevoflurane, although it is also mostly eliminated by the lungs, has a higher liver biotransformation rate (approximately 3%), which may represent a limiting factor in patients with impaired liver function (Trepanier, 2016). However, its metabolization is still seen as reduced relative to other inhalational anesthetics, such as halothane, and rarely results in significant clinical complications when used with adequate oxygen flows (Carpenter *et al*., 2005).

With regard to renal function, there are concerns about the possible nephrotoxicity of sevoflurane, given that its biotransformation can originate fluorinated compounds, such as compound A, which in experimental studies has shown renal toxicity at high doses (Medeiros 2011). However, this impact is not seen as significant in anesthetized cats under normal clinical conditions, especially when appropriate oxygen flows are employed to reduce exposure to compound A (Fantoni & Cortopassi, 2010).

ANESTHETIC SAFETY AND INTRAOPERATIVE AND POSTOPERATIVE COMPLICATIONS

The efficacy of anesthesia is determined by the interaction between the pharmacological characteristics of the drug used and the patient's clinical condition. In older cats, the decrease in physiological reserve and the greater propensity for hemodynamic changes increase the danger of anesthetic complications, making it crucial to select the most appropriate anesthetic for each situation (Figueiredo, 2005).

In addition, due to its rapid induction and recovery, sevoflurane decreases the likelihood of complications after surgery, such as prolonged hypothermia and respiratory depression (Scarparo, Gorczak & Valandro, 2020). However, its slightly higher hepatic metabolism and the possible risk of nephrotoxicity require caution in patients with preexisting liver and kidney dysfunction (Souza & Amorim, 2018).

On the other hand, isoflurane is often used in critically ill patients, thanks to its almost non-existent metabolism and minimal effect on kidney and liver function (Carpenter *et al*., 2005). However, its slow anesthetic recovery can extend the monitoring time after surgery, increasing the time needed for the patient's full recovery (Fantoni & Cortopassi, 2010).

FINAL CONSIDERATIONS

The choice between isoflurane and sevoflurane to anesthetize elderly cats should be based on a thorough analysis of the animal's clinical condition and the duration of the anesthetic procedure. Isoflurane is a safe alternative for patients with liver and kidney failure, while sevoflurane is more suitable for short-term surgical procedures, thanks to its rapid induction and recovery. Both agents can be employed safely, provided appropriate monitoring and anesthetic care measures are implemented.

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