Enormous Metabolic Costs

- 2% of weight
- 17% of blood flow
- 20% of oxygen
- Stop for 10 seconds leads to unconsciousness
- Evolutionary “cost”? 

Importance

- Cardiovascular accidents (CVAs) are the third major cause of death
- More than accidents, less than cancer or heart disease
- e.g. subdural haematoma

Diagnostically Important

- Haemangiomas (congenital)
- Displacement by “space occupying lesions” cancer or clots/bleeds
- Hyperplasia in tumours

Vascular Abnormalities

- Haemangiomas
- Congenital aneurysms
- Haematomas
- Guillain Barre syndrome

Major Blood Supply

- Forms the “siphon” in the cavernous venous sinus (note the proximity to the ON)
Important Branches

- Hypophysial
  - releasing factors
- Ophthalmic
  - nose, scalp, sinuses
- Posterior commissure
  - circle of Willis
- Anterior Choroidal
  - plexus, limbic system, LGN, internal capsule
  - small calibre arteries to globus pallidus and hippocampus are sensitive to hypertension

Middle Cerebral Artery

Cerebral Arteries

- Middle Cerebral
  - (note damage spares feet)
- Anterior Cerebral
  - pericallosal
  - callosomarginal
  - medial striate

Vertebral System

- Branch of Subclavian
- From vertebral arteries
- Quite variable
- Arteries named after the areas they supply
  - e.g. Anterior inferior cerebellar artery
  - anterior spinal artery
  - labyrinthine (inner ear)
  - posterior cerebral (spares the macula?)

Circle of Willis

- Forms a circle around the base of the brain
- Can equalise pressure
- Can compensate for slow blockages (arteromatous changes)
- Very variable - so are symptoms after vascular occlusion
Circle of Willis

- Gives off some crucial small branches that can rupture in hypertension
  - spastic (movement disorders)
  - internal capsule
  - thalamus
  - hypothalamus

Blood Supply of the Spinal Cord

- Bleeds can have serious consequences
- Posterior spinal plexus
- Anterior spinal from vertebral arteries in the cervical cord
- Lower branches from spinal arteries of posterior intercostal branches of the thoracic aorta and lumbar branches of the abdominal aorta
- Anterior and posterior radicular arteries supply the plexus and the nerve roots, very sensitive to damage
- Veins drain into the radicular veins then into the vertebral, intercostal and lumbar veins

Spinal Cord Blood Supply

Venous Drainage

- Brain stem and cerebellum drain into the sinuses in the posterior cranial fossa
- Cerebrum drains to external and internal veins

External Cerebral Veins

- Superior cerebral
  - sagittal sinus (may tear and lead to a subdural haematoma)
- Superficial middle cerebral
  - lateral fissure - cavernous sinus
- Deep middle cerebral & Anterior cerebral
  - basal vein

Main Veins
Internal Cerebral Veins

- lateral ventricle
  - vena terminalis
  - choroidal vein
- internal cerebral vein
- great vein
- straight sinus

Factors regulating bloodflow

- Extrinsic Factors
  - systemic BP (only extremes have an effect unless there is arterial disease)
  - blood viscosity (anemia - lower viscosity - more flow)
  - vessel lumen (must be 70-90% to effect flow)
- Intrinsic Factors
  - autoregulation (vessel diameter)
  - biochemical response
    - CO₂ increases flow
    - O₂ increases flow
    - pH increases flow
- Neural control
  - sympathetic
  - parasympathetic

Visualising Blood Flow

- Subtraction Angiography
- Isotope washout
- De-oxyc glucose
- PET (positron emission tomography)
- fMRI

Research into Brain Function

- fMRI (functional magnetic resonance imaging)
- PET (positron emission tomography)
- Photon imaging
- Squids (detectors of magnetic fields)

Causes neurological problems

- Stenosis
- Emboli
  - Fat from fractures
  - Fat from Artheromatous changes (plaques)
  - Clots from sedentary lifestyle or pregnancy

Clinical Effects of Blood Flow

- Steal syndrome: ischaemic areas cannot dilate, therefore administration of vasodilators may be counter productive, as other areas “dilate” and steal blood flow.
- Epilepsy 2x - 3x increase in flow
- Coma severely reduced flow
- Lethal vasospasm can follow stroke
- Ischemia worse than anoxia - no glucose or removal of wastes