Endovascular Treatment of Cerebrovascular Disease

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• Cerebral circulation
• Anterior circulation
  – Carotid arteries bifurcate around the angle of the mandible, internal carotid moves through foramen lacerum and into the petrous bone, through the cavernous sinus and at the clinoid process it enters the dura and emerges into the subarachnoid space
  – The vertebral arteries travel through the transverse foramen and penetrate the dura into the subarachnoid space then merge to form the basilar artery
• Branches Vertebral Basilar System
  – Posterior inferior cerebellar artery
  – Anterior inferior cerebellar artery
  – Perforators
  – Superior cerebellar arteries
  – Posterior cerebral (collateral)
• Internal carotid artery
  – Enters dura at clinoid
  – Branches of Supraclinoid Internal Carotid Artery
    • Ophthalmic artery origin is positioned in the region of the clinoid process
    • Posterior communicating artery
    • Anterior choroidal
  – Then bifurcates to into the anterior cerebral artery and the middle cerebral artery
• Collateral circulation
  – ICA occlusion
    • Retrograde
      – ECA to ethmoidals to ophthalmic to supraclinoidal carotid
      – Can be strong enough to feed entire MCA and ACA
    • Antegrade
      – Vert to basilar to posterior cerebral to PCOM to supraclinoid ICA to ACA MCA
• Collaterals
  – Pial collateral
  – Watershed territories
  – ACA MCA PCA distribution
  – AICA – PICA
• Deep Nuclei Circulation
  – Lenticulostriate originating on the Main trunk M1 of the MCA
  – Perforating vessels from basilar to brainstem
  – Posterior thalamoperforators from PCA
  – All are end arteries, little or no collateral circulation

• The number one cause of (SAH) Subarachnoid Hemorrhage is trauma
• SAH due to aneurysm or arterial venous malformation rupture are less common but can be devastating
• Outcome after aneurysm SAH is proportional to
  – Hunt and Hess score on admission
  – Fischer class based on CT
• SAH Fun Facts
  – 30K SAH from aneurysm rupture in North America each year
Autopsy would predict 5% of population with aneurysms
Prevalence in parts of Japan secondary to high frequency of salting pickles in diet
Up to 50% mortality after aneurysmal SAH
Rebleed within first 24 hours highest,
After treatment with open surgery or coils rupture rate trends back to normal
Familial lines of SAH
Associated with FMD

• Vasospasm
  Morbidity and mortality after SAH secondary to blood in subarachnoid space
  Causes vessels to spasm
  Driven by many factors
  Treatment
    MgSO4 drip as in treatment of preeclampsia
    Hypertensive hypervolemic therapy
    Angioplasty

• Acute ischemic stroke
  750K stroke/yr in North America
  NIHSS
  Sources
    Cardiac
    Carotid
    Aortic arch
    Vasculitis

• Treatments Acute stroke
  0 to 3 hours IV tPA
  3 to 4.5 hours IV tPA new evidence
  0-6 hours Intraarterial thrombolytic
  0-8 hours Merci and Penumbra
  0-? Based on perfusion imaging

• CT Perfusion imaging
  Time to peak map for opacification of the cerebral circulation after IV infusion contrast
  Calculate CBV and CBF in a defined volume
  Compromised CBF with a normal CBV defines best candidate for revascularization
  Least likely to bleed after reperfusion