

Clinicopathological characterization of amelanotic eyelid melanoma in a mixed-breed dog (*Canis lupus familiaris*)

Caracterização clínico-patológica do melanoma amelanótico da pálpe- bra em um cão de raça mista (*Canis lupus familiaris*)

Caracterización clínico-patológica del melanoma amelanótico de pár- pado en un perro de raza mixta (*Canis lupus familiaris*)

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ABSTRACT

The dog (*Canis lupus familiaris*) is a mammal that has been domesticated by humans for thousands of years, exhibiting great morphological and behavioral diversity resulting from processes of artificial selection. Intensive genetic selection and the development of different breeds have, however, contributed to an increased predisposition to various diseases, including dermatological and neoplastic conditions. Among the oncological conditions of importance in veterinary medicine, ocular neoplasms stand out, as they can compromise the animals' vision, well-being, and quality of life. These neoplasms can be classified as primary, secondary, or multicentric and may affect the eyeball, the orbit, or their adnexa. Among these, eyelid neoplasms are common in dogs and may be benign or malignant. Melanocytic neoplasms originate from melanocytes and can be classified as melanocytomas or melanomas. Amelanotic melanoma presents particular diagnostic challenges due to the absence of pigmentation and may be histologically confused with other types of neoplasms. Therefore, the combination of histopathological examination and immunohistochemistry, using markers such as S-100 protein, melan-A, and vimentin, is important for diagnostic confirmation and establishing the prognosis. Treatment should be tailored according to the location and extent of the lesion, the patient's clinical condition, and the viability of the affected eye, and may include surgical excision, cryosurgery, electrochemotherapy, and chemotherapy. The present study aims to report a case of amelanotic eyelid melanoma in a mixed-breed dog, addressing the clinical aspects, diagnosis, surgical treatment, and histopathological evaluation, as well as discussing the importance of early diagnosis and excision of the neoplasm for local control of the disease and maintenance of the patient's quality of life.

Keywords: Dogs, Ocular Neoplasm, Amelanotic Melanoma, Eyelid, Histopathology, Immunohistochemistry.

RESUMO

O cão (*Canis lupus familiaris*) é um mamífero domesticado pelos seres humanos há milhares de anos, apresentando grande diversidade morfológica e comportamental resultante de processos de seleção artificial. A seleção genética intensiva e o desenvolvimento de diferentes raças, no entanto, contribuíram para uma maior predisposição a várias doenças,

incluindo condições dermatológicas e neoplásicas. Entre as condições oncológicas de importância na medicina veterinária, destacam-se as neoplasias oculares, pois podem comprometer a visão, o bem-estar e a qualidade de vida dos animais. Essas neoplasias podem ser classificadas como primárias, secundárias ou multicêntricas e podem afetar o globo ocular, a órbita ou seus anexos. Entre elas, as neoplasias das pálpebras são comuns em cães e podem ser benignas ou malignas. As neoplasias melanocíticas têm origem nos melanócitos e podem ser classificadas como melanocitomas ou melanomas. O melanoma amelanótico apresenta desafios diagnósticos específicos devido à ausência de pigmentação e pode ser confundido histologicamente com outros tipos de neoplasias. Portanto, a combinação do exame histopatológico com a imuno-histoquímica, utilizando marcadores como a proteína S-100, melan-A e vimentina, é importante para a confirmação do diagnóstico e para estabelecer o prognóstico. O tratamento deve ser adaptado de acordo com a localização e a extensão da lesão, o quadro clínico do paciente e a viabilidade do olho afetado, podendo incluir excisão cirúrgica, criocirurgia, eletroquimioterapia e quimioterapia. O presente estudo tem como objetivo relatar um caso de melanoma amelanótico da pálpebra em um cão de raça mista, abordando os aspectos clínicos, o diagnóstico, o tratamento cirúrgico e a avaliação histopatológica, além de discutir a importância do diagnóstico precoce e da excisão da neoplasia para o controle local da doença e a manutenção da qualidade de vida do paciente.

Palavras-chave: Cães, Neoplasia Ocular, Melanoma Amelanótico, Pálpebra, Histopatologia, Imuno-Histoquímica.

RESUMEN

El perro (*Canis lupus familiaris*) es un mamífero domesticado por el ser humano desde hace miles de años, que presenta una gran diversidad morfológica y conductual como resultado de los procesos de selección artificial. Sin embargo, la selección genética intensiva y el desarrollo de diferentes razas han contribuido a una mayor predisposición a diversas enfermedades, entre las que se incluyen afecciones dermatológicas y neoplásicas. Entre las afecciones oncológicas de importancia en medicina veterinaria, destacan las neoplasias oculares, ya que pueden comprometer la visión, el bienestar y la calidad de vida de los animales. Estas neoplasias pueden clasificarse como primarias, secundarias o multicéntricas y pueden afectar al globo ocular, a la órbita o a sus anexos. Entre ellas, las neoplasias de los párpados son frecuentes en los perros y pueden ser benignas o malignas. Las neoplasias melanocíticas se originan a partir de los melanocitos y pueden clasificarse como melanocitomas o melanomas. El melanoma amelanótico plantea dificultades diagnósticas particulares debido a la ausencia de pigmentación y puede confundirse histológicamente con otros tipos de neoplasias. Por lo tanto, la combinación del examen histopatológico y la inmunohistoquímica, utilizando marcadores como la proteína S-100, la melan-A y la vimentina, es importante para confirmar el diagnóstico y establecer el pronóstico. El tratamiento debe adaptarse en función de la localización y la extensión de la lesión, el estado clínico del paciente y la viabilidad del ojo afectado, y puede incluir la extirpación quirúrgica, la criocirugía, la electroquimioterapia y la quimioterapia. El presente estudio tiene como objetivo describir un caso de melanoma amelanótico del párpado en un perro de raza mixta, abordando los aspectos clínicos, el diagnóstico, el tratamiento quirúrgico y la evaluación histopatológica, además de analizar la importancia del diagnóstico precoz y la extirpación de la neoplasia para el control local de la enfermedad y el mantenimiento de la calidad de vida del paciente.

Palabras clave: Perros, Neoplasia Ocular, Melanoma Amelanótico, Párpado, Histopatología, Inmunohistoquímica.

1 INTRODUCTION

The dog (*Canis lupus familiaris*) is a carnivorous mammal belonging to the Canidae family and classified as a subspecies of the wolf. Considered humanity's oldest domesticated animal, researchers believe it originated from the gray wolf in Asia more than 100,000 years ago. Over time, human intervention has guided artificial selection based on abilities, temperament, and appearance. This process has resulted in the immense variety of breeds found today, which differ greatly in size and coat type and are divided into specific groups. Meanwhile, animals of undefined breed or mixed breeds are popularly known as “vira-latas” in Brazil and “rafeiros” in Portugal (Dewey and Bhagat, 2002).

According to Dias (2019), the subfamily Caninae includes the genus *Canis*, which has a wide geographic distribution and whose species produce fertile hybrids in the wild. Although Dewey and Bhagat (2002) highlight the reclassification of the dog as *Canis lupus familiaris* in 1993 due to the similarity of its mitochondrial DNA to that of the gray wolf, Dias (2019) suggests that an extinct wolf species may be the true common ancestor of both, given the extreme difficulty of domesticating modern wolves.

This evolutionary process was accelerated by human selection pressure based on pedomorphism (Dias, 2019). However, the recent breeding of dog breeds has imposed strong reproductive isolation. As Dias (2019) points out, inbreeding has resulted in hundreds of recessive genetic diseases, while drastic phenotypic changes have predisposed dogs to dystocia and respiratory problems. As Goldschmidt and Hendrick (2002) add, these changes have also dramatically increased the occurrence of structural dermatological disorders in the species.

Finally, Dias (2019) warns that communication breakdowns between humans and dogs often lead to aggressive reactions caused by ambiguous situations. Furthermore, close proximity to humans has facilitated the emergence of zoonotic diseases, given that 92% of pathogens found in domestic carnivores affect humans, highlighting a critical gap in translating effective control methodologies into public health policies.

1.1 CASE STUDY

1.1.1 Ocular neoplasms in veterinary medicine: general aspects and classification

The increase in the life expectancy of companion animals has driven up the incidence of oncological conditions in routine clinical practice, giving ocular neoplasms a prominent role in veterinary ophthalmology (Kleiner, 2022). The clinical presentation of these diseases is markedly heterogeneous. When they affect the eyeball, the orbit, or the adnexa, such lesions compromise visual acuity, periocular aesthetics, and the patient's well-being, in addition to frequently serving as sentinel signs for systemic diseases or latent metastatic foci (Miller & Teixeira, 2020; Kleiner, 2022).

In terms of etiology and anatomical progression, ocular tumors are classified as primary, secondary, or multicentric (Grahm & Peiffer, 2021; Kleiner, 2022). Primary neoplasms arise directly from the orbital structures, the adnexa, or components of the fibrous, vascular, and nervous layers of the eyeball (Wilcock & Peiffer, 1986). In turn, secondary neoplasms result from local invasion by contiguity originating in the oral and nasal cavities and salivary glands, or from hematogenous spread via distant metastasis a process facilitated by the rich vascular and lymphatic supply of the orbital region (Adkins *et al.*, 1997; Cassotis *et al.*, 1999; Miller & Dubielzig, 2013; Dubielzig, 2017). Multicentric manifestations, on the other hand, involve multiple synchronous anatomical sites, including ocular tissue (Grahm & Peiffer, 2021; Kleiner, 2022).

1.2 EYELID NEOPLASMS

Eyelid neoplasms represent the most prevalent ocular oncological conditions in dogs. They are characterized by the development of nodular formations on the upper or lower eyelids, which, due to chronic mechanical friction, lead to ocular discharge, conjunctival hyperemia, and corneal ulceration. Most present as unilateral, benign lesions with indolent growth (Krehbiel & Langham, 1975; Carlton, 1983; Aquino, 2007; Wang *et al.*, 2019; Grahm & Peiffer, 2021).

1.3 MELANOCYTIC NEOPLASMS

They arise from melanoblasts and melanocytes cells capable of producing melanin which originate in the neural ectoderm (Garma and Aviña *et al.*, 1981; Cangul, 2001; Goldschmidt & Hendrick, 2002; Smith *et al.*, 2002). In veterinary medicine, the benign form of melanocytic tumors is called a melanocytoma, and the malignant form is called a melanoma (Goldschmidt *et al.*, 1998). Both forms are considered common in dogs, and melanoma accounts for approximately 7% of the malignant neoplasms affecting the species (Garma-Aviña *et al.* 1981, Bolon *et al.* 1990, Cangul 2001, Koenig *et al.* 2001, Laprie *et al.*, 2001, Goldschmidt & Hendrick 2002, Smith *et al.* 2002). Diagnosing melanoma can be challenging, as there are varying degrees of melanin pigmentation, including cases with a complete absence of pigment (Sandusky *et al.*, 1985, Ramos-Vara *et al.* 2000, Sulaimon *et al.*, 2002). In amelanotic melanomas, the neoplastic cells do not synthesize intracellular melanin (Sulaimon *et al.*, 2002), and because of this characteristic, they can lead to a misdiagnosis, since histologically they can mimic other neoplasms, such as lymphomas, poorly differentiated carcinomas, neuroendocrine tumors, poorly differentiated sarcomas, and germ cell tumors (Ramos and Vara *et al.*, 2000; Smith *et al.*, 2002; Ohsie *et al.*, 2008).

Additionally, the biological behavior of the neoplasm does not correlate with its histological appearance in 10 to 40% of cases. Thus, relying solely on morphological diagnosis may be inappropriate (Bolon *et al.*, 1990). Some studies report that measuring mitotic activity can be an important prognostic criterion for melanomas, as it provides an estimate of the rate of cell proliferation (Cangul 2001, Laprie *et al.*, 2001).

The most accurate diagnosis in cases of amelanotic melanoma is the combination of histopathology with immunohistochemistry (IHC), since IHC confirmation is often necessary to establish the most appropriate prognosis and treatment (Ramos-Vara *et al.*, 2000, Cangul 2001, Smith *et al.*, 2002; Ohsie *et al.*, 2008).

Therefore, some studies have demonstrated the use of markers useful in differentiating melanomas from other tumors, such as vimentin, S-100 protein, and melan-A (Sandusky *et al.*, 1985; Ramos and Vara *et al.*, 2000; Koenig *et al.*, 2001; Ramos and Vara *et al.*, 2002; Smith *et al.*, 2002).

The therapeutic approach should be individualized, taking into account the histological subtype, the extent of the lesion, the visual function of the affected eye, the

patient's estimated life expectancy, and pain management, while also aligning with the owner's financial circumstances (Miller & Teixeira, 2020). Current protocols include surgical excision, cryosurgery, electrochemotherapy, systemic chemotherapy, or combined approaches (Aquino, 2007; Guimarães *et al.*, 2021).

The present study aims to report a case of amelanotic eyelid melanoma in a mixed-breed dog, describing the clinical findings, diagnosis, surgical approach, and histopathological evaluation of the neoplasm.

Additionally, it seeks to discuss the importance of early diagnosis and surgical excision as a therapeutic strategy for local control of the disease, with the aim of providing the patient with a better quality of life, well-being, and prognosis.

2 MATERIALS AND METHODS

This study is a case report of a mixed-breed dog, *Canis lupus familiaris*, male, approximately 16 years old, kept as a pet in the municipality of Peruíbe, São Paulo. The animal was referred to the Arca de Noé Veterinary Clinic in Pirassununga, SP, Brazil, after the owner noticed a swelling on the right side of the face, adjacent to the right eye.

During the initial clinical evaluation, a complete physical examination, complete blood count, serum biochemical profile, and fine-needle aspiration cytology of the lesion were performed. The cytological analysis was suggestive of melanoma; additional tests were subsequently ordered to investigate metastases and assess the local extent of the neoplasm, enabling appropriate surgical planning.

Following preoperative tests and anesthetic evaluation, the patient underwent surgery. As preanesthetic medication, acepromazine at a dose of 0.022 mg/kg and methadone at a dose of 0.2 mg/kg were administered intramuscularly. Anesthetic induction was performed with propofol, administered intravenously until the desired effect was achieved, in combination with midazolam at a dose of 0.4 mg/kg. Anesthetic maintenance was achieved with isoflurane vaporized in oxygen throughout the procedure (Cortez *et al.*, 2026).

After anesthetic stabilization, extensive trichotomy was performed on the right temporal, frontal, periocular, and auricular regions, covering both the recipient and donor sites of the skin flap. The patient was positioned in the left lateral decubitus position, with the right side facing upward. Next, the surgical field was prepared using antiseptic

measures with chlorhexidine solution, followed by the application of alcoholic chlorhexidine, in accordance with the principles of aseptic technique; sterile surgical drapes were then applied.

Excision of the tumor mass was performed using an electrosurgical scalpel, which allowed for adequate tissue dissection and hemostasis control. Larger blood vessels identified during the procedure were ligated to control bleeding. After complete removal of the neoplasm, the surgical defect was carefully measured to plan the reconstruction.

Reconstruction was performed using an axial skin flap based on the superficial temporal artery. The flap was pre-delineated according to the anatomical landmarks of the vascular pedicle, prepared caudally to the zygomatic arch, and carefully dissected while preserving the superficial temporal artery and the flap's blood supply. After elevation, the flap was rotated over the recipient site, providing complete coverage of the surgical defect, adequate tissue perfusion, and minimal tension on the wound edges.

Tissue approximation was performed in anatomical planes using monofilament nylon suture, with 2-0 nylon for the sutures providing the greatest support to the flap and 3-0 nylon for dermal suturing using a simple interrupted pattern, ensuring adequate tissue approximation and stability of the reconstruction. At the end of the procedure, adequate perfusion of the flap was observed; the surgical wound was cleaned, and the surgical site was protected with a sterile dressing.

The surgical specimen was sent for histopathological examination, which confirmed the diagnosis of grade II melanoma, revealing involvement of the surgical margins.

2.1 MACROSCOPIC EXAMINATION

The examination was performed according to the FOR-ANA protocol—Histopathological Examination with Routine Staining HE (86) Version 00 Approved by DT Aug. 2016.

Facial region: an ulcerated cutaneous nodular lesion measuring 4.0 x 3.0 x 1.0 cm. The inner surface was brownish with blackened areas, soft, and irregular.

2.2 MICROSCOPY

Tissue fragments showing a malignant neoplasm invading the superficial and deep dermis, characterized by organoid arrangements sometimes solid and cohesive of epithelioid to fusiform cells, with large nuclei, prominent nucleoli, and numerous mitoses (13 figures in 2.37 mm²) and cytoplasm with indistinct borders. Collagenous stroma. Presence of extensive central necrosis.

2.3 DIAGNOSIS

Malignant neoplasm composed of epithelioid to fusiform cells, morphologically suggestive of amelanotic melanoma.

The research project was submitted to and approved by the Ethics Committee of the Institute of Marine Biology and Environment (IBIMM) at a meeting held on March 12, 2026, under protocol No. 0038/26.

3 RESULTS

Animal before the onset of the tumor (Figure 1).

Figure 1 Image of a domestic dog (mixed breed) *Canis lupus domesticus*.

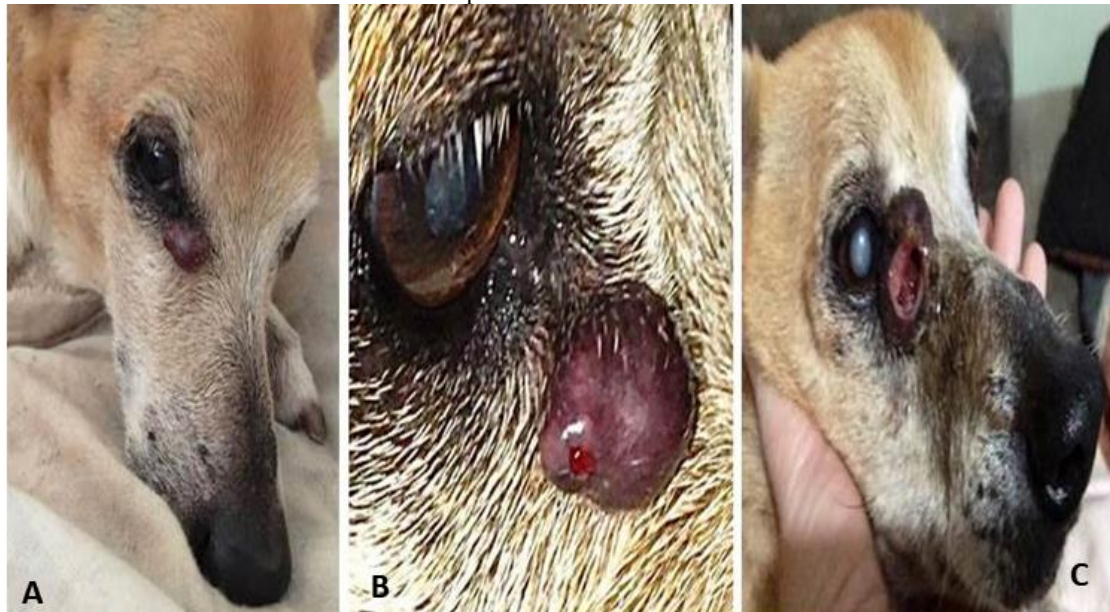


Source: Prepared by the authors (2026).

In (Figure 2), we can observe the emergence of a nodule in the right eye through various stages of progression, with accelerated growth. Figure 2A shows the initial stage of the tumor; Figure 2B shows the tumor at 60 days with accelerated growth; and Figure

2C shows an advanced stage with deepening and rupture of the tumor, revealing the typical pink coloration of amelanotic melanoma.

Figure 2 Stages of tumor progression (amelanotic melanoma) following initial onset: Figure 2A shows the initial stage; Figure 2B shows accelerated growth at 60 days; and Figure 2C shows an advanced stage with rupture of the nodule.



Source: Prepared by the authors (2026).

In (Figure 3), we can observe the rapid growth and progression of the tumor.

Figure 3 Tumour progression 90 days after the onset of the tumor (amelanotic melanoma), showing tumor involvement and a well-developed nodule.



Source: Prepared by the authors (2026).

The animal was sedated for removal of the nodule (Figure 4). The procedures were performed under general inhalation anesthesia, with safety margins of 3 cm around the lesion.

Figure 4 Animal sedated for surgical procedures and removal of the nodule (amelanotic melanoma). Source: Prepared by the authors (2026). Figure 4A shows surgical preparation; Figure 4B shows the sedation process; and Figure 4C shows the tumor removal procedure and preparation for skin grafting.



Source: Prepared by the authors (2026).

In (Figure 5), we can observe the process of epidermal reconstruction, with sutures and repair of functional tissue via skin grafting.

Figure 5 Reconstruction of the skin layer via grafting after tumor removal.



Source: Prepared by the authors (2026).

In Figure 6, we can already see the patient's rapid recovery and advanced healing process 15 days after surgery.

Figure 6 Removal of sutures and initial therapy.



Source: Prepared by the authors (2026).

4 DISCUSSION

Melanomas are neoplasms originating from melanocytes and can be classified as melanocytomas, which are generally benign, and melanomas, which are characterized by malignant behavior. The amelanotic form is characterized by the absence or scarcity of

melanin in the neoplastic cells, making clinical and histopathological recognition difficult. These lesions may appear pink, whitish, or reddish in color and, consequently, may be mistaken for carcinomas, sarcomas, or other neoplasms composed of spindle-shaped and epithelioid cells. The difficulty in identifying these tumors is primarily related to the absence of pigment, making it necessary to use complementary methods for diagnostic confirmation (Sandusky *et al.*, 1985; Smith *et al.*, 2002; Choi & Kusewitt, 2003).

Eyelid neoplasms are common in routine veterinary ophthalmology, especially in elderly dogs, and exhibit variable biological behavior, ranging from benign to malignant lesions with varying degrees of invasiveness. Among the neoplasms affecting the ocular region and its adnexa, melanocytic tumors are of clinical importance due to their potential for growth, local recurrence, and, in certain cases, metastatic spread (Wilcock *et al.*, 1986; Dubielzig, 2017; Wang & Kern, 2015). Although eyelid melanomas are less common than other epithelial neoplasms of the region, their biological behavior warrants diagnostic investigation and clinical follow-up of patients.

In cases of amelanotic melanoma, histopathological evaluation may have limitations, since the absence of pigment makes it difficult to identify the melanocytic origin. Thus, the combination of histopathology and immunohistochemistry is of great importance in differentiating these neoplasms from other morphologically similar tumors. Markers such as S-100, Melan-A, and PNL2 have proven useful in identifying melanocytic neoplasms, and different immunohistochemical panels can be employed depending on the morphological characteristics of the lesion and the differential diagnoses under consideration (Sandusky *et al.*, 1985; Koenig *et al.*, 2001; Choi & Kusewitt, 2003; Giudice *et al.*, 2010). Thus, the use of these markers can contribute to establishing a definitive diagnosis, especially in cases where melanin pigmentation is absent or barely evident.

In addition to confirming the melanocytic origin, the evaluation of histological characteristics and proliferative activity is important for determining biological behavior and prognosis. Studies have demonstrated an association between parameters such as mitotic activity, degree of differentiation, and other histological characteristics and the behavior of melanocytic neoplasms in dogs (Bolon *et al.*, 1990; Laprie *et al.*, 2001; Millanta *et al.*, 2002). Thus, a detailed histopathological analysis of the lesion is a fundamental step in prognostic evaluation and in determining the clinical management.

Early diagnosis and surgical excision with adequate margins are important strategies for managing eyelid melanocytic tumors. Complete removal of the lesion aims to reduce the likelihood of persistence and local recurrence, while preserving, whenever possible, eyelid function and the patient's quality of life. Histopathological evaluation of the excised tissue is essential for diagnostic confirmation and for analyzing the surgical margins. In cases of incomplete resection or when the tumor exhibits more aggressive biological behavior, adjunctive therapies may be considered, depending on the lesion's location, clinical staging, and the presence of metastases (Wang & Kern, 2015; Withrow *et al.*, 2020).

The prognosis of melanocytic neoplasms is related to various characteristics, including histological subtype, degree of cellular differentiation, proliferative activity, extent of local invasion, and the presence of clear surgical margins. Smedley *et al.* (2011) highlight the importance of vari , histopathological, and molecular parameters in the prognostic evaluation of canine melanocytic neoplasms. Similarly, consensus recommendations for the histological classification of ocular melanocytic neoplasms reinforce the need to standardize diagnostic criteria to improve the characterization of the behavior of these lesions (Smedley *et al.*, 2018).

In the present case, despite clinical recovery following the surgical procedure, the occurrence of early recurrence suggests a biologically more aggressive behavior of the neoplasm, reinforcing the importance of periodic clinical follow-up. Recurrence following excision highlights the need for continuous patient monitoring, particularly through ophthalmological evaluations and additional imaging studies when clinically indicated. Such follow-up enables the early identification of recurrent changes or possible metastases and allows for the implementation of additional therapeutic measures based on the progression of the condition.

Thus, the present case highlights the importance of early diagnosis, histopathological evaluation, and, when necessary, immunohistochemistry for the proper characterization of amelanotic eyelid melanoma. The surgical approach, combined with continuous clinical follow-up, constitutes a fundamental strategy for disease control, enabling the early identification of possible recurrences and contributing to the maintenance of the patient's quality of life and survival.

5 CONCLUSION

Amelanotic eyelid melanoma in dogs is a rare malignant melanocytic neoplasm and poses a significant diagnostic challenge due to the absence or scarcity of pigmentation, a characteristic that can make it difficult to differentiate from other neoplasms. In such cases, histopathological evaluation plays a fundamental role and may be supplemented by immunohistochemistry to confirm the melanocytic origin of the lesion.

In the present case, histopathological examination revealed a malignant neoplasm composed of epithelioid and spindle-shaped cells, morphologically suggestive of amelanotic melanoma. Surgical excision was performed as the initial treatment, resulting in satisfactory postoperative recovery. However, the occurrence of local recurrence after two months indicated biologically aggressive behavior, leading to the subsequent use of electrochemotherapy as adjuvant therapy. The absence of a response to the adjunctive treatment and the subsequent progression to death demonstrate the complexity of managing this neoplasm and the possibility of an unfavorable outcome in certain patients.

The occurrence of early recurrence reinforces the importance of evaluating histopathological characteristics, surgical margins, and periodic clinical follow-up, since histological and proliferative parameters may be related to the biological behavior of canine melanocytic neoplasms. Thus, early diagnosis, an appropriate surgical approach, and continuous monitoring are essential for disease control and for making therapeutic decisions in the face of possible recurrences.

Finally, this report contributes to the understanding of the clinical, diagnostic, and therapeutic characteristics of amelanotic eyelid melanoma in dogs, highlighting the importance of integrating clinical and histopathological findings to determine the most appropriate course of action. The description of early recurrence and the lack of response to adjuvant therapy also highlights the need for individualized follow-up and the exploration of alternative therapies in patients with aggressive neoplastic behavior, and suggests greater involvement of pet owners in animal welfare.

Further studies are needed to better understand these findings; however, due to the limited number of cases brought to veterinary clinics by pet owners, this poses a challenge, as patients are often not referred as suggested and do not continue with the recommended treatment.

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