

What You Need To Know About the Anatomy

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Disclosures

- Research and consultant support: Canon, Stryker, Penumbra, Medtronic, Jacobs Institute
- Founding member: Neurovascular Diagnostics
- Stockholder: Blockade Medical

It's important!

- Essential to recognizing pathology and operative complications
- Any surgical procedure is an exercise in anatomical knowledge
- Permits for innovative & improved treatment options
 - Alternative access
 - Vessel sacrifice
- Also critical to appreciate how the Anatomy and **Physiology** work together!
 - Think in Vascular Functional Regions

The Basics

- ICAs (x2)
 - Fixed near the skull base
- VAs (x2)
 - Fixed within foramen transversarium
- These 4 vessels carry 20% of cardiac output

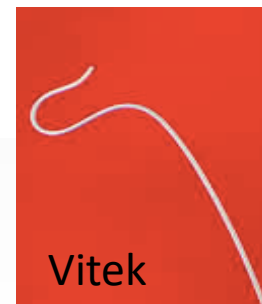
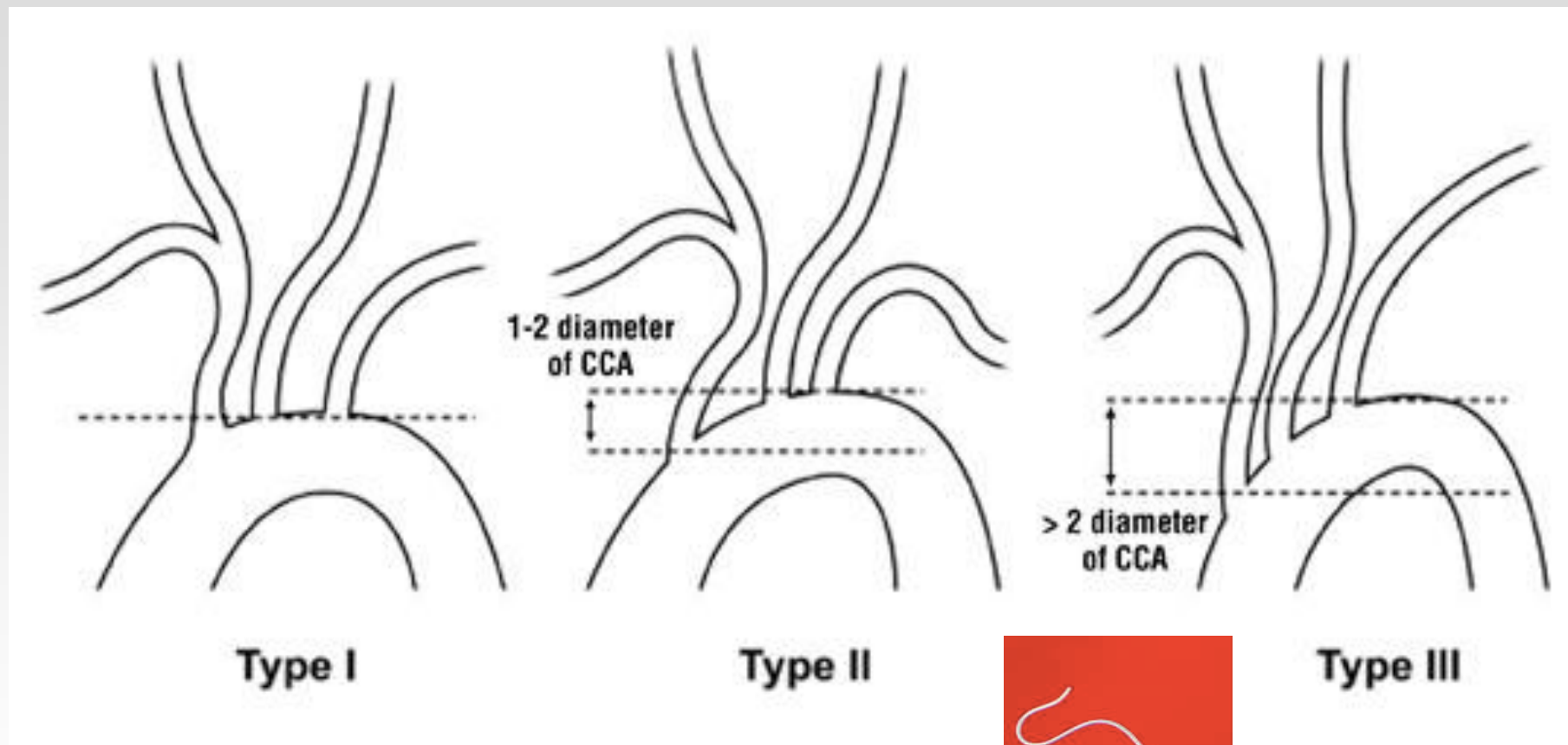


Aortic Arch

- Branches
 - L subclavian artery
 - L CCA
 - Brachiocephalic (innominate)
 - R Subclavian
 - R CCA
- Many variations

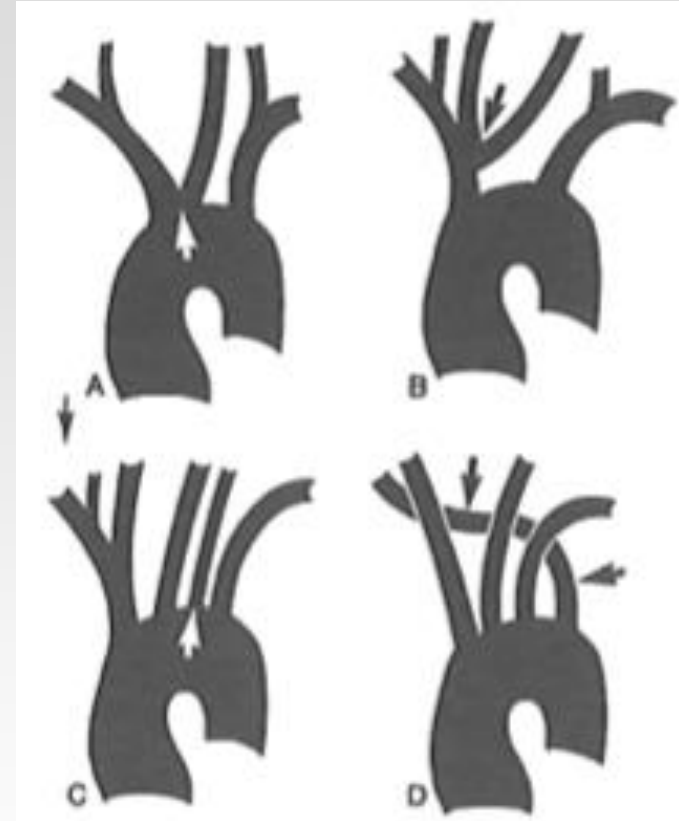


Arch Types



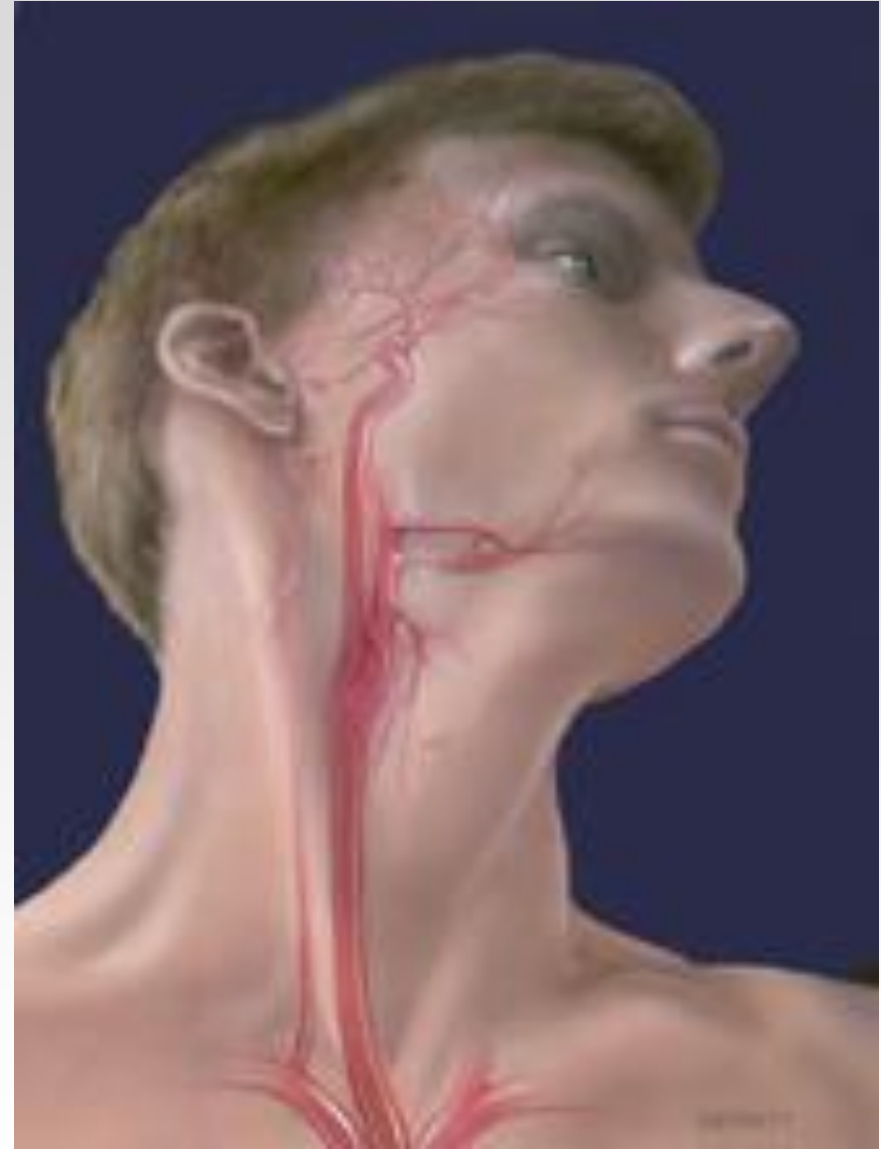
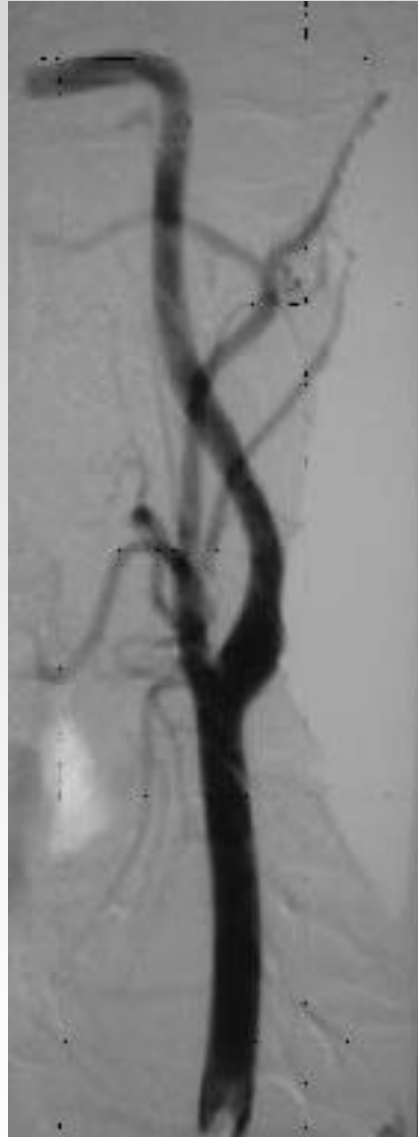
Common Variants

- Bovine (27%)
 - common origin of innominate and left CCA
- Innominate origin of left CCA
- Arch origin of left VA
- Aberrant left subclavian
 - Origin from arch

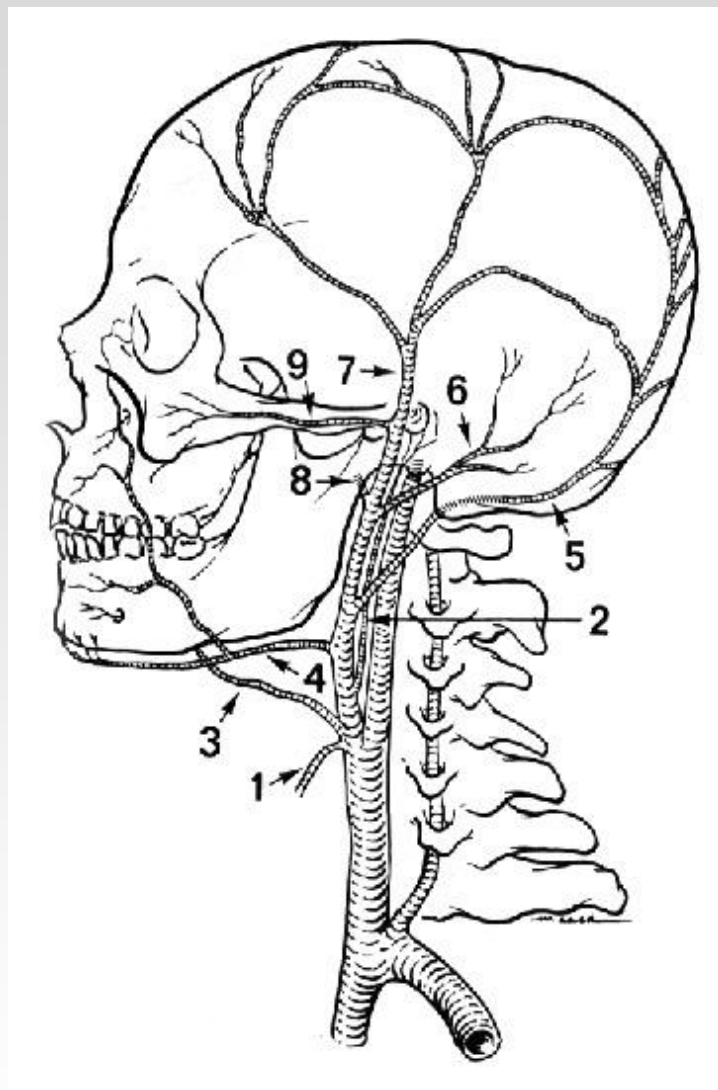


Carotid Artery

- The length of CCA varies
- Bifurcation most commonly occurs at C4 (may vary from C1 to T2)
- Many different curvatures
- Ultrasound for direct stick
- Cut down 2 cm above clavicle

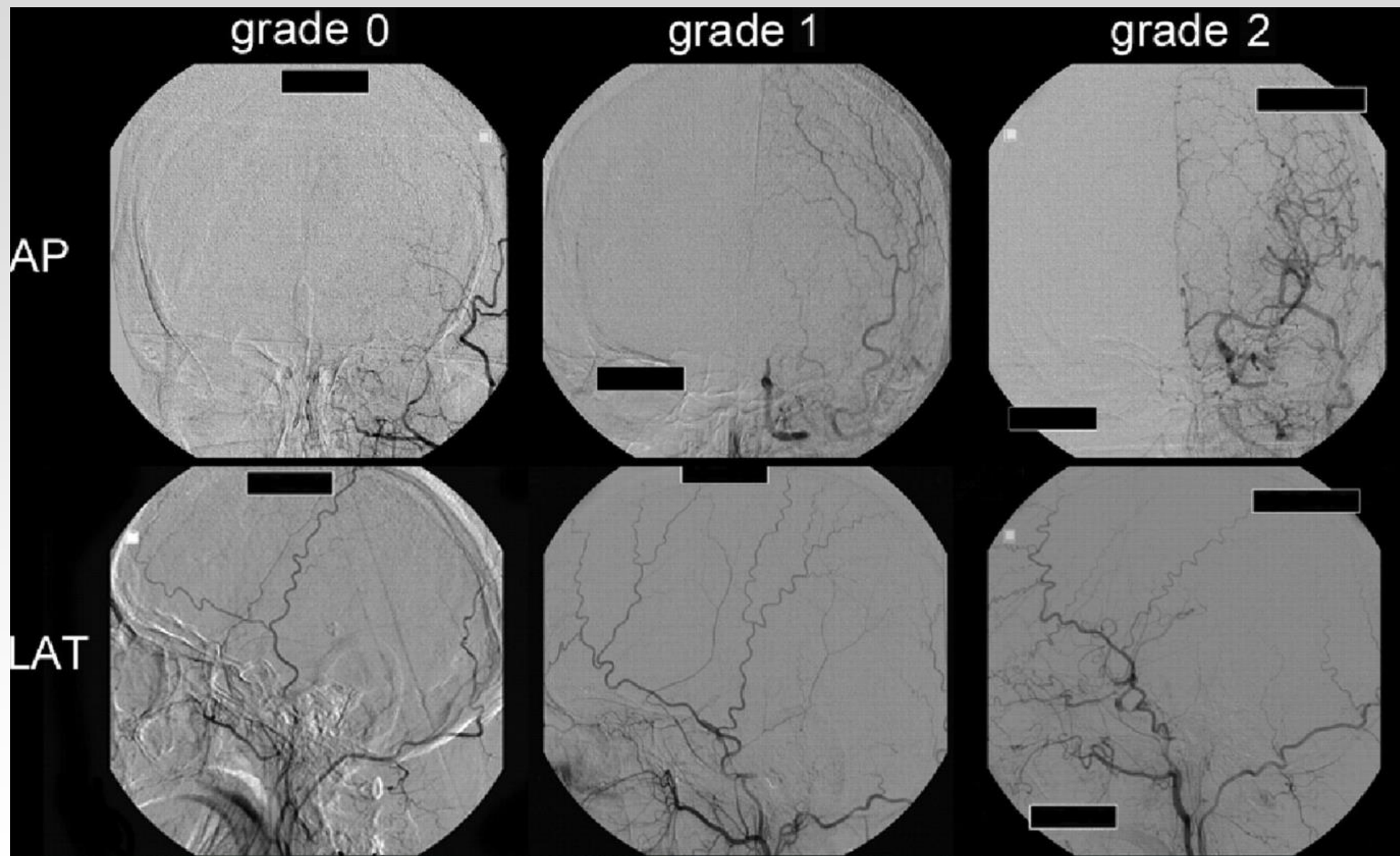


ECA anatomy

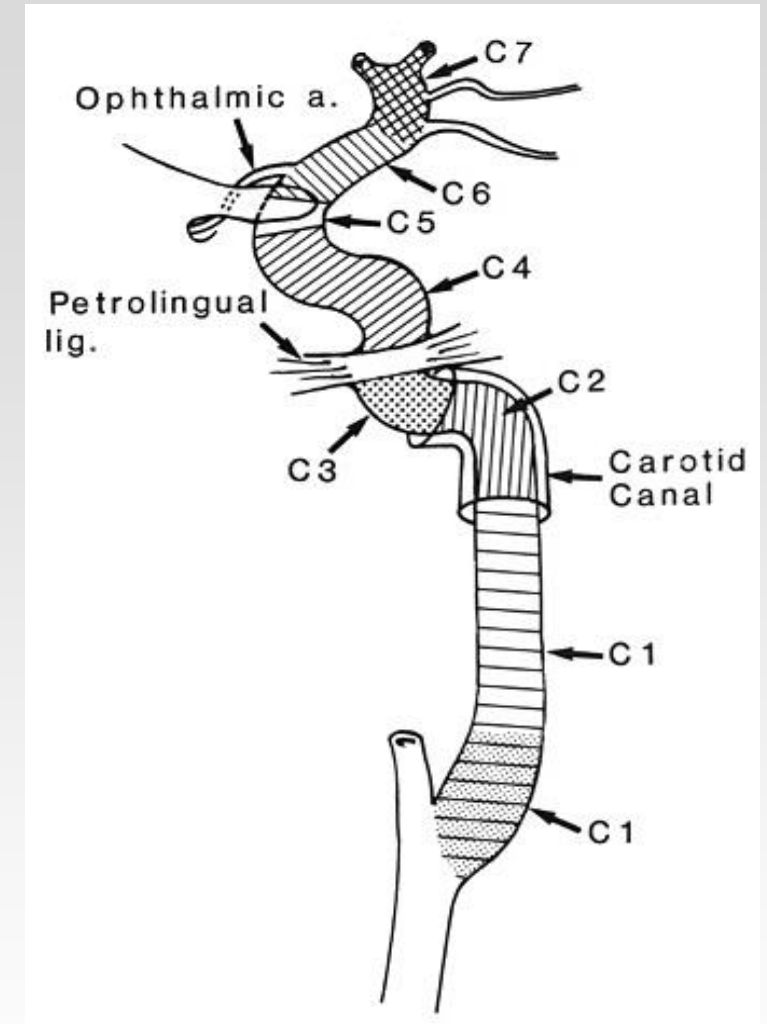
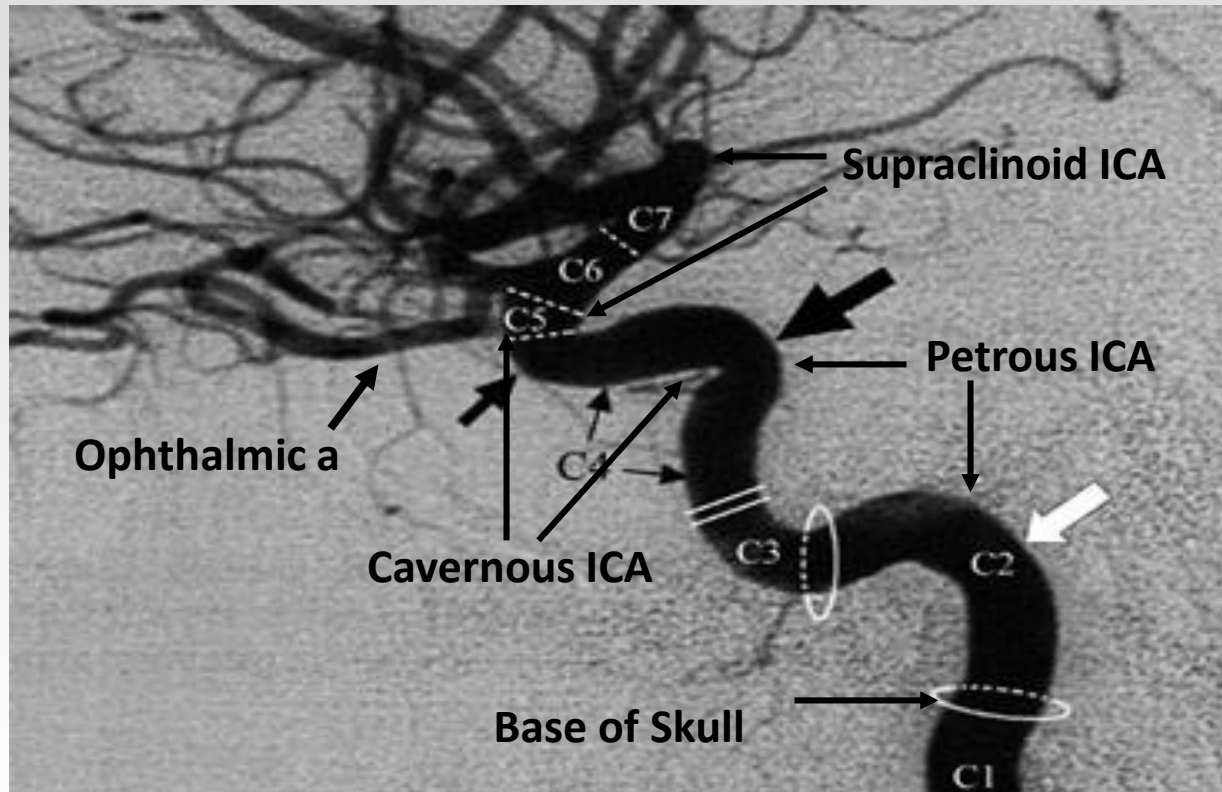


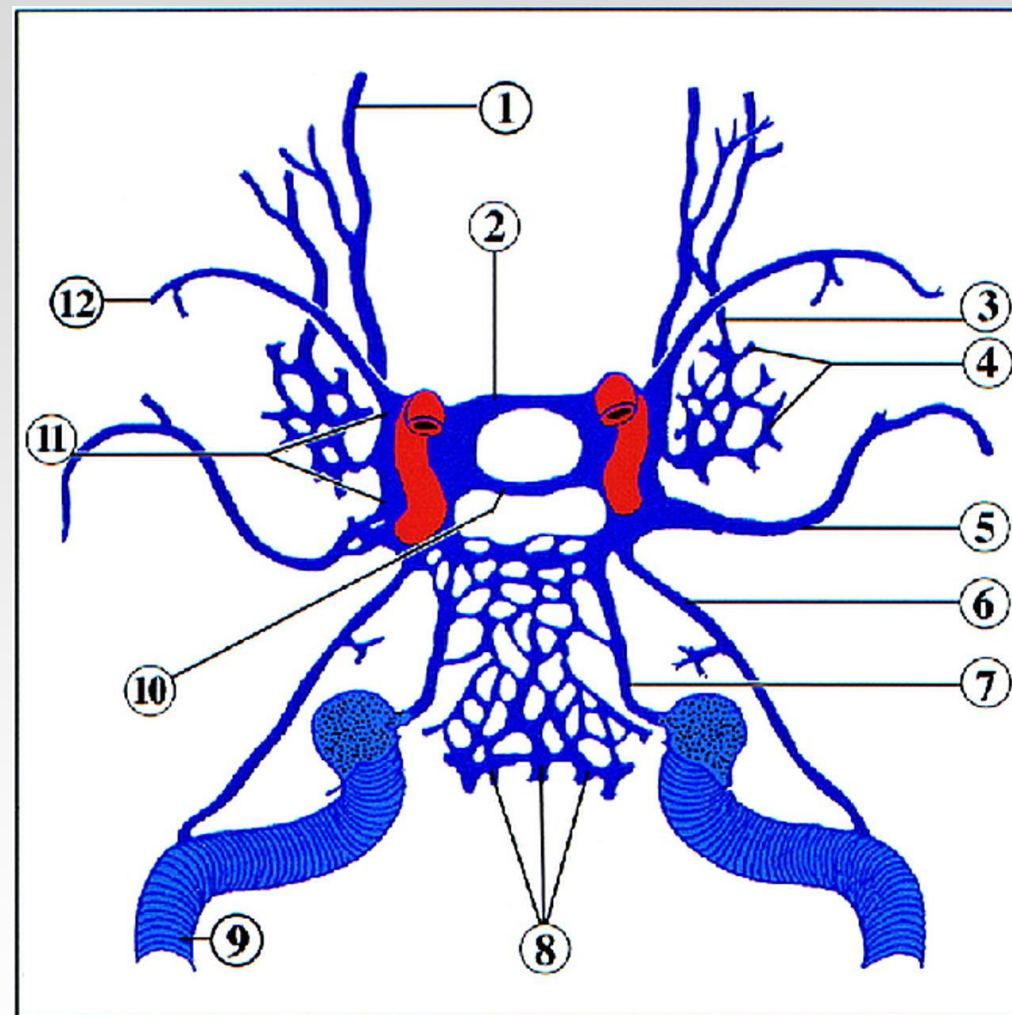
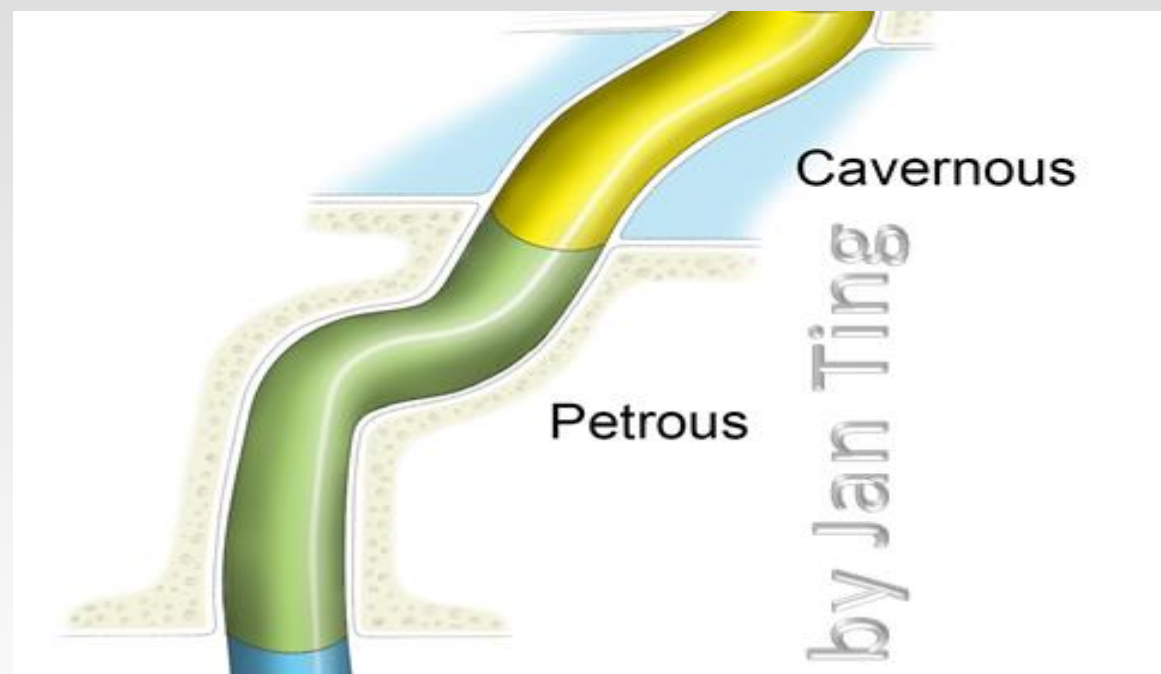
Common EC-ICA Anastomoses

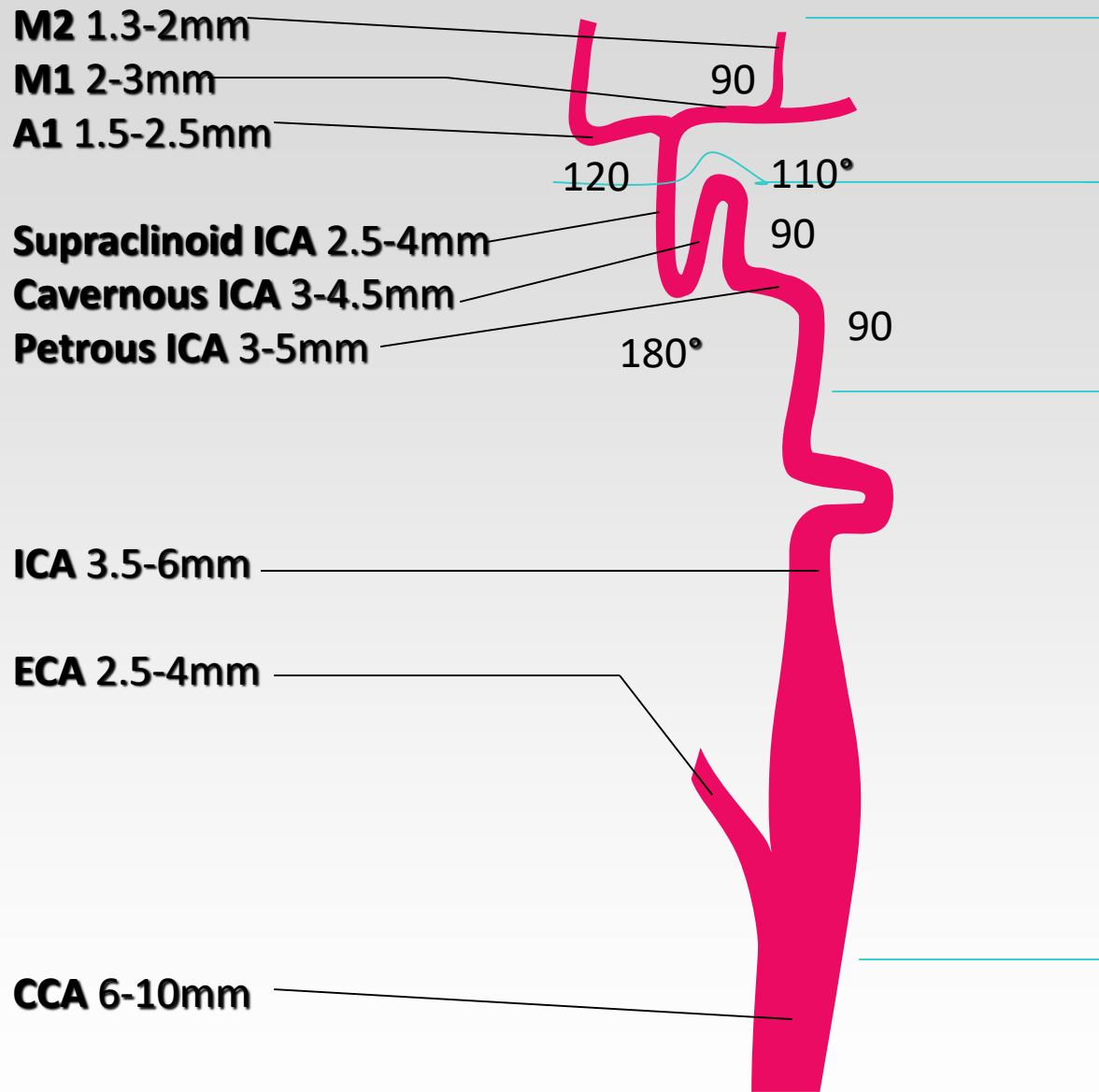
EXTRACRANIAL A.A.	INTRACRANIAL A.A.
Anterior branch of middle meningeal	Ophthalmic (ethmoidal)
Anterior meningeal	Anterior cerebral
Petrosquamosal branch of middle meningeal	Petrous internal carotid (cranial nerve VII)
Occipital	Vertebral
Neuromeningeal branch of ascending pharyngeal	Posterior inferior cerebellar/ anterior inferior cerebellar (cranial nerves IX-XI)



Internal Carotid







Intracranial

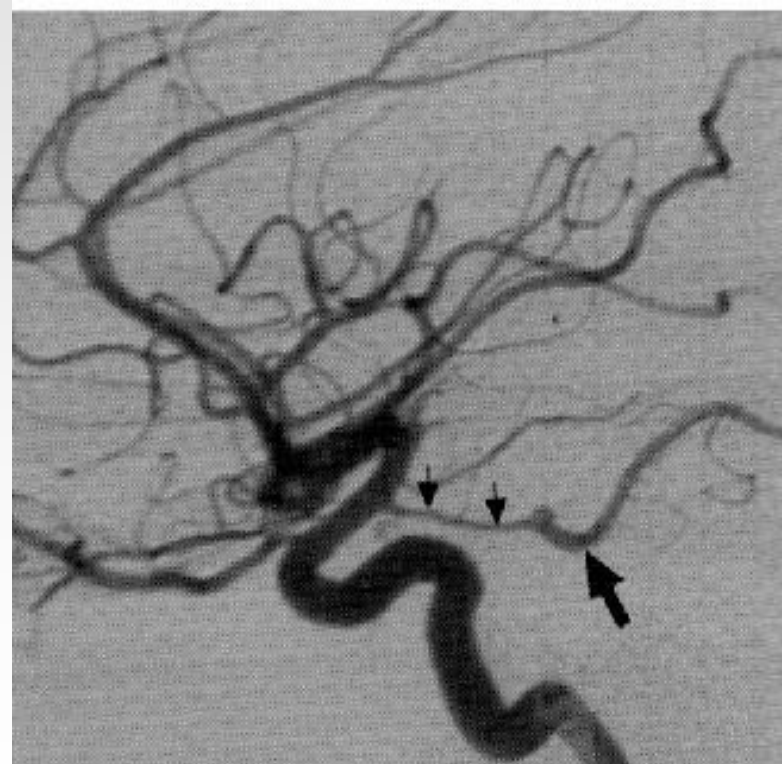
Skull base

cervical

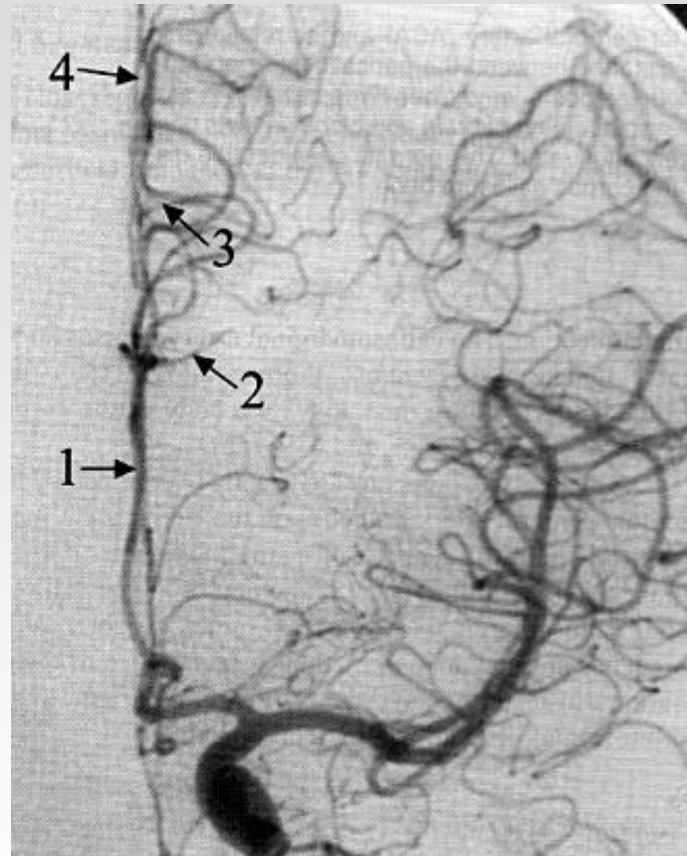
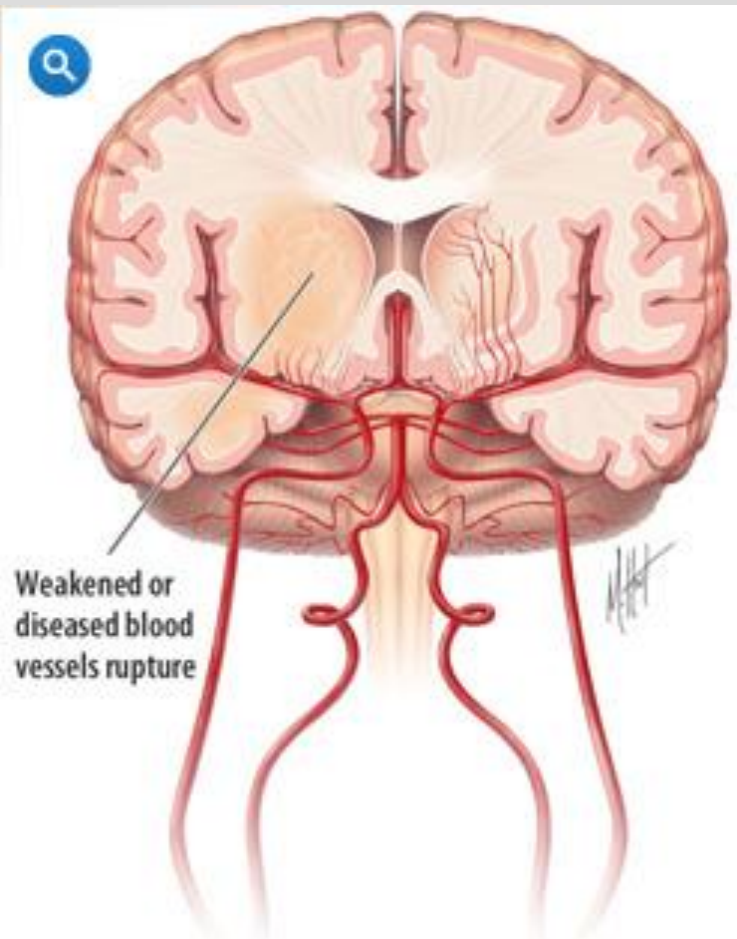


Intracranial Vascular Anatomy

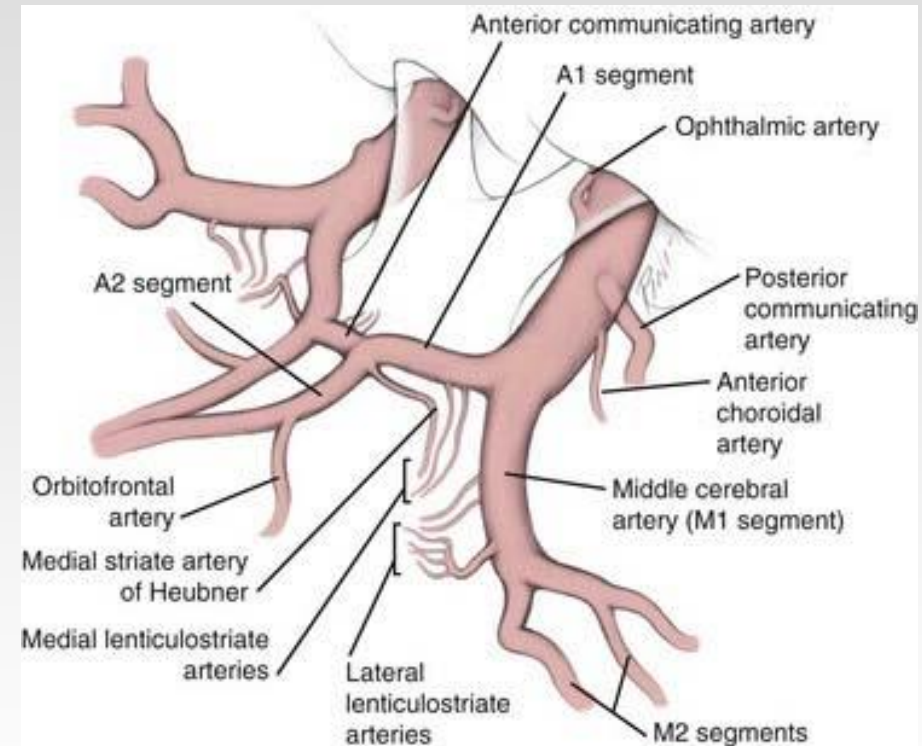
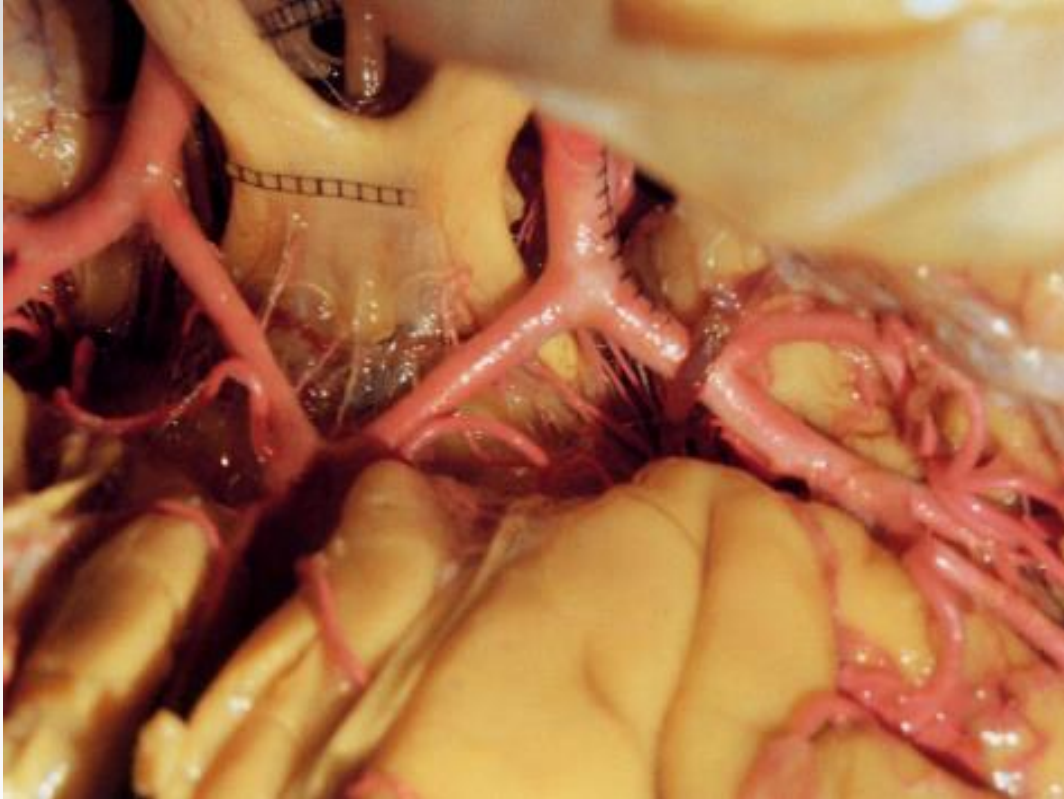
- Ophthalmic artery is typically the first intradural branch (90%)
- Prior to bifurcating into the ACA & MCA the ICA gives rise to:
 - Posterior communicating
 - Anterior choroidal



AP and Lat IC views

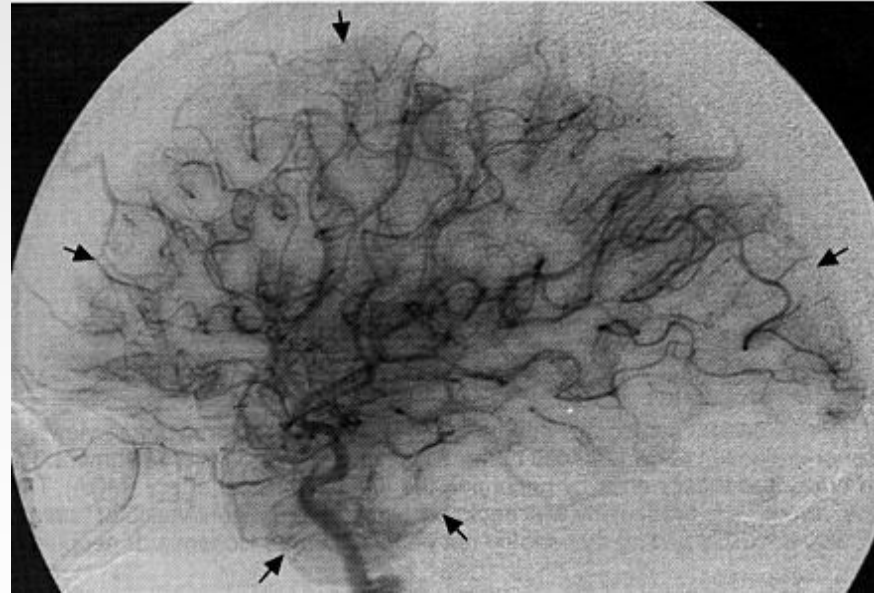
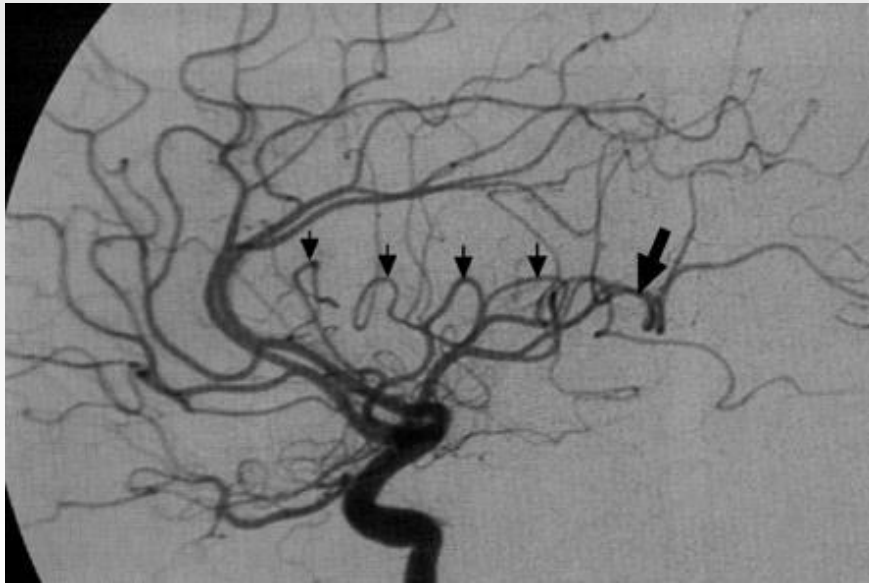


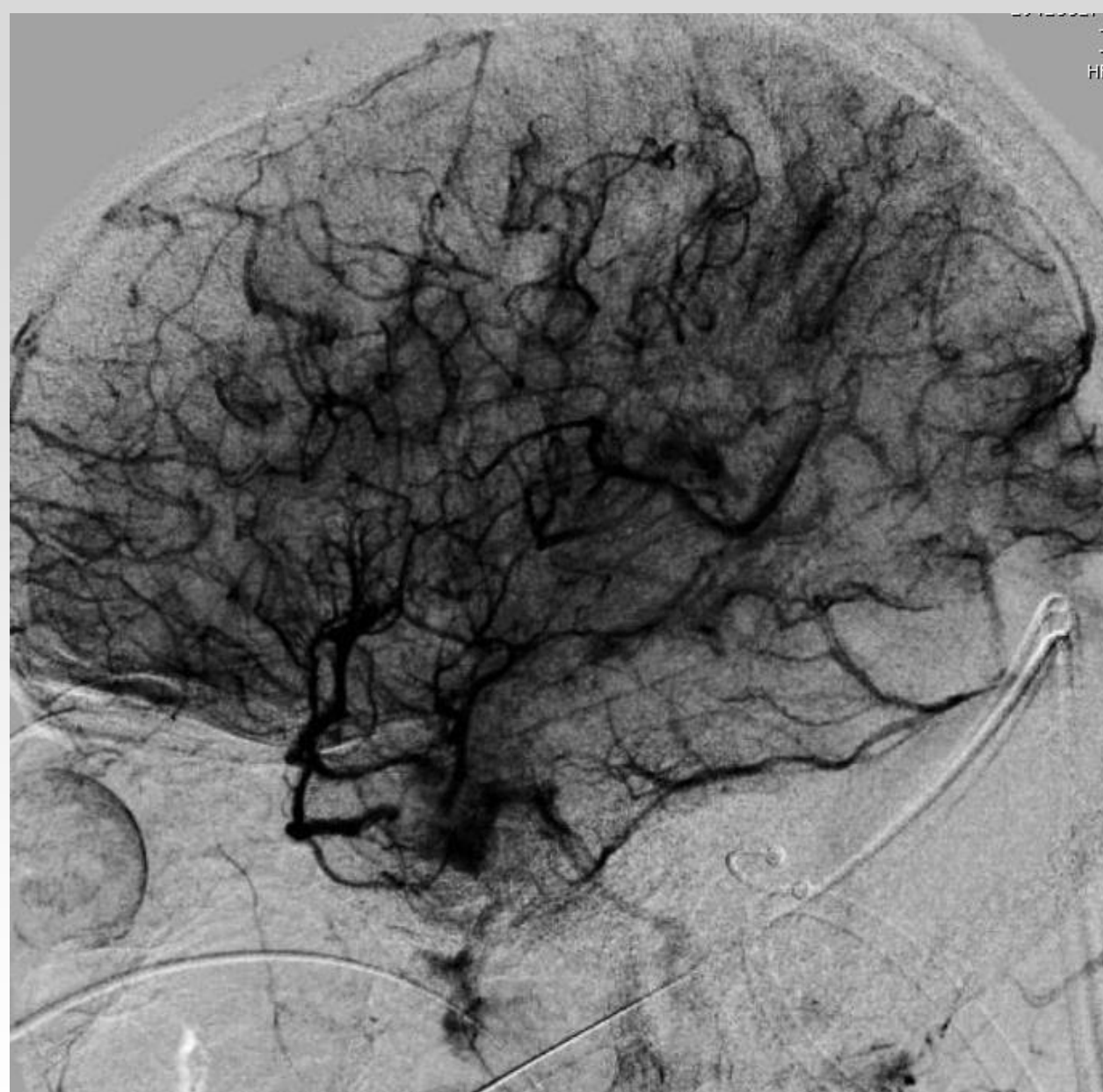
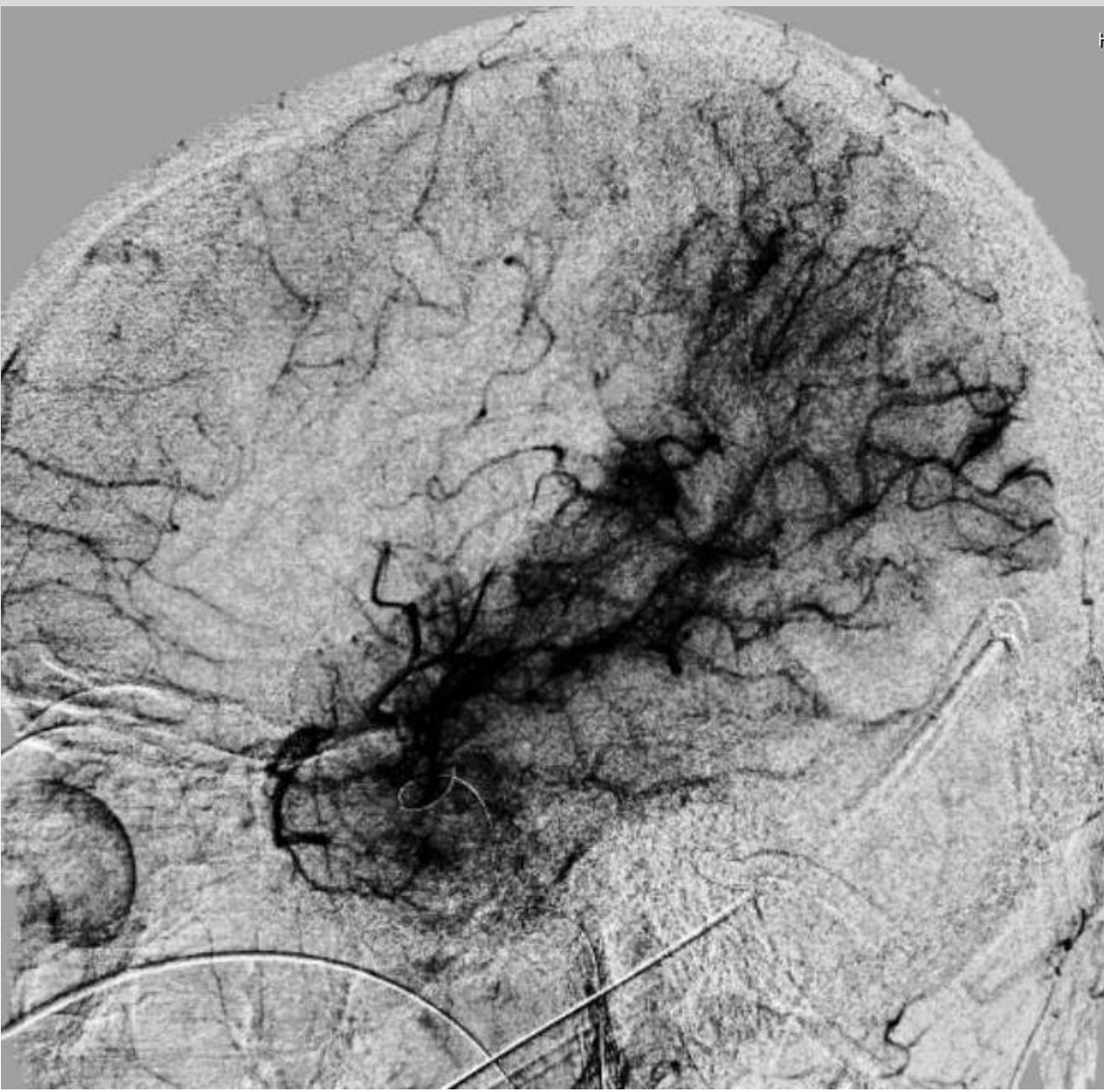
Tiny perforators everywhere!



MCA Anatomy

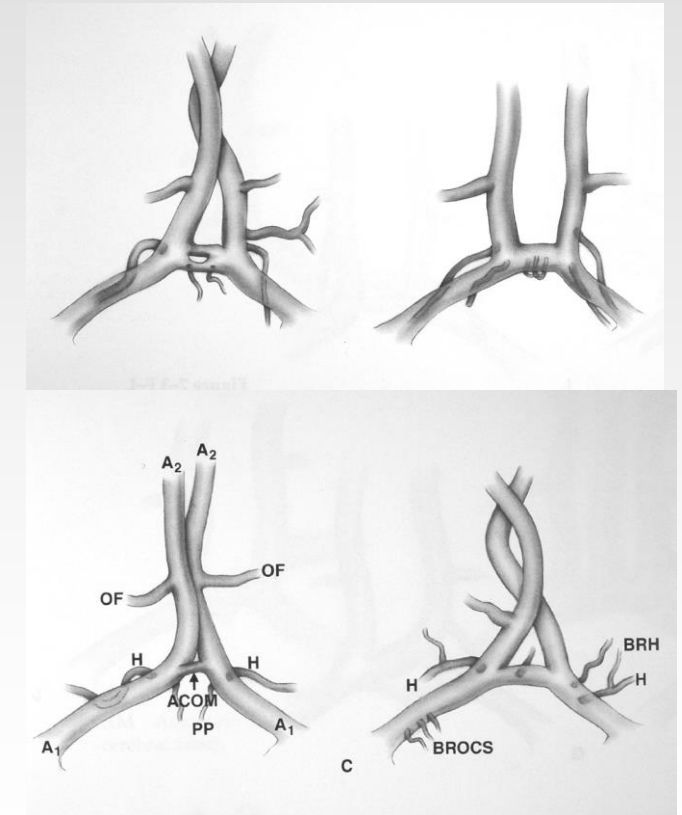
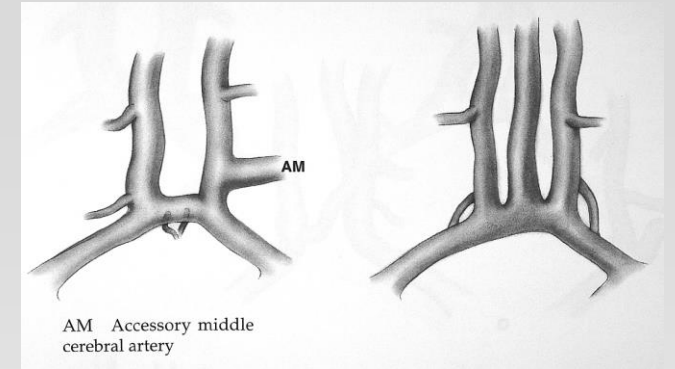
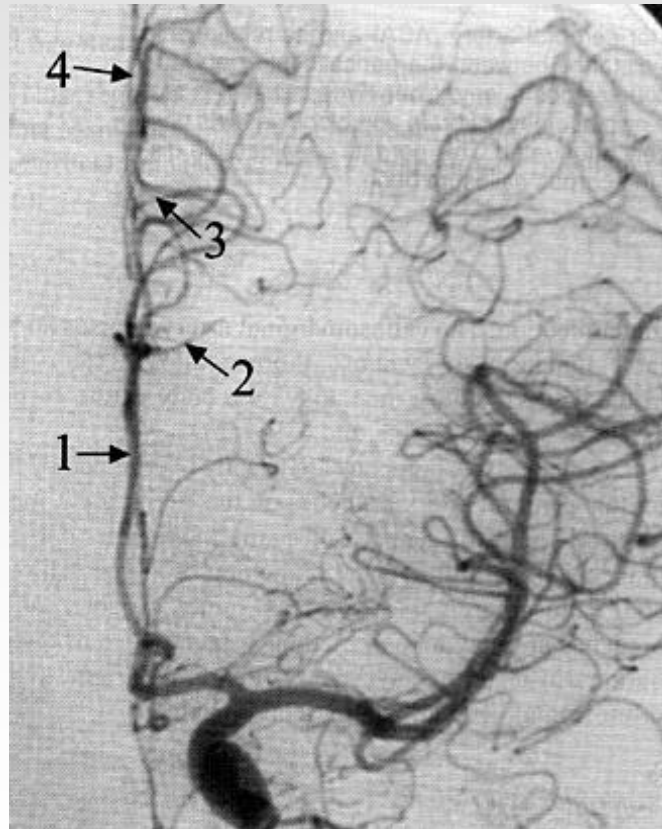
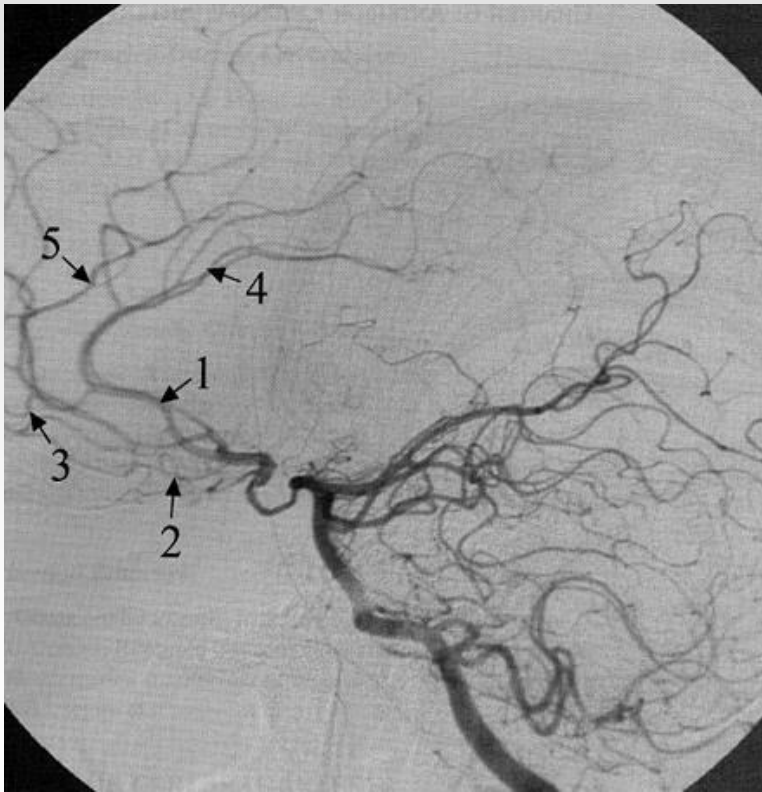
- Larger of the 2 terminal branches of the ICA
- Supplies majority of the cerebral convexity





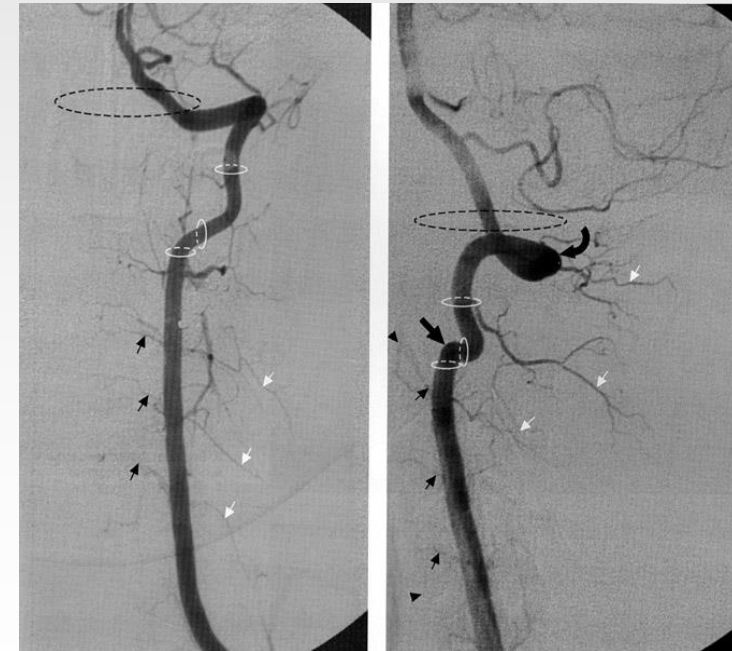
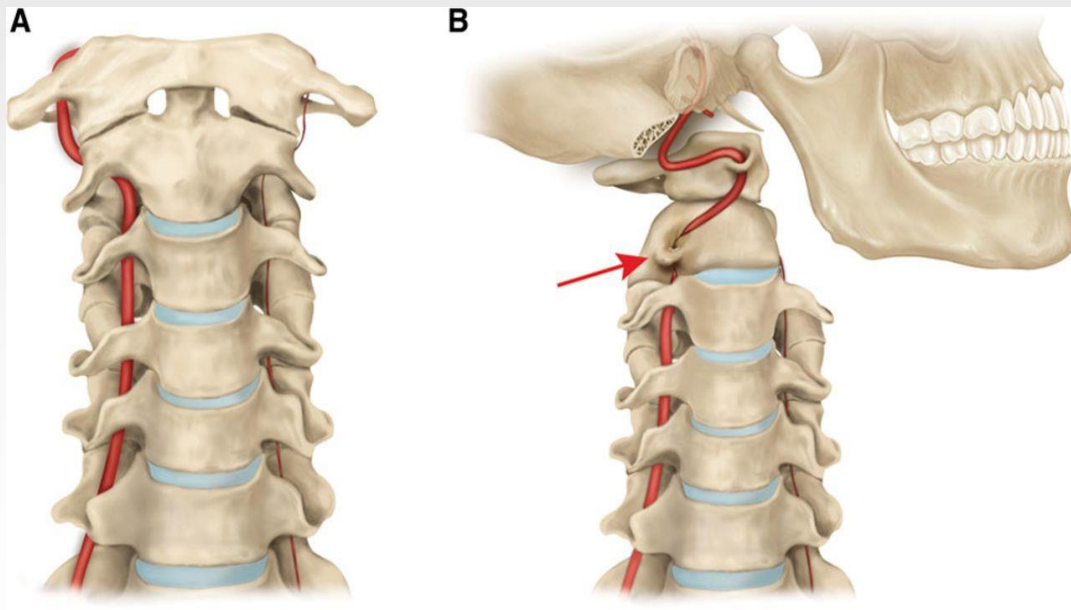
ACA Anatomy

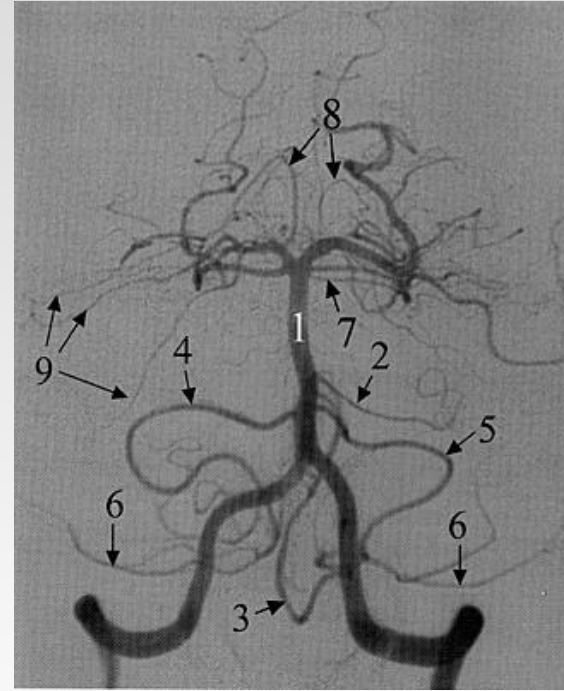
- Smaller of 2 terminal branches of ICA
- Supplies parasagittal region (lower extremities)



Vertebral Artery Anatomy

- VA fixed within foramen transversarium throughout its cervical segment
- Enters the dura at the foramen magnum

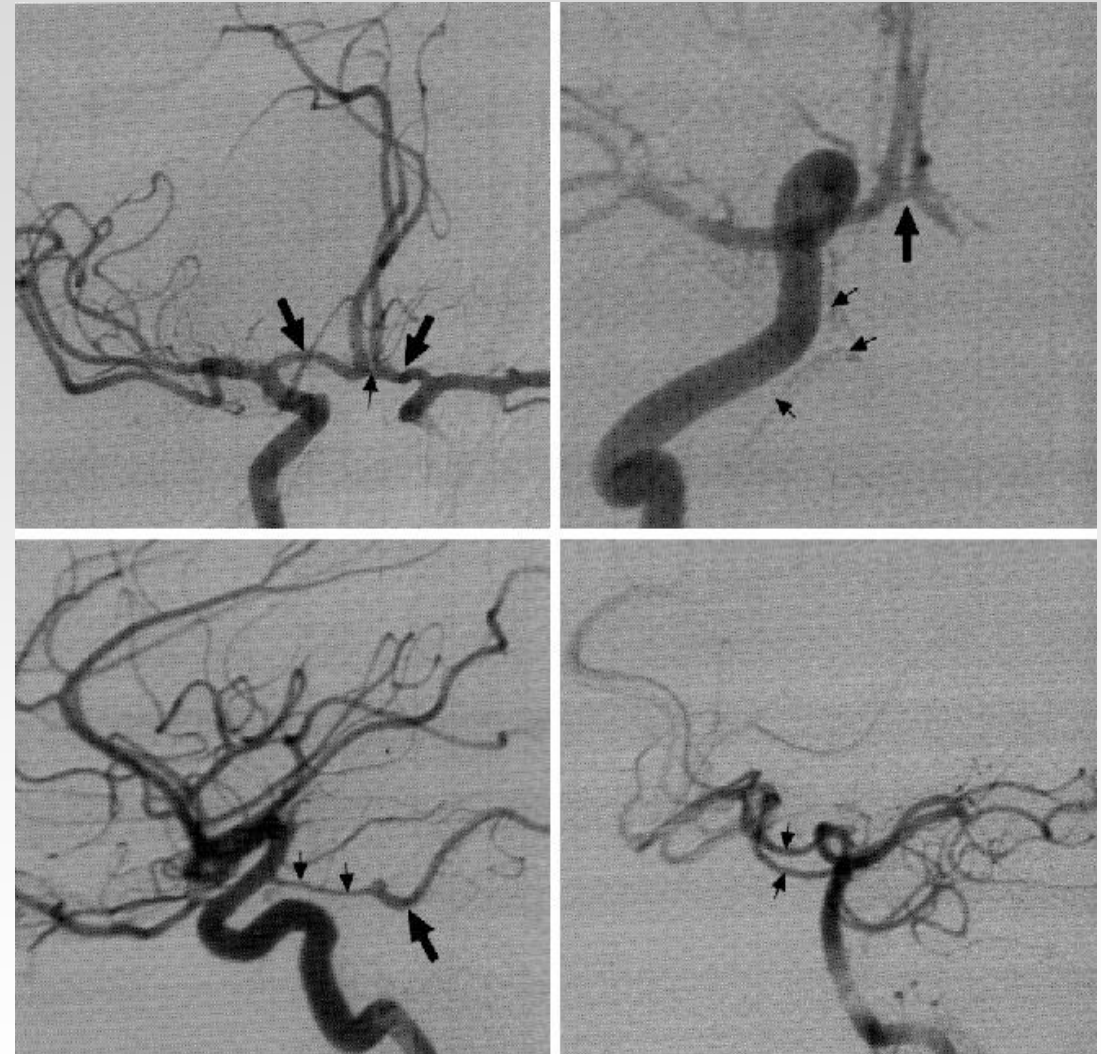
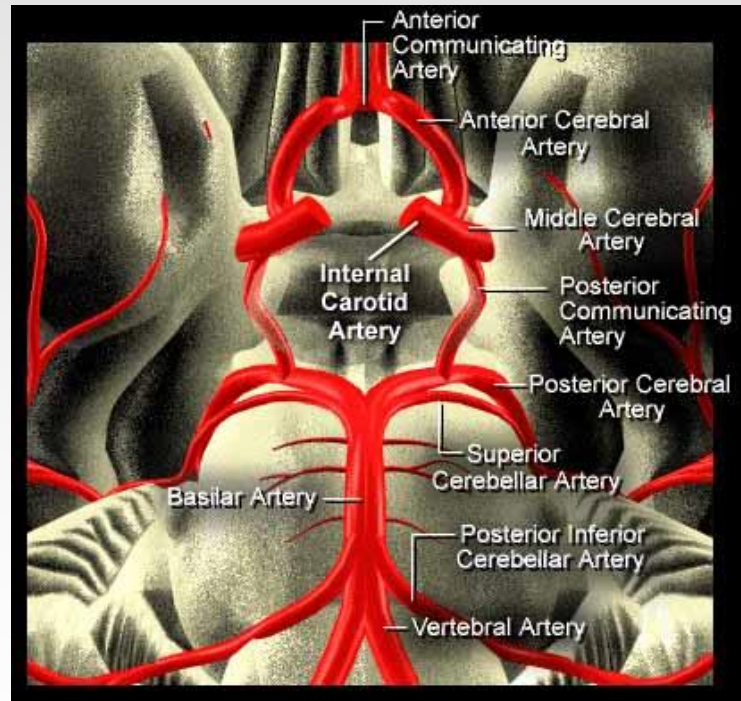




Circle of Willis

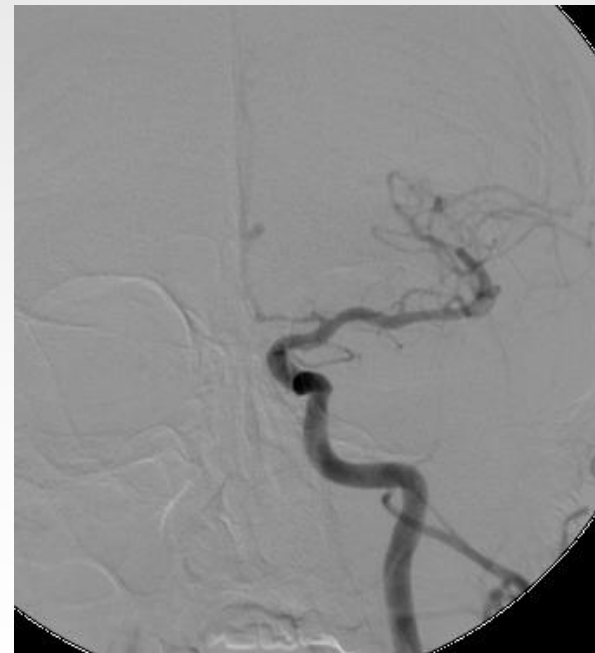
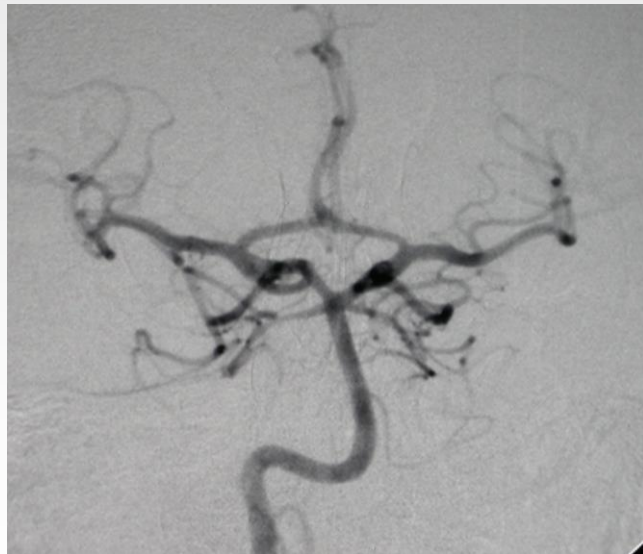
■ Normal connection between the carotid & basilar systems and the right & left sides

- ACAs (A1)
- ACoA
- ICAs
- PCoA
- PCAs (P1)
- Basilar



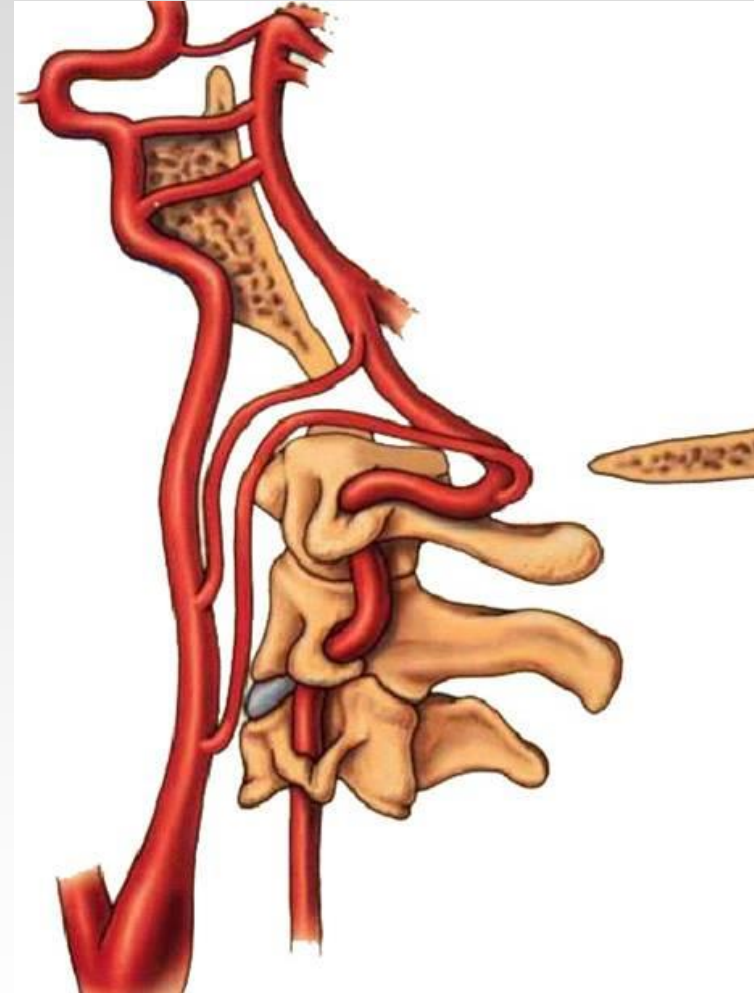
Circle of Willis

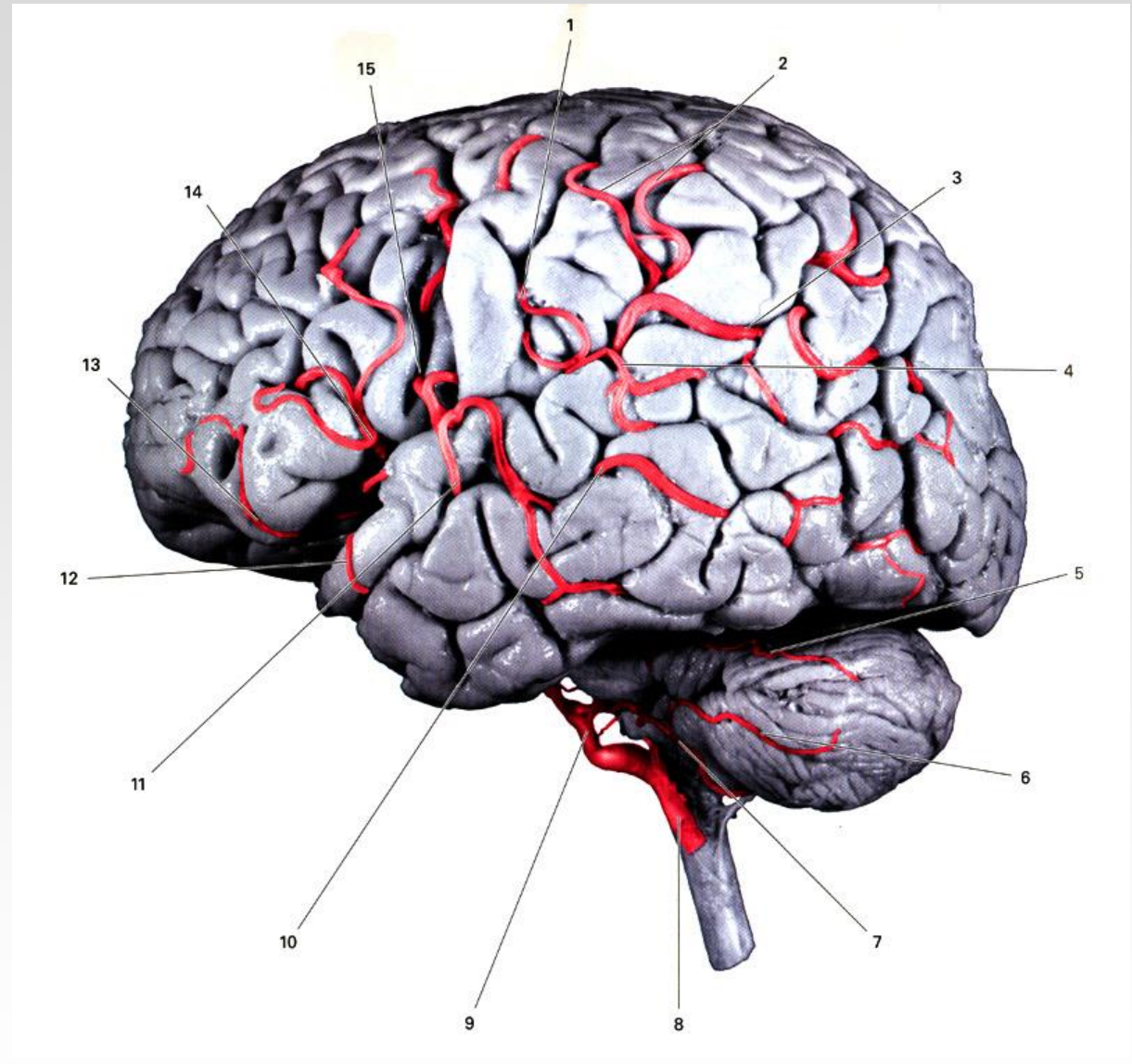
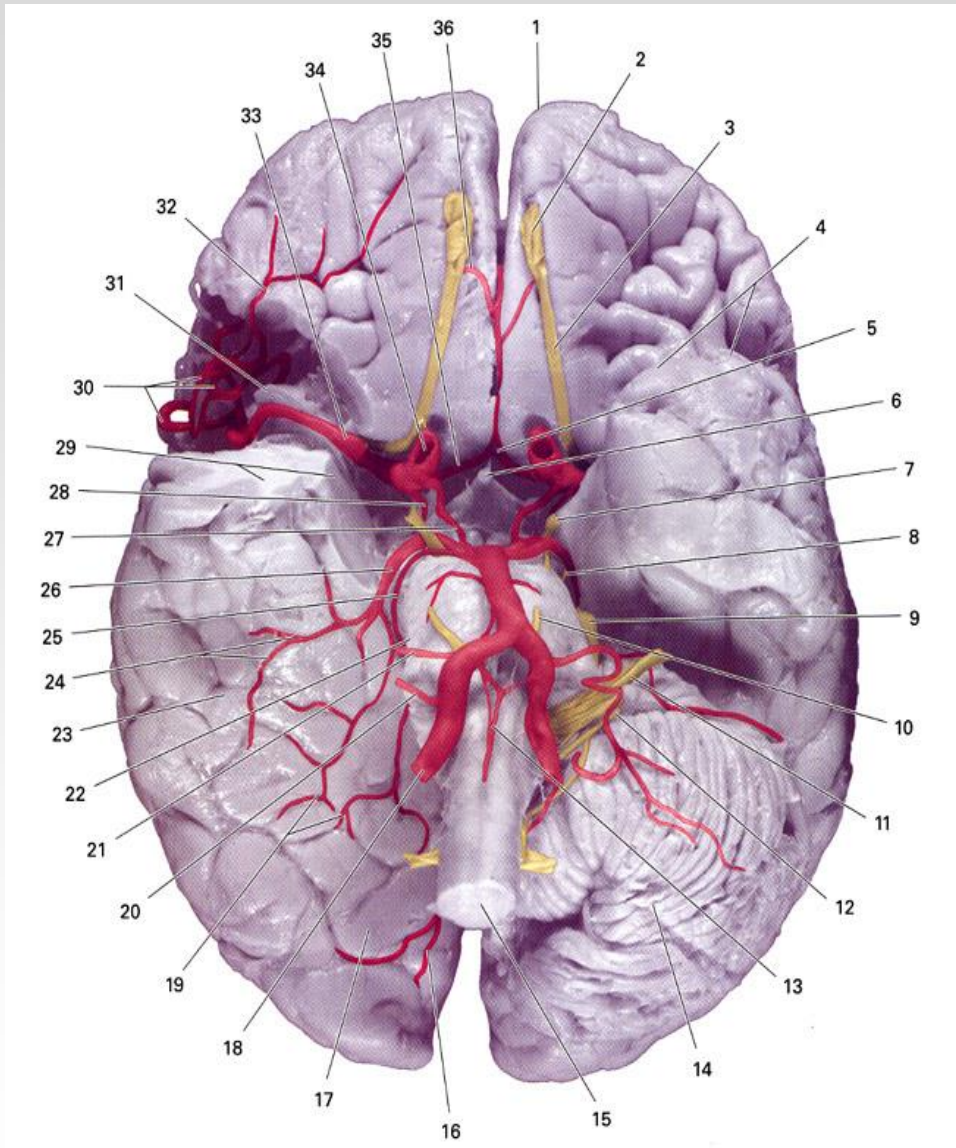
- Variations in the circle of Willis are common
- Segments may be hypoplastic or absent
- A complete circle may be present in as few as 20-30%

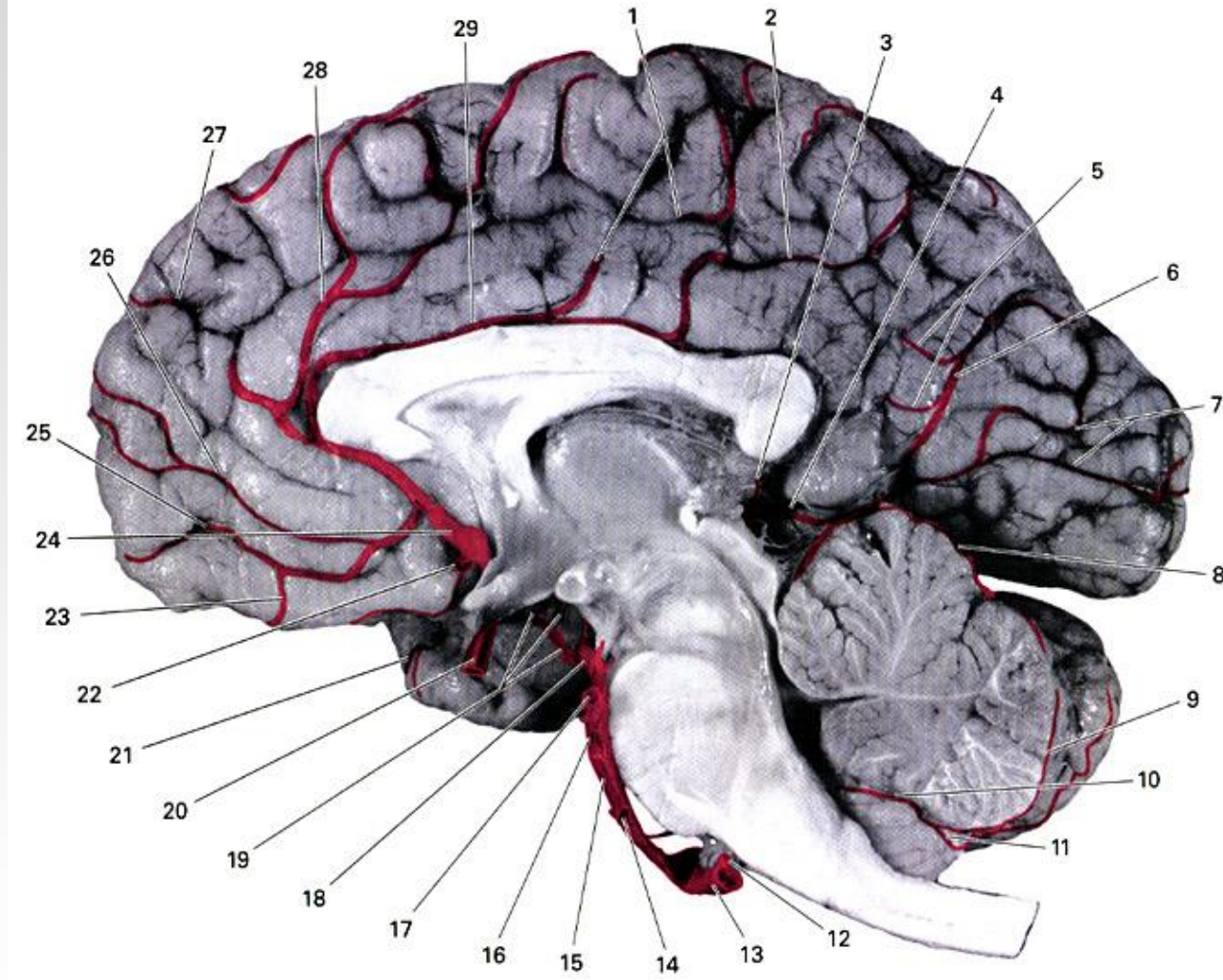


More Anastamoses...

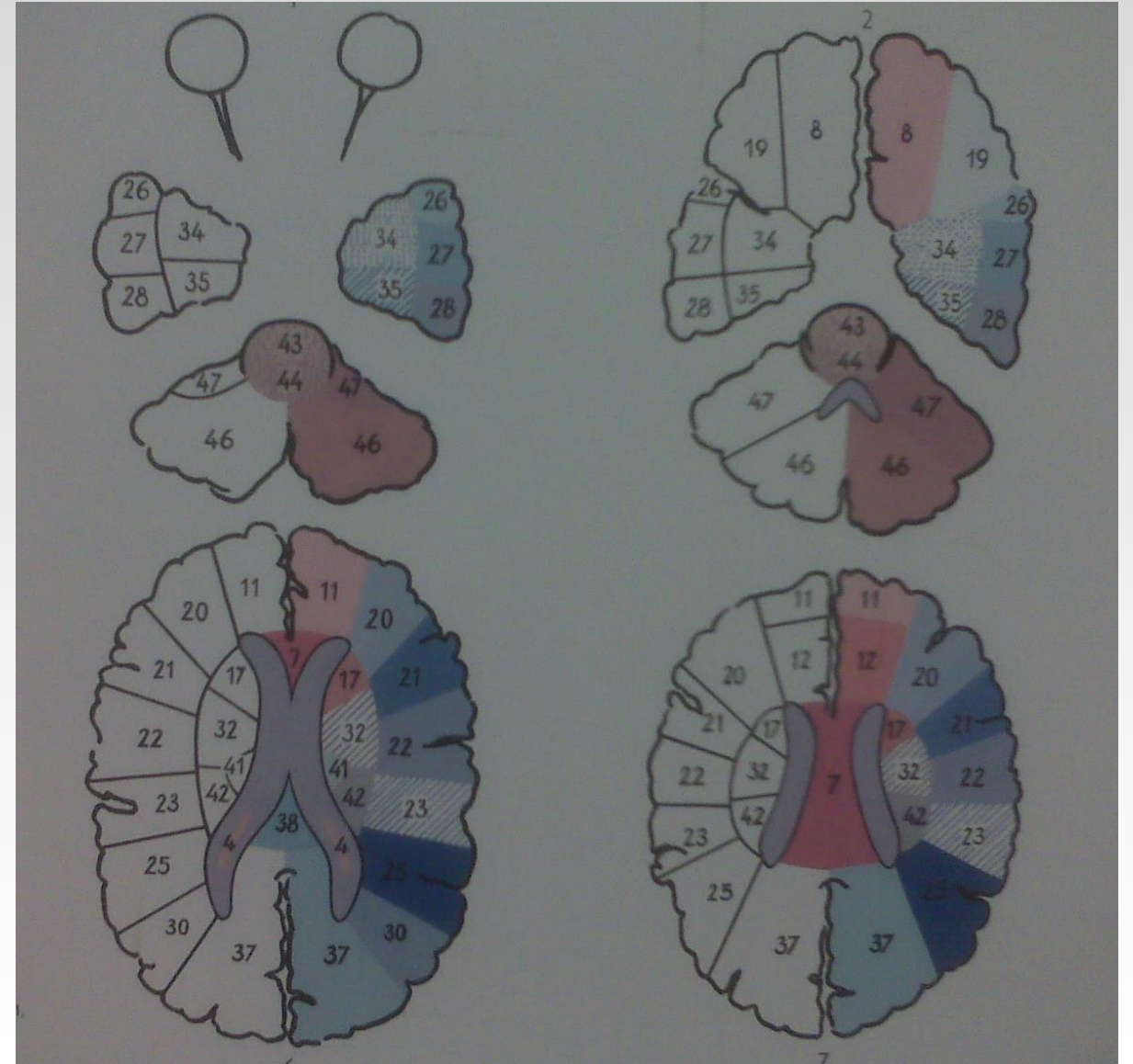
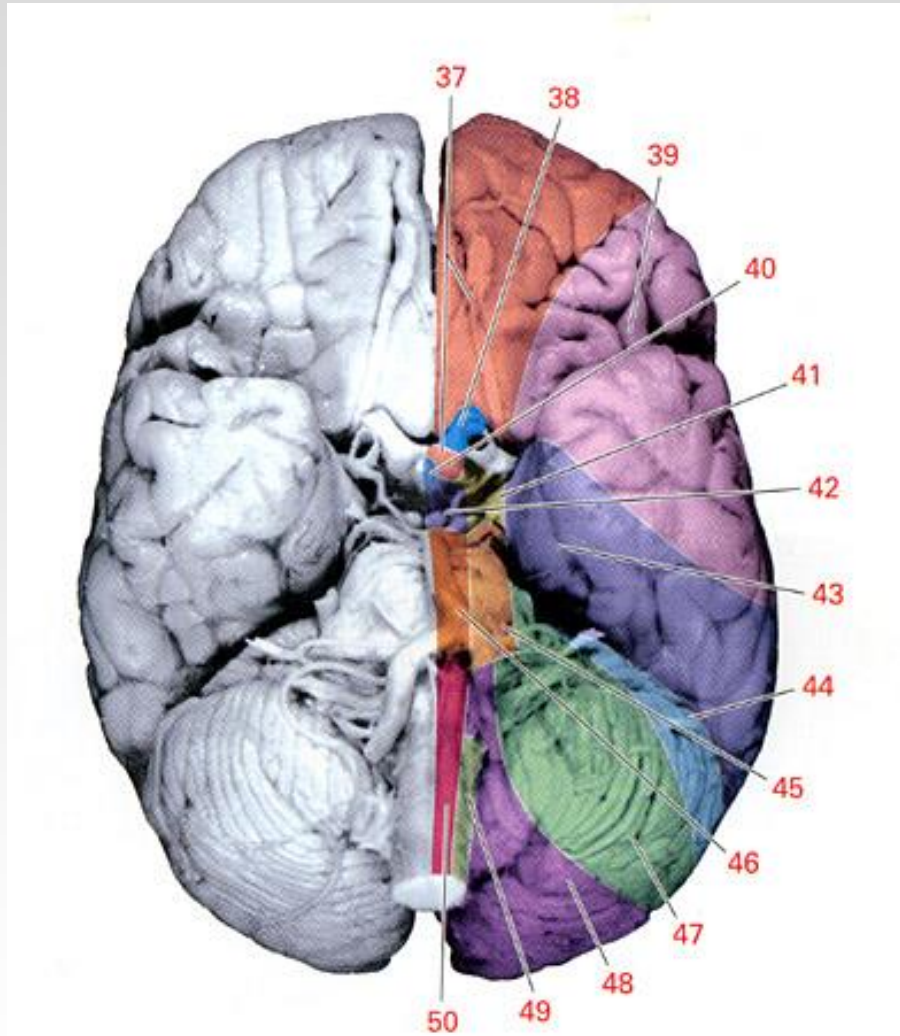
- Primitive carotid-basilar anastamoses may occur
 - Persistent trigeminal
 - Persistent otic
 - Persistent hypoglossal
 - Proatlantal intersegmental







Vascular Territories

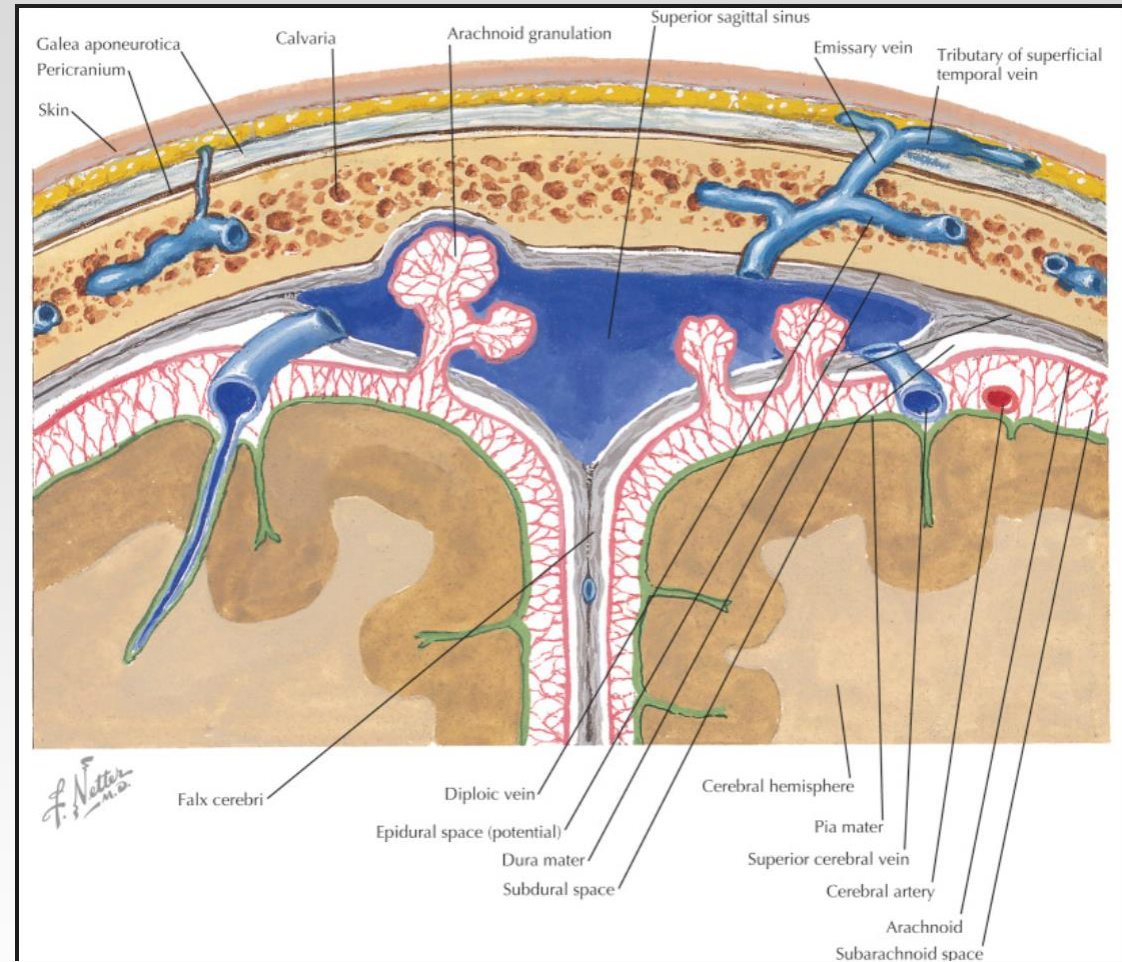


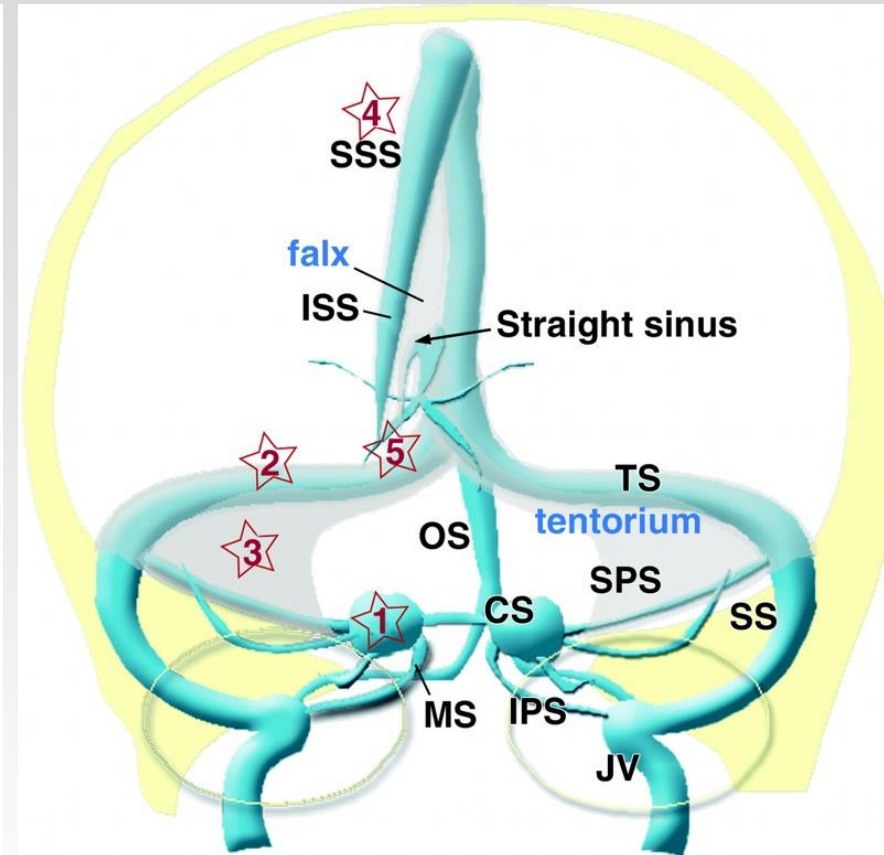
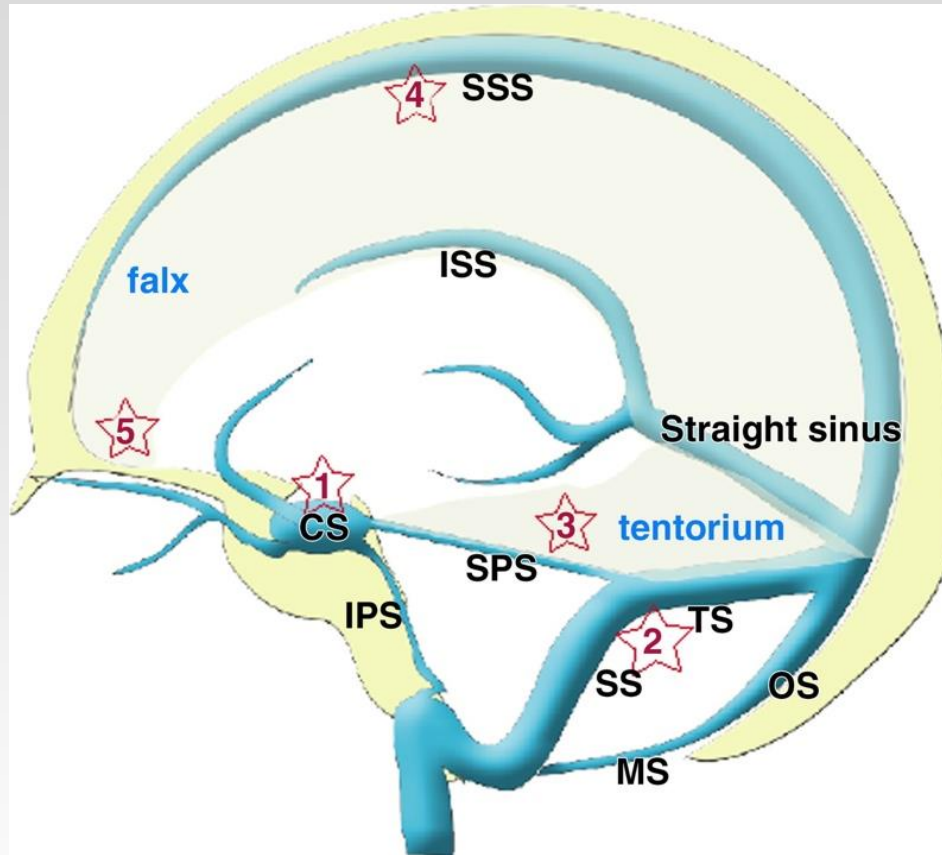
Venous Anatomy: Why are they important?

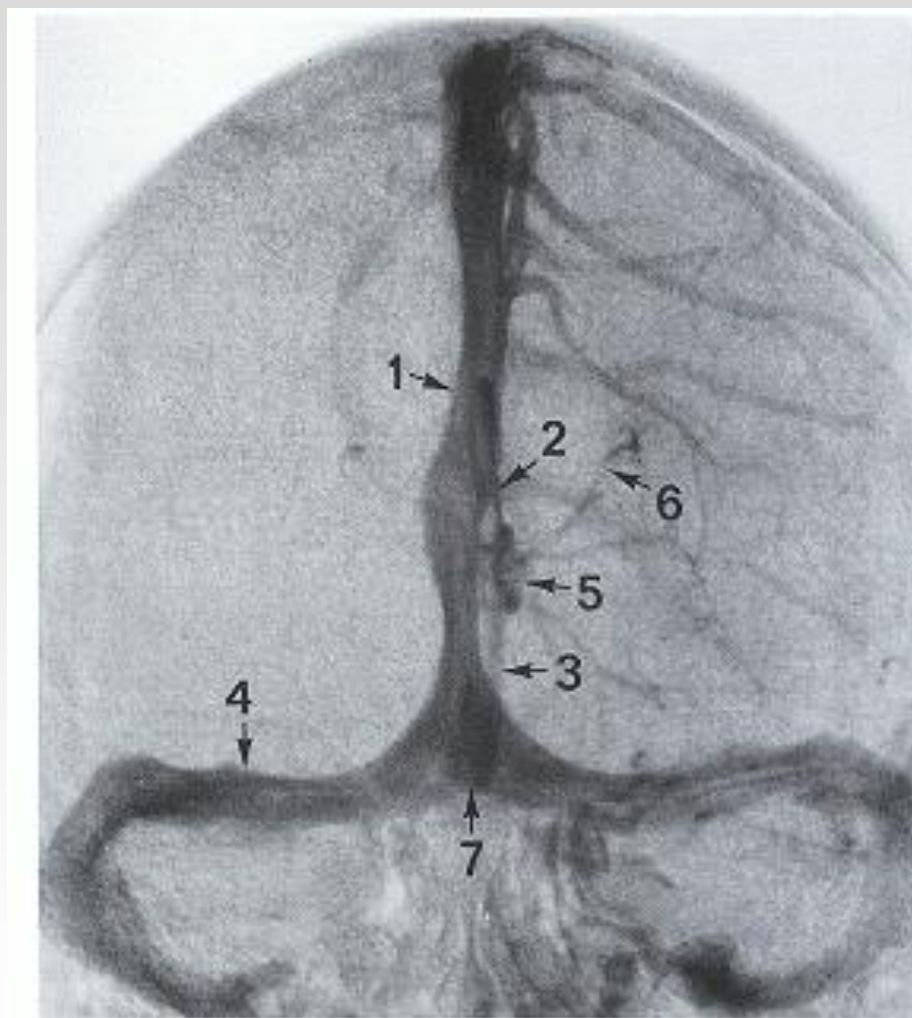
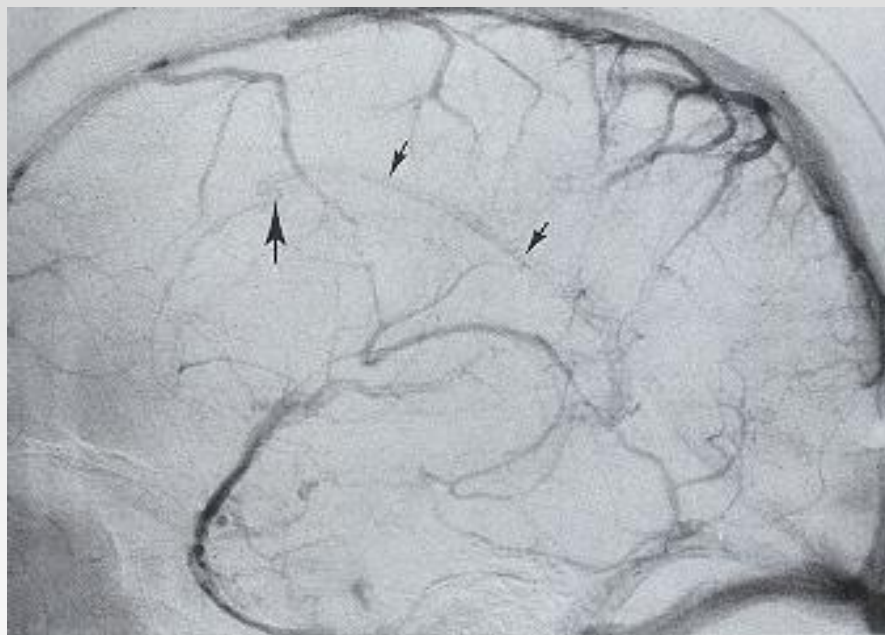
- Surgical preservation may be a matter of life & death
- Veins are important components of several pathologies:
 - AVM, AVF
 - CCF
 - cavernoma
- Alternative access (e.g. transvenous embolization)

Types of Veins

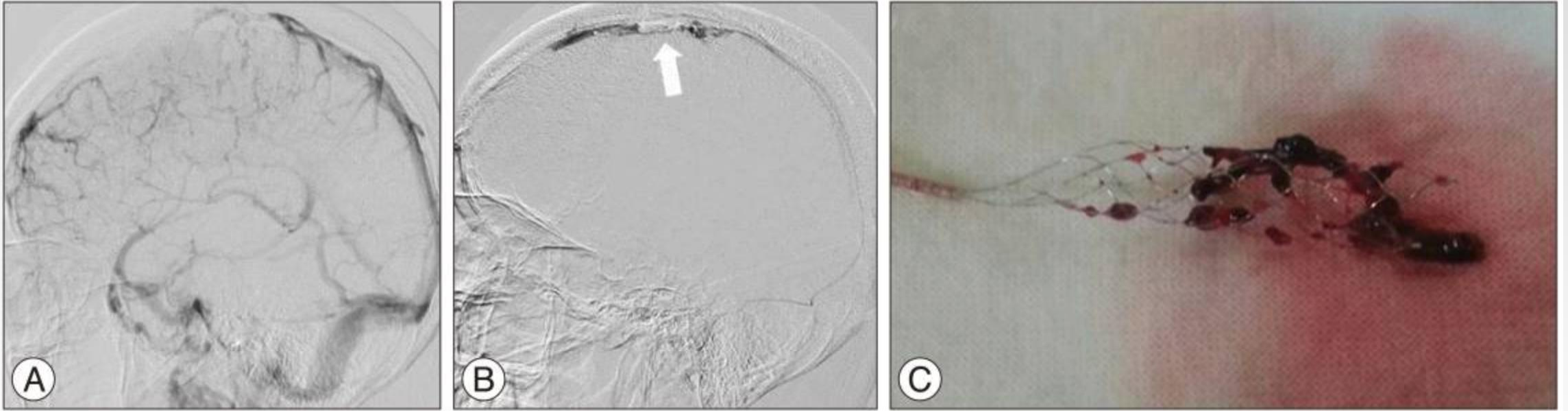
- Emissary veins
- Diploic veins
- Dural veins
- Bridging veins
- Cortical veins
- Venous sinuses
- Deep / subependymal

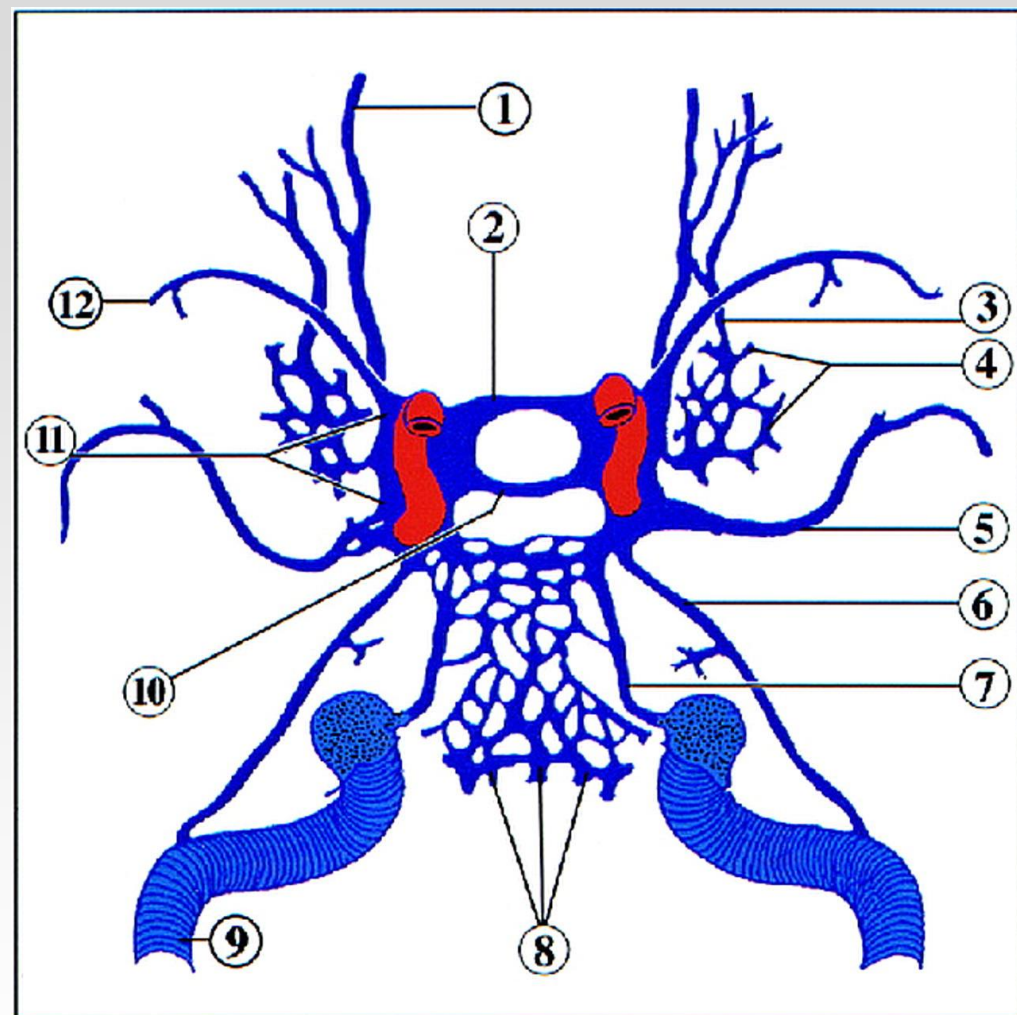
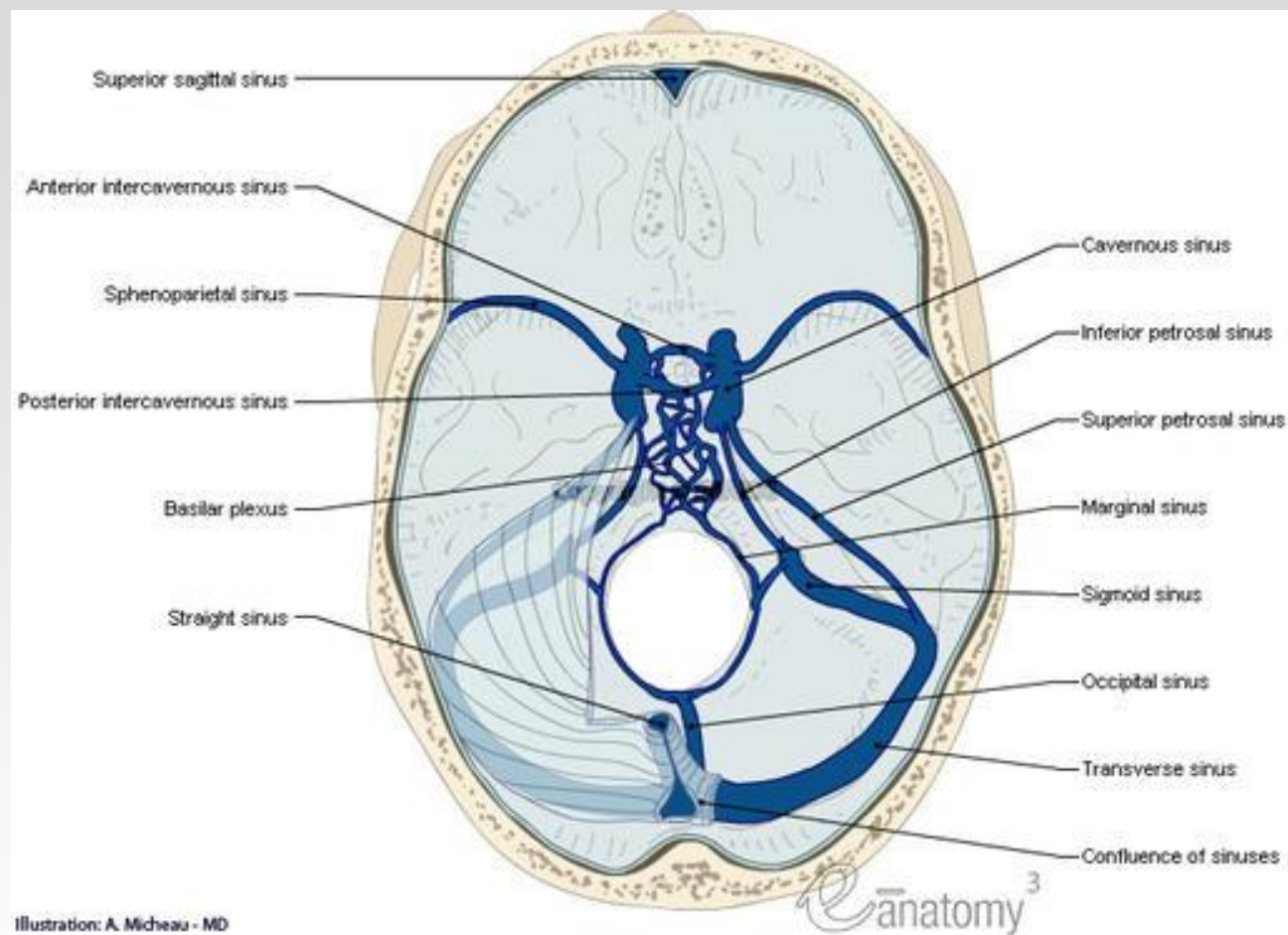


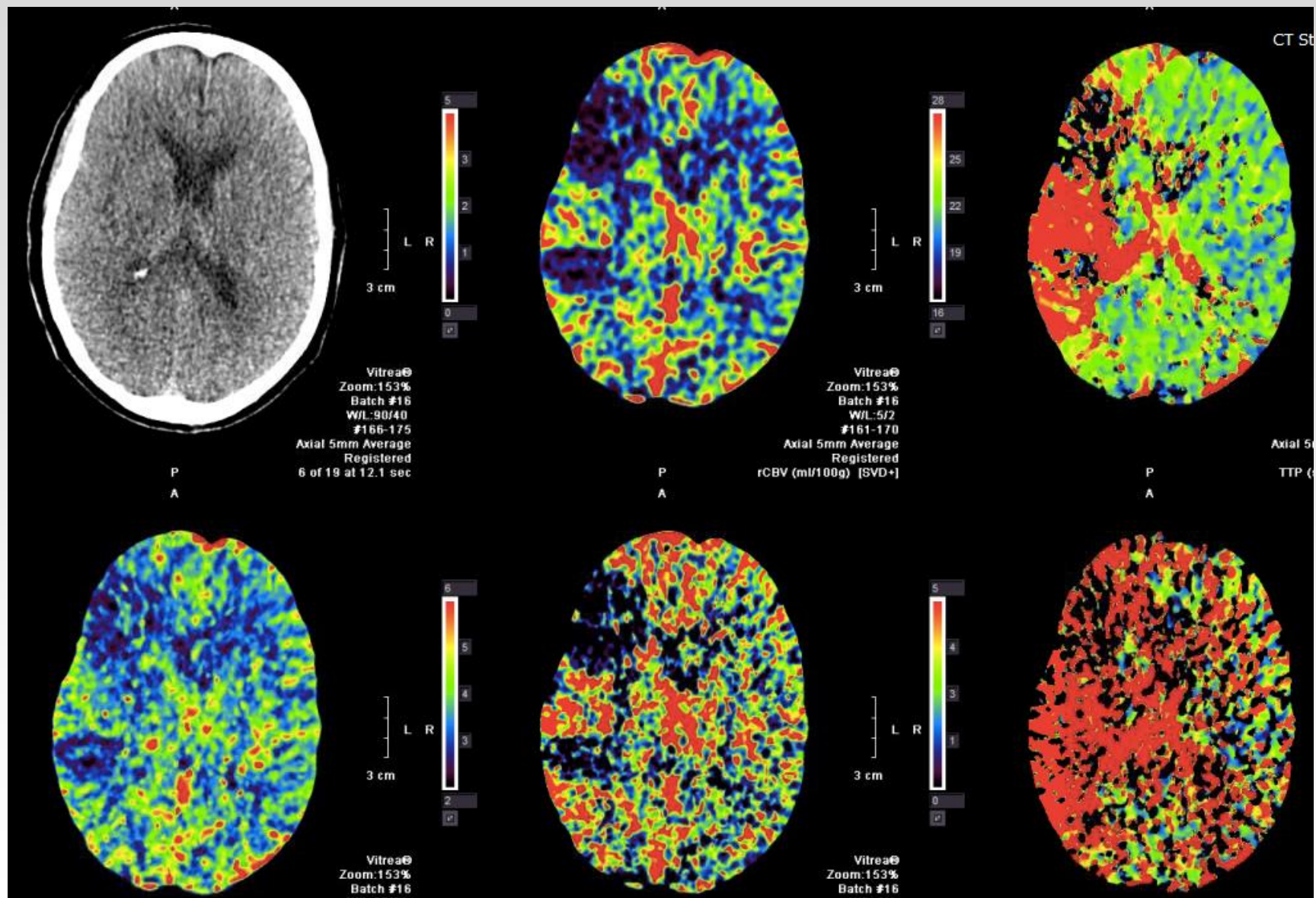


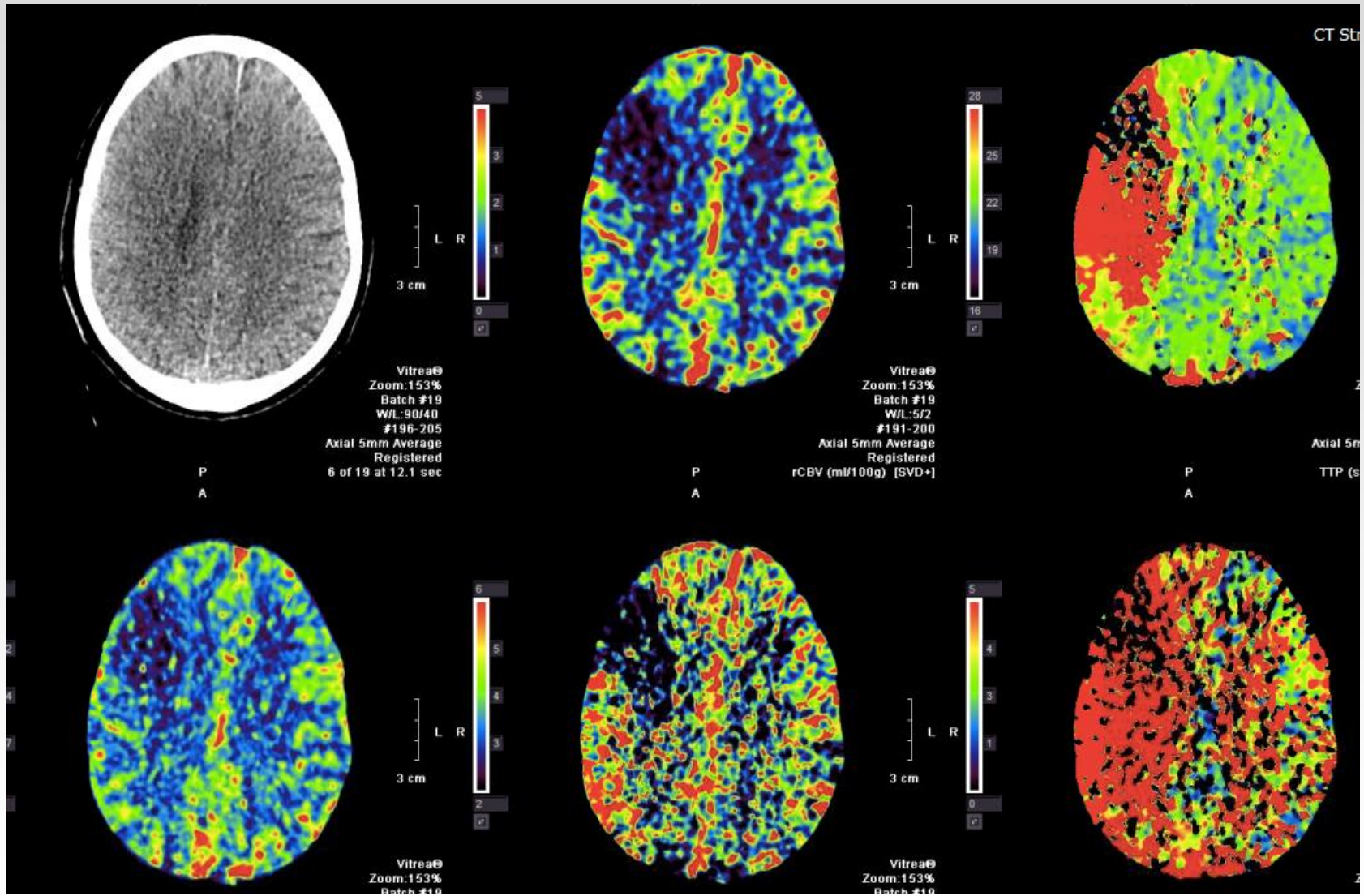


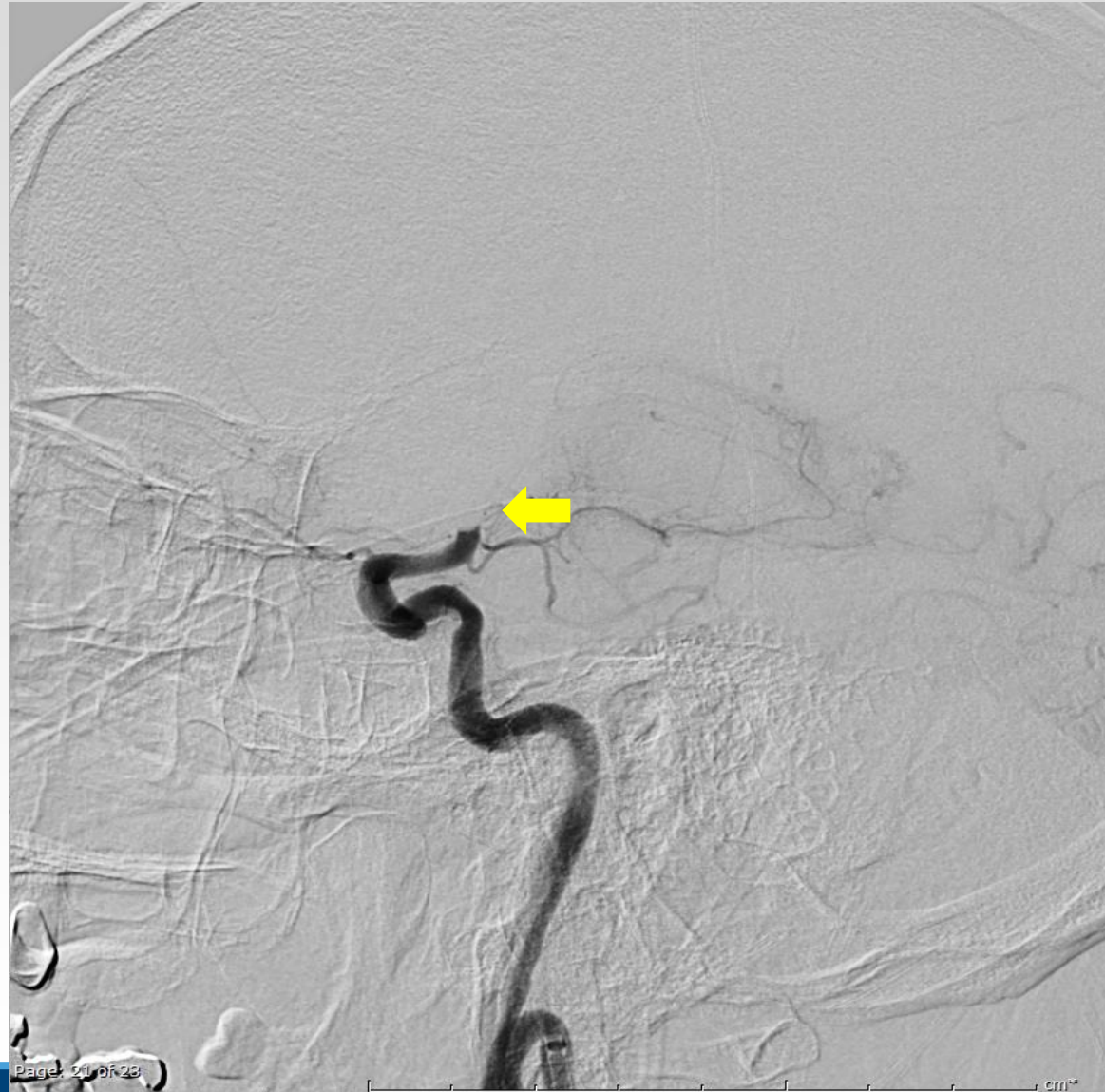
SSS Thrombosis

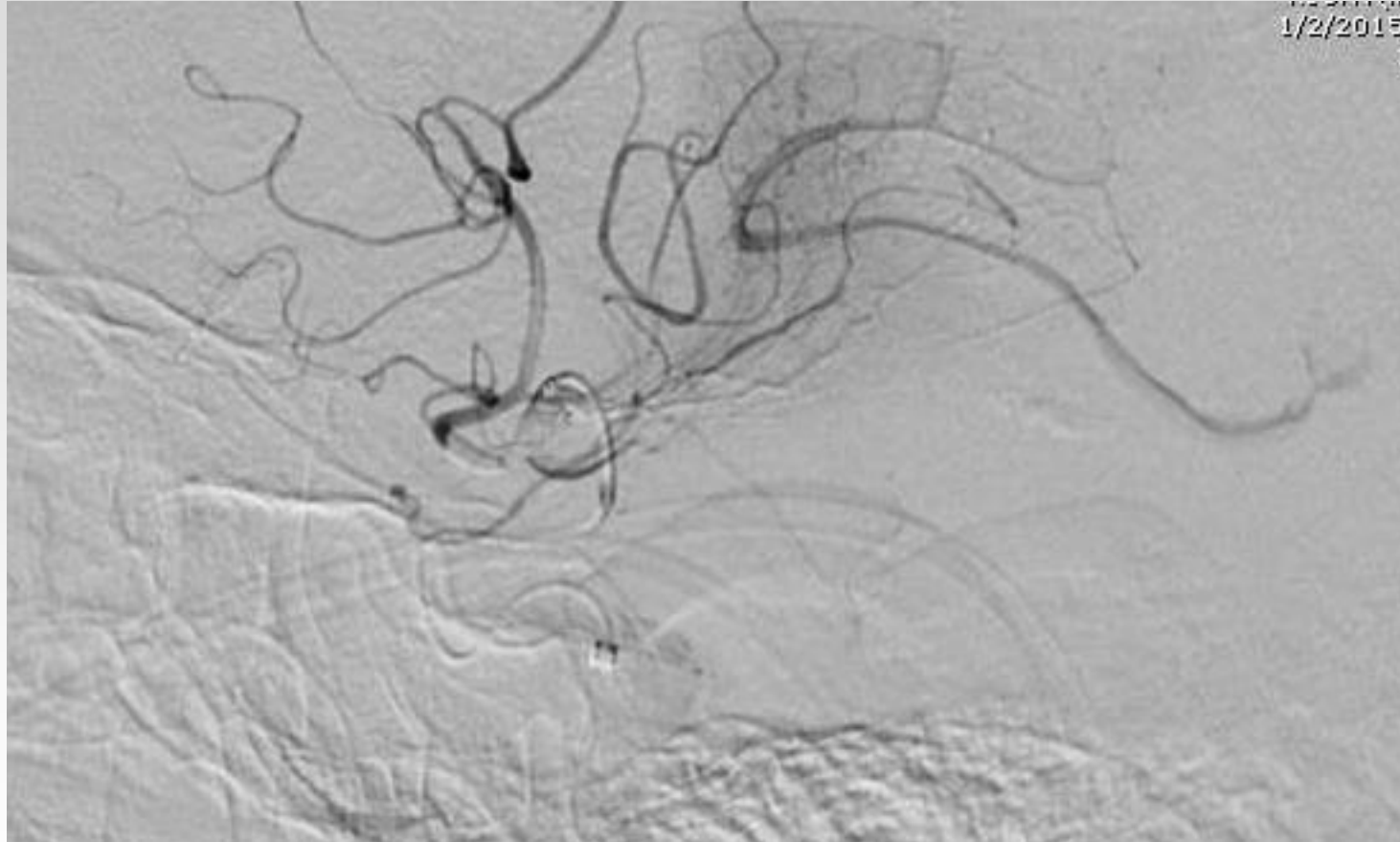


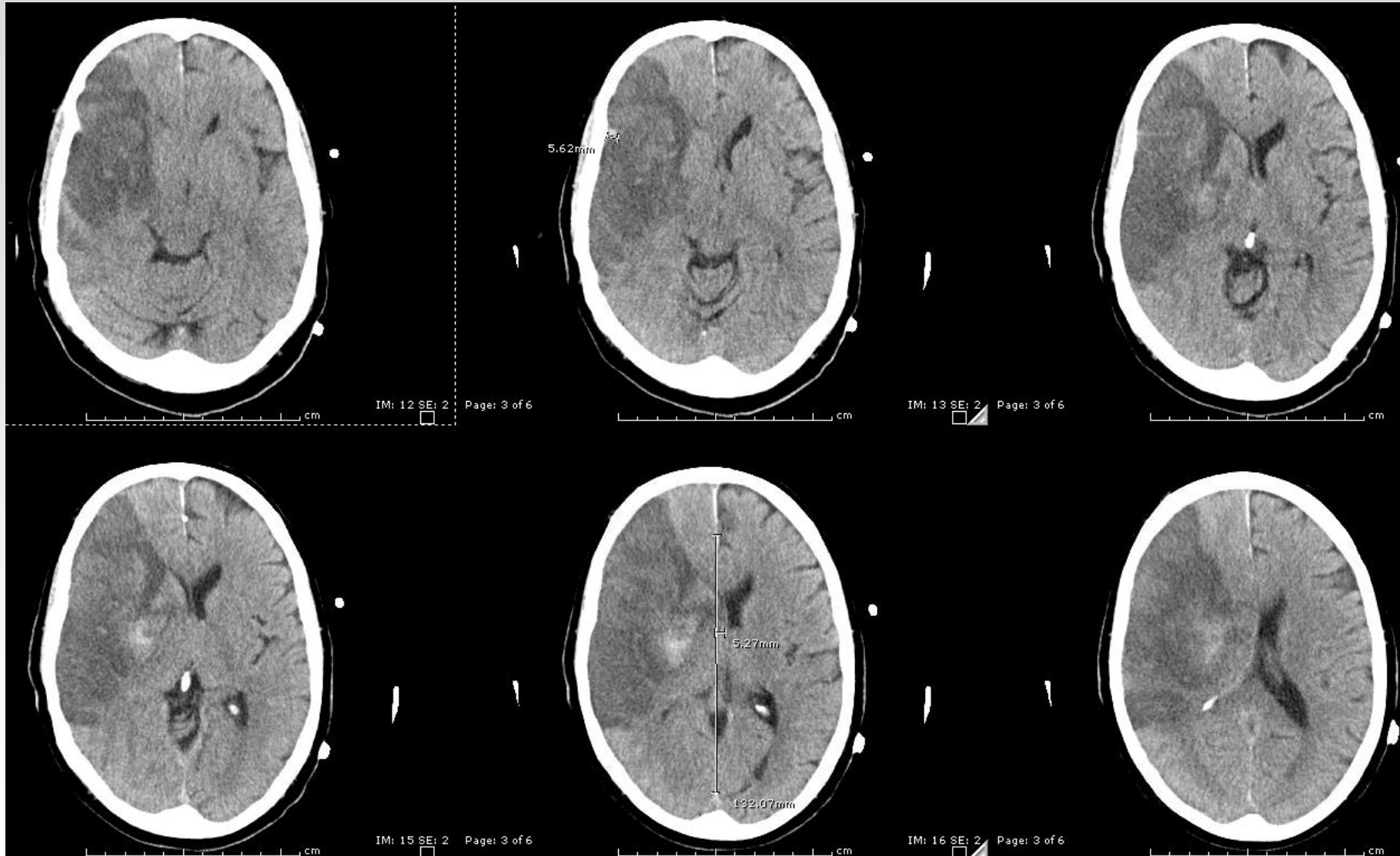


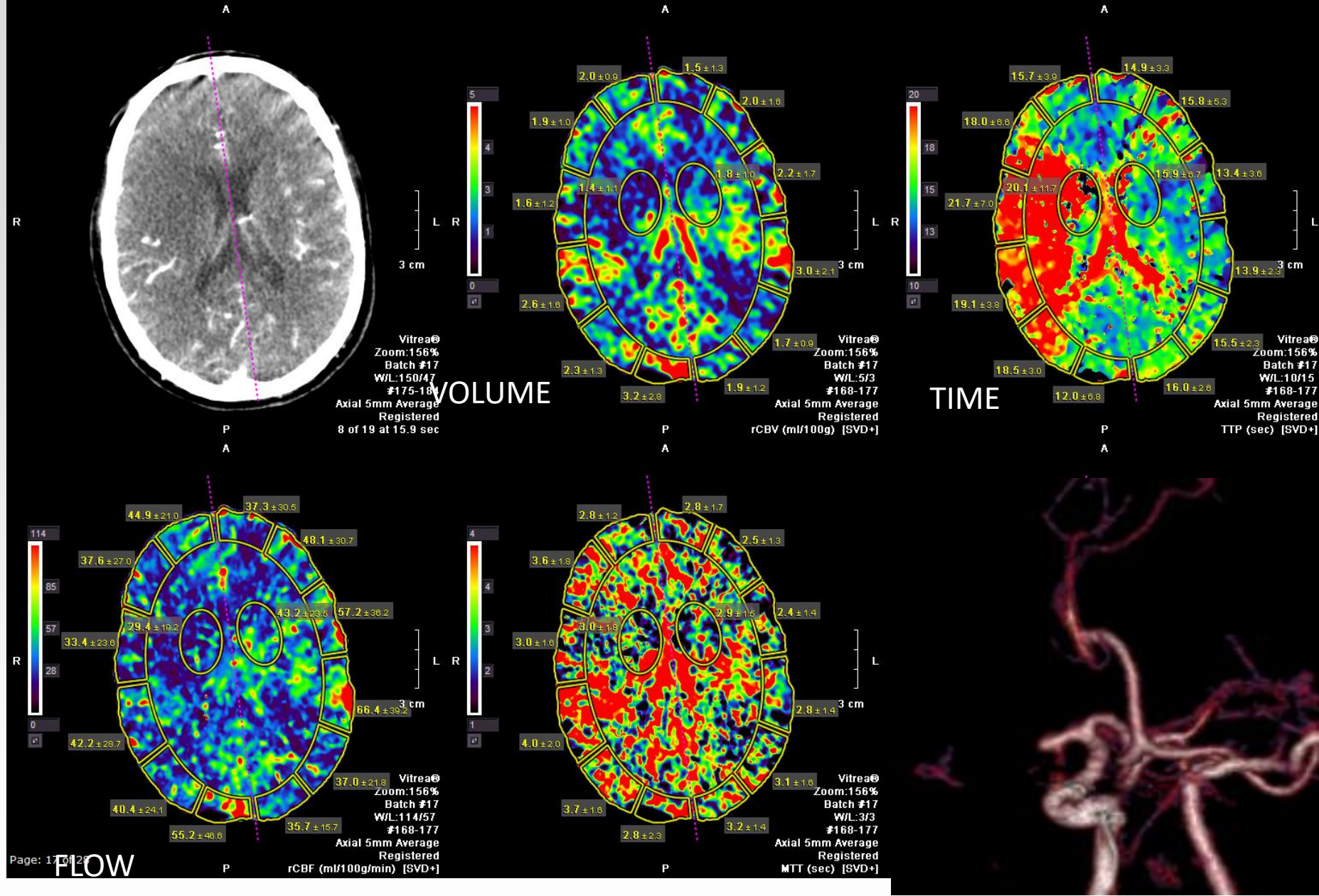


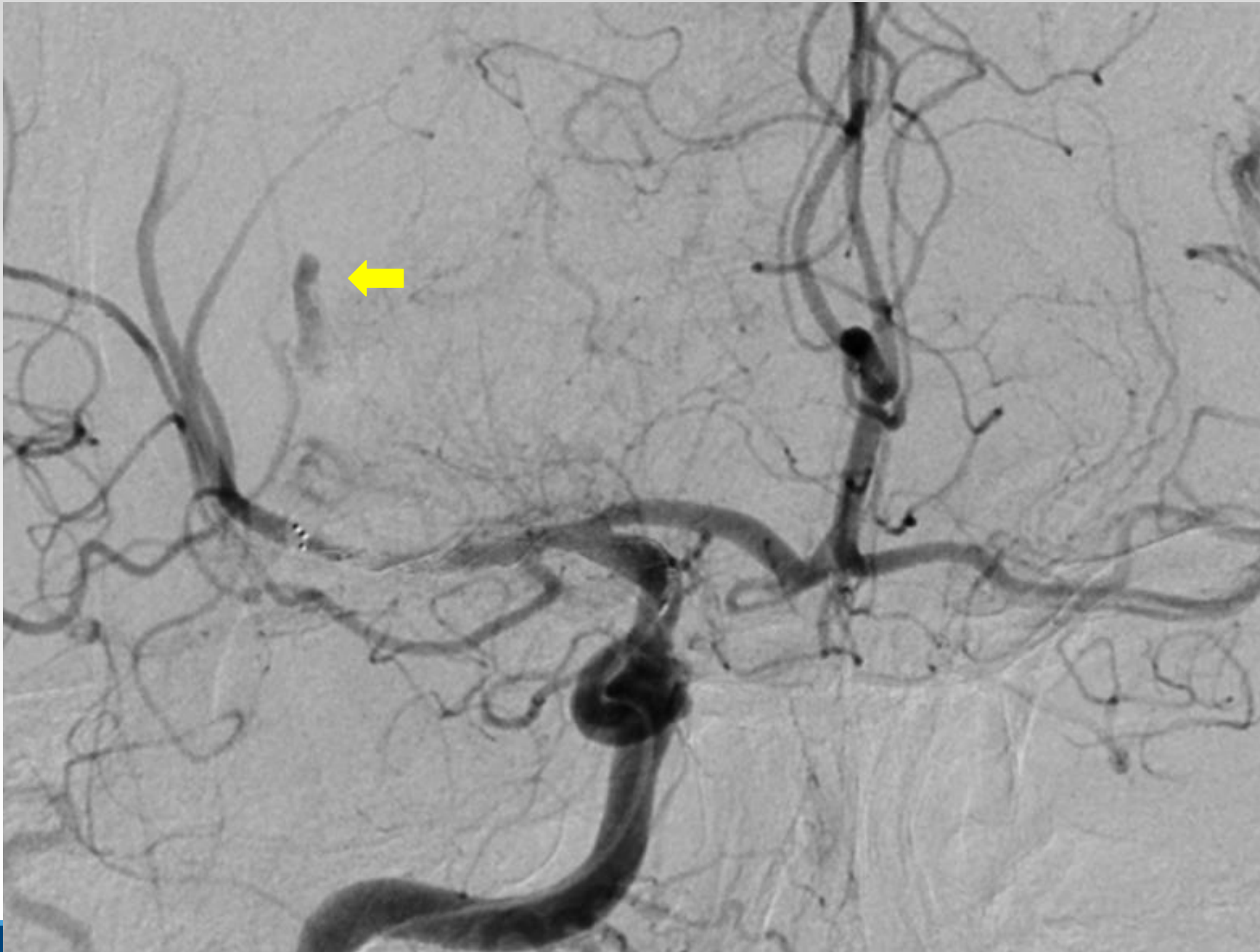


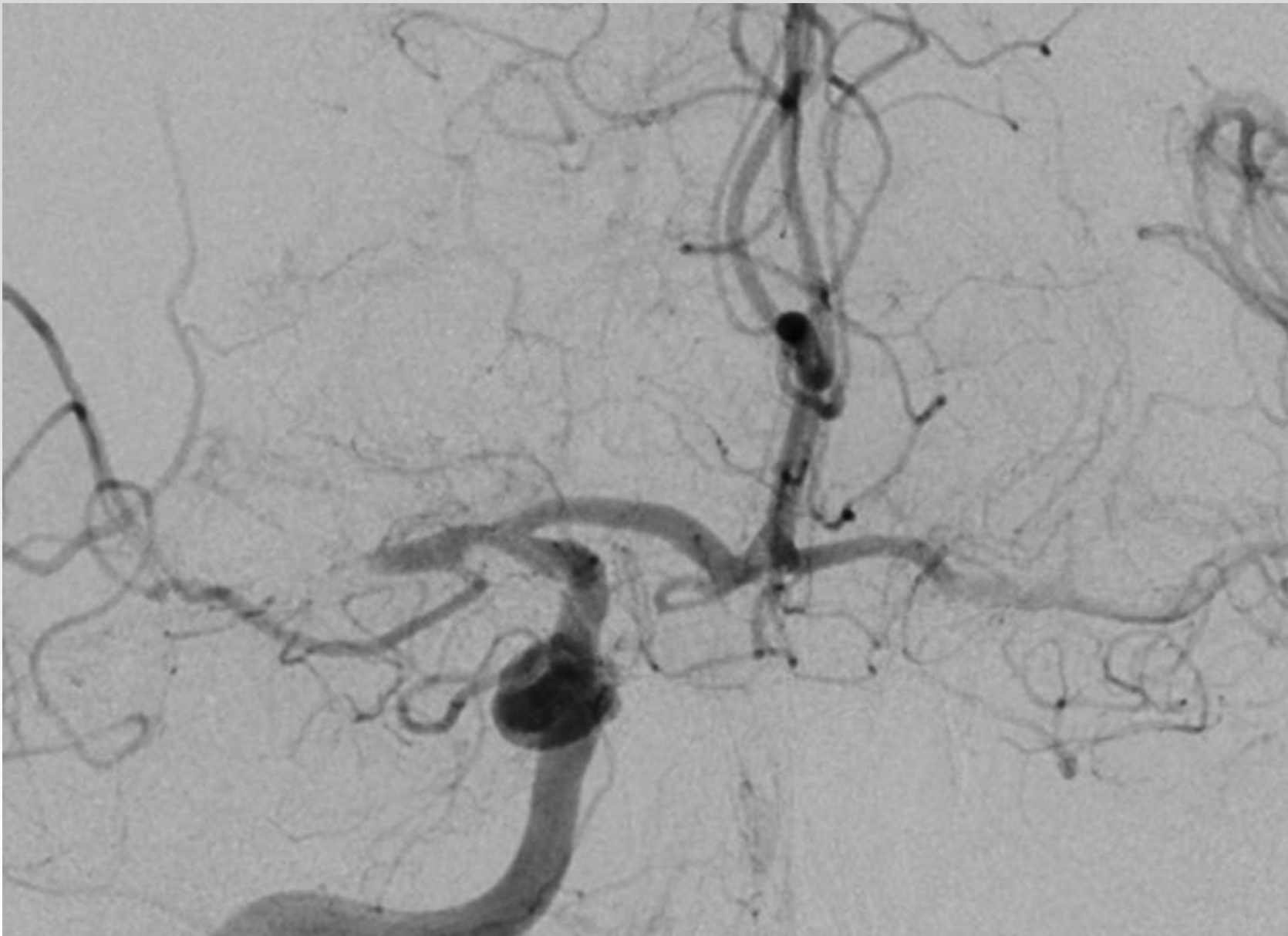




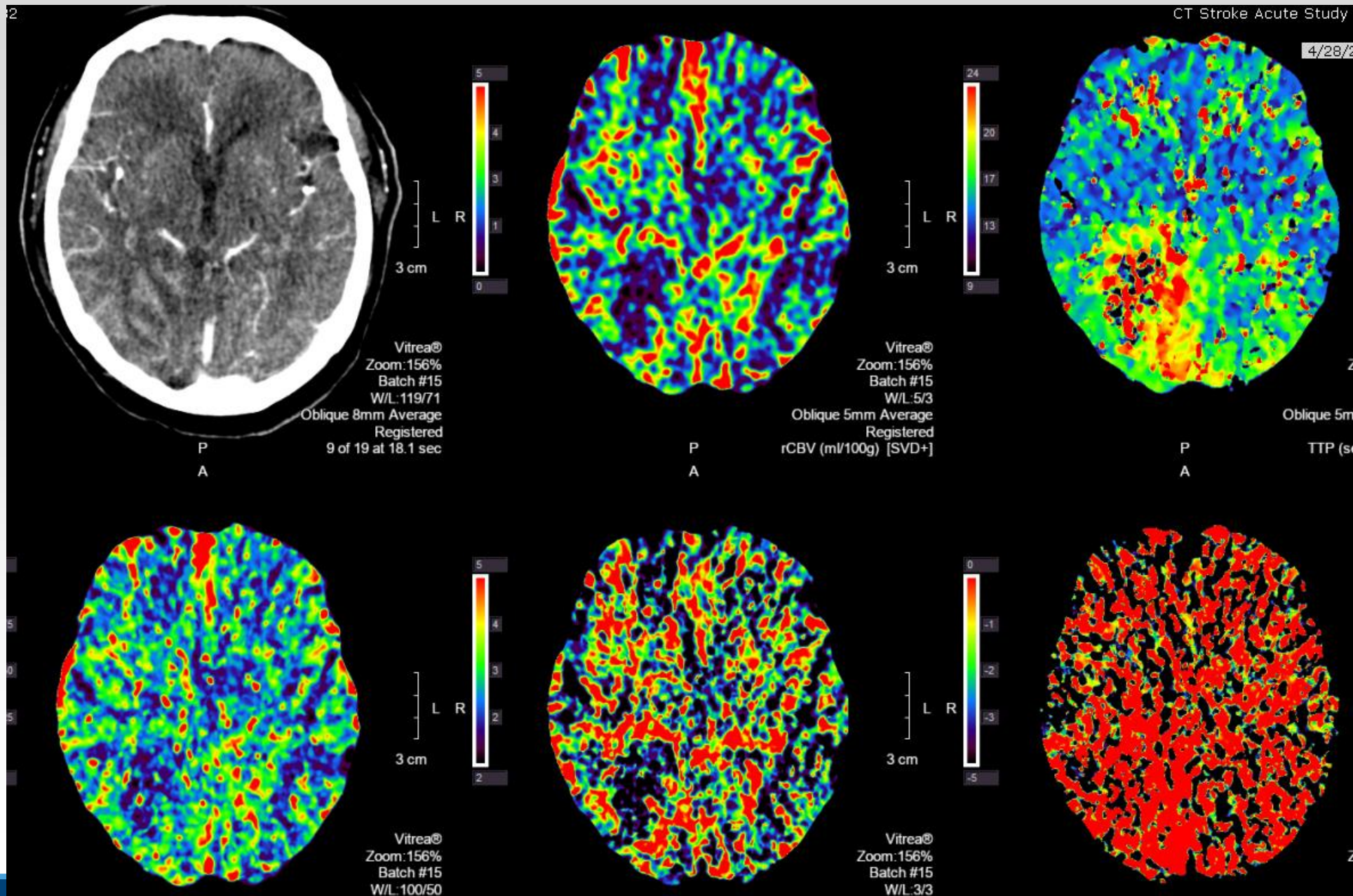




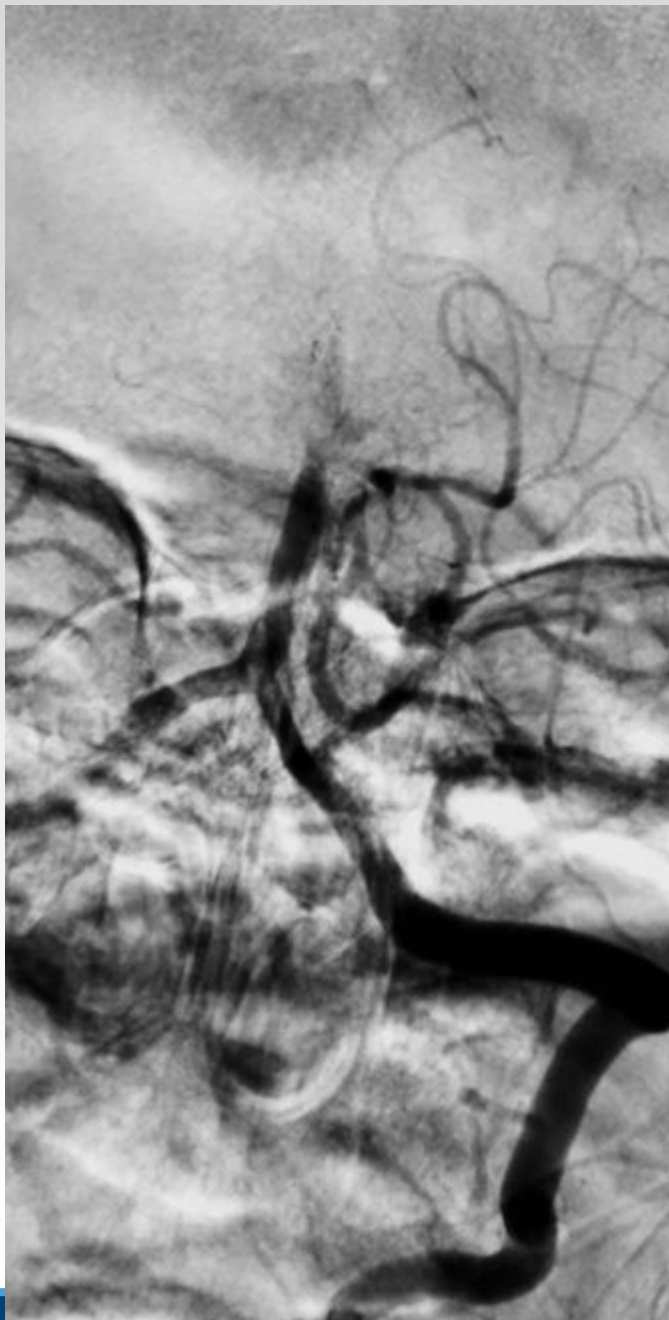












- Successful surgical procedures are dependent upon knowledge and recognition of anatomy and its regional physiological consequences

Thank you!
Questions?

