Fourth Year ‘Meds’ Clinical Neuroanatomy

Ventricles, CSF, Brain Swelling etc.

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What Are We Going to Do?

• Hydrocephalus and some effects of the interruption of CSF flow
• Some aspects of the effects of ‘space occupancy’ on the central nervous system

With audience participation (perhaps?) particular with reference to Neuroanatomy, and learning a bit of general neuropathology on the way!

Hydrocephalus and Effects of Interruption of CSF Flow
Cerebral Ventricles

Tube Blockage Doctrine

- Something pressing on the tube
  - Tumour
  - Brain swelling
  - Hematoma
- Something in the wall of the tube
  - Tumour
  - Congenital abnormality
- Something in the tube
  - Hematoma
  - Tumour
Aqueduct Stenosis
Acute Cerebellar Haemorrhage

Acute Basilar Subarachnoid Haemorrhage

Acute Bacterial Meningitis in an Infant
Compensatory ('ex vacuo')
Hydrocephalus
(Niemann-Pick Disease)

Ex Vacuo Hydrocephalus

Alzheimer’s disease Niemann-Pick’s disease

Some Aspects of the Effects of ‘Space Occupancy’ on the Central Nervous System
Intracranial ‘Space Occupancy’

- **Brain swelling** occupies intracranial space
- **Various lesions** (hematomas, tumours) occupy intracranial space
- The expanding ventricles in **obstructive hydrocephalus** occupy intracranial space.
- **Intracranial space is limited.**
General Effects of Intracranial Space Occupancy

- Phase 1: ‘Leeway’ space is used up (sulci, ventricles become narrow)
- Phase 2: Localised areas of brain move (‘herniate’) into other intracranial compartments
- Phase 3: Caudalward displacement of the brainstem.
- Phase 4: Intracranial pressure exceeds blood pressure and cerebral perfusion stops.

Neuropathological Features of Intracranial Space Occupancy

- Differ depending on the cause and the rate of increase in space occupancy
  - Diffuse brain swelling as a result of a severe hypoxic ischaemic encephalopathy
  - Localised (supratentorial) space occupancy
  - Obstructive hydrocephalus

Effects of Diffuse Intracranial Space Occupancy

- Phase 1:
  - Gyral crests are flat and sulci are effaced
  - Lateral ventricles are narrow
  - Papilloedema develops.
- Phase 2: Minimal uncal herniation.
- Phase 3: Severe tonsillar herniation
- Phase 4: Death or ventilator brain.
General Effects of Focal Intracranial Space Occupancy

- **Phase 1**: Gyral crests are flat and sulci are effaced. Lateral ventricles are narrow.
  - Paradoxical contralateral lateral ventricular dilatation may occur.
- **Phase 2**: Herniation:
  - Subfalcine herniation away from the lesion
  - Uncal herniation with oculomotor nerve compression (dilated pupil) and compression of posterior cerebral artery (infarcts)
  - Early tonsillar herniation
- **Phase 3**: Brain stem distortion
  - Kernohan’s notch phenomenon
  - Brainstem haemorrhages
  - Severe tonsillar herniation
- **Phase 4**: Death or ventilator brain.

General Effects of Asymmetric Intracranial ‘Space Occupancy’

Displacement effects
- Subfalcine herniation
- Central herniation
- Transtentorial herniation
- Cerebellar Tonsillar herniation
Examples of Asymmetric Intracranial Space Occupancy

Epidural Hematomas
Very fast space occupancy
Acute Subdural Hematoma
(Fast Space-Occupancy)

Chronic Subdural Hematoma
(Slow Space-Occupancy)

Effects of Acute and Chronic Subdural Hematomas Compared
Some Other Space-Occupying Phenomena

Cases

1. Describe type of hydrocephalus and/or effects of space-occupancy
2. Name the disease process
3. Provide a differential diagnosis
DESCRIBE HCP/SO EFFECT, NAME THE DISEASE PROCESS, DIFFERENTIAL DIAGNOSIS

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