

Neoplasms of the Central Nervous System of Dogs and Cats

Version: CNS QRG 1.0

Date: June 2023

Introduction: This Quick Reference Guide focuses on the histologic characteristics of the most common primary central nervous system (CNS) neoplasms of dogs and cats, including meningioma, glioma (oligodendroglioma, astrocytoma, ependymoma), and choroid plexus tumors. Neoplasms of the peripheral nervous system (PNS) are discussed in a separate protocol.

The **neuroanatomic location** of all CNS neoplasms should be systematically described. Please refer to the full CNS Protocol for a checklist, images, and guidelines.

<http://www.vcgp.org>

Patient information to collect includes:

Signalment (species, age, sex, breed), laterality, neuroimaging findings, method of obtaining sample, specimen size, interaction with adjacent tissues, mitotic count, histology classification and grading (when applicable), ancillary tests, tissue margins, treatment and patient outcome.

Diagnostic Algorithm: Please refer to Figure 1 for helpful histologic features of common primary CNS neoplasms.

Histological grading: Grading of canine and feline primary CNS neoplasms is based on outdated guidelines that are extrapolated from human medicine. Other than canine glioma, which has recently had a species-specific grading scheme published, all other grading schemes used in the dog and cat for CNS tumors are not specific to those species and their utility is unreliable. Prognostic parameters obtained with standardized approaches should be correlated with outcome data and validated in future studies so that more meaningful grading systems can be established. Parameters that can be more objectively classified, detailed, and standardized include mitotic count, margins, cellularity, nuclear atypia and pleomorphism, tumor necrosis, and others. Ancillary tests (molecular, genetic) may also provide additional helpful prognostic information.

Figure 1 (click on thumbnails for access to larger images):

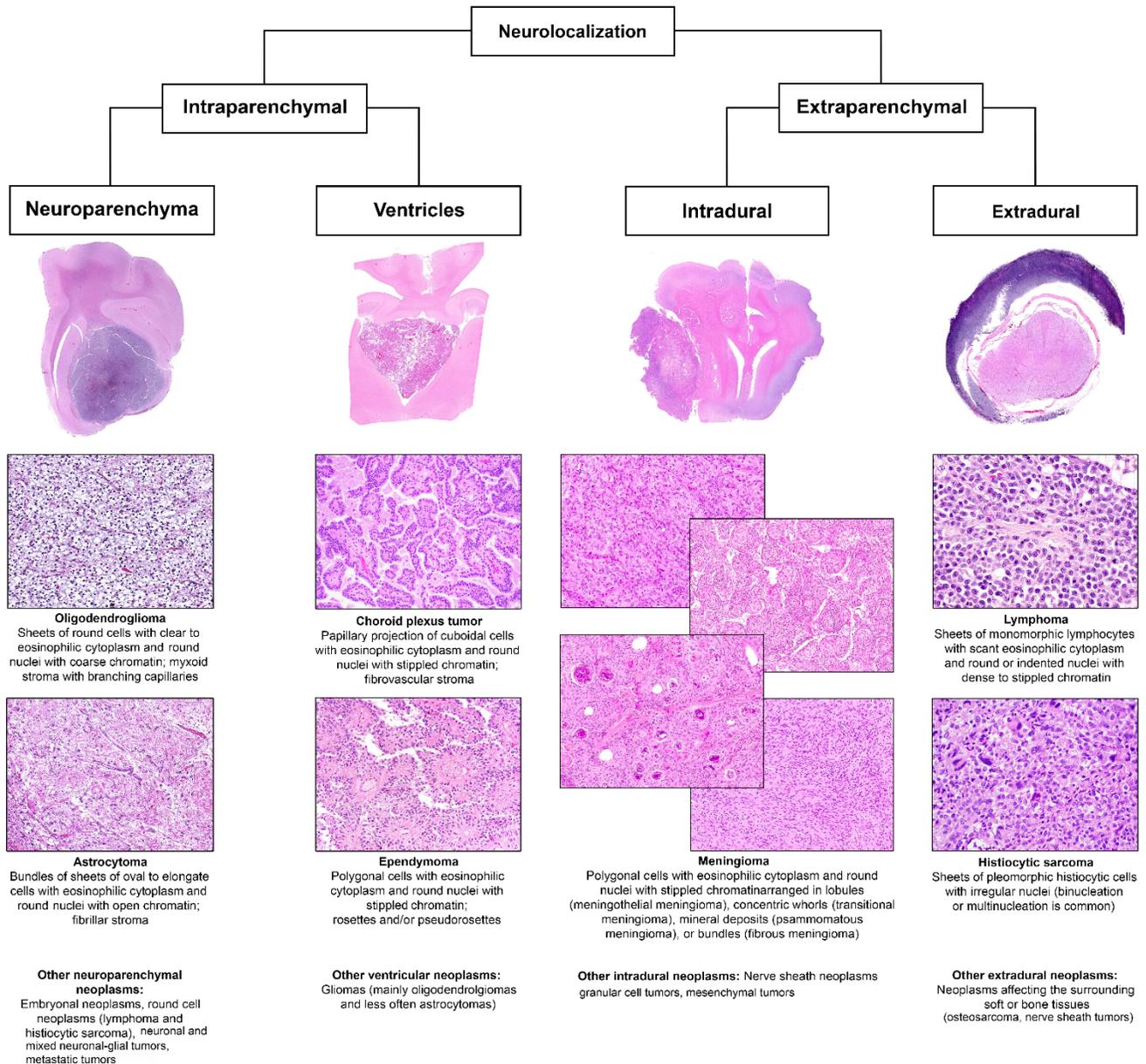


Table 1. Common diagnostic immunomarkers utilized for canine and feline CNS neoplasms.

Neoplasm	Dogs		Cats	
	Consistent immunolabeling	Variable immunolabeling	Consistent immunolabeling	Variable immunolabeling
Meningioma	Vim	CK, E-cad	Vim, E-cad	CK
Oligodendroglioma	Olig2, CNPase	GFAP	Olig2	GFAP
Astrocytoma	GFAP	Olig2	GFAP	Olig2
Ependymoma	GFAP, CK	Olig2	GFAP, CK, Olig2	-
Choroid plexus tumor	Kir7.1	CK	-	-

Selected References:

Koehler JW, Miller AD, Miller CR, et al. A revised diagnostic classification of canine glioma: Towards validation of the canine glioma patient as a naturally occurring preclinical model for human glioma. *J Neuropathol Exp Neurol.* 2018;77: 1039-1054.

Meuten DJ, Moore FM, George JW. Mitotic count and the field of view area: Time to standardize. *Vet Pathol.* 2016;53: 7-9.

Miller AD, Koehler JW, Donovan TA, et al. Canine ependymoma: Diagnostic criteria and common pitfalls. *Vet Pathol.* 2019;56: 860-867.

Miller AD, Miller CR, Rossmeisl JH. Canine primary intracranial cancer: A clinicopathologic and comparative review of glioma, meningioma, and choroid plexus tumors. *Front Oncol.* 2019;9: 1151

Rissi DR et al. Canine and Feline Central Nervous System Neoplasms Protocol, version 1.0. *Veterinary Cancer Guidelines and Protocols.* <http://www.vcgp.org>. Accessed on (5/2/23).

Saito R, Chambers JK, Kishimoto TE, Uchida K. Pathological and immunohistochemical features of 45 cases of feline meningioma. *J Vet Med Sci.* 2021;83: 1219-1224

WHO Classification of Tumours: Central Nervous System Tumours, 5th ed. International Agency for Research on Cancer; 2022.

Woolford L, de Lahunta A, Baiker K, Dobson E, Summers BA. Ventricular and extraventricular ependymal tumors in 18 cats. *Vet Pathol.* 2013;50: 243-251.

Authors: (anatomic pathologists): Daniel R. Rissi,* Taryn A. Donovan,* Claudio S.L. Barros, Molly E. Church, Jennifer W. Koehler, Kaspar Matiasek, Andrew D. Miller, Brian F. Porter

*Denotes communication authors; all other contributing authors are listed alphabetically; contact communication authors to suggest updates, provide edits and comments: Daniel R. Rissi (rissi@uga.edu) Taryn A. Donovan (taryn.donovan@amcn.org)