In cooperation with

What Is Your Neurologic Diagnosis?

An 11-year-old 32-kg (70.4-lb) spayed female Labrador Retriever was evaluated at the University of Georgia College of Veterinary Medicine because of exophthalmos and epiphora of the right eye. Additionally, the owners perceived that the right eye was painful because the dog would squint that eye when the area of the head near the eye was touched. Physical examination findings were considered normal with the exception of exophthalmos, decreased retropulsion, and slight protrusion of the third eyelid of the right eye. Signs of pain were elicited when transpalpebral pressure was applied to the right eye. Examination of the left eye revealed no abnormalities.

Neurologic examination

Observation

Mental	Alert	X	Depressed		Disoriented		Stupor		Coma		
Posture	Normal	X	Head tilt		Tremor		Falling				
Gait	Normal	X	Ataxia		Pelvic limbs		All 4		Circling		
Paresis	Pelvic limbs		Tetra		Hemi		Mono				
Other											

Postural reactions

Key: 4 = exaggerated, clonus; 3 = exaggerated; 2 = normal; 1 = diminished; 0 = none; NE = not evaluated

	LF	RF	LR	RR
Wheelbarrow	NE	NE		
Hopping	2	2	2	2
Ext postural thrust			NE	NE
Proprioceptive pos	2	2	2	2
Hemistand/walk	NE	NE		
Placing–tactile	NE	NE		
Placing–visual	NE	NE		

Spinal reflexes

	LF	RF	LR	RR
Quadriceps			2	2
Extensor carpi	NE	NE		
Flexion	2	2	2	2
Crossed extensor	NE	NE	NE	NE
Perineal			2	2

Cranial nerves

	L	R		L	R
II, VII–Vision menace	2	2	VIII–Nystagmus, resting	0	0
II, III–Pupils resting	2	0	VIII–Nystagmus, change	0	0
Stim L	2	0	V–Sensation	2	0
Stim R	2	0	VII–Facial mm	2	2
II–Fundus	2	2	V, VII–Palpebral flex	2	0
III, IV, VI–Strabismus, resting	0	0	IX, X–Gag	2	2
III, IV, VI, VIII–Strabismus, position	0	0	XII–Tongue	2	2

Comments CN

The dog had anisocoria with mydriasis of the right eye; the left eye had a normal-sized pupil. Physiologic nystagmus was lacking in the right eye; findings were normal in the left eye. There was slight ptosis of the dorsal eyelid of the right eye. When the skin of the medial canthus of the right eye was stimulated, the palpebral reflex was absent; however, when the skin of the lateral canthus of the right eye was stimulated, the palpebral reflex was normal. Sensation in the mucosa of the nares was normal bilaterally.

Sensation (Locate and describe abnormal)

Hyperesthesia	3	With transpalpebral pressure applied to the right eye.
Superficial pain	NE	
Cutaneous reflex	2	
Deep pain	NE	

What is the problem? Where is the lesion? What are the most probable causes of this problem? What is your plan to establish a diagnosis? Please turn the page.

Assessment

Anatomic diagnosis

Problem	Rule out location
Mydriasis of the right eye; with stimulation of the right eye, pupillary light reflex was absent in the right eye and consensual response was normal in the left eye; with stimulation of the left eye, pupillary light reflex was normal in the left eye and consensual response was absent in the right eye	Right cranial nerve III or midbrain (parasympathetic division)
Ptosis of the right dorsal eyelid	Right cranial nerve III or midbrain (general somatic efferent)
Reduced physiologic nystagmus (ophthalmoparesis) in the right eye; no signs of vestibular dysfunction	Right cranial nerves III, IV, and VI or brainstem
Absent palpebral reflex with stimulation of the medial canthus of the right eye	Right ophthalmic branch of cranial nerve V

Likely location of one lesion

Right-sided lesion involving cranial nerves III (parasympathetic and general somatic divisions), IV, and VI, and ophthalmic branch of cranial nerve V; anatomic areas to consider include within the cranial cavity (a lesion involving these cranial nerves in the meninges overlying the cavernous sinus), within the orbital fissure, or within the orbit

Etiologic diagnosis—Rule out disease processes included neoplasia (primary, metastatic, or multicentric [eg, lymphoma]), infectious or inflammatory diseases, or trauma. The diagnostic plan included a CBC, serum biochemical analyses, and urinalysis (to provide support for generalized infectious or inflammatory processes as well as metastatic or multicentric neoplasms and to detect any concurrent disease processes prior to anesthesia for diagnostic imaging); thoracic radiography (3 views; to provide additional evidence of infectious or neoplastic disease); and magnetic resonance (MR) imaging with and without administration of a contrast agent of the brain and orbit (to discern any abnormalities within the cranial cavity, orbital fissure, or orbit).

Diagnostic test findings—The CBC, serum biochemical analyses, urinalysis, and thoracic radiography revealed no abnormalities. Via MR imaging, a multilobulated, well-circumscribed mass was detected within the right orbit. The mass extended from the rostroventral aspect of the orbit caudally to the orbital fissure. In the MR images, the mass had a homogenous intensity; in comparison with the appearance of the zygomatic salivary gland, the mass was isointense in T2-weighted and hypointense in T1-weighted images. Additionally, the mass had homogenous enhancement in T1-weighted images obtained after administration of a contrast agent (**Figures 1 and 2**). In addition, the right orbital fissure contained tissue with the same MR imaging characteristics as the mass within the right orbit. As a consequence of the mass, the right eye was deviated dorsorostrally with deformation of the shape of the globe ventrally. On the basis of the MR imaging findings, an ultrasound-guided biopsy specimen of the mass was collected. Results of a microscopic evaluation of formalin-fixed and paraffin-embedding samples of tissue obtained via the ultrasound-guided biopsy were consistent with lymphoma. Immunohistochemical analysis of the biopsy specimen revealed that the

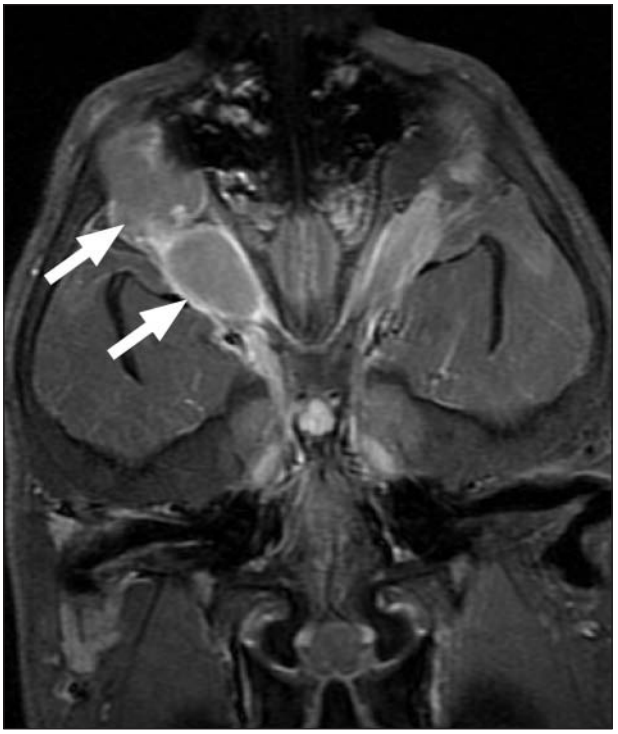

Figure 1—Dorsal plane T1-weighted MR image (obtained following administration of a contrast agent via a chemical fat saturation pulse) of the head of a dog with deficits involving cranial nerves III, IV, and V (ophthalmic branch) on the right side. Notice the homogenously contrast-enhanced multilobulated mass in the right orbit (arrows). The mass extends from the rostral aspect of the orbit to the orbital fissure.

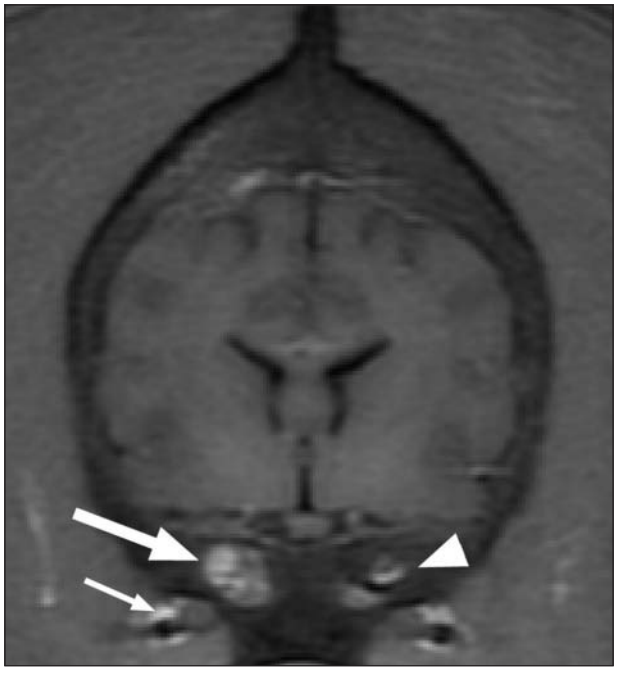

Figure 2—Transverse plane T1-weighted image (obtained following administration of a contrast agent via a chemical fat saturation pulse) of the head of the dog in Figure 1. Contrast-enhanced tissue is visible in the right orbital fissure (large arrow). Contrast agent is observed within the emissary vein of the orbital fissure as well as a signal void of the anastomotic artery and the cranial nerves within the left orbital fissure (arrowhead). The maxillary artery and maxillary nerve appear normal (small arrow).

neoplastic cells were positive for CD3 and negative for CD79a, consistent with lymphoma of T-cell origin.

Comments

The neurologic abnormalities in the dog of this report were consistent with deficits in cranial nerves III (parasympathetic and general somatic effect), IV, and VI, and the ophthalmic branch of cranial nerve V. This constellation of deficits along with deficits associated with the ophthalmic and maxillary branches of cranial nerve V are commonly associated with lesions in the cranial cavity in the area of the cavernous sinus; hence, the term cavernous sinus syndrome (CSS) has been applied to such observations.[1] In addition, a lack of sympathetic innervations to the eye may also occur in CSS. The cavernous sinuses are paired venous structures that lie on the ventral surface of the cranial cavity from the orbital fissure to the petro-occipital canal and are connected by rostral and caudal intercavernous sinuses.[2]

Causes of CSS in dogs and cats include neoplasia (primary, metastatic, or multicentric [eg, lymphoma]), infectious disease (cryptococcosis, feline infectious peritonitis, and toxoplasmosis), trauma, and vascular malformation.[1,3] Commonly, animals are unilaterally affected, although CSS can develop bilaterally.[3] In the dog of this report, it was difficult to discern whether the sympathetic innervation was affected. Signs of a lack of sympathetic innervation to the eye (Horner syndrome) include miosis, enophthalmos, ptosis, and elevation of the third eyelid. In this dog, ptosis also may have resulted from lack of innervation of the levator palpebrae superioris muscle by cranial nerve III. Likewise, the elevation of the third eyelid may have been a result of deviation caused by the mass. Moreover, the exophthalmos secondary to the mass would have obscured the presence of enophthalmos secondary to Horner syndrome. Deficits in the maxillary branch of cranial nerve V were not detected.

Findings of ophthalmoplegia or ophthalmoparesis, mydriasis, absence of the pupillary light reflex, and sensory deficits in the autonomous zones of the ophthalmic and maxillary branches of cranial nerve V should warrant consideration of CSS secondary to lesions involving the ventral cranial cavity in the area of the cavernous sinus. However, given the anatomic locations of the cranial nerves involved in CSS, lesions involving the orbital fissure and orbit may also result in similar deficits. In the dog of this report, the lack of deficits associated with the maxillary branch of cranial nerve V suggested that the lesion was located rostral to the round foramen where the maxillary nerve exits the cranial cavity. Consequently, because of a lack of deficits associated with the maxillary branch of cranial nerve V, a lesion involving the orbital fissure or orbit may have been more likely than a lesion within the cranial cavity in the present case. Given the common association with neoplastic processes, the observation of CSS should prompt clinicians to perform cross-sectional imaging of the brain and orbit. Ultimately, definitive diagnosis necessitates serologic, cytologic, or histologic confirmation.

References

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This feature is published in coordination with the American College of Veterinary Internal Medicine on behalf of the specialty of neurology. Contributors to this feature should contact Dr. Helen L. Simons (800-248-2862, ext 6692) for case submission forms. Submissions will be sent to Dr. Karen Kline, DVM, DACVIM, for her review.