

IMAGING DIAGNOSIS—HEMORRHAGIC MENINGIOMA

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An 8-year-old Labrador Retriever developed acute central vestibular signs. An extra-axial mass was detected on MR images ventral to the brainstem. The mass was both T1- and T2-hypointense; there was also thin-rimmed patchy contrast enhancement. These findings were nonspecific, but the extreme T2-hypointensity was notable and suggested a hemorrhagic mass. The histologic diagnosis was anaplastic meningioma with acute hemorrhage. These findings document an unusual appearance of a meningioma in MR images due to intratumoral hemorrhage. © 2010 *Veterinary Radiology & Ultrasound*, Vol. 51, No. 2, 2010, pp 165–167.

Key words: acute hemorrhage, dog, intracranial neoplasia, magnetic resonance imaging.

Signalment, History, and Clinical Findings

AN 8-YEAR-OLD Labrador Retriever was evaluated for a 36-h history of incoordination, abnormal mentation, and a right-sided head tilt. The referring veterinarian had noted intermittent positional vertical nystagmus. The dog was somnolent, and there was vestibular ataxia with a right-sided head tilt and a tendency to lean toward the right. There were also bilaterally decreased direct and consensual pupillary light reflexes, ventral strabismus of the right eye, vertical rotational nystagmus, right facial paresis, and slightly delayed conscious proprioceptive positioning of the left limbs. These signs were consistent with a paradoxical vestibular syndrome suggesting damage to the central vestibular system and localized the lesion to the rostral medulla. Cerebrospinal fluid collected from the cisterna magna contained elevated protein, evidence of acute hemorrhage, due to the occasional presence of erythrocytosis, and blood contamination.

Imaging

Magnetic resonance (MR) imaging of the brain was performed using a 3.0T magnet.* Turbo spin echo T1-weighted (T1W) and T2-weighted (T2W) images were acquired in the sagittal and transverse planes. FLAIR images were acquired in the transverse plane. Postcontrast T1-weighted images were acquired in sagittal, transverse, and dorsal planes after intravenous administration of gadodiamide.†† Gradient-echo sequences were not acquired.

*Achieva 3.0T, Philips Healthcare, Cleveland, OH.

††Omniscan™, GE Health Care, Oslo, Norway.

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There was an approximately 3 cm × 2 cm × 1 cm extra-axial, broad-based mass, mainly on the left side, extending from the caudal midbrain to the caudal medulla and causing compression of the adjacent brainstem; the compressed brainstem was T2-hyperintense, consistent with peritumoral edema. The mass was homogeneous and moderately hypointense on T1W images. On T2W images, the mass was heterogeneously hypointense and with a few small regions that were isointense to adjacent white matter (Fig. 1). There was a thin, moderately contrast enhancing rim, but most of the mass did not enhance (Fig. 2). The lateral ventricles, the third ventricle and the mesencephalic aqueduct were dilated, whereas the fourth ventricle was compressed. The imaging findings were not typical of any specific condition. The marked T2-hypointensity was unusual and suggested hemorrhage, mineralization, or dense connective tissue. Specific considerations were: (1) neoplasia with mineralization, hemorrhage and secondary obstructive hydrocephalus, (2) inflammatory mass, (3) spontaneous intracranial hemorrhage, and (4) mucocele.

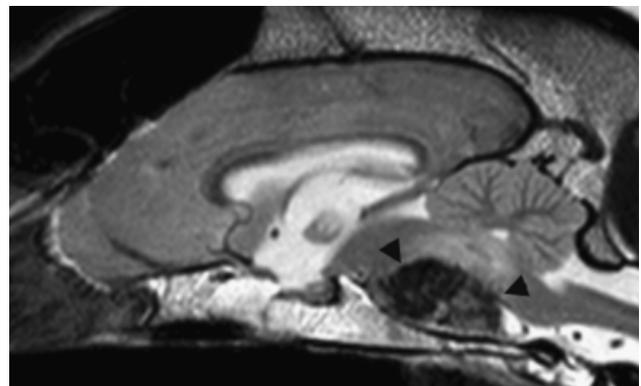


FIG. 1. Sagittal T2-weighted image. The mass is heterogeneous and extremely hypointense (arrowheads). The overlying brainstem is compressed and has T2 hyperintensity, suggestive of edema. Hydrocephalus is present rostral to the mass (T2W-TSE, TR = 3000 ms, TE = 80 ms, slice thickness = 2 mm, interslice gap = 1 mm, FOV = 18 × 18 cm, matrix acquisition = 312 × 249).

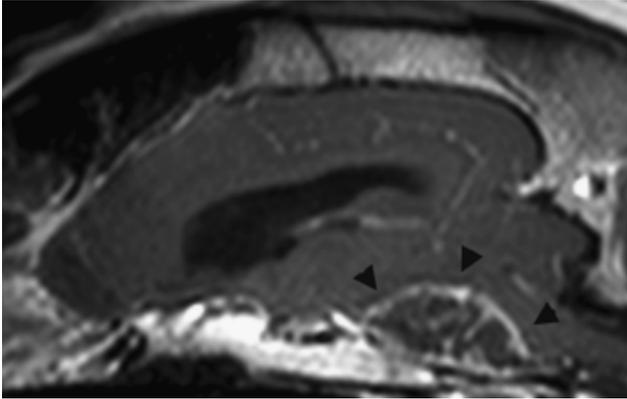


FIG. 2. Sagittal T1-weighted postcontrast image. A thin, moderately contrast enhancing rim is present around the hypointense mass (arrowheads). A patchy contrast enhancing appearance with marked heterogeneity is seen (postcontrast T1W-TSE, TR = 600 ms, TE = 10 ms, slice thickness = 2 mm, interslice gap = 1 mm, FOV [sagittal] = 18 × 18 cm, matrix acquisition [sagittal] = 200 × 161).

Outcome

The dog was euthanized because of the poor prognosis. At postmortem examination, there was subdural hemorrhage on the ventral surface of the brainstem from the pituitary gland to the foramen magna. A dark red, soft irregular mass was attached to the ventral aspect of the brainstem. Microscopically, the mass contained a nearly equal mixture of erythrocytes and sheets of neoplastic cells with extensive necrosis. The neoplasm was markedly cellular, poorly demarcated, and not encapsulated. While the majority of cells were arranged in a haphazard manner, occasionally small whorls were present. The cells were polygonal with moderate anisokaryosis, round to oval nuclei with clumped hyperchromatic chromatin and contained one prominent eosinophilic nucleolus. There were 13 mitotic figures per 10 high power fields. Vast neutrophilic infiltration was noted, often associated with necrosis. Only scant amounts of hemosiderin were present, despite the large amount of hemorrhage. The neoplastic cells were positive for vimentin, negative for GFAP and partly positive for cytokeratin. Findings were consistent with an anaplastic meningioma with acute hemorrhage.

Discussion

Meningiomas are the most common central nervous system tumor in dogs.¹ On MR imaging, canine meningiomas are usually T1-hypointense or T1-isointense to gray matter and T2-hyperintense or T2-isointense.^{2–6} They tend to have marked contrast enhancement with well-defined margins. Peritumoral edema, cysts, intratumoral calcification, and meningeal enhancement are sometimes present. The tumor in this dog had some imaging features typical of meningioma, but there were two unusual MR imaging findings: the extreme T2-hypointensity and the thin-rimmed contrast enhancement. Of 168 reported intracranial meningiomas, only two were T2-hypointense.^{2–5,7} We attributed the T2-hypointensity in this dog to intratumoral hemorrhage. Intrameningeal hemorrhage has been found in one dog,⁶ which was characterized by T1-hyperintensity, T2- and FLAIR mixed intensity and marked homogenous contrast enhancement; these features were different than the dog described herein. The MR imaging features of intracranial hemorrhage is time dependent.^{8–10} In this dog, the tumor was T1- and T2-hypointense, making it most consistent with acute hemorrhage (1–3 days), which matched the onset of clinical signs, and the relative lack of hemosiderin. Besides hemorrhage, other causes for a T2-hypointense meningioma are calcification, abundant psammoma bodies, or a dense collagenous matrix.^{11–14} None of these features were present in this dog.

The meningioma in this dog had an atypical thin contrast enhancing rim with lack of central enhancement. This may have reflected peripheral neovascularization.¹⁵ The absence of central enhancement was most likely related to the extensive necrosis.^{15,16} Infarction could also cause lack of contrast enhancement.^{15,16} Although uncommon, intratumoral hemorrhage can occur in canine meningiomas. It may cause acute exacerbation of clinical signs and lead to MR imaging features that differ from those considered typical.

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