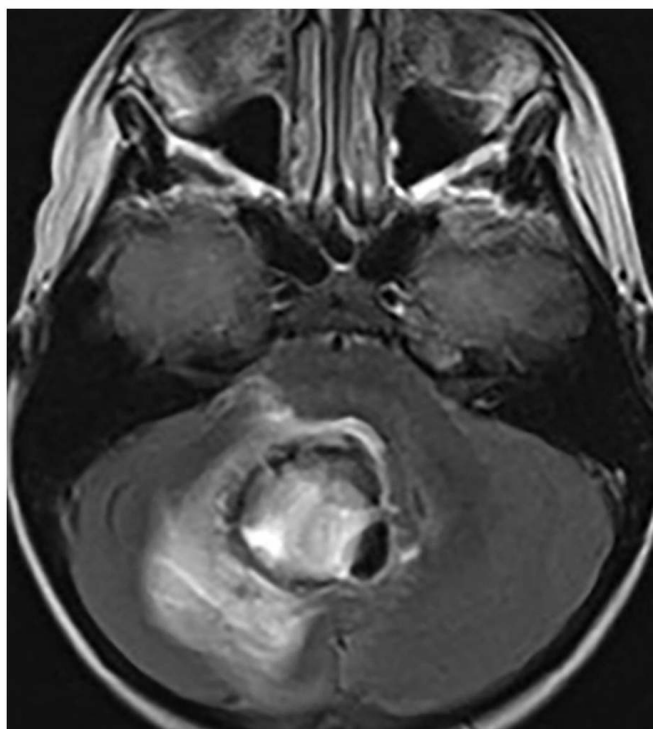
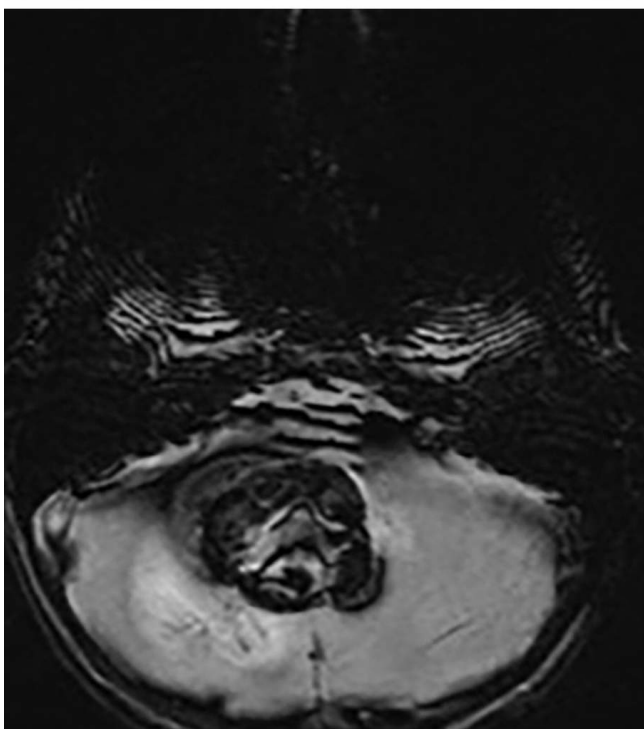
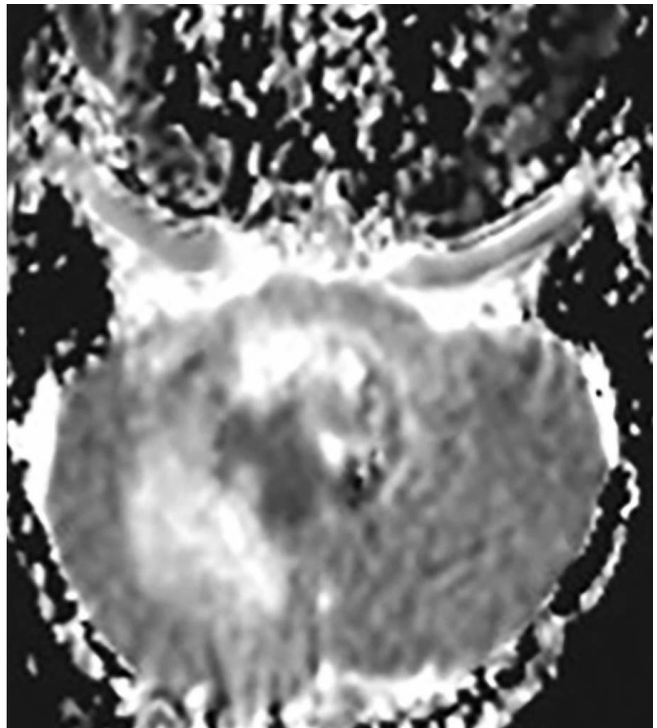
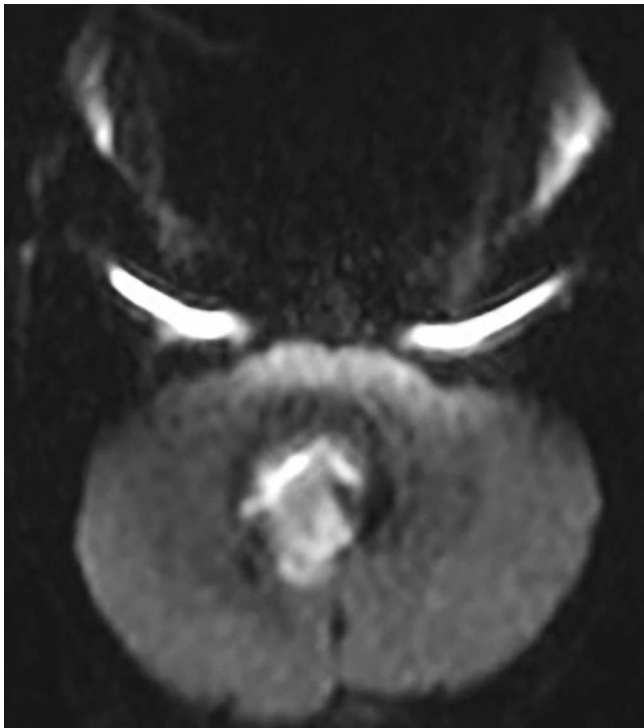




# Cerebral Cavernous Malformation (Cavernoma)

*Last Updated: July 1, 2021*



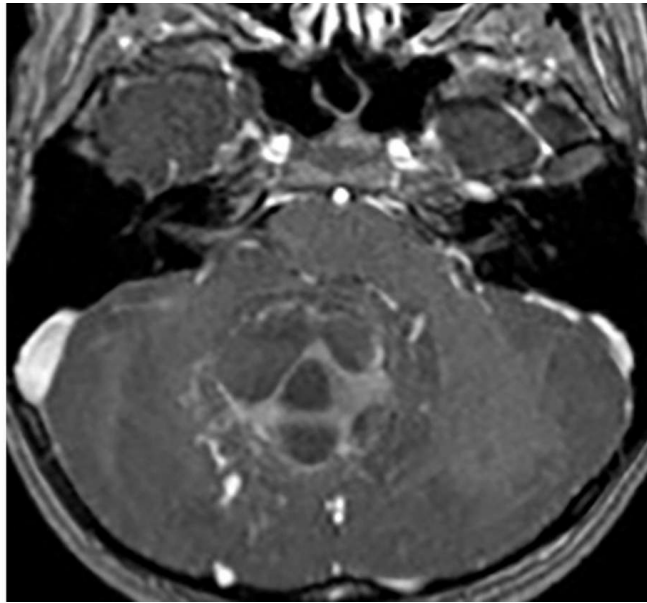


Figure 1: MR images demonstrate a large parenchymal lesion centered in the right cerebellar hemisphere causing significant adjacent mass effect and complete obstruction of the fourth ventricle. There is central reduced diffusivity (top left and top right) and a large amount of susceptibility (blooming) artifact on SWI (middle left) secondary to recent hemorrhage. (Middle Right) A FLAIR image demonstrates a moderate amount of hyperintense signal, which is typically seen only in lesions that have recently hemorrhaged or occasionally when the lesions are large and have a significant mass effect. (Bottom) Somewhat atypical is the degree of heterogeneous enhancement on postcontrast imaging.

## Description

- Benign vascular lesion with a classic imaging appearance

## Pathology

- Blood cavities surrounded by a single layer of endothelium without muscular tissue or intervening brain parenchyma
- Two types
  - Sporadic and familial

## Clinical Features

- Symptoms
  - Seizure, hemorrhage, focal progressive neurologic deficits, and

headaches

- ~25% are asymptomatic
- Age
  - Peak presentation in middle age
  - Familial cavernous malformations tend to present earlier
- Gender
  - No gender predilection
- Associations
  - Developmental venous anomaly (DVA)
  - Superficial siderosis (hemosiderin deposition on the surface of the brain)
  - Cutaneous abnormalities
    - Café au lait spots
    - Hyperkeratotic capillary-venous malformation

## Imaging

- General
  - Classic “popcorn ball” appearance with complete hypointense rim on T2-weighted imaging
- Modality specific
  - CT
    - Often negative
    - If positive, will see a well-defined hyperdense lesion with associated calcifications that demonstrates little to no enhancement
  - MRI
    - T1WI and T2WI
      - “Popcorn ball” appearance with low signal rim and mixed internal signal demonstrating differing stages of hemorrhage
      - Surrounding edema present only if recent hemorrhaging has occurred
    - T2\*

- Hypointense signal associated due to hemosiderin and calcification
  - Contrast
    - Minimal or no contrast enhancement, unless associated with a developmental venous anomaly
- Conventional angiography
  - Usually normal
  - Occasional slow intralesional flow without arteriovenous shunting and venous pooling
- Imaging recommendations
  - MRI with contrast
  - Contrast used to exclude associated anomalies
  - T2\*/SWI/GRE sequence with long TE
- Mimic
  - When recently hemorrhagic, it can be difficult to distinguish from an underlying hemorrhagic neoplasm or an arteriovenous malformation. Follow-up imaging is often a necessary approach for monitoring evolution of the blood products and evaluating for an underlying neoplasm.

For more information, please see the corresponding chapter in [Radiopaedia](#) and the [Cavernous Malformation](#) chapter within the [Cerebral Vascular Diseases](#) subvolume within *The Neurosurgical Atlas*.

Contributor: Sean Dodson, MD

DOI: <https://doi.org/10.18791/nsatlas.v1.03.02.09>

## REFERENCES

Brunereau L, Labauge P, Tournier-Lasserre E, et al. Familial form of intracranial cavernous angioma: MR imaging findings in 51 families. *Radiology*. 2000;214:209–216.

[doi.org/10.1148/radiology.214.1.r00ja19209](https://doi.org/10.1148/radiology.214.1.r00ja19209)

Huisman TAGM. Tumor-like lesions of the brain. *Cancer Imaging*.

2009;9:S10–S13. [doi.org/10.1102/1470-7330.2009.9003](https://doi.org/10.1102/1470-7330.2009.9003)

Meng G, Bai C, Yu T, et al. The association between cerebral developmental venous anomaly and concomitant cavernous malformation: an observational study using magnetic resonance imaging. *BMC Neurol.* 2014;14:50. [doi.org/10.1186/1471-2377-14-50](https://doi.org/10.1186/1471-2377-14-50)

Moore SA, et al. Long-term natural history of incidentally discovered cavernous malformations in a single-center cohort. *J Neurosurg.* 2014;120:1188–1192. [doi.org/10.3171/2014.1.JNS131619](https://doi.org/10.3171/2014.1.JNS131619)

Sohn CH, Kim SP, Kim IM, et al. Characteristic MR imaging findings of cavernous hemangiomas in the cavernous sinus. *AJNR Am J Neuroradiol.* 2003;24:1148–1151.

Tamburrini G, Iannelli A, Caldarelli M, et al. Large cerebral cavernoma mimicking a brain tumor. *Pediatr Neurosurg.* 2002;37:105–106. [doi.org/10.1159/000065114](https://doi.org/10.1159/000065114)

Yun TJ, Na DG, Kwon BJ, et al. A T1 hyperintense perilesional signal aids in the differentiation of a cavernous angioma from other hemorrhagic masses. *AJNR Am J Neuroradiol* 2008;29:494–500. [doi.org/10.3174/ajnr.A0847](https://doi.org/10.3174/ajnr.A0847)