







A rare retrobulbar and chiasmal meningioma in a dog

Graciane Aiello¹ Angel Ripplinger¹  Marcelo Luís Schwab¹  Dênis Antonio Ferrarin¹ 
 Júlia da Silva Rauber² Walter Cardozo Areco¹ Mariana Martins Flores³ Alexandre Mazzanti^{4*} 

¹Programa de Pós-Graduação em Medicina Veterinária, Centro de Ciências Rurais (CCR), Universidade Federal de Santa Maria (UFSM), Santa Maria, RS, Brasil.

²Curso de Medicina Veterinária, Centro de Ciências Rurais (CCR), Universidade Federal de Santa Maria (UFSM), Santa Maria, RS, Brasil.

³Departamento de Patologia, Centro de Ciências da Saúde (CCS), Universidade Federal de Santa Maria (UFSM), Santa Maria, RS, Brasil.

⁴Serviço de Neurologia e Neurocirurgia, Hospital Veterinário Universitário (HVU), Departamento de Clínica de Pequenos Animais, Universidade Federal de Santa Maria (UFSM), 97105-900, Santa Maria, RS, Brasil. E-mail: alexamazza@yahoo.com.br. *Corresponding author.

ABSTRACT: A 14-year-old female Dachshund was referred to a veterinary hospital with a history and signalment of head pressing, compulsive walking, and right circling. At ophthalmologic examination, a mature cataract and absence of photomotor reflex in the right eye were observed. The neurological exam revealed multifocal encephalic signs. At necropsy, a conical solid tan mass was observed involving the right optic nerve throughout its extension to the optic chiasm. Histopathological findings confirmed a retrobulbar papillary meningioma, considered rare and seldom included as differential diagnosis in patients with neurological signs.

Key words: ocular neoplasm, papillary meningioma, central nervous system, canine.

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RESUMO: Uma fêmea Dachshund de 14 anos de idade foi encaminhada para um hospital veterinário universitário com histórico e manifestação de "head pressing", andar compulsivo e em círculos para o lado direito. No exame oftalmológico foi diagnosticado catarata madura bilateral e ausência de reflexo fotomotor pupilar no olho direito. O exame neurológico revelou sinais encefálicos multifocais. Na necropsia, uma massa sólida cônica, branco-amarelada, foi observada envolvendo o nervo óptico em toda a sua extensão até o quiasma óptico. O exame histopatológico confirmou diagnóstico de meningioma papilar retrobulbar, considerado raro e pouco incluído no diagnóstico diferencial de pacientes com sinais neurológicos.

Palavras-chave: neoplasma ocular, meningioma papilar, sistema nervosa central, canino.

Meningiomas are the most common central nervous system (CNS) neoplasms in dogs (SNYDER et al., 2006). Retrobulbar meningiomas may be originated from a secondary extension of an intracranial neoplasm through the optic nerve or as a primary orbital tumor, from the arachnoid cells of the intraorbital optic nerve sheath (CHOW & MILES, 1991). Clinical signs can include exophthalmos, orbital edema, and ocular bulb prolapse. The fundus may present papilledema, abnormal optic disc, retinal hemorrhage and ipsilateral blindness to the lesion (MAULDIN et al., 2000). The aim of this study was to report a rare case of optic nerve papillary meningioma in a dog with atypical clinical signs.

A 14-year-old female Dachshund, weighing 6.8 kg, was referred to a university veterinary hospital with a three months history of drowsiness, head

pressing, compulsive walking, and circling to the right side. Ophthalmologic exam revealed a mature bilateral cataract, absent direct photomotor reflex in the right eye, bilateral absent indirect reflex, and intraocular pressure within limits for the species. It was not possible to perform fundus examination due to bilateral lens opacity.

The neurological exam also revealed vestibular ataxia, ambulatory tetraparesis, normal postural reactions on the left thoracic limb and decreased postural reactions in the right thoracic and pelvic limbs, negative bilateral menace response and nasal sensation, and decrease oculocephalic reflex in both eyes. Therefore, the lesion was characterized as multifocal.

Hematological and biochemical laboratory exams were within normal limits for the species

(ROCCO, 2009). Cerebrospinal fluid tap and ultrasound exam of the ocular bulb were indicated to aid the diagnosis; however, the owner did not agree and opted for euthanasia.

At necropsy, a conical, solid tan mass with 10 cm-length was observed involving the optic nerve from the posterior aspect of the right globe to the optic chiasm. Its thickness varied from 0.5 cm (in the optic chiasm region) to 3 cm (in the remaining areas of the tumor) (Figure 1A, B, C). The optic nerve was intact and could be seen in the center of the mass (Figure 1D).

On histopathological exam, a neoplastic proliferation was surrounding the optic nerve, underlying the dura mater. It was well differentiated, circumscribed and highly cellular. At least three histological patterns were observed throughout the mass. The most prevalent was a papillary pattern (Figure 2A, 2B). The nuclei were round to oval, with loose chromatin, some with longitudinal slits in the center. Some nuclei contained intranuclear pseudo-inclusions.

The second pattern was uncommon, characterized by a meningothelial pattern (Figure 2C). These cells had indistinct boundaries, the cytoplasm was abundant and eosinophilic, and the nucleus was oval to round, with loose chromatin, some with longitudinal crevices in the center. Intranuclear pseudo-inclusions were also seen.

The third pattern was also uncommonly seen, characterized as a rhabdoid pattern (Figure 2D). Occasionally, all patterns presented areas of coagulative necrosis. Due to the predominance of the first histological pattern, this meningioma was classified as papillary. The right ocular bulb presented a focally extensive area of retinal detachment with a hypertrophy retinal pigmented epithelium. No other abnormalities were observed.

The most common reported breeds are Poodle, Samoyed, German Shepherd, Labrador Retriever, Golden Retriever, and Boxer (MAULDIN et al., 2000; STURGES et al., 2008). No report of this type of tumor was reported in the Dachshund.

Clinical signs of retrobulbar neoplasm were not present in this case, but of a multifocal

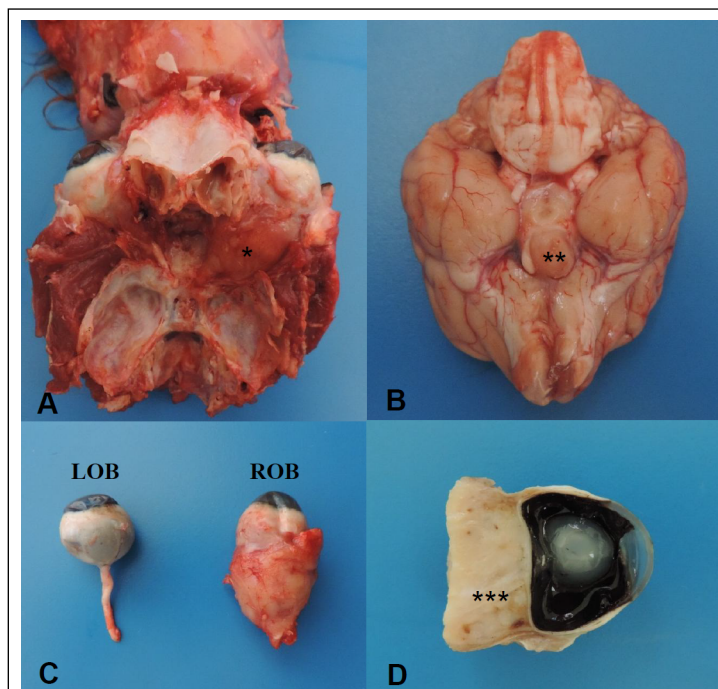


Figure 1 - Macroscopic appearance of a retrobulbar meningioma in a 14-year-old Daschshund bitch. A. Presence of a mass in the right retrobulbar region (*); B. Part of the neoplastic mass affected the optic chiasm region (**); C. Comparison between the optic nerves of the LOB and ROB. D. Longitudinal section of the right OB, evidencing the opacity of the lens (cataract) and the optic nerve (***) surrounded by the neoplasm. ROB: right ocular bulb; LOB: left ocular bulb.

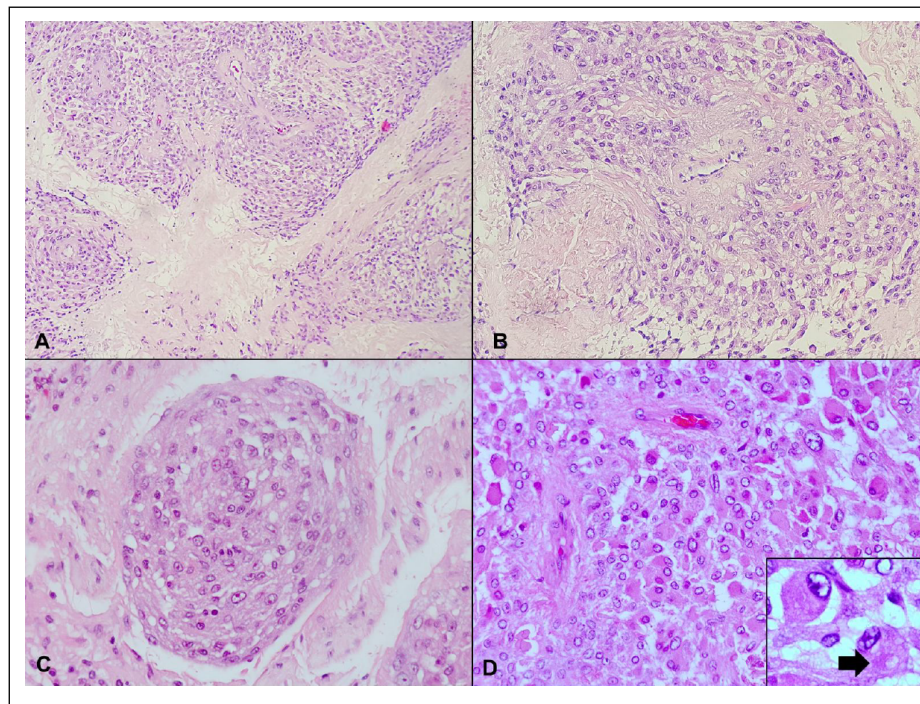


Figure 2 - Histologic appearance of a retrobulbar meningioma in a 14-year-old daschshund bitch. A, B. The predominant pattern (papillary) characterized by cells arranged in a radial pattern around vessels, mimicking pseudo rosettes (papillary pattern). Hematoxylin & Eosin (H&E), 10x (A), 20x (B). C. Areas with meningotheelial pattern had cells arranged in sheets which were separated by thin collagen septa. Cells had indistinct cell boundaries. H&E, 40x. D. Areas with rhabdoid pattern where constituted of discohesive cells arranged in loose sheets. Inset: these cells contained a large vesicular to hyperchromatic nucleus and an intracytoplasmic, paranuclear, eosinophilic, globular inclusion-like body (arrow). H&E, 20x, 100x (inset).

neurological lesion involving intracranial structures. Neurological signs of dogs with meningiomas resulted from the compression of adjacent brain structures or from direct tissue invasion (PÉREZ et al., 2005). The main hypothesis to explain these clinical signs would be an increase in intracranial pressure (mass effect); however, necropsy and histopathological findings did not confirm it. Moreover, BOUDREAU et al. (2018) verified that thalamic lesions may originate vestibular signs; although, the cause remains unknown. This may explain the findings of the present report, in which the meningioma located in the optic chiasm (thalamic region) also caused multifocal neurological signs.

The lens opacity prevented the performance of a proper fundus examination, which made it difficult to define an ante-mortem ophthalmic diagnosis. The direct pupillary photomotor reflex absence in the right eye and indirect reflex absence in both eyes can be explained by the presence of the

tumor mass extending from the adjacent ocular bulb portion to the optic chiasm (Figure 1B).

About 82% of dogs' meningiomas occur intracranially, 15% intraspinally and 2-3% affected retrobulbar sites (STURGES et al., 2008; MOTTA et al., 2012). The CNS meningiomas are well described in humans and dogs (DICKINSON et al., 2006), but retrobulbar meningiomas are less frequently explored. In a study with retrobulbar meningiomas, all tumors were caudal to the ocular bulb and in 54.5% of them, the optic nerve could not be located due to the total involvement by the mass (MAULDIN, et al., 2000).

The most common subtypes attributed to meningiomas were transitional and meningotheelial (BARNET et al., MAULDIN et al., 2000; REGAN et al., 2011; DUBIELZIG, 2002). Here, it was possible to identify three histological patterns that resemble those subtypes described in the WHO classification system (KOESTNER et al., 1999). According to the predominant cell arrangement, this tumor was classified as papillary.

In conclusion, the optic nerve meningioma described here is considered rare in dogs. In addition, the exclusively neurological signs observed were consequence of a secondary involvement of encephalic structures such as thalamus-cortex and brainstem, causing multifocal neurological signs. Therefore, even if there are only neurological signs, tumors involving the retrobulbar region must be included in the differential diagnosis, especially when it is not possible to perform fundus examination.

DECLARATION OF CONFLICT OF INTERESTS

The authors declare no conflict of interest. The founding sponsors had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results.

AUTHORS' CONTRIBUTIONS

All authors contributed equally for the conception and writing of the manuscript. All authors critically revised the manuscript and approved of the final version.

REFERENCES

- BOUDREAU, C.E. et al. Reliability of interpretation of neurologic examination findings for the localization of vestibular dysfunction in dogs. **Journal of the American Veterinary Medical Association**, v.252, n.7, p.830-838, 2018.
- CHOW, S.; MILES, J. The pathology of meningioma. In: ALMEFTY, O. ed. **Meningiomas**. New York: Raven Press, 1991, p.31-37.
- DICKINSON, P.J.; et al. Characteristics of cisternal cerebrospinal fluid associated with intracranial meningiomas in dogs: 56 cases (1985-2004). **Journal of the American Veterinary Medical Association**, v.228, p.564-567, 2006.
- DUBIELZIG, R.R. Tumors of the eye. In: MEUTEN, D.J. ed. **Tumors in domestic animals**. Ames:Iowa State Press, 2002, p.753.
- KOESTNER, A. et al. Histological classification of tumors of the nervous system of domestic animals. In: KOESTNER, A.; et al. **Histological classification of tumors of the nervous system of domestic animals WHO international classification of tumors of domestic animals**. Washington:Armed Forces Institute of Pathology, 1999, p.22.
- MAULDIN, E. et al. Canine orbital meningiomas: A review of 22 cases. **Veterinary Ophthalmology**, v.3, n.1, p.11-16, 2000.
- MOTTA, L. et al. Canine and feline intracranial meningiomas: An updated review. **Veterinary Journal**, v.192, n. 2, p.153-165, 2012.
- PÉREZ, V. et al. Orbital meningioma with a granular cell component in a dog, with extracranial metastasis. **Journal of Comparative Pathology**, v.133, p.212-217, 2005.
- REGAN, D.P. et al. Clinicopathologic findings in a dog with a retrobulbar meningioma. **Journal of Veterinary Diagnostic Investigation**, v.23, n.857-862, 2011.
- ROCCO, L.C.M. Avaliação laboratorial de lesões musculares esqueléticas e cardíacas. In: _____. **Guia prático para coleta e interpretação de exames laboratoriais em cães e gatos**. São Caetano do Sul:Interbook, 2009, p.49-50.
- SNYDER, J.M. et al. Canine intracranial primary neoplasia: 173 cases (1986-2003). **Journal of Veterinary Internal Medicine**, v.20, p.669-675, 2006.
- STURGES, B.K. et al. Magnetic resonance imaging and histological classification of intracranial meningiomas in 112 dogs. **Journal of Veterinary Internal Medicine**, v.22, p.586-595, 2008.