SONOGRAPHER’S QUICK REFERENCE GUIDE TO COMMON PAEDIATRIC CRANIAL PATHOLOGY

Intraventricular haemorrhage (IVH)

**GRADE 1**
- Presentation: Seizures, hypotonia, apnea, abnormal posturing, low haematocrit.
- Pathophysiology: Primarily attributed to germinal matrix fragility, disturbances in cerebral blood flow and platelet and coagulation disorders.
- Ultrasound findings: Grade 1: of IVH is confined to the subependymal region, i.e. germinal matrix haemorrhage.

**GRADE 2**
- Presentation: Seizures, hypotonia, apnea, abnormal posturing, low haematocrit.
- Pathophysiology: Primarily attributed to germinal matrix fragility, disturbances in cerebral blood flow and platelet and coagulation disorders.
- Ultrasound findings: Grade 2: IVH. Haemorrhage is clearly in the ventricle, 10–50% of the ventricular area on parasagittal view.

**GRADE 3**
- Presentation: Seizures, hypotonia, apnea, abnormal posturing, low haematocrit.
- Pathophysiology: Primarily attributed to germinal matrix fragility, disturbances in cerebral blood flow and platelet and coagulation disorders.
- Ultrasound findings: Grade 3: of IVH. -50% of the ventricular area on parasagittal view. Distension of the lateral ventricle. Concomitant periventricular echodensity.

**GRADE 4**
- Presentation: Seizures, hypotonia, apnea, abnormal posturing, low haematocrit.
- Pathophysiology: Primarily attributed to germinal matrix fragility, disturbances in cerebral blood flow and platelet and coagulation disorders.
- Ultrasound findings: Grade 4: is related to the subependymal region, i.e. germinal matrix haemorrhage.

**Periventricular leukomalacia (PVL)**

**EARLY CHANGES**
- Presentation: Apnea, bradycardia, hypotonia, seizures.
- Pathophysiology: Disruption necrosis of the periventricular deep white matter leading to macrophage and astrocyte proliferation and gradual cyst formation. Injury can occur due to the lack of cerebral autoregulation in premature infants, cardiovascular immaturity and the vulnerability of the premature white matter to hypoxia and ischemia. The cerebral cortex is generally unaffected due to the gestational meningo-arterial anastomoses (bilateral) present to the superior sagittal sinus, i.e. germinal matrix haemorrhage.
- Ultrasound findings: Periventricular echogenicity greater than that of adjacent choroid. The echogenic regions undergo cavitation 2–6 weeks after the event with resultant cystic change demonstrated.

**LATE CHANGES**
- Presentation: Seizures, hypotonia, apnea, abnormal posturing, low haematocrit.
- Pathophysiology: Disruption necrosis of the periventricular deep white matter leading to macrophage and astrocyte proliferation and gradual cyst formation. Injury can occur due to the lack of cerebral autoregulation in premature infants, cardiovascular immaturity and the vulnerability of the premature white matter to hypoxia and ischemia. The cerebral cortex is generally unaffected due to the gestational meningo-arterial anastomoses (bilateral) present to the superior sagittal sinus, i.e. germinal matrix haemorrhage.
- Ultrasound findings: Periventricular echogenicity greater than that of adjacent choroid. The echogenic regions undergo cavitation 2–6 weeks after the event with resultant cystic change demonstrated.

**Benign external hydrocephalus (BEH)**

**Presentation:** Head circumference >95%, parental concern.
- Pathophysiology: Self-limiting form of hydrocephalus in infants between 6–24 months. Most common cause of macrocephaly. Aetiology unclear – immature anastomotic vili in subarachnoid space causing impaired absorption for CSF.
- Differential – subdural haematoma, cerebral atrophy.
- Ultrasound findings: Bilateral symmetric extra axial fluid collections.
- **Measurement:**
  - Sinocortical width: 10 mm: abnormal requires monitoring from increased intracranial pressure.

**Hydrocephalus**

**HYDROCEPHALUS**

**NORMAL VENTRICLES WITH MEASUREMENTS**

**Periventricular echogenicity greater than that of adjacent choroid.**

**Hypoxic ischaemic encephalopathy (HIE)**

**Presentation:** Seizures, hypotonia, apnea, abnormal posturing, low haematocrit.
- Pathophysiology: Disruption necrosis of the periventricular deep white matter leading to macrophage and astrocyte proliferation and gradual cyst formation. Injury can occur due to the lack of cerebral autoregulation in premature infants, cardiovascular immaturity and the vulnerability of the premature white matter to hypoxia and ischemia. The cerebral cortex is generally unaffected due to the gestational meningo-arterial anastomoses (bilateral) present to the superior sagittal sinus, i.e. germinal matrix haemorrhage.
- Ultrasound findings: Periventricular echogenicity greater than that of adjacent choroid. The echogenic regions undergo cavitation 2–6 weeks after the event with resultant cystic change demonstrated.