https://doi.org/10.21708/avb.2025.19.1.12681

CASE REPORT

ACTA VETERINARIA BRASILICA

ISSN: 1981-5484

Anesthesia in *Canis lupus familiaris* (Linnaeus, 1758) with polyglandular syndrome - case report

Anestesia em *Canis lupus familiaris* (Linnaeus, 1758) com síndrome poliglandular - relato de caso

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ABSTRACT: A male dog of undetermined breed was treated at the Veterinary Hospital with complaints of polyglandular syndrome and neoformations. The patient was then referred for prior stabilization and investigation of the condition in order to perform a surgical procedure with greater anesthesia safety. This report describes the anesthetic procedure of a patient with polyglandular syndrome, its particularities, and its complications, such as bradyarrhythmias during the surgical procedure.

Keywords: endocrinopathy; complications; arrhythmias.

RESUMO: Um cão macho, de raça indefinida, foi atendido no Hospital Veterinário com queixas de síndrome poliglandular e neoformações. O paciente foi então encaminhado para estabilização prévia e investigação do quadro, a fim de realizar um procedimento cirúrgico com maior segurança anestésica. Este relato descreve o procedimento anestésico de um paciente com síndrome poliglandular, suas particularidades e suas complicações, como bradiarritmias durante o procedimento cirúrgico.

Palavras-chave: endocrinopatia; complicações; arritmias.

INTRODUCTION

Autoimmune polyglandular syndrome (APS) is a rare pathology, where the development of autoimmunity against two or more endocrine organs occurs (Poppl, 2009).

In humans, there are four types of classifications of this syndrome. Type I involves two or three autoimmune diseases, such as primary hypoadrenocorticism, hypoparathyroidism, and mucocutaneous candidiasis. Type II, which is also known as Schmidt Syndrome, is characterized by hypoadrenocorticism and primary autoimmune hypothyroidism, which may or may not be associated with type 1 diabetes mellitus. Type III refers to the presence of autoimmune thyroid disease and another autoimmune pathology, such as autoimmune gastritis, lupus, liver cirrhosis, among others. Type IV refers to the presence of two or more autoimmune endocrinopathies that cannot be attributed to either of the two previous classes (Frommer; Kahalay, 2019).

The treatment of endocrinopathies consists of specific hormone replacement. In the case of hypothyroidism, the therapy of choice is levothyroxine; the treatment of hypoadrenocorticism is the use of corticosteroids; and in diabetes mellitus, insulin therapy (Pikula *et al*.,2007).

When these patients need to undergo a surgical procedure, prior stabilization is essential.

Anesthesia in diabetic patients is associated with greater complications due to poor blood glucose regulation, which directly affects the homeostasis of the cardiovascular system, central nervous system, autonomic nervous system, kidneys, and eyes (Robertshaw; Hall, 2006; Rand; Marshall, 2005).

Blood glucose levels need to be assessed pre- and intra-operatively. If they are below 100 mg/dL, insulin administration should be suspended, and 2.5% or 5% dextrose should be administered by intravenous (IV) infusion. If blood glucose levels are between 100 and 200 mg/dL, a quarter of the patient's usual morning insulin dose should be administered, and intravenous dextrose infusion should also be administered. If blood glucose levels are above 200 mg/dL, half of the usual morning insulin dose should be administered, and the dextrose infusion should be interrupted. The goal is to keep blood glucose levels between 150 and 250 mg/dL throughout the anesthetic period until the patient is able to eat again (Nelson; Couto, 2015). Fluid therapy is also a very important point in diabetic patients due to the correction of potential dehydration and electrolyte imbalances; therefore, the condition of a patient undergoing anesthesia needs to be properly monitored (Davis *et al*., 2013).

Animals with hypoadrenocorticism have a higher anesthesia risk, as glucocorticoids have multiple effects on the vasculature, consequently affecting the integrity of the endothelium, vascular permeability, and sensitivity to catecholamines; thus, there is interference in the maintenance of blood pressure (Grimm *et al*.,

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Received: 07/31/2024
Accepted: 09/16/2024

2015). If not adequately stabilized, a patient with hypoadrenocorticism may present cardiac arrhythmias, hypoglycemia, hypovolemia, and hypotension during the anesthetic procedure (Feldman; Nelson, 2004; Mama, 2012).

Hypothyroidism increases the chances of hypothermia, cardiac complications such as bradycardia, bradyarrhythmias, decreased myocardial contractility, anemia, and there is a lower capacity for biotransformation of anesthetics, which makes the patient sensitive to cardiovascular depression caused by anesthesia and allows for a more prolonged action of the drugs (Haskins, 2007). The measurement of serum free thyroxine concentration is an important tool for distinguishing hypothyroidism from euthyroid sick syndrome in dogs (Nelson *et al*., 1991).

Therefore, the purpose of this study is to report the anesthesia of a dog with polyglandular syndrome, as well as its complications.

CASE REPORT

A 13-year-old male dog of undetermined breed weighing 13kg was admitted to the Veterinary Hospital on 01/03/23 with complaints of polyglandular syndrome, neoformations in the prepuce, chest, and pelvic and thoracic limbs regions.

During the first visit at the medical clinic, the doses of his medications were readjusted, with 12mcg/kg levothyroxine BID, intermediate NPH 9IU/Kg insulin in the morning, 8IU/kg insulin at night, and 0.1mg/kg prednisone SID being instituted as treatment. This allowed for the prior stabilization of the patient's condition before the surgical procedure could be performed.

The surgical team performed a cytology of the formations, with the formation in the left parapenile region suggesting malignant spindle cell neoplasia, while the other formations in the cytology were suggestive of lipoma.

Pre-anesthetic tests were: blood count, albumin, triglycerides, cholesterol, sodium, potassium, ALT, ALP, urea, creatinine, abdominal ultrasound, chest X-ray, electrocardiogram, and echocardiogram.

The supplementary exams did not show any changes that would prevent the surgical procedure. The electrocardiogram showed sinus arrhythmia, with a minimum frequency of 68 bpm and a maximum frequency of 133 bpm; the echocardiogram showed myxomatous mitral valve disease, mitral valve insufficiency, and tricuspid valve insufficiency, both of a mild degree. On 03/01/23, the patient was then referred to the anesthesiology department for anaplasty surgery.

The patient was admitted after a 6-hour food fast and a 2-hour water fast. The following medications had been administered 6 hours prior to the procedure: 9IU/kg NPH insulin, 0.1mg/kg prednisone, and 12mcg/kg levothyroxine.

On physical examination, the patient had a heart rate of 100 bpm, tachypnea, normal-colored mucosa, capillary filling time of 2 seconds, adequate hydration, rectal temperature of 38.6°C, clear lung fields on pulmonary auscultation, and normal heart sounds on cardiac auscultation.

To perform the anesthetic procedure, it was decided to use 0.2mg/kg methadone associated with 0.5mg/kg IM ketamine as pre-anesthetic medication. Fifteen minutes after administering the medication, a venous access was set up in the cephalic vein with a 20G catheter, and the patient's blood glucose level was measured, which was 157mg/dL.

The animal was induced with 5mg/kg propofol intravenously, then the patient was intubated with an endotracheal tube no. 7.5; the patient was kept under inhalation anesthesia with isoflurane – in a rebreathing valve circuit; and an infiltrative blockade was performed with 4mg/kg lidocaine with a 2cm margin in the formations.

Patient monitoring consisted of electrocardiogram, pulse oximetry, capnography, capnometry, invasive blood pressure in the metatarsal artery, and blood glucose. During the procedure, blood glucose remained around 150mg/dL; the patient had a significant decrease in heart rate and invasive blood pressure, 36 bpm and a mean arterial pressure of 40mmHg. At this time, the patient had changes in the electrocardiogram, developing a 2nd degree atrioventricular block and then progressing to a 3rd degree block. 0.044mg/kg atropine was administered intravenously, and the patient's heart rate and blood pressure improved. After this complication, the patient remained stable.

As postoperative medication, 25mg/kg dipyrone, 0.3mg/kg dexamethasone, 0.1mg/kg methadone were administered, all intravenously, and a new blood glucose level of 144 mg/dL was achieved. After the procedure, the patient ate spontaneously.

DISCUSSION

Endocrine diseases are becoming increasingly common, and as a result, these patients often need to undergo general anesthesia. The coexistence of diabetes mellitus and hyperadrenocrticism has been previously reported in dogs, requiring careful management of both endocrine disorders (Peterson; Nesbitt; Schaer, 1984).

In most cases, the procedure is not related to the endocrine disorder, but stabilizing the clinical condition is extremely important.

Pre-anesthetic management of patients includes assessing blood glucose levels; mild to severe hypoglycemia may occur in diabetic patients, leading to dehydration due to osmotic diuresis that results in significant fluid loss, ketoacidosis that causes electrolyte changes such as hyponatremia, hypochloremia, hypocalcemia, and hypomagnesemia; potassium and phosphorus concentrations may or may not be altered, and metabolic acidosis (Wellman; Dibartola, 2006). The classification and pathogenesis of diabetes mellitus in dogs and cats vary depending on the animal model used (Nelson; Reusch, 2014). Therefore, it is necessary to prevent hypoglycemia and maintain electrolyte balance. Thus, the ideal time to start surgery should be in the afternoon, maintaining the usual feeding and food supply in the morning (Peterson; Kintzer; Kass, 1996), as instructed to the tutor. Blood glucose levels must be measured throughout the entire intra-operative period for correct intervention if necessary (Adams; Figueiredo; Graves, 2015). Throughout the anesthetic procedure, blood glucose levels were measured at 30-minute intervals, and the patient kept his blood glucose levels around 150 mg/dL.

There are no contraindications to anesthetic medications for patients with hypoadrenocorticism, but during induction etomidate should be avoided because it inhibits for up to 6 hours an enzyme called 11-β-hydroxylase, necessary for cortisol synthesis in dogs. The patient was then induced with propofol, which has no contraindications in this case. Minimum doses of anesthetics should be chosen, as these patients have myocardial depression and muscle weakness (Hines; Marschall, 2012).

Animals with hypoadrenocorticism tend to have multisystemic changes that increase the anesthesia risk, such as hypotension, hypoglycemia, bradycardia, and bradyarrhythmias. Regarding the anesthetic management of patients with hypothyroidism, we need to be aware of the difficulty in maintaining thermoregulation, decreased myocardial contractility, sinus bradycardia, hypotension, and decreased metabolism of anesthetic agents (Rosychuk, 1986).

During anesthesia, the patient in the report had a second-degree atrioventricular block evolving to third-degree. Atrioventricular block is a bradyarrhythmia, in which a conduction disturbance occurs. There are three types of atrioventricular blocks. First-degree is a delay in the supraventricular impulse through the bundle of His and the atrioventricular junction; in this type of bradyarrhythmia, there is no change in heart rhythm or rate, and there is a constant prolongation in the P-R interval (Tilley; Goodwin, 2008). Second-degree atrioventricular block occurs due to failure in the atrial impulse and can be classified as Mobitz I and II. In Mobitz type I, there is progressive prolongation in the P-R interval until the P wave is no longer conducted by a QRS complex; in type II, there is no prolongation of the preceding P-R interval, and two P waves can be seen for each QRS complex (Nelson; Couto, 2015). Third-degree or complete atrioventricular blocks represent the complete absence of transmission of electrical impulses between the atria and ventricles (Côte; Laste, 2000; Santilli *et al.*, 2018). The presence of a second-degree Mobitz type II atrioventricular block can be explained by the presence of endocrine diseases that tend to cause a decrease in metabolism, contractility, electrolyte disturbances, and predispose to bradycardia and bradyarrhythmia, as occurred with the patient reported.

According to Peterson, Kintzer and Kass (1996), patients with hypoadrenocorticism need to supplement with glucocorticoids. In the post-operative period, glucocorticoid supplementation should be continued at approximately three to five times the maintenance dose for at least 3 days. Due to post-surgical stress, this corticosteroid replacement was advised to the tutor and carried out.

CONCLUSION

We can conclude from this report that endocrine diseases can directly interfere during anesthesia; the patient needs to be stabilized beforehand for non-emergency surgeries, and knowing the pathophysiology of the disease and the effects of the drugs used in the anesthetic protocol provides greater safety and quality for the anesthetic procedure.

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