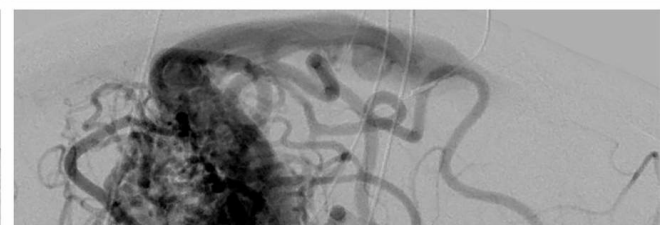
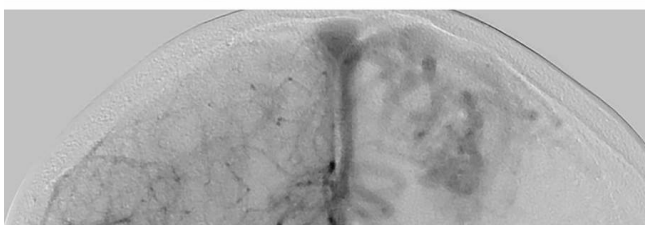
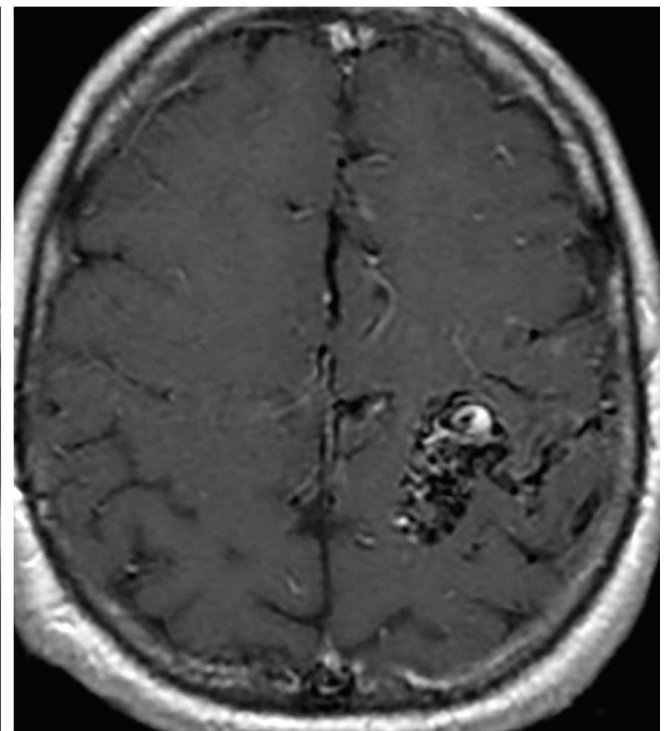
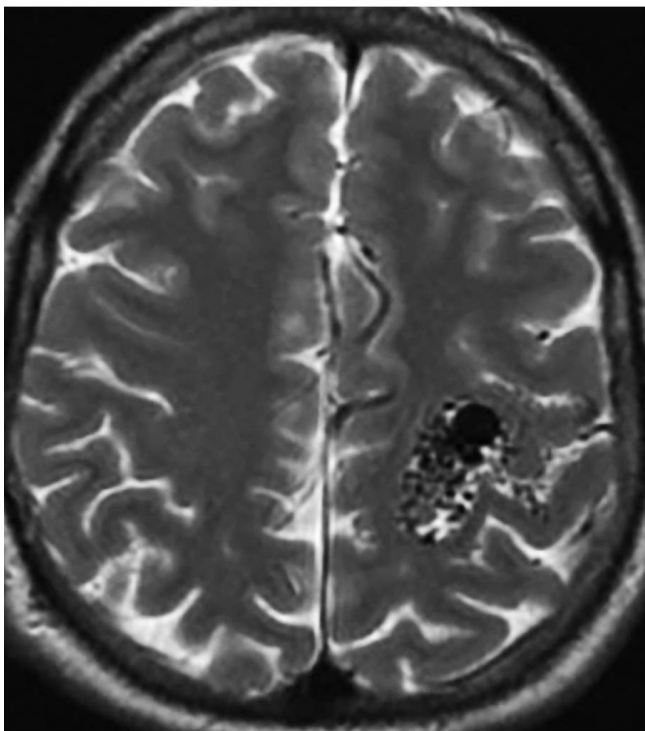
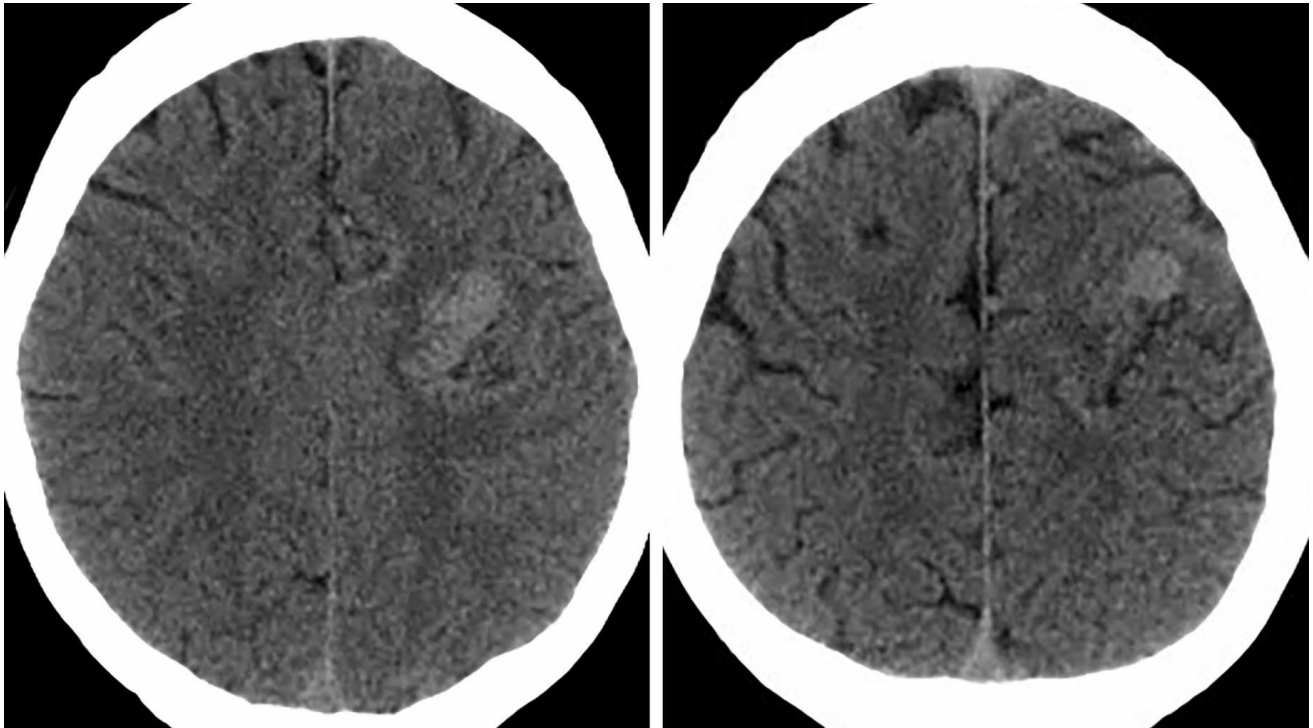
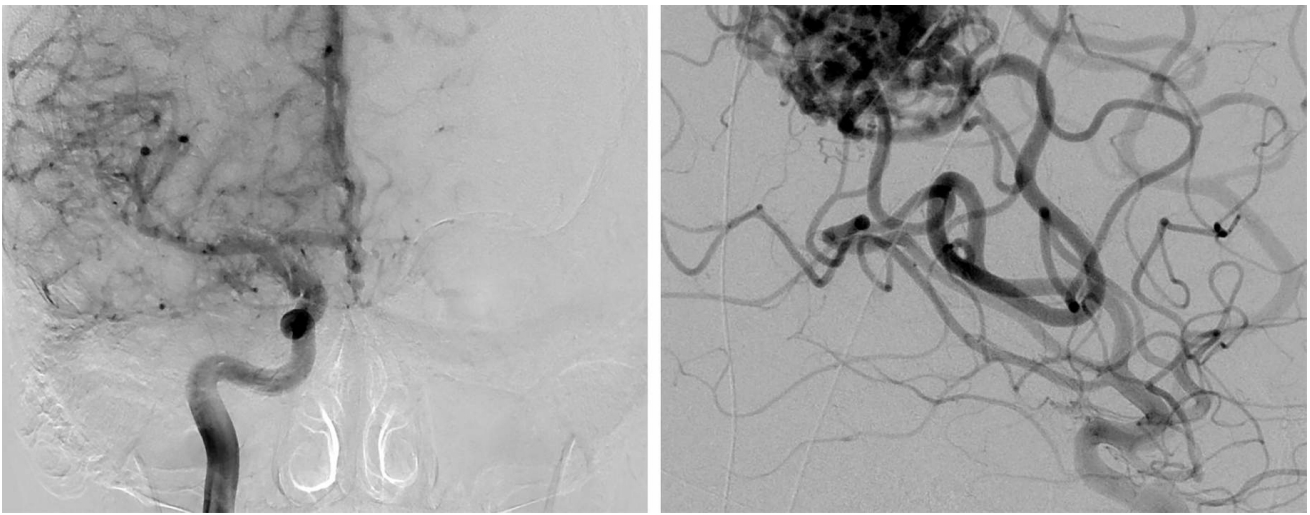




# Arteriovenous Malformation

*Last Updated: June 30, 2021*





**Figure 1:** (Top Left and Top Right) Noncontrast CT image showing a serpiginous region of masslike hyperdensity centered within the left precentral gyrus with adjacent hypodense gliosis. The corresponding MR images show a tangle of serpiginous low-signal flow voids on T2WI (Middle Left) with minimal associated anterior contrast enhancement (Middle Right). Anteroposterior (Bottom Left) and left-lateral (Bottom Right) conventional angiographic images demonstrate a large tangle of vessels that has an arterial supply from multiple branches of the middle cerebral artery and drains primarily into the superior sagittal sinus.

## Description

- Pial vascular malformation of brain with arterial-to-venous shunting through a central nidus without an intervening capillary bed

## Pathology

- Both sporadic and syndromic forms
- Dysregulation of vascular endothelial growth factor (VEGF)
- Often contains gliotic tissues, calcifications, and blood at various stages

## Clinical Features

- Symptoms
  - Highly variable, ranging from an incidental finding to seizure, headache, ischemia caused by vascular steal, and hemorrhage

- Age
  - Peak presentation, 20 to 40 years of age
- Gender
  - Male = female
- Grading
  - Spetzler-Martin scale
    - Based on size, location, and venous drainage pattern

## Imaging

- General
  - “Bag of worms” on MRI with minimal to no mass effect
  - 85% are supratentorial
- CT
  - Can be normal
  - Isodense to slightly hyperdense vessels with avid enhancement
  - 25% will have calcifications
- MRI
  - T1
    - Dependent on flow rate, direction, and presence of hemorrhage
  - T2
    - Tangle of serpiginous low-signal flow voids
    - Can have hemorrhage at different stages
  - GRE
    - Blooming if hemorrhage or calcifications
  - Contrast
    - Avid enhancement or flow voids of numerous tangled vessels and often large draining veins
- Conventional angiography
  - Best delineates internal structure
  - Helpful for evaluating arterial supply and venous drainage
- Imaging recommendations

- Conventional angiography
- Protocol advice
  - MRI with contrast and GRE sequences
- Mimic
  - Arteriovenous malformations (AVMs) can be difficult to distinguish from other vascular lesions or potentially an underlying neoplasm with extensive neovascularity. Typically, an AVM can be distinguished from an underlying neoplasm given the lack of mass effect or masslike enhancement.

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

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