CRANIAL ULTRASOUND SCANS

PURPOSE
- To detect brain injury in at-risk babies in order to provide appropriate medical management
- To detect lesions associated with long-term adverse neurodevelopmental outcome

INDICATIONS
- Prematurity
- Neonatal encephalopathy/ischaemic brain injury
- Neonatal seizures
- Abnormal neurological signs (e.g. floppy child, large head)
- Multiple congenital abnormalities (except trisomy 21)
- Unexplained poor feeding at term
- Unexplained hypoglycaemia, looking for pituitary and midline structures
- Meningitis
- Congenital viral infection
- Metabolic disorders
- Suspected brain malformations

SCANNING PROTOCOL FOR PRETERM INFANTS

Initiation
- ≤29 weeks
  - initial scan day 4–7
  - 2nd scan day 10–14
  - 3rd scan between 36–40 weeks of postmenstrual age
- 30-32 weeks
  - initial scan day 3–7
  - 2nd scan at term equivalent age, or discharge if earlier
- >32 weeks
  - only if clinically indicated, discuss on ward round
- Perform additional scans following a significant clinical event:
  - necrotising enterocolitis
  - major collapse
  - repeated severe episodes of apnoea and bradycardia
  - unexplained sharp fall in haemoglobin
  - change in neurological status
  - abnormal head growth
  - pre- and post-operatively

Follow-up
- If initial scan shows intraventricular haemorrhage (IVH) or hydrocephalus, haemorrhagic parenchymal infarction, or any other abnormality
  - discuss serial scanning with consultant
- If scan abnormal at six weeks:
  - discuss further imaging with consultant
  - usually an MR scan

SCANNING PROTOCOL FOR TERM OR NEAR-TERM INFANTS

Neonatal encephalopathy
- Initial scan within 24 hr
Cranial u/s 2009-11

- 2nd scan 3-4 days
- 3rd scan 7-14 days
- In encephalopathic infants with significant birth trauma and low haematocrit, request non-contrast CT scan
- For babies with moderate to severe encephalopathy between 3-8 days of age, MR scan recommended but availability limited and instability of baby may contraindicate

**Seizures**
- In term infants with seizures, MR scan preferred. However, in experienced hands, ultrasound can detect focal infarction and should be performed on admission, 2 and 7 days later

**PROCEDURE**

**Operator must achieve an acceptable level of competence before performing and reporting scans independently**

- Record minimum set of coronal (6+ images):
  - anterior to frontal horns of lateral ventricles
  - at anterior horns of lateral ventricles and Sylvian fissures
  - at third ventricle and thalami
  - at posterior horns of lateral ventricles (with choroids)
  - posterior to choroids (posterior brain substance)
  - if lateral ventricular dilatation, make an index measurement of lateral ventricles at the level of third ventricle at the foramina of Munro (ventricular index)
- Record minimum set of sagittal (5+ images):
  - midline through 3rd ventricle, septum cavum pellucidum, cerebellum with 4th ventricle and foramen magnum
  - through each lateral ventricle showing anterior and posterior horns, with caudothalamic notch imaged if possible
  - through each hemisphere lateral to the ventricle for deep white matter
  - Supplemental oblique, surface and axial images may be necessary to record pathology
  - For detection of cerebellar lesions, scanning through posterior fontanelle (junction of lambdoid and sagittal sutures) and mastoid fontanelle (junction of posterior parietal, temporal and occipital bones) can be useful

**DIFFERENTIAL DIAGNOSIS**
- Radiologists or appropriately trained staff must interpret cranial ultrasound scans
- Scans must be reported using categories/terminology in Table 1

**Table 1**

| Intraventricular haemorrhage | • None  
|                            | • Localised IVH without dilatation (germinal matrix haemorrhage, subependymal haemorrhage)  
|                            | • IVH with ventricular dilatation  
|                            | • Parenchymal haemorrhage  |
| Ventricular size           | • Normal  
|                            | • Enlarged |
| Parenchymal lesions        | • None  
|                            | • Periventricular flare  
|                            | • Cystic lesions  
|                            | • single large porencephalic cyst  
|                            | • multiple cysts (cystic periventricular leukomalacia) |
COMMUNICATION

- Any member of neonatal team may communicate a normal result to parents but note that a normal scan does not equate to normal development and follow-up is essential
- Discuss an abnormal result with neonatal consultant before discussion with parents

DOCUMENTATION

- Documentation is extremely important. Archive digital copies of scans suitably
- Record following information on investigation chart:
  - date scan requested
  - date scan carried out
- Record ultrasound result (or file a written report) in baby’s notes (neonatal staff)
- Record in notes any discussion with parents, especially of abnormal scans
- Include in discharge summary results of all scans, even if normal,
- If eligible baby transferred to another hospital before scanning, communicate need for scan in transfer summary