Anesthetic classification and surgical casuistic of dogs seen at a teaching veterinary clinic

Classificação anestésica e casuística cirúrgica de cães atendidos em clínica veterinária de ensino

Clasificación anestésica y casuística quirúrgica de perros atendidos en clínica veterinaria de enseñanza

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ABSTRACT

The classification proposed by the American Society of Anesthesiologists (ASA) classifies patients according to anesthetic risk into five categories, ranging from healthy to very severe patients. Because of this, it is an essential tool to ensure the safety of patients undergoing a surgical procedure. The use of this classification allows the anesthesiologist to be prepared for possible complications and to predict the patient’s real prognosis. The objective of the article was to carry out a retrospective study in a teaching veterinary clinic (CEV), analyzing medical records of dogs undergoing surgical procedures for two years, in order to verify the casuistry of each ASA category and the main surgical procedures carried out at CEV. Within the period studied, 810 patients were classified. The ASA I category included 166 animals (20.49%; 166/810). The ASA II category had 212 dogs (26.17%; 212/810). The ASA III category included 320 animals (39.50%; 320/810). The ASA IV category had 91 patients (11.23%; 91/810) and the ASA V category included 21 patients (2.59%; 21/810). The total number of deaths corresponded to 16 cases (1.97%; 16/810), affecting animals from ASA III or higher. The most frequent surgical procedures were ovariohysterectomy, fracture correction and mastectomy. It was concluded that the largest sample of dogs undergoing surgical...
procedures was ASA III patients and the most common surgical procedures were therapeutic.

**Keywords:** Anesthesia, Canine, Surgery, Anesthetic Risk.

**RESUMO**

A classificação proposta pela American Society of Anesthesiologists (ASA), classifica os pacientes quanto ao risco anestésico em cinco categorias, variando de paciente hígido até muito grave. Devido a isso é uma ferramenta indispensável para garantir a segurança do paciente submetido a procedimento cirúrgico. A utilização de tal classificação permite preparar o anestesiologista para possíveis intercorrências e predizer sobre o real prognóstico do paciente. O objetivo do artigo foi realizar um estudo retrospectivo em uma clínica veterinária de ensino (CEV), analisando-se prontuários médicos de cães submetidos a procedimentos cirúrgicos durante dois anos, a fim de se verificar a casuística de cada categoria ASA e os principais procedimentos cirúrgicos realizados na CEV.

Dentro do período estudado foram classificados 810 pacientes. A categoria ASA I incluiu 166 animais (20,49%; 166/810). A categoria ASA II contou com 212 cães (26,17%; 212/810). A categoria ASA III incluiu 320 animais (39,50%; 320/810). A categoria ASA IV teve 91 pacientes (11,23%; 91/810) e a categoria ASA V incluiu 21 pacientes (2,59%; 21/810). A quantidade total de óbitos correspondeu a 16 casos (1,97%; 16/810), acometendo animais a partir de ASA III. Os procedimentos cirúrgicos mais frequentes foram ovariohisterectomia, correção de fraturas e mastectomia. Concluiu-se que a maior casuística de cães submetidos a procedimentos cirúrgicos foi de pacientes ASA III e os procedimentos cirúrgicos mais comuns foram terapêuticos.

**Palavras-chave:** Anestesia, Canino, Cirurgia, Risco Anestésico.

**RESUMEN**

La clasificación propuesta por la Sociedad Americana de Anestesiólogos (ASA) clasifica a los pacientes según el riesgo anestésico en cinco categorías, que van desde pacientes sanos hasta pacientes muy graves. Por ello, es una herramienta esencial para garantizar la seguridad de los pacientes sometidos a un procedimiento quirúrgico. El uso de esta clasificación permite al anestesiólogo prepararse ante posibles complicaciones y predecir el pronóstico real del paciente. El objetivo del artículo fue realizar un estudio retrospectivo en una clínica veterinaria de enseñanza (CEV) analizando historias clínicas de perros sometidos a procedimientos quirúrgicos durante dos años con el fin de verificar la casuística de cada categoría ASA y los principales procedimientos quirúrgicos realizados en CEV. Dentro del período estudiado, se clasificaron 810 pacientes. La categoría ASA I incluyó 166 animales (20,49%; 166/810). La categoría ASA II contó con 212 perros (26,17%; 212/810). La categoría ASA III incluyó 320 animales (39,50%; 320/810). La categoría ASA IV tuvo 91 pacientes (11,23%; 91/810) y la categoría ASA V incluyó 21 pacientes (2,59%; 21/810). El número total de muertes correspondieron a 16 casos (1,97%; 16/810), afectando a animales de ASA III. Los procedimientos quirúrgicos más frecuentes fueron ovariohisterectomía, corrección de fracturas y mastectomía. La muestra
más grande de perros sometidos a procedimientos quirúrgicos fue la de pacientes ASA III. Los procedimientos quirúrgicos fueron terapéuticos.

**Palabras clave:** Anestesia, Canino, Cirugía, Riesgo Anestésico.

1 INTRODUCTION

Advances in Veterinary Medicine and the dogs’ owners search for better treatments have significantly increased these animals' life expectancy. Due to this longevity, it increases the likelihood of pets undergoing a surgical or anesthetic procedure throughout their lives. Such procedures, despite its safety, always pose a risk to the patient (Carareto et al., 2005).

Every patient who needs any surgical procedure requires pre-surgical assessment with anamnesis, physical examination and complementary tests before undergoing anesthesia. This evaluation reduces the risk of complications during surgeries and post-surgical deaths rates (Schwartzman et al., 2011).

It is known that risks involving surgical procedures does not only rely on the degree of surgical complexity to be performed, but also depends on several factors involved with the patient’s physiology. Those factors include age, patient physical status and the surgery nature (elective or emergency) (Fernandes et al., 2010).

The **American Society of Anesthesiologists** classification of patients who will undergo surgical procedures has become an important tool to ensure safety (Schwartzman et al., 2011), and must be included on the animal's physical state description, thus minimizing possible complications during the surgical and anesthetic procedures, making more efficient the real prognosis of the patient (Luz et al., 2012).

The aim of this paper was to review the surgical procedures done in dogs over a two-year interval at a Teaching Veterinary Clinic, as well as classify these patients according to their anesthetic risk.
2 MATERIAL AND METHODS

This study retrospectively reviewed a total of 904 medical records of dogs that underwent surgical and anesthetic procedures at a Teaching Veterinary Clinic during a two-year interval.

After checking the patient's medical records, data about age, weight, physical exam findings, changes in hematological and biochemical tests and type of procedure performed were recorded. Subsequently, the classification based on physical status and anesthetic risks was made according to the American Society of Anesthesiologists (ASA, 2020) (Table 1).

<table>
<thead>
<tr>
<th>Risk and patient condition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASA I – normally healthy patients</td>
<td>No known disease. Elective procedures.</td>
</tr>
<tr>
<td>ASA II - Healthy; localized disease, no systemic signs</td>
<td>Patellar dislocation, cutaneous neoplasia, fracture without shock, uncomplicated hernia, cryptorchidectomy, localized infection or compensated cardiac disease.</td>
</tr>
<tr>
<td>ASA III - Moderate systemic signs that limits the function</td>
<td>Pneumonia, fever, dehydration, anemia, heart murmurs.</td>
</tr>
<tr>
<td>ASA IV - Life threatening systemic disease</td>
<td>Heart, kidney or liver failure, severe hemorrhage or dehydration, cardiac failure.</td>
</tr>
<tr>
<td>ASA V – Moribund patient, not expected to live for more than 24 hours with or without surgery</td>
<td>Endotoxic shock, severe trauma</td>
</tr>
</tbody>
</table>


3 RESULTS AND DISCUSSION

During a two-year interval, 904 dogs underwent surgical procedures at a Teaching Veterinary Clinic (CEV). However, 94 medical records were excluded due to lack of data. Therefore, 810 medical records from dogs that underwent surgical procedures were analyzed. Consequently, an average of 33 surgeries was performed on dogs monthly during the period analyzed (two years). In a series registered at a veterinary service in São
Paulo, the number of surgical procedures in dogs was higher, with an average of approximately 67 cases per month (Cruz-Pinto et al., 2015). In a survey carried out in Teresina (state of Piauí), the number of monthly surgical procedures in dogs had an average of 34 procedures (Rodrigues et al., 2019), a rate very similar to the study in question.

Regarding the ASA classification, the results are summarized in figure 1, with 166 ASA I patients (20.49%; 166/810), 212 ASA II animals (26.17%; 212/810), 320 ASA III dogs (39.50%; 320/810), 91 ASA IV (11.23%; 91/810) and 21 ASA V (2.59%; 21/810) (Figure 1). These results are similar to other studies in dogs, where the ASA III patients are the majority (Rodrigues et al., 2018). However, in a survey with a smaller number of animals, dogs classified as ASA I prevailed, but this was related to a bigger number of elective neutering (Soares et al., 2022).

![Figure 1. Classification of dogs regarding anesthetic risk according to the American Society of Anesthesiologists (ASA) in a Teaching Veterinary Clinic (n=810).](image_url)

Source: the author.

Of the total number of dogs included in the study (810), 16 deaths occurred (Table 2), representing 1.97% of anesthetic-surgical mortality. This rate is similar to that found by other authors who studied anesthetic-surgical mortality in dogs (Rodrigues et al.,...
2018). It's important to highlight that deaths occurred from the ASA III category (Table 2) as seen in another study (Rodrigues et al., 2018).

<table>
<thead>
<tr>
<th>ASA</th>
<th>Number of patients</th>
<th>Number of deaths</th>
<th>Percentage of deaths %</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASA I</td>
<td>166</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>ASA II</td>
<td>212</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>ASA III</td>
<td>320</td>
<td>6</td>
<td>1.87</td>
</tr>
<tr>
<td>ASA IV</td>
<td>91</td>
<td>6</td>
<td>6.59</td>
</tr>
<tr>
<td>ASA V</td>
<td>21</td>
<td>4</td>
<td>19.04</td>
</tr>
<tr>
<td>TOTAL</td>
<td>810</td>
<td>16</td>
<td>1.97</td>
</tr>
</tbody>
</table>

Source: the author.

At this veterinary service, 166 dogs were classified as ASA I category (Figure 1), accounting for 20.49% of total patients. In one study with 243 dogs in a Teaching Hospital, the percentage of animals classified as ASA I was 15.64% (Rodrigues et al., 2018), therefore, lower than what was recorded here, but with a rate close to that obtained.

All patients classified as ASA I underwent elective procedures and there were no deaths (Table 2). Similar findings were observed in other studies (Rodrigues et al., 2018; Soares et al., 2022). In animals under this category, death is not common, since ASA I patients have a good prognosis (Shmon, 2007).

In ASA II category, 212 animals were classified, representing 26.17% patients. In a study carried out in Piauí state (Brazil), the amount of ASA II animals was similar with 22.63% of cases (Rodrigues et al., 2018). Patients belonging to the ASA II category are clinically stable, with localized or mild systemic illness (ASA, 2020). Geriatric patients, over seven or eight years old (Grubb et al., 2017) who underwent elective surgeries also fall into ASA II category (Rodrigues et al., 2017). Therefore, in this study, nine elective ovariohysterectomy (OH) and six orchiectomies in elderly patients were classified as ASA II. There were no deaths in this category (Table 2), data similar to other studies on the same species (Rodrigues et al., 2018).

There were 320 patients classified as ASA III (39.50%). The incidence of patients in this category resembles literature data on dog health services (Rodrigues et al., 2018). ASA III patients were included in this category due to the changes produced by the
disease that led to surgery being indicated. Besides, most of it had abnormalities in the complementary exams. Changes in complementary exams are widely used as tools to classify and evaluate patients undergoing anesthesia (ASA, 2020; Rodrigues et al., 2018). Among the animals in this classification (ASA III) included in this study, six deaths occurred (1.87%; 6/320) (Table 2). This rate is higher than that observed in literature (Luz et. al., 2012; Rodrigues et al., 2018). Probably, such differences are related to the number of patients. In the study presented here, 320 animals were included in category ASA III while in another study patients in this category had a minor number of animals included (104 animals) (Rodrigues et al., 2018).

In the ASA IV category, 91 animals (11.23%) were included. This rate was similar to studies in dogs conducted in another veterinary service (Rodrigues et al., 2018). In comparison to the ASA III category, the rate of ASA IV patients is lower, because animals with serious clinical disturbances that oblige the anesthetist to place them in this category are only subjected to surgical procedures if this is absolutely necessary. Otherwise, it’s important to take measures and actions that improve the patient’s condition and, consequently, reduce the ASA classification. In summary, ASA IV patients only undergo a surgical procedure in emergency cases. Corroborating this affirmation, it was identified that all patients in this category had abnormalities in laboratory exams, mostly in hematological tests. Beyond that, the most frequent surgery in this category was therapeutic ovariohysterectomy due to pyometra, and animals in this condition were referred to the surgical procedure on an emergency basis. In a study performed at Piauí state there were two deaths in bitches with pyometra and classified as ASA IV patients. The authors attribute as probable cause of death the severity of the illness itself (Rodrigues et al., 2018). This disease has a high risk of endotoxemia and renal impairment (Evangelista et al., 2010), with high mortality (Ferreira et al., 2010). Among the animals included in the ASA IV category, there were six deaths (6.59%, 6/91) (Table 2). This mortality rate is higher than that recorded in Brazilian studies with dogs (Rodrigues et al., 2018). It is likely that this difference is related to the number of patients studied. In the studies cited, the number of animals classified as ASA IV was 63 and in the study presented here there were 91 animals.
Patients who fall into the ASA V category, who are at risk of dying with or without surgery (ASA, 2020) corresponded to 2.59% of animals undergoing surgery. There were four deaths in the group of animals included in this category (19.04%; 4/21) (Table 2). In a study with dogs, the mortality rate in this category was 100%. However, only two animals were included in this classification (ASA V) (Rodrigues et al.), making comparisons with the present study impossible.

Regarding the surgical procedures performed, most surgeries involved the genital system (Table 3), corresponding to 34.67% of cases (281/810). This genital system predominance is related to the number of ovariomyectomy (OH) carried out during the study. This procedure was carried out on 214 bitches, representing 26.41% of the total surgical procedures performed in two years. In several studies about dog surgical casuistry in Brazil, ovariomyectomies are the majority (Ataíde et al., 2020; Reis et al., 2018; Rodrigues et al., 2018; Rodrigues et al., 2019; Soares et al., 2022). In the present study, OH was more frequent than orchiectomies. Published papers in Brazil showed that females are the majority in castration projects and campaigns (Carvalho et al., 2007; Catapan et al., 2014; Silva et al., 2017). Probably the owner’s preference for neutering females comes from the fact that males do not return home with unwanted offspring (Quessada et al., 2014).

Table 3. Casuistry of surgical procedures performed on dogs at Teaching Veterinary Clinic, over two years (n=810).

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>PROCEDURE</th>
<th>NUMBER</th>
<th>PERCENTAGE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genital</td>
<td>Elective Ovariomyectomy (OH)</td>
<td>140</td>
<td>17.28</td>
</tr>
<tr>
<td></td>
<td>Therapeutic OH (pyometra)</td>
<td>55</td>
<td>6.79</td>
</tr>
<tr>
<td></td>
<td>Elective orchiectomy</td>
<td>38</td>
<td>4.69</td>
</tr>
<tr>
<td></td>
<td>Therapeutic OH (dystocia)</td>
<td>19</td>
<td>2.34</td>
</tr>
<tr>
<td></td>
<td>Exploratory laparotomy (suspicion of remaining ovary)</td>
<td>16</td>
<td>1.97</td>
</tr>
<tr>
<td></td>
<td>Therapeutic orchiectomy</td>
<td>13</td>
<td>1.60</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>281</td>
<td>34.67</td>
</tr>
<tr>
<td>Locomotor</td>
<td>Osteosynthesis</td>
<td>114</td>
<td>14.07</td>
</tr>
<tr>
<td></td>
<td>Femoral colocephalectomy</td>
<td>32</td>
<td>3.95</td>
</tr>
<tr>
<td></td>
<td>Patella dislocation correction</td>
<td>23</td>
<td>2.83</td>
</tr>
<tr>
<td></td>
<td>Removal of orthopedic prosthesis</td>
<td>12</td>
<td>1.48</td>
</tr>
<tr>
<td></td>
<td>Tail/digit amputation</td>
<td>5</td>
<td>0.61</td>
</tr>
</tbody>
</table>
In this study, locomotor system surgeries (orthopedic) ranked second in frequency (Table 3). Orthopedic disorders correspond to nearly one third of all medical appointments in small animal routines, with fracture corrections being the main representative of orthopedic surgeries (Shiju, 2010), like seen in this study. In Brazilian veterinary services, orthopedic surgeries were also frequent (Ataíde et al., 2020; Reis et al., 2018; Rodrigues et al., 2019; Rodrigues et al., 2018; Soares et al., 2022).

The third most common surgical procedure in the service herein analyzed was mastectomy, performed on 105 patients (Table 3). Such procedure is one of the most performed surgeries in canine species in Brazil (Ataíde et al., 2020; Reis et al., 2018; Rodrigues et al., 2018; Rodrigues et al., 2019). This occurs due to high frequency of mammary gland neoplasia in bitches in the country (Honório et al., 2017; Ribas et al., 2012; Torfíbio et al., 2012).

Regarding the case number, cutaneous nodule removal with 65 cases stood out as the fourth most common surgical procedure in CEV during the two years studied. This data is similar to one study in dogs where neoplasia was considered the principal cause of skin problems in canine species (Silva et al., 2011). In a research conducted at a
University center, the authors related that oncologic surgeries were common. Probably, such surgeries included cutaneous nodule removal (Soares et al., 2022).

4 CONCLUSION

In the service analyzed, over the two-year period, the majority of cases undergoing surgery and classified according to the ASA classification were ASA III patients.

The most common surgeries were therapeutic. The main surgeries performed in dogs during this two-year period at this analyzed veterinary service were ovariohysterectomies, followed by orthopedics (mainly fracture correction) and mastectomy.
REFERENCES


