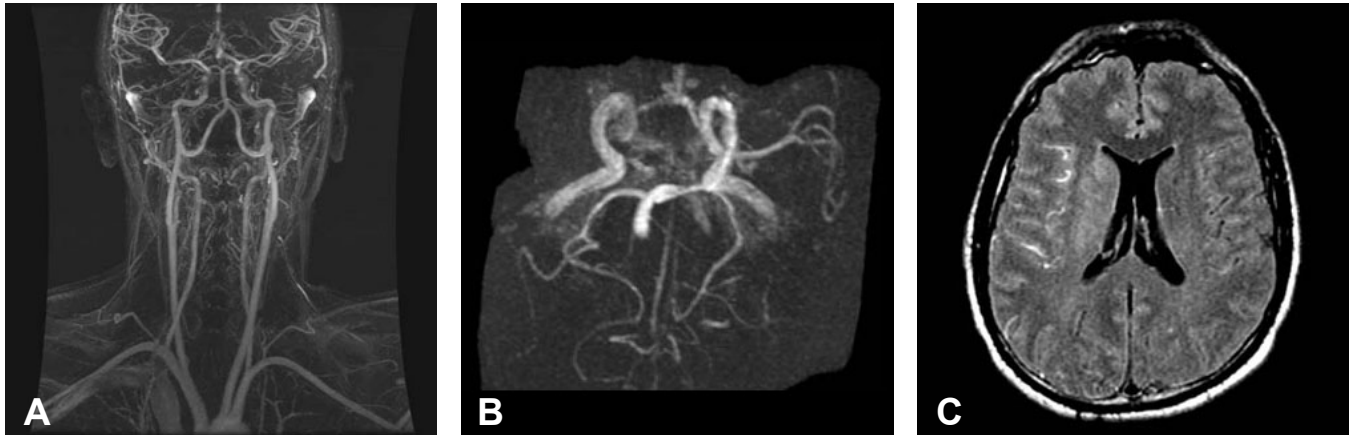




Diagnostic Service: MR Angiography - Perfusion / Diffusion

MRI and MR angiography provide another method of examining the brain, spine and vasculature. MR imaging of the brain yields a more detailed examination of the tissues than CT, but it is a more involved procedure. MR angiography is used as a screening method for cerebrovascular diseases such as aneurysms or stenoses. It is the study of choice for patients with suspected carotid or vertebral artery dissection and utilized T1 weighted imaging with fat saturation technique. With gadolinium enhanced MRA, the data provided is similar to CTA for carotid stenosis. Diffusion and perfusion weighted MR imaging is a good method of evaluating ischemia and blood flow to the brain, and was pioneered at MGH by our research colleagues in the Charlestown NMR Center. Diffusion weighted MR imaging (DWI) examines the passive movement of water molecules, which tend to be restricted in areas of acute infarction. It can identify an acute stroke within an hour of onset in 95% of cases. Perfusion weighted MR imaging is a bolus tracking method using rapid spin echo or gradient echo techniques. This multislice imaging allows the Neuroradiologist to identify areas of ischemia. In combination with DWI, one can look for areas of tissue at risk for infarct. Many times these areas can be saved by interventions with the care of the Neurology, Neurosurgery and Interventional Neuroradiology services.



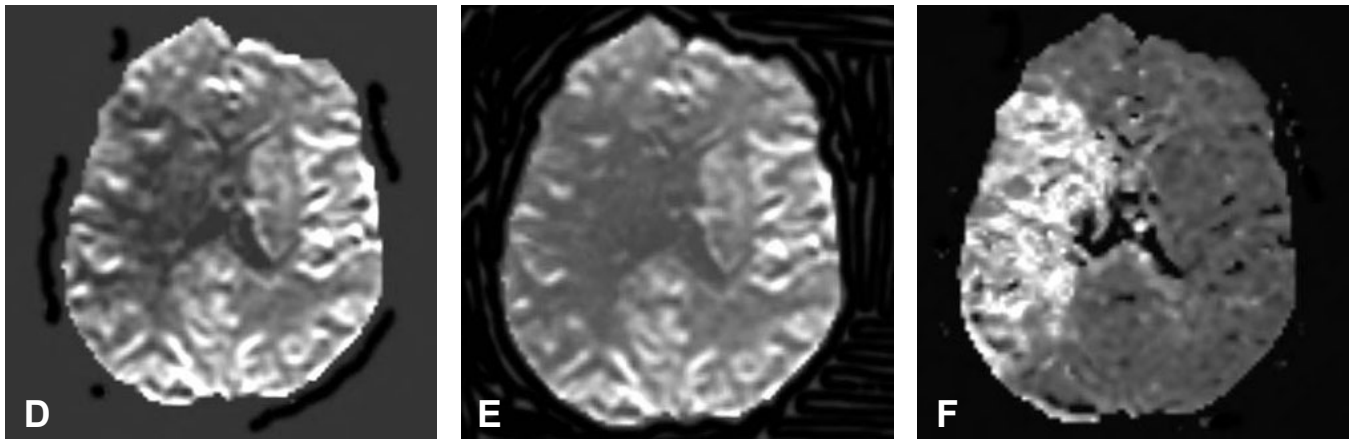
- (A) Gadolinium enhanced MR angiogram of the cervical and cerebral vasculature shows the origins of the great vessels from the aortic arch. The carotid bifurcations and the internal and external carotid arteries are well visualized in the neck, and the circle of Willis in the brain is also included in this normal examination.
- (B) MRA shows a right MCA cutoff in a different patient with acute stroke.
- (C) FLAIR image shows some signal change in the right basal ganglia.

Interventional Neuroradiology Program, Neurovascular Service

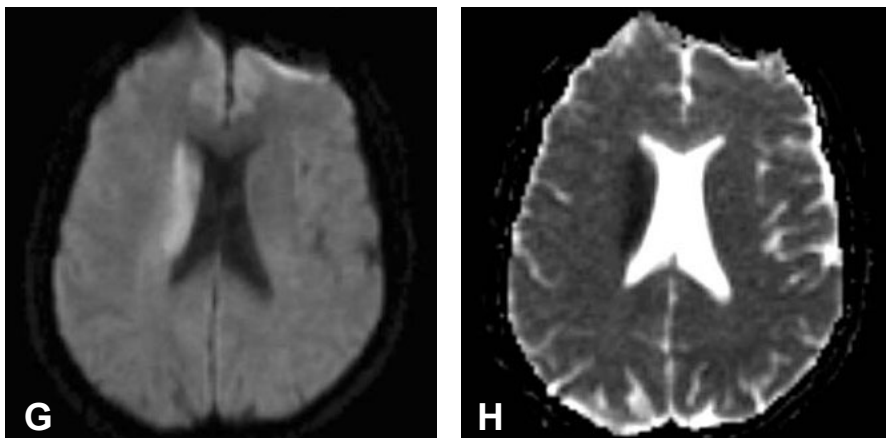
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- (D) Perfusion MRI Techniques can be used to assess areas of abnormal blood flow to the brain. Cerebral blood volume map shows a large region of diminished blood supply.
- (E) Cerebral blood flow is also decreased.
- (F) Mean transit time is increased in the region of the stroke.



- (G,H) However, the Diffusion Weighted Image and Apparent Diffusion Coefficient maps show only part of this region has undergone infarction. There is a penumbra of brain tissue at risk noted as a mismatch between the perfusion and diffusion studies. Stroke intervention can be helpful to re-establish circulation through the MCA with IV thrombolytic medication or a catheter procedure to open the vessel.

The Neurovascular Service at Massachusetts General Hospital provides a multidisciplinary approach to patient care that combines neurosurgery, neurology and interventional neuroradiology. Based in the Department of Radiology, the Neurovascular Service's Interventional Neuroradiology Program uses minimally invasive procedures to treat a range of neurovascular disease and spinal disorders. For more information, visit www.mgh-interventional-neurorad.org

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