Teaching NeuroImages: The Venous System and Developmental Venous Anomalies

Drivers of Vascular Malformations?

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Figure Imaging Features of a CM Concurrent with DVA and AVM

(A) Left-hemispheric hemorrhage. MRI/MRA suggestive of a (B) CM (arrow) and (C) DVA (arrow). (D) A basal ganglia AVM (arrows) with (E) an intranidal aneurysm (arrow), the likely source of hemorrhage. (F) 3-D angiography showing the DVA with smaller veins (solid arrows) and a larger collecting vein (dashed arrow). AVM = arteriovenous malformation; CM = cavernous malformation; DVA = developmental venous anomaly.

A 57-year-old woman presented with acute confusion. CT-scan showed a left-sided hemorrhage, and MR-imaging demonstrated an adjacent cavernous malformation (CM) associated with a complex developmental venous anomaly (DVA) continuous with the hemorrhage (figure, A–C). Digital subtraction angiography demonstrated an arteriovenous malformation (AVM) draining into the DVA (figure, D–F). DVAs are typically benign lesions commonly associated with CMs and rarely, AVMs.¹ Concurrence of these 3 malformations is exceptionally rare. Preserving DVA outflow is crucial when AVM extirpation is indicated.¹ Our understanding of the role of the venous system and DVAs in the genesis of vascular malformations continues to evolve.²

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Name	Location	Contribution
Anthony S. Larson, BS	Department of Radiology, Mayo Clinic, Rochester, MN	Design and conceptualized study; analyzed the data; drafted the manuscript for intellectual content
Harry Cloft, MD, PhD	Department of Radiology, Mayo Clinic, Rochester, MN	Design and conceptualized study; analyzed and acquired the data; drafted the manuscript for intellectual content

Appendix (continued)

Name	Location	Contribution
Ivan D. Carabenciov, MD	Department of Neurology, Mayo Clinic, Rochester, MN	Design and conceptualized study; analyzed and acquired the data; drafted the manuscript for intellectual content
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