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CASE REPORT

Retrobulbar Sarcoma in a Poodle Dog: Diagnosis and Surgical Management

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A B S T R A C T

Most neoplasms located in the posterior part of the eyeball pose a serious diagnostic challenge. An early diagnose and appropriate treatment of such neoplasms is crucial for the successful outcome, reflected in the survival of the affected animal. The present clinical case describes an 11-year-old male Poodle dog presented with blepharospasm, epiphora and progressive ocular irritation in the right eye, accompanied by pain, inflammation and proptosis of the ocular globe. The dog had a history of having received treatment for conjunctivitis with ophthalmic antibiotics without any improvement. Ophthalmologic examination of the dog revealed unilateral proptosis of the ocular globe with ventrolateral deviation, conjunctivitis, erythema, partial vision loss, elevated intraocular pressure and pain upon palpation. Computed Tomography imaging revealed a 5.11cm² solid retrobulbar mass affecting the optic nerve without compromising the orbital socket. Histopathological and the immunohistochemistry test for vimentin examination confirmed the presence of Grade II retrobulbar sarcoma. The Ki-67 marker was below 30%, which indicated a favorable prognosis for the survival of the dog. Exenteration proved to be the appropriate treatment, with a successful post-operative outcome and no recurrence was observed during seven months of follow-up, ensuring a prolonged quality of life for the affected dog.

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INTRODUCTION

Most neoplasms located in the posterior part of the eyeball pose a serious diagnostic challenge. An early diagnose and appropriate treatment of such neoplasms is crucial for the successful outcome, reflected in the survival of the affected animal. Depending on the tumor type and the involvement of vital structures, such as the optic nerve and soft tissues, the consequences may extend beyond irreversible loss of vision to the complete and irreversible loss of the eyeball itself, as exenteration of the eyeball is often required.

Retrobulbar sarcoma and its variants, such as osteosarcomas, fusocellular sarcomas and rhabdomyosarcomas, are among the most aggressive tumors characterized by their complexity and invasive growth. These tumors compromise vital ocular anatomical structures, as well as adjacent tissues (Labelle and Labelle, 2013). The presence and incidence of these tumors are influenced by risk factors such as age and breed of the animal. Older dogs, with an average age of 9.5 years, are the most often affected, although its occurrence in younger animals cannot be ruled out (Miller and Dubielzig, 2013). There is also a breed predisposition, with the most susceptible breeds being the Irish Setter, Ibizan Hound, Belgian Shepherd, Catalan Sheepdog, Miniature Schnauzer, German Pointer, Fox Terrier and Doberman (Boixeda *et al.*, 2002).

Procedures such as ultrasound examination and radiology are mostly used to establish an accurate diagnosis of retrobulbar sarcoma. However, advanced imaging techniques, such as Multi-slice Computed

Tomography (CT) and Magnetic Resonance Imaging (MRI), are considered crucial, since these techniques have been proved to provide better precision and clarity in determining the condition of the tumor, its relationship with surrounding structures, and differentiating it from common conditions found in the same area, such as glaucoma or chronic conjunctivitis (Attali-Soussay *et al.*, 2001).

Some previous clinical reports have confirmed that clinical signs of a retrobulbar ocular tumor are observed only when it has reached an advanced stage (McLellan and Bartoe, 2021). Clinical examination of animals affected by such tumors frequently reveals issues such as exophthalmos, strabismus, increased intraocular pressure (IOP), and evident vision loss, indicating that the tumor has finally affected the optic nerve (Attali-Soussay *et al.*, 2001). An early diagnosis of the tumor is crucial for initiating effective treatment, as conservative medical treatments are ineffective in improving quality of life. Therefore, application of radical surgical methods appears necessary to save the life of the affected animal.

Selection of a suitable surgical technique depends on the location and size of the tumor, extent of the involvement of adjacent structures, and, in most cases, the surgeon's experience. Mostly, orbitectomy or exenteration is recommended for invasive and extensive tumors to ensure complete removal of the affected tissue (Dent *et al.*, 2019). Aim of the present study was to provide a comprehensive description of the clinical signs, imaging (CT) features, histopathological and immunohistochemical characteristics of orbital sarcoma in a Poodle dog. The main goal was to assess the severity of the condition and to determine the appropriate course of treatment.

Case history: An adult, non-neutered male dog of Poodle breed, aged around 11 years, and showing initial signs of discomfort in the right eyeball, evidenced by occasional rubbing of the head against the floor and with the limbs, was presented at the Cuatro Patas Veterinary Clinic, Huánuco, Perú. There was no history of traumatic injuries to the affected area of the dog. Additionally, the owner reported to have observed conjunctival redness and eye swelling two months earlier, which became progressively more evident over time. The dog had previously received treatment for glaucoma and ocular antibiotics, but no improvement was noted.

Clinical examination: Upon inspection, conjunctivitis, erythema, moderate unilateral proptosis of the right eye (Fig. 1A), with a certain ventrolateral deviation of the right eyeball, protrusion of the third eyelid and slight divergent strabismus (Fig. 1B) were noted. A 3D CT scan showing the proptosis in the right eye is also presented in Fig. 1C. Partial vision loss was observed during threat testing with the contralateral eye closed. No structural abnormalities were detected in the lens or cornea, and the optic discs appeared unremarkable. Intraocular pressure (IOP) was elevated (32mmHg), measured using a Riester Schiötz tonometer, model 5112.

Initial diagnosis: Considering the ocular protrusion, a cranial radiographic examination was performed but it did not reveal any significant finding. A subsequent coronal section of CT scan identified a retrobulbar mass rounded in shape and solid in consistency, measuring 5.11cm² (Fig. 2A). Transverse section of the CT scan showed an ovoid mass with a major diameter of 2.94cm and a minor diameter of 2.25cm (Fig. 2B). The tumor was located in the dorsal portion of the ocular globe, in proximity to the optic nerve, but did not involve adjacent bone structures. The 3D image of the bony structures showing the position of the affected eye is also presented in Fig. 2C.

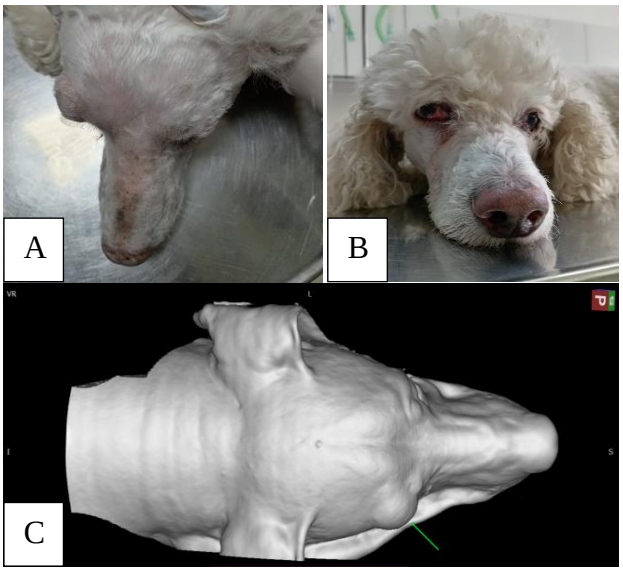

Fig. 1: Showing A: The evident proptosis of the right eye; B: Protrusion of the third eyelid and slight divergent strabismus; and C: 3D CT scan with skin between preset. The green arrow indicates the proptosis in the right eye.

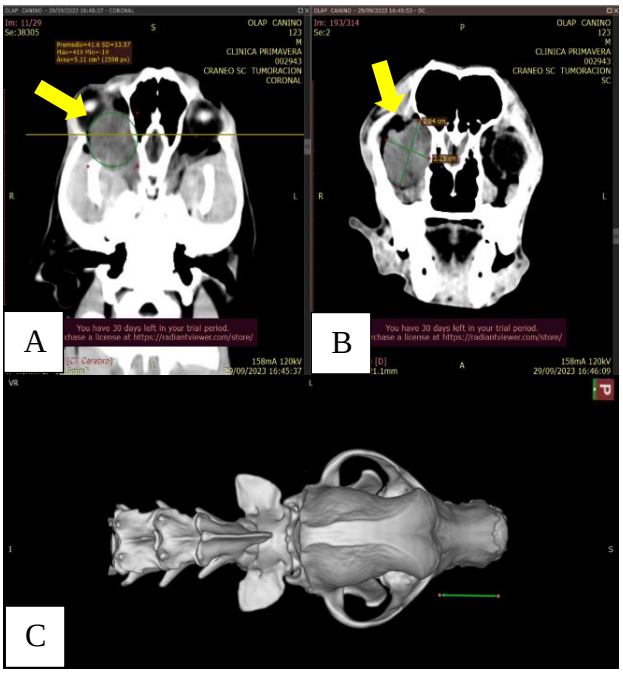

Fig. 2: Showing A: Coronal section of the CT image with a circular retrobulbar mass (arrowhead) measuring 5.11cm². Yellow line indicates the correlation line; B: Transverse section of the CT scan showing an ovoid mass (arrowhead) with a major diameter of 2.94cm and a minor diameter of 2.25cm; C: 3D image of the bony structures with 3D Angio preset. The green arrow indicates the position of the affected eye.

Confirmatory diagnosis: Following exenteration of the ocular globe and tumor, histopathological analysis confirmed a nodular neoformation with infiltrative growth accompanied by numerous pleomorphic mesenchymal cells, interspersed with small lymphocytes. The majority of the mesenchymal cells exhibited spindle cell morphology, with variations in cytoplasmic and nuclear features (Fig. 3A). Mitotic activity ranged from 0 to 2 per field. Immunohistochemical analysis using the Ki-67 marker (FLEX Monoclonal Mouse Anti-Human Ki-67 Antigen Clone MIB-1, Dako Omnis, Catalog No. GA626) assessed tumor cell proliferation, aiding in prognosis determination (Brigandí *et al.*, 2024). Results showed 21 Ki-67-positive cells per 100 examined (Fig. 3B), below the 37% threshold that indicates a high proliferation index (Miller *et al.*, 2018). Likewise, the immunohistochemistry test with Vimentin antibody (Monoclonal cloned at a 1:100 dilution, manufactured by Dako) was strongly positive for the antibody, confirming the presence of an undifferentiated mesenchymal neoplasm (Fig. 3C) compatible with grade II ocular sarcoma (Ettinger *et al.*, 2006).

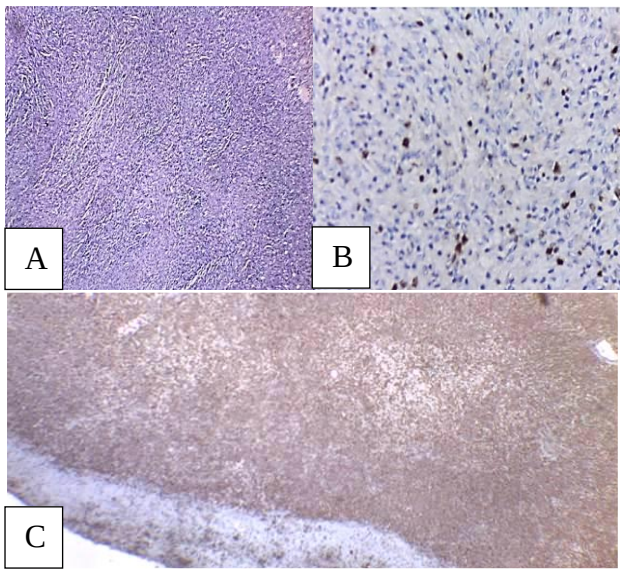

Fig. 3: Showing A: Nodular neoformation with infiltrative growth, composed of pleomorphic mesenchymal cells. The cells are mostly spindle-shaped, varying to polygonal; B: Immunohistochemical staining for Ki-67, showing 21 reactions in 100 cells (<37), dilution 1:50; C: Undifferentiated mesenchymal neoplasm (sarcoma) strongly positive for Vimentin.

Treatment: Based on clinical and imaging findings, surgical intervention was performed. Exenteration of the ocular globe was selected due to tumor location and involvement of surrounding soft tissues. The trans-palpebral approach facilitated complete excision, including the tumor, lacrimal gland, third eyelid, and affected optic nerve segment. Preoperative assessments included hematological and biochemical tests to evaluate anesthetic risk. Postoperative care consisted of analgesia with Tramadol (Richmond-Grand Bourg, Buenos Aires, Argentina) 2mg/kg/12h IV for one day, anti-inflammatory therapy with Meloxicam (Lab. Marethfarm SA Lima 29, Peru) 0.3mg/kg IM for 3-4 days orally, and a 7-day course of antibiotics (Cephalexin, Zoovet CP 3000-Ciudad de Santa Fe, Argentina) 20mg/kg IM for 3 days, then orally for 4 days. Sutures were removed on day 12, and no tumor recurrence was noted over seven months of follow-up period.

DISCUSSION

Retrobulbar tumors are uncommon in dogs but pose serious diagnostic and therapeutic challenges due to their deep orbital location and progressive, insidious nature. Early-stage diagnosis is difficult, and by the time clinical signs such as exophthalmos and ocular deviation appear (Attali-Soussay *et al.*, 2001), the pathology has often advanced to involve vital structures, including the optic nerve and ocular globe (Song *et al.*, 2020). As mentioned by Spiess and Pot (2013), an early diagnosis of an orbital tumor is crucial for implementing timely treatment, as it remarkably improves the prognosis and quality of life of the affected dog.

In the case under report, histopathological analysis of the tumor mass and the immunohistochemistry test with Vimentin antibody confirmed a grade II ocular sarcoma with pleomorphic mesenchymal cells and a low proliferation index, suggesting moderate differentiation. Retrobulbar sarcomas typically exhibit infiltrative growth, complicating management (Ettinger *et al.*, 2006). The Ki-67 proliferation index (Brigandí *et al.*, 2024) further helped in assessment of prognosis and treatment planning.

The decision to use advanced imaging techniques such as CT imaging was essential not only to determine the presence of the tumor but also to assess its extent in terms of area and diameter, as well as the involvement of periocular structures. The presence of a solid mass affecting the dorsal portion of the eyeball and the vicinity of the optic nerve, without compromising the bony structure of the eye socket, was crucial in opting for a radical surgery such as ocular exenteration instead of a lateral orbitectomy. In addition, this technique is recommended when the tumor exhibits such signs and symptoms as facial asymmetry, progressive swelling ventral to the eye, and exophthalmos (Dent *et al.*, 2019), and by removing it completely, the survival prognosis of the affected animal is more favorable. However, postoperative follow-up must be necessary while monitoring the potential recurrence of the tumor. Nevertheless, after seven months post-surgery, no recurrence of the tumor was observed, suggesting that the removal of the Grade II ocular sarcoma through exenteration was the correct decision.

In conclusion, an early diagnosis of Grade II ocular sarcoma through the use of advanced imaging techniques such as CT imaging, which accurately details the presence, position, size, and characteristics of ocular tumors, along with the Ki-67 test via immunohistochemistry to determine its stage, is crucial in deciding the appropriate action for effective management of the tumor. These factors were key for us when opting for exenteration, ultimately benefiting survival of the affected dog and improving its quality of life.

Conflict of interest: The authors declare no conflict of interest.

Authors contribution: GV was the primary physician, while RV and MS supervised the study. MC and PR performed the clinical diagnosis and interpreted the computed tomography findings. GV, RJ, and AP

conducted the surgery for biopsy. All authors participated in the drafting of the manuscript, while MP drafted the final manuscript.

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