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

- 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