MASSACHUSETTS GENERAL HOSPITAL

Neurovascular Service: Arteriovenous Malformation

Brain arteriovenous malformation (AVM) is a collection of abnormal of blood vessels within the brain itself. Such a nidus acts as a short circuit of circulation with a rapid shunt of blood flow directly from arteries into veins. Pressure can build up causing bleeding from the AVM from the veins or from aneurysms which can form as a result of the pressure.

AVM's are graded by size, type of venous drainage and whether they involve eloquent tissue such as speech or motor cortex (Spetzler-Martin Classification). On average, there is a 1% per year likelihood of intracranial bleeding. Patients can be asymptomatic or may present with headaches, seizures, or deterioration of neurologic function. The recent ARUBA Trial has helped to define whether asymptomatic patients should be treated. If hemorrhage occurs patients may experience severe headache, stroke-like symptoms or even loss of consciousness. It is important to get such patients to the emergency room for clinical evaluation, medical stabilization and diagnostic imaging with CT/CTA and angiography. We have a multidisciplinary approach with colleagues in Neurosurgery and Neurology to evaluate and manage our patients.

Treatment of AVM's may include surgical excision, radiation treatment and/or embolization. In many cases, embolization is used to block supply to the AVM and make definitive treatment safe. This may include reduction in size of the AVM, closure of large fistulas, and treatment of aneurysms, which are associated with the AVM nidus or arterial feeders. Before a patient is treated he or she may undergo a series of tests such as MRI, functional MRI, CT, and CT angiography. Diagnostic angiography is also performed with the possibility of sodium amytal testing. The multidisciplinary team of physicians carefully reviews this data in a weekly Neurovascular conference. If embolization is determined to be part of the treatment plan, our physicians will meet with you and discuss the procedure in full.

Embolization is performed under general anesthesia. A sheath and catheter system is placed in the femoral artery, usually in the right groin. The catheter system is brought up to the neck and diagnostic angiogram is obtained. Using this information and live fluoroscopic visualization, a microcatheter is placed through the guide catheter and navigated into the arteries supplying the AVM. Another angiogram is done to determine whether it is a safe artery to block off. If so, then liquid embolic agent is used such as ONYX or N-butyl cyanoacrolate in a mixture with radio-opaque material. This process is repeated up to several times after which the catheters are removed and the arteriotomy site is closed. The patient is awakened from anesthesia and transferred to the Neurointensive care unit. Elective patients are usually in the hospital for elective procedures for 1-2 days. Blood flow to the AVM may be treated in stages to prevent thrombosis or hemorrhage from occurring. In some cases, embolization may fully treat a lesion, but most patients will undergo surgical resection or radiation therapy. Angiography is used following these treatments to insure the lesion is fully treated.

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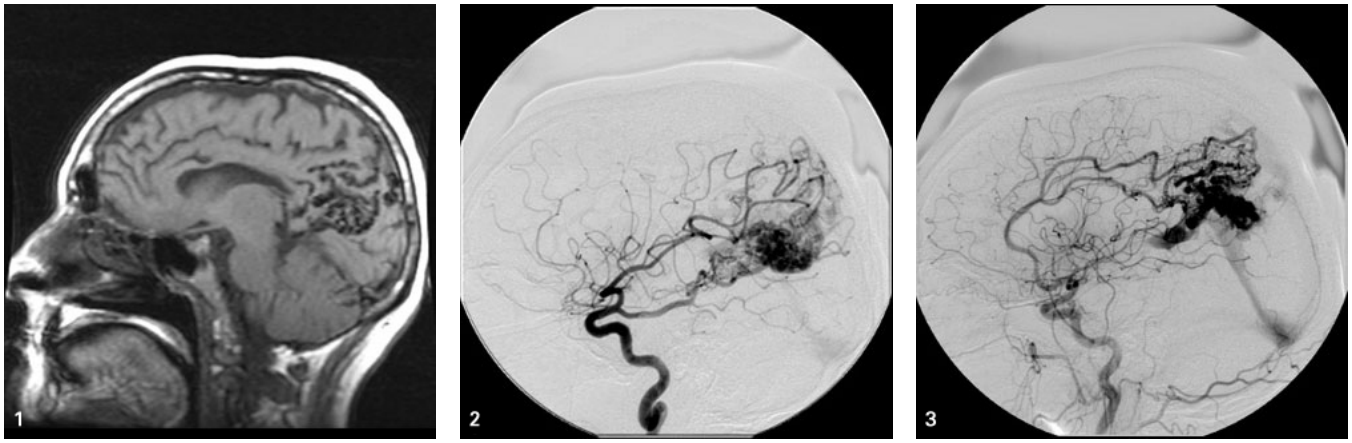
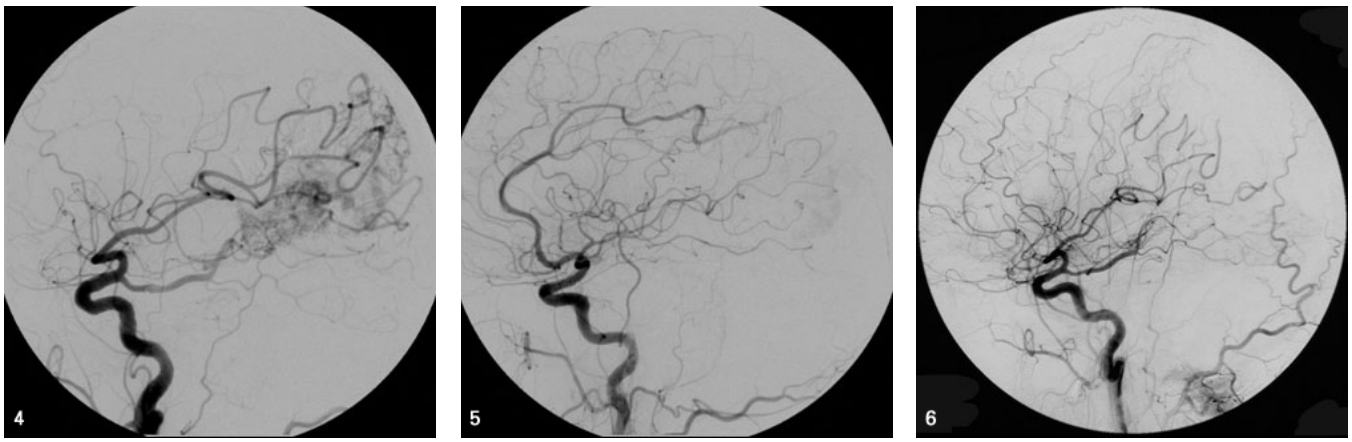


(1) Sagittal T1 weighted MRI shows a rounded collection flow voids in the right parietal lobe consistent with an arteriovenous malformation (AVM). (2) Initial right carotid angiogram in the lateral projection shows the AVM fed by posterior cerebral and middle cerebral artery branches. (3) The left internal carotid angiogram also shows anterior cerebral artery supply across the Circle of Willis. Early venous drainage is seen into the deep and superficial venous system.



(4,5) Post embolization angiograms of the right and left internal carotid arteries show marked reduction in the size and flow of the AVM. (6) Post surgical angiogram shows complete resection of the AVM.

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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