# ENDOVASCULAR NEUROSURGERY OVERVIEW NEWSLETTER #3

Endovascular neurosurgery (aka: Interventional neuroradiology; Neuroendovascular Surgery) is a subspecialty that focuses on the management of neurosurgical, neurologic and otolaryngologic conditions that affect the brain, skull, spine, and spinal cord. Procedures are performed by using major arteries or veins to gain percutaneous access to the pertinent anatomic system and location. While the femoral artery or vein is the most common access point, other commonly accessed locations can include the radial, brachial, axillary, and carotid arteries. Once arterial or venous access is achieved, surgeons use X ray angiography equipment to advance various sized catheters and wires through the vascular tree. Once a therapeutic target is reached, devices can be advanced through the catheter to treat a variety of conditions that will be discussed below.

The road to becoming an endovascular neurosurgeon is gradual. Following college and medical school, all such physicians complete one year of General Surgery Internship followed by 6-7 years of Neurosurgical Residency. After completing Neurosurgical Residency the surgeon moves on to a 2-3 year Fellowship training program where he/she pursues additional training in endovascular neurosurgery and often open vascular neurosurgery as well. After the 8-10 years of surgical training that followed college and medical school the physician is ready to begin an independent practice.

Endovascular neurosurgical procedures are myriad. They include the following:

Diagnostic cervical and cerebral angiography
Treatment of acute cerebral stroke
Carotid stenting
Vertebral artery stenting
Intracanial arterial and venous angioplasty and stenting
Tumor embolization (spine, spinal cord, skull and brain)
Epistaxis embolization (posterior nosebleeds)
Aneurysm coiling and stenting
Arteriovenous malformation embolization (brain and spinal cord)
Arteriovenous fistula embolization (brain and spinal cord)
Treatment of neonatal vascular abnormalities
Management of venous sinus thrombosis
Management of penetrating trauma

<u>Sample Procedures</u>

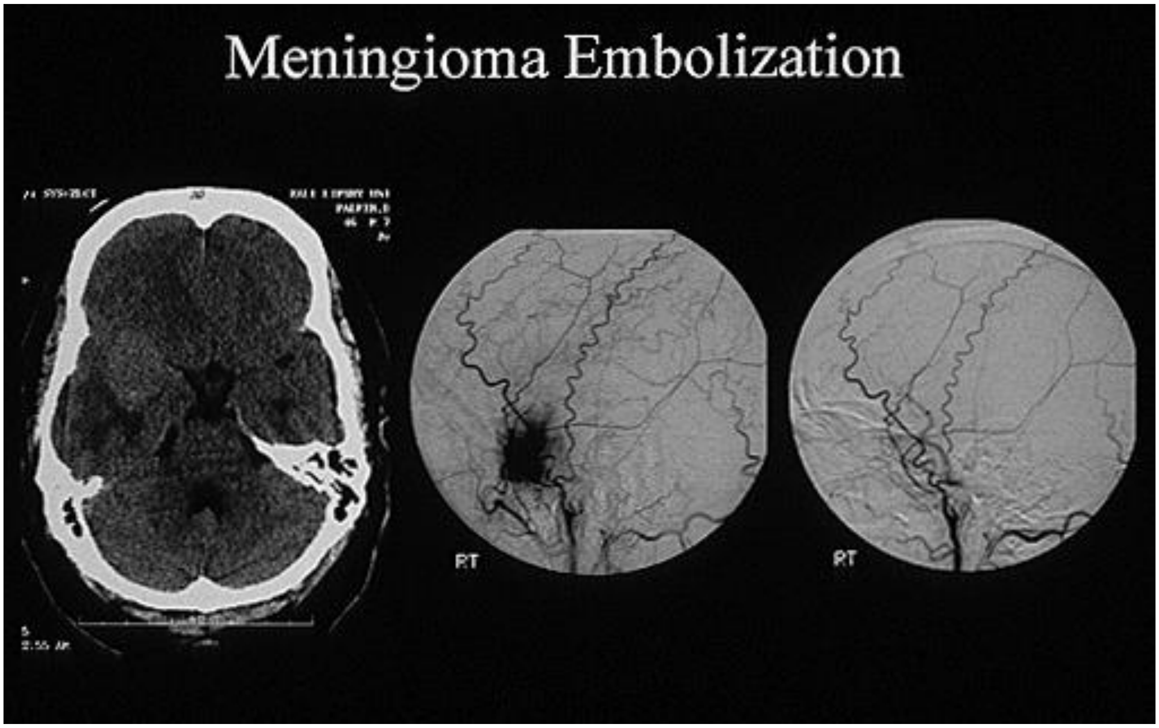



Figure1: Right sphenoid wing meningioma seen on the CT scan. Middle image shows the tumor blush prior to embolization. The image on the right shows the absence of tumor blush (devascularization) after tumor embolization. The tumor can now be more easily removed at surgery.


Figure 2: The left sided image shows a carotid body tumor located between the cervical internal and external carotid arteries. The right sided image shows the same tumor after it has been embolized. Note the tumor devascularization as indicated by the absence of the tumor blush seen on the left sided image. The tumor can now be more easily resected.


Figure 3: The figure on the left shows a catheter inserted into the left internal maxillary artery in a patient with severe nose bleeds (epistaxis). The image on the right shows absent blood flow to the nasal mucosa after embolization. The epistaxis was cured without the need for open surgery.

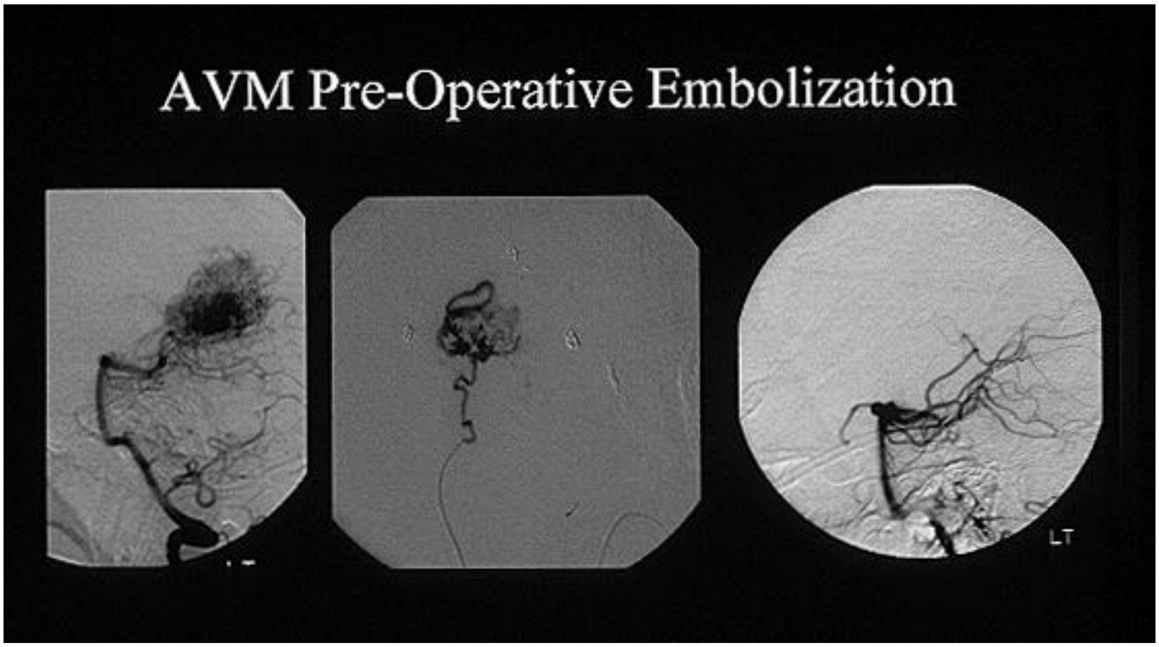



Figure 4: The image on the left shows an intracranial arteriovenous malformation (AVM) arising from the left posterior cerebral artery (PCA). The center image shows a microcatheter positioned in a branch of left PCA that supplied blood flow to the AVM prior to embolization. The image on the right shows an arteriogram after AVM embolization. The AVM no longer fills with blood and has been completely devascularized.

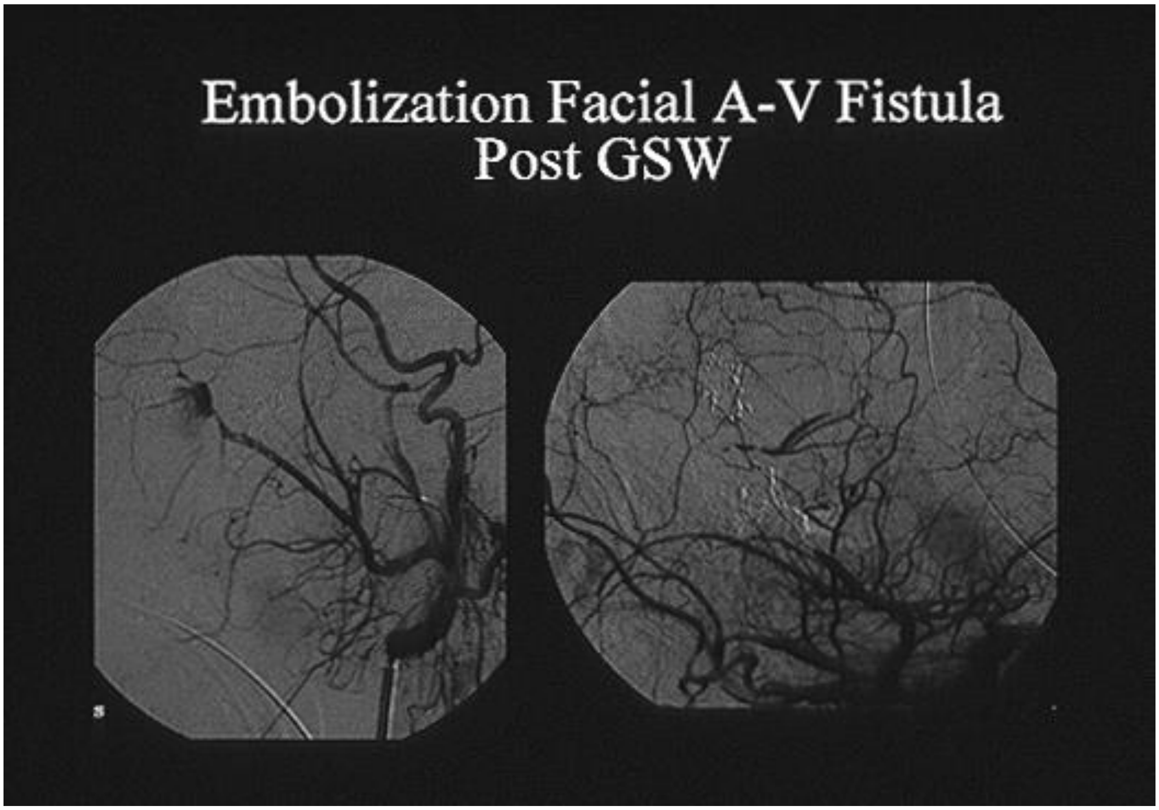



Figure 5: The image on the left shows the result of a shotgun blast to the face. The internal maxillary artery has been damaged and is actively bleeding through the wound causing imminent exsanguination. The image on the right shows the internal maxillary artery no longer filling and no active bleeding. The artery was emergently embolized to stop the bleeding.

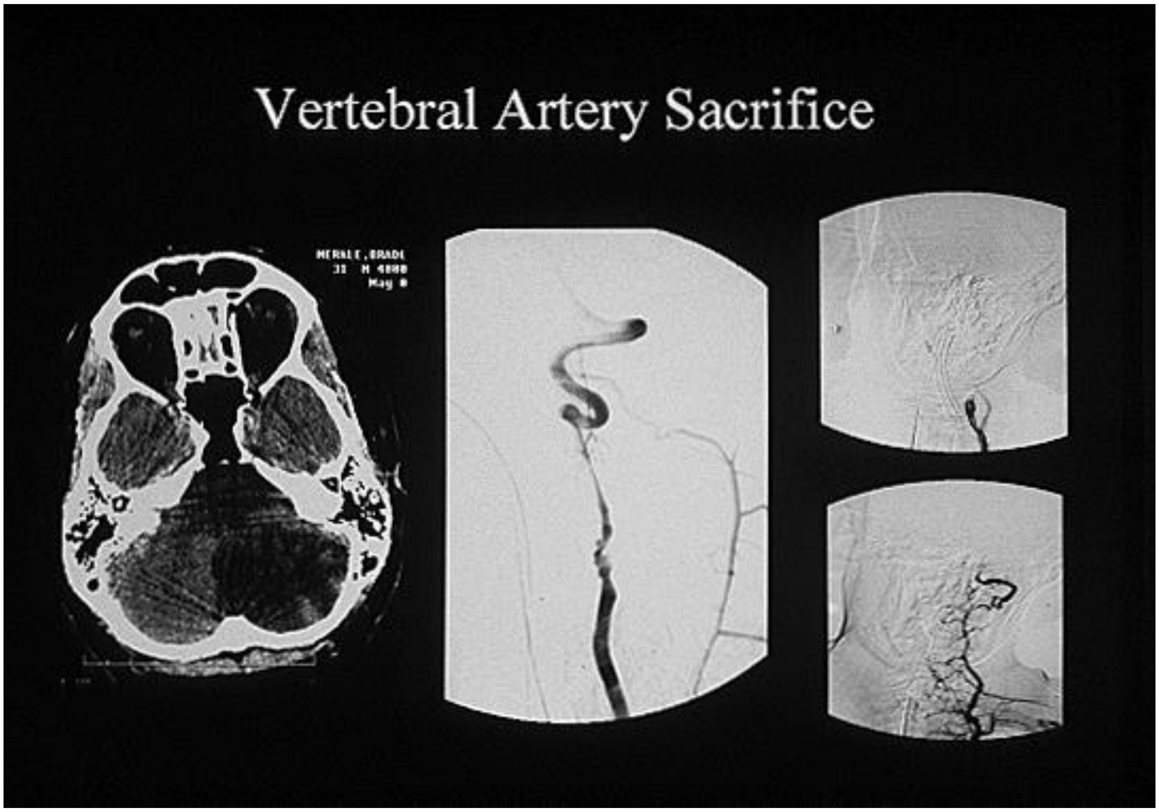



Figure 6: This patient suffered a left cerebellar stroke (CT scan on left) secondary to a spontaneously dissected left vertebral artery seen in the center image. The stroke was secondary to a thromboembolus forming in the diseased artery. This embolus then went on to lodge in the left posterior inferior cerebellar artery to cause a stroke. The two right sided images show absent filling of the left vertebral artery after it has been occluded endovascularly using platinum coils. The intracranial circulation will continue to fill from the right vertebral artery. The occluded left vertebral artery will no longer be a source for emboli and future strokes.

Figure 7:  The top two images show a large basilar tip aneurysm.  The lower two images show that same aneurysm after it has been embolized using platinum coils.  The aneurysm no longer opacifies and has been cured.

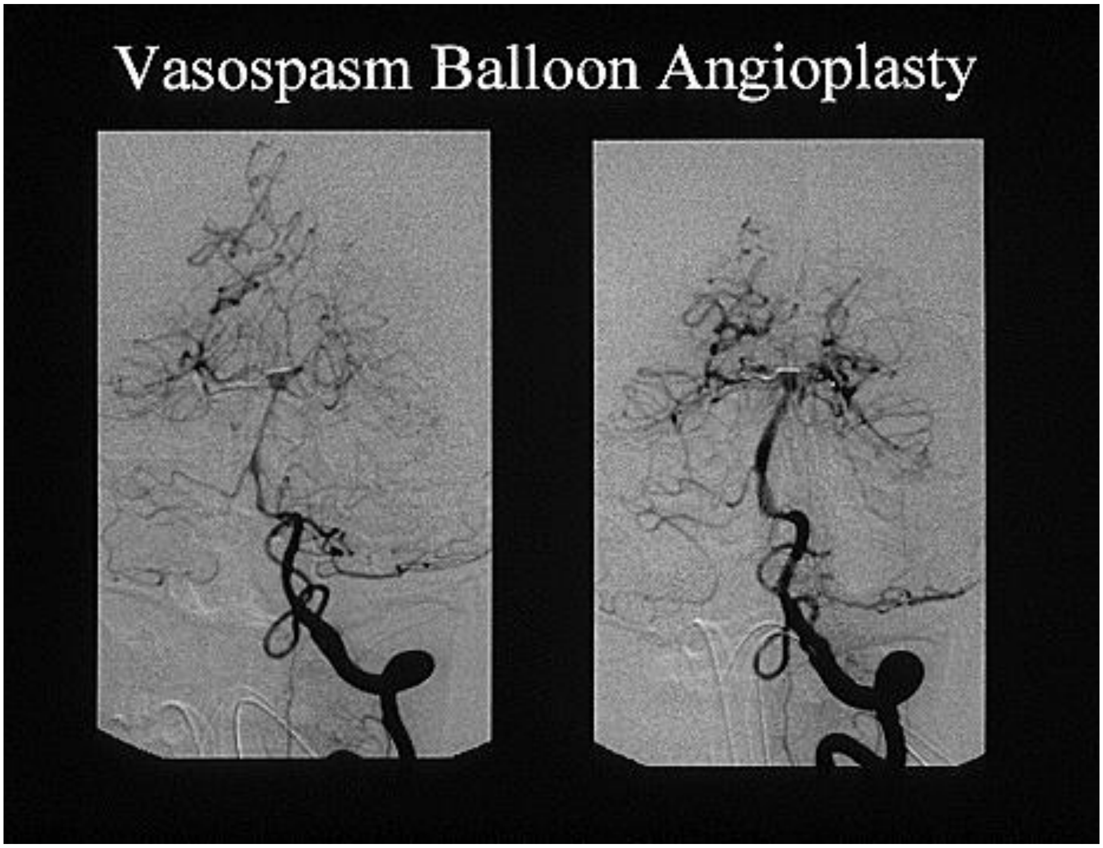



Figure 8: The left sided image shows the basilar artery in vasospasm after an aneurysmal subarachnoid hemorrhage . The aneurysm has been treated with open surgical clipping. The right sided image shows the basilar artery back to its normal diameter after an angiopasty balloon was advanced into the artery, inflated and removed. This procedure treated cerebral ischemia and reduced the risk of stroke.

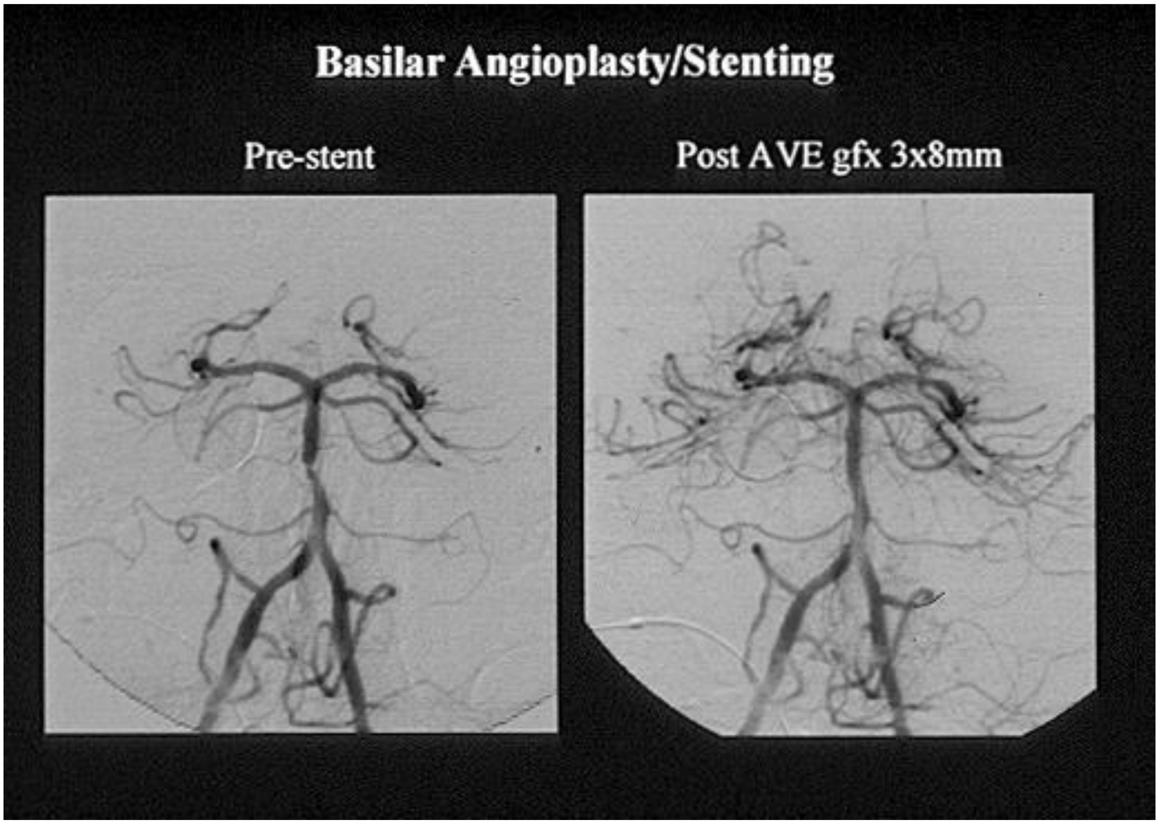



Figure 9: The image on the left shows a basilar artery that is stenotic secondary to atherosclerotic disease. This patient was having recurrent strokes despite being on antiplatelet and anticoagulant agents. The image on the right shows the same vessel after it has been angioplastied and stented. The stenosis is now resolved.

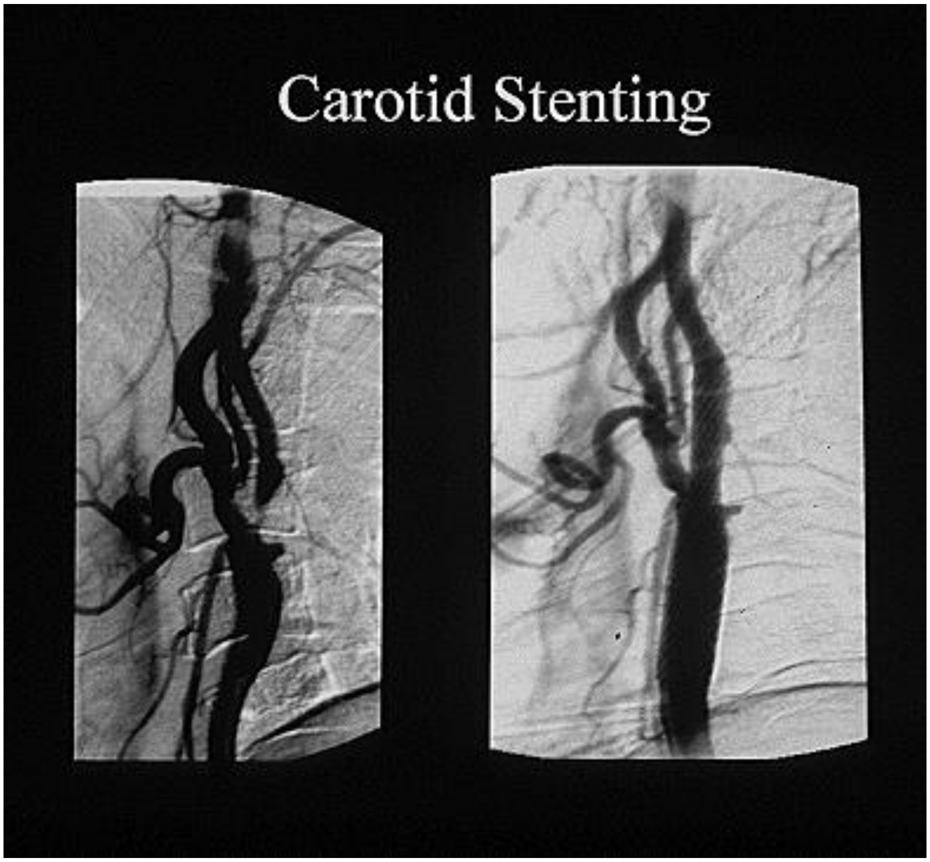



Figure 10: The image on the left shows a >99% stenosed cervical internal carotid artery. The image on the right shows no residual stenosis following angioplasty and stenting.

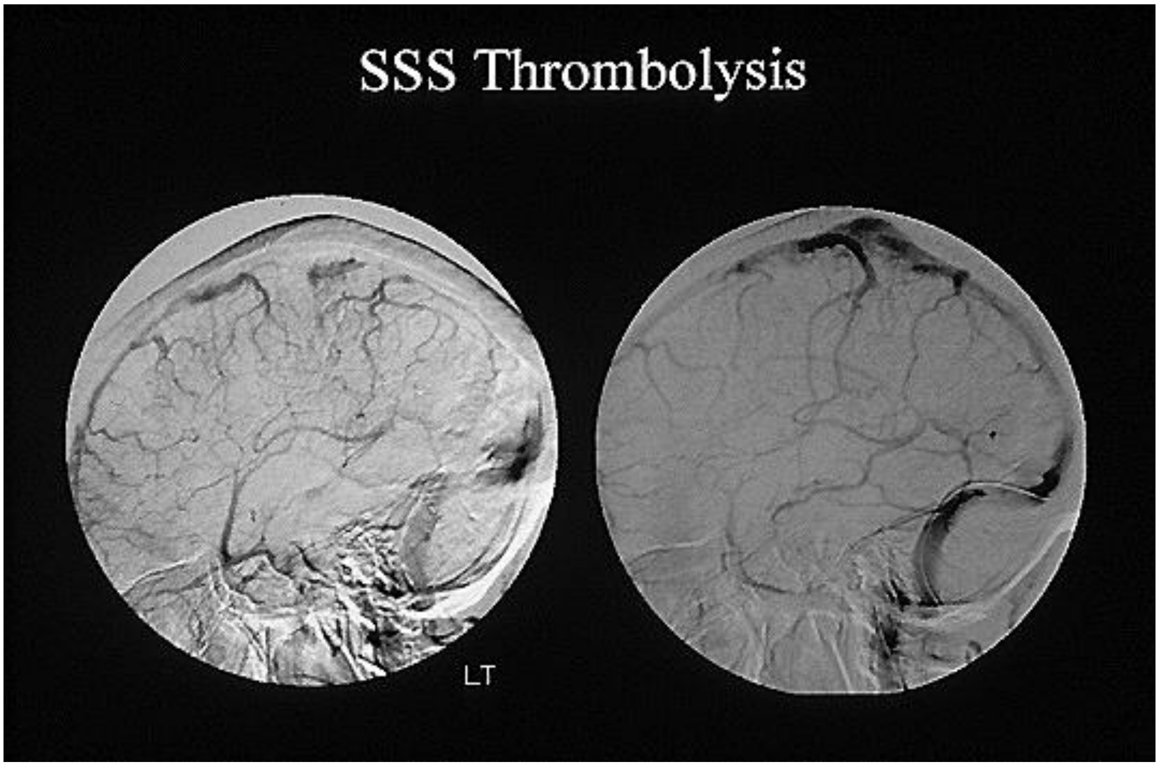
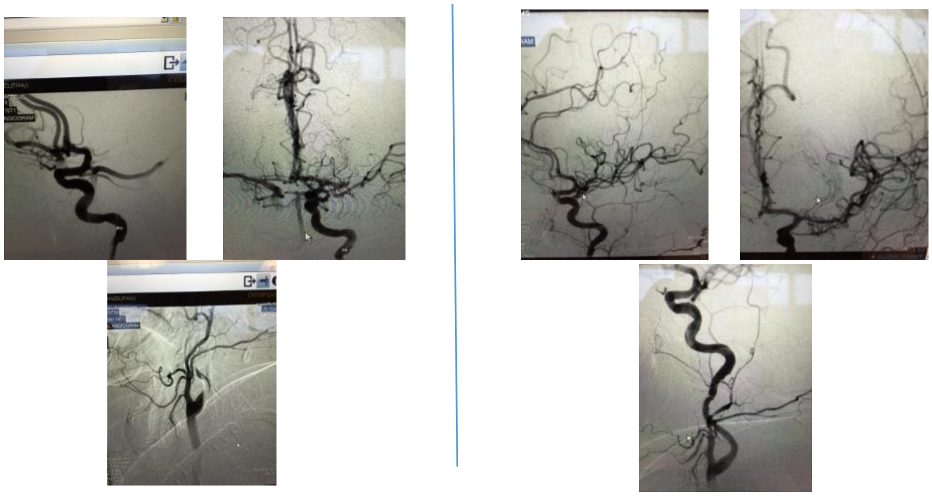



Figure 11: The image on the left shows a patient with thrombotic occlusion of the superior sagittal sinus secondary to severe dehydration. The image on the right shows the sinus reopened after 48 hours of thrombolytic infusion directly into the venous sinus using a microcatheter advanced from the right femoral vein.

PRE TREATMENT POST TREATMENT



**MANAGEMENT OF ACUTE STROKE**

Figures 12 and 13: The left three images above show an occluded cervical left internal carotid artery and left intracranial middle cerebral artery in a patient who presented with stroke. The right three images show the vessels reopened. The image below shows the thrombus that was removed from the middle cerebral artery using a thrombectomy device.

RETRIEVED THROMBUS