

An Update on Cerebrovascular Disease in Dogs and Cats



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KEYWORDS

• Vascular • Brain • Dog • Hemorrhage • Ischemia • Stroke

KEY POINTS

- Cerebrovascular disease (CVD) in dogs and cats can be either ischemic or hemorrhagic. Exclusive of trauma cases, ischemic CVD is more commonly recognized in both species.
- These conditions are often presumptively diagnosed. Exclusion of mimicking brain diseases and identification of predisposing factors are important in animals with suspect CVD.
- Advanced imaging, especially MRI, is the key diagnostic test for making a presumptive diagnosis of either ischemic or hemorrhagic CVD.
- Current standard-of-care treatments are largely supportive and aimed at minimizing secondary brain injury.
- Cases of ischemic CVD and nontraumatic intracranial hemorrhage may have a good prognosis with just supportive care, especially if no underlying cause is identified.

INTRODUCTION

Once thought rare, neurological dysfunction in companion animals due to compromised blood supply is now commonly recognized in veterinary medicine. Terms used to characterize such dysfunction are defined in **Box 1**.¹⁻³

VASCULAR ANATOMY IN DOGS AND CATS

Canine arterial cerebrovascular blood supply arises from the basilar and internal carotid arteries, which feed into the cerebral arterial circle. In the cat, blood flow through the basilar artery is predominantly directed craniocaudally, and the external carotid artery (via the maxillary artery) supplies most of the blood to the cerebral arterial circle.

The cerebral arterial circle ensures constant pressure in the end arteries, allowing for collateral perfusion of the parenchyma in the event of arterial occlusion.⁵ **Fig. 1** depicts the primary branches of the cerebral arterial circle, other major derivatives, and territories supplied.

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Box 1**General definitions in cerebrovascular disease**

- *Cerebrovascular disease (CVD)*: An abnormality of the brain due to disturbance of blood supply^{1,2}
- *Stroke*: Rapidly developing clinical signs of focal (or global) disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin³
- *Transient ischemic attack (TIA)*: Brief (<24 hours), focal brain dysfunction. The clinical diagnosis of TIA is made when no other cause for the clinical signs is found, and the character of dysfunction implicates a region of the brain served by one vascular supply. TIAs are characterized by complete return of function but often recur.^{2,4}

The rostral cerebellar arteries have 3 terminal branches (lateral, intermediate, and medial; shown in **Fig. 2**), which supply overlapping and variable areas of the rostral cerebellar hemispheres and vermis, from lateral to medial, respectively. The rostral cerebellar arteries also supply the dorsal medulla.⁶

The caudal cerebellar arteries are derived from the basilar artery.⁷ These arteries supply the caudoventral aspects of the cerebellar hemispheres and vermis, including the flocculus and nodulus, as well as the lateral aspects of the medulla.⁸

Cerebrovascular disease (CVD) results from the disruption of one or more of these vascular territories due to failure of normal regulation, vessel occlusion (ischemic CVD), or vessel rupture (hemorrhagic CVD).

REGULATION OF CEREBRAL BLOOD FLOW

Cerebral arteriolar tone responds to physiologic stimuli to maintain relatively constant blood supply to the brain through autoregulation (**Table 1**). Total cerebral blood flow (CBF) should be constant for mean arterial pressures (MAPs) between 50 and

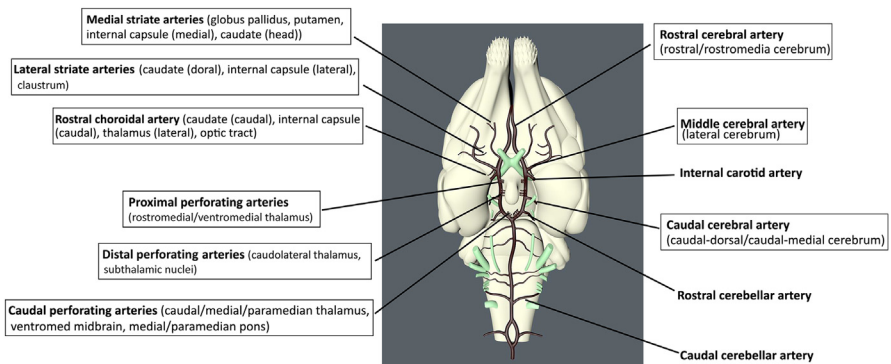


Fig. 1. Schematic of major intracranial arterial supply. The major branches from the cerebral arterial circle to the cerebrum (rostral middle and caudal cerebral arteries) are identified on the right of the diagram. The rostral and caudal cerebellar arteries are identified, branching from the caudal communicating artery and the basilar artery, respectively. On the left side, the major arterial branches to deep structures of the forebrain, midbrain, and pons are labeled, with a summary of the structures they supply presented in the accompanying box for each.

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