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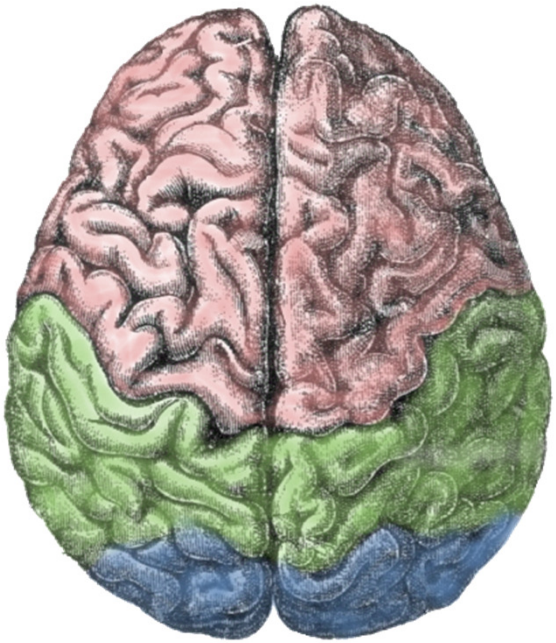

Neonatal Neurological Conditions & Care

Julia Petty

Neurological assessment

- *For any neurological condition….*
- Reflexes are assessed
- Examination of cranial nerve function – e.g. pupil response to light, blink, cough and gag reflex
- Consciousness – alertness, responses to environment / pain (central) and cry
- Muscle tone and spontaneous movement
- Abnormal movements

Raised intracranial pressure (ICP)

- *Observe for this in any neurological condition*
- Decreased responsiveness
- Inability to fix – follow
- Decreased spontaneous movement
- Decreased response to painful stimuli
- Pupil dilation with decreased response to light
- Observe fontanelles (?bulging)
- Effect on brain stem – later (apnoea, bradycardia, hypertension)

Neonatal Brain Injury

- The effects of hypoxic damage (lack of oxygen) to the brain in the term newborn=
- 'Hypoxic-Ischaemic Encephalopathy' (HIE)
- Decreased oxygen delivery to, and perfusion of, vital organs, particularly the brain
- Causes – *Include* : difficult labour, meconium aspiration
- Multi-system disorder
- Effect on brain & grade of HIE predicts outcome

Clinical Signs of HIE

- *May include……*
- Alterations in consciousness and behaviour
- Abnormal tone
- Convulsions
- Failure to maintain respiration
- Feeding difficulties
- Range / variability - grading system (1=mild / 2= moderate / 3= severe)

Management

- Assess all systems – Apgars?, pH and base deficit on blood gas at birth, clinical assessment, cerebral function monitoring? (CFM)
- Consider therapeutic cooling if criteria are met?
- Within the recommended time frame, transfer if appropriate for whole body therapeutic cooling.

Ongoing support

- Respiratory & Circulatory support
- Support blood pressure
- Correct metabolic disturbances (e.g. glucose)
- Control cerebral oedema
- Restrict fluids – to protect against cerebral oedema and reduces overload.
- Monitor urine output.
- Control CO2 carefully - be aware of the effects of high and low CO2
- Anti-consultants – to stabilise membranes and reduce cellular metabolism

Intraventricular haemorrhage

- Rupture of capillaries within the immature germinal matrix (GM) of the preterm brain
- GM is a collection of fine blood vessels that line the ventricles and is present between 24-34 weeks and then involutes
- Changes in cerebral blood flow precipitate bleeding – ventilation, abnormal CO2 levels, metabolic acidosis, coagulation disorders, stress

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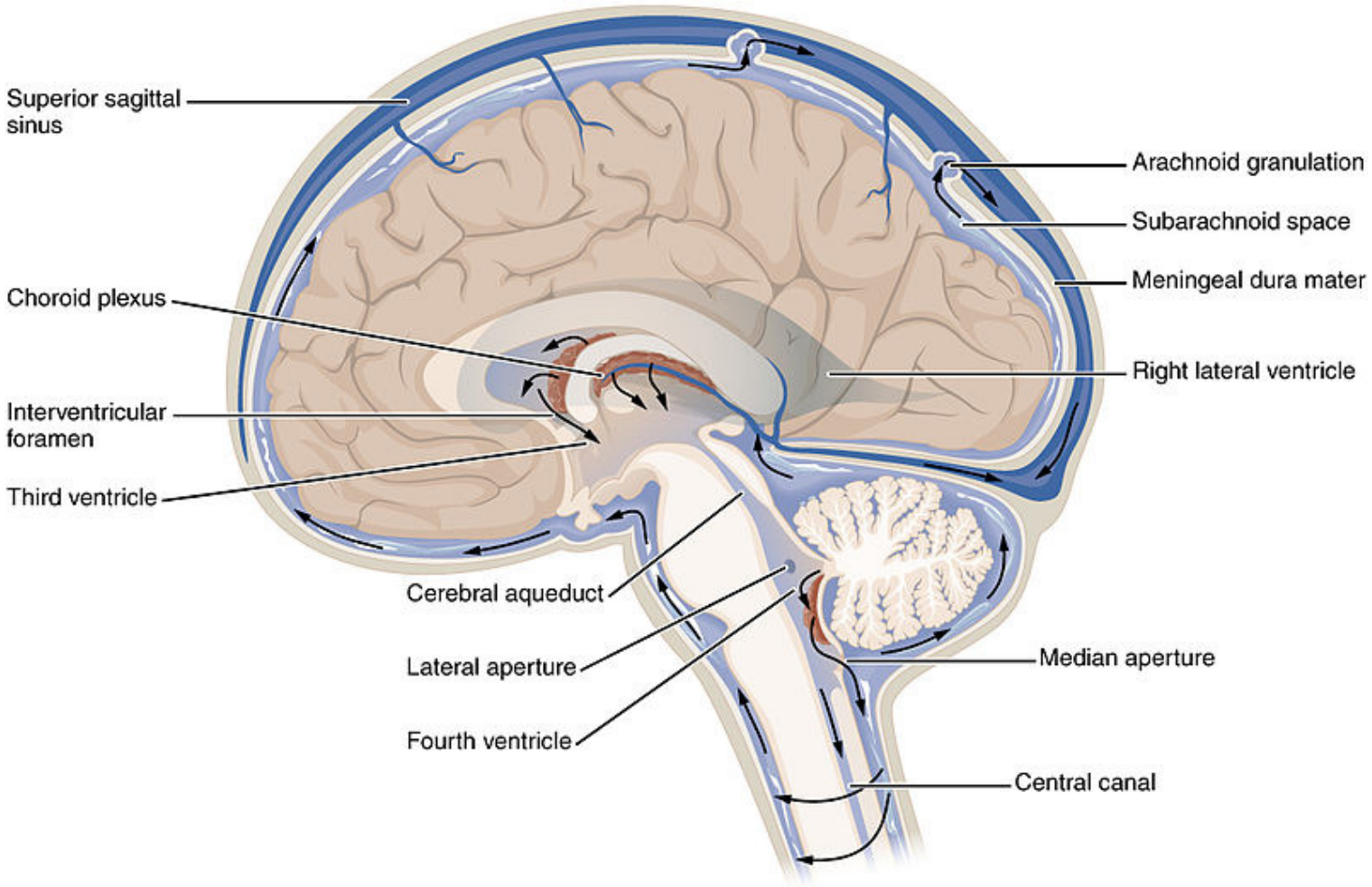
Flow of cerebrospinal fluid (CSF) and ventricles



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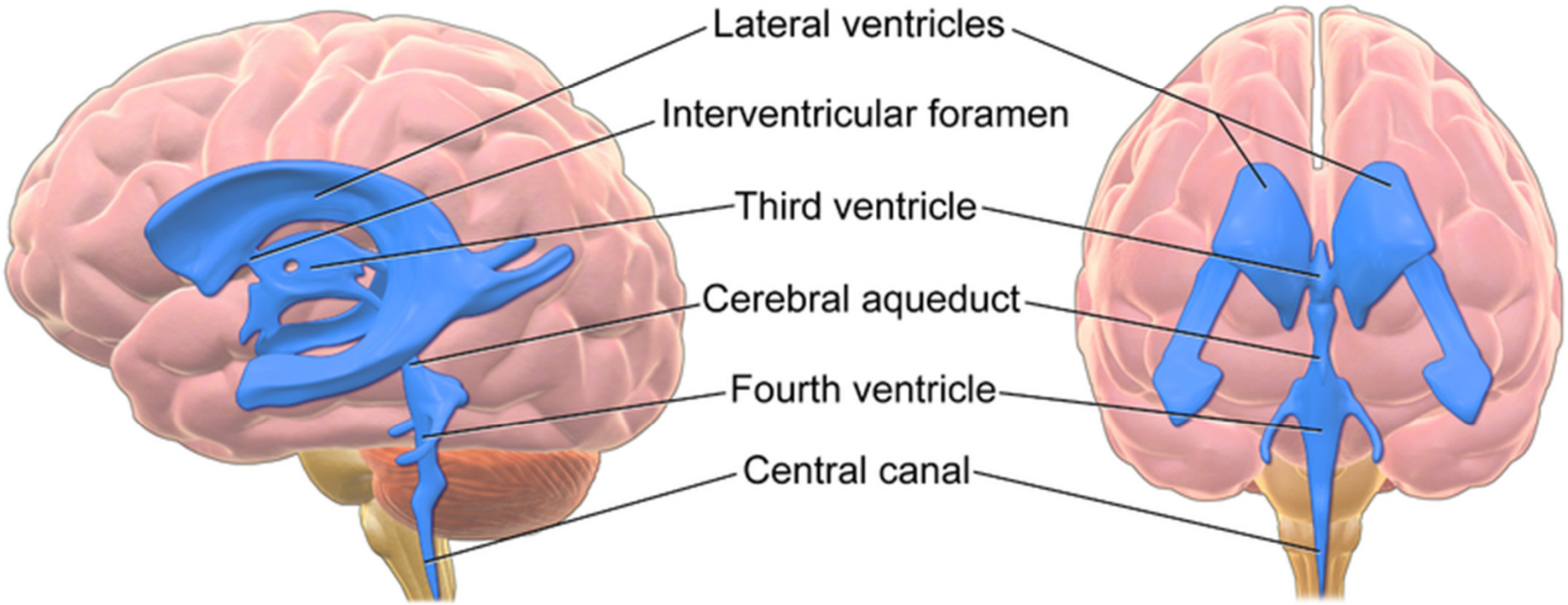
Ventricles of the Brain



Ventricular System (lateral view)

Ventricular System (anterior view)

Classification based on the extent of bleeding

- 0 - no bleed
- 1 - germinal matrix only
- 2 - germinal matrix with blood in the ventricles
- 3 - germinal matrix with blood in the ventricles. May lead to hydrocephalus
- 4 - intraventricular *and* parenchymal bleeding (into the brain tissue)
- Diagnosed by *head ultrasound*
- N.B. Grade determines outcome. Can be one side or both

Post haemorrhagic hydrocephalus

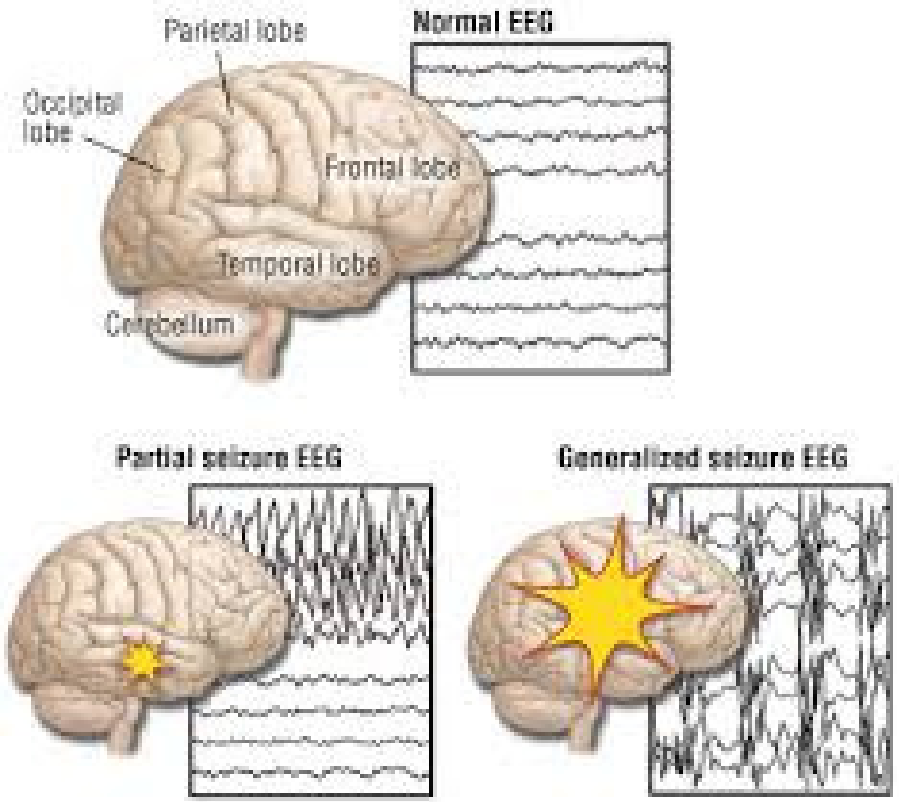
- Imbalance between production and absorption of CSF
- Ventricular dilatation shown on ultrasound
- Obstructive or non-obstructive
- Important factors are extent of the haemorrhage and the pressure
- Risk of increased ICP (observe closely) and need for CSF tapping, ? Later shunt?

Periventricular leucomalacia

- Associated with the preterm brain and leads to cerebral palsy
- Affects *periventricular* area (i.e. around the ventricles)
- Caused by bleeding or ischaemia (lack of blood supply) at this vulnerable area of brain
- Circulation at < 34 weeks based at this area, becomes more peripheral towards term (so less risk in term)
- Underperfusion and re-perfusion implicated (caused by swings of oxygen and/or blood pressure)
- Limited auto regulation in preterm neonate (i.e. unable to maintain adequate pressure to the brain during systemic low blood pressure)

Convulsions

- Convulsion , fit, seizure
- Differentiate from 'jittery' – exaggerated responses to stimuli & fine tremulous movements
- Occurs in response to minor stimulation & movements cease when held, no eye deviation
- Fit – Not stimulus provoked, movements do not cease and eye deviation present – with altered consciousness


Parietal lobe
Normal EEG
Occipital lobe
Frontal lobe
Temporal lobe
Cerebellum
Partial seizure EEG
Generalized seizure EEG

Types of seizure

- Subtle – similar to 'jitteriness' but have eye deviation / 'dancing', sucking, bicycling & apnoea
- Tonic – extensor spasm of trunk and limbs
- Multifocal / clonic - limbs
- Focal clonic – limb or jaw
- Myoclonic – jerking movements, multi

CAUSES

- Perinatal asphyxia
- Intracranial haemorrhage
- Infection (e.g. Meningitis)
- Drug withdrawal
- Metabolic – e.g. glucose, calcium
- Inborn errors of metabolism
- Pyridoxine deficiency
- 5 day fits

Diagnosis

- History
- Examination
- Metabolic
- LP
- EEG / CFM
- Septic screen
- Ultrasound scan
- Urine - metabolic

Long term care

- Ongoing and regular family support, information to parents, outcome discussions and reassurance.
- Developmental follow-up
- Physiotherapy and aid with motor problems
- Feeding interventions
- Long-term ventilation may be an issue
- Control of seizures
- Multi-disciplinary team approach

Further Reading

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