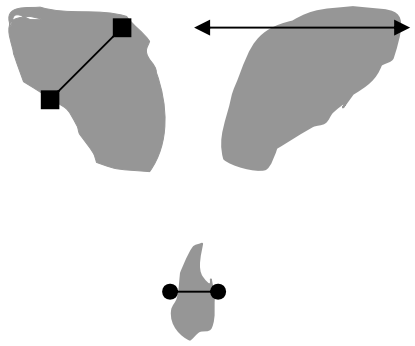
POST HAEMORRHAGIC VENTRICULAR DILATATION

Introduction

- Post-haemorrhagic ventricular dilatation (PHVD) precedes hydrocephalus which is widely defined as intraventricular haemorrhage followed by progressive enlargement of the lateral ventricles until the ventricular index (VI) exceeds 4mm above the 97th centile for gestational age.
- Ventricular enlargement due to cerebral atrophy can be distinguished from that due to raised intra cranial pressure (ICP). With cerebral atrophy the lateral ventricles are less rounded, they enlarge slowly and the head circumference is not enlarged.

Measurements

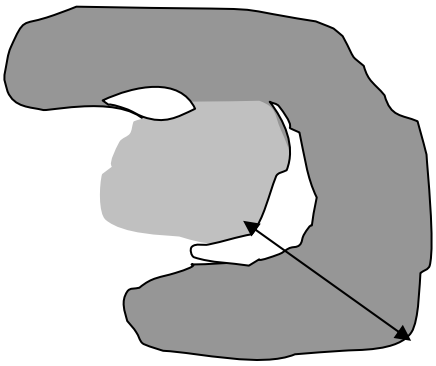
Lateral ventricles and third ventricle at level of foramen of Munro



► Ventricular index

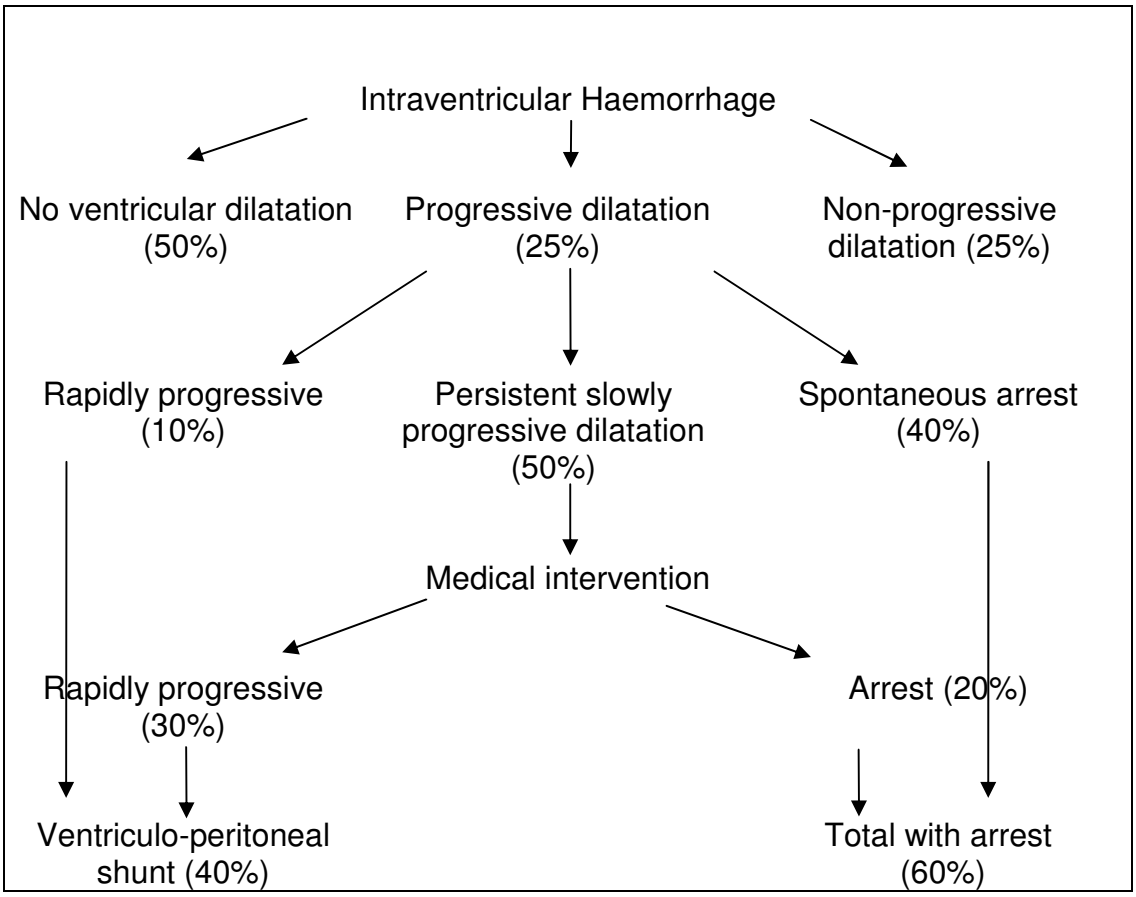
▪ Anterior horn width, >4mm is abnormal

● Third ventricular width, >3mm is abnormal



► Thalamo-occipital dimension, >26mm is abnormal

Progression of PHVD



Management

General:

- Management is best directed according to progression of PHVD. Aim to achieve the following:
  - Prevent excessive head growth
  - Control symptoms of raised ICP
- Early and recurrent CSF taps may theoretically achieve the following:
  - Remove blood products and inflammatory mediators
  - Reduce the need for permanent shunting
  - Improve neurological outcome by minimising brain injury due to raised ICP
- Complications of LP therapy include a 7-10 % risk of CSF infection and very rarely vertebral osteomyelitis
- There is no evidence to support drug therapies. Acetazolamide and Furosemide therapy are neither effective (no reduction in VP shunt insertion) or safe (risk of nephrocalcinosis and biochemical disturbance)

Slowly progressive ventricular dilatation

- Close surveillance as spontaneous arrest of dilatation is possible and overall trials of repeated early CSF taps for slowly progressive ventricular dilatation have not shown a reduction in VP shunt surgery or disability
- Monitor symptoms and signs of raised ICP:
  - Apnoea, vomiting, changes in tone or conscious level, tense fontanelle, separation of cranial sutures

- Measure and plot OFC and VI twice weekly. An increase in OFC of >3 mm (if twice weekly) or >5 mm/week or >2 cm/month are abnormal
- Measure twice weekly resistance index (RI = PSV – EDV/PSV) from the anterior cerebral artery. RI >0.85 = raised ICP, RI ≥1.0 = impaired perfusion; RI may not be useful if hypocapnia or PDA present

Persistent slowly progressive ventricular dilatation

- If VI climbs above the 97th centile for gestational age a 'baseline' lumbar puncture may be indicated to test for communication and to measure ICP
- The rate of VI climb and increase in OFC will influence the exact timing of an LP:
  - CSF opening pressure >6 cmH_2O is abnormal (normal 3-6 cmH_2O)
  - Drain 10-20 ml/kg CSF, no faster than 1 ml/kg/min
  - Measure CSF protein and glucose, send for microscopy and culture
- Continue surveillance with OFC, VI and RI measurements as above
- If the ventricular system is communicating further LP (10-15 ml/kg) taps may be useful, aim for the following:
  - Head growth <2 mm/day (preferably 1 mm/day up to 32 weeks, then 0.7 mm/day)
  - VI within 4 mm of 97th centile for gestational age
  - CSF opening pressure <12 cmH_2O (ideally below 9 cmH_2O)
  - Keep taps to a minimum due to risk of infection
  - Watch for hyponatraemia
- If the ventricular system is non-communicating discuss with neurosurgeons
- Try to avoid use of ventricular taps unless there is evidence of rapidly progressive dilatation (see below)

Rapidly progressive ventricular dilatation

- Uncontrolled ventricular dilatation even with serial LP taps:
  - Clinical features of raised ICP may persist
  - OFC increasing by >5 mm (if twice weekly) or >1 cm/week
  - VI continues to increase >4mm above 97th centile for gestational age
  - CSF pressure >12 cm H_2O
- Contact neurosurgeon and refer for consideration of ventricular reservoir insertion. For ventriculo-peritoneal shunting surgeons will wait until the baby is > 2500 g and infection free. Ideally the CSF should be clear of blood and the protein < 1.5 g/l.
- Whilst awaiting transfer for surgical intervention, continue close surveillance and serial LPs to 'buy time.'
- Ventricular taps may become unavoidable at this stage if LPs fail

<u>Prognosis</u>

- Evidence from current trials are awaited - Early versus Late Ventricular Intervention Study (ELVIS).
- DRIFT (Drainage, Irrigation and Fibrinolytic Therapy) did not reduce ventriculo-peritoneal shunt surgery or death in preterm infants with PHVD when compared with repeated tapping, but some improved neurodevelopmental outcome .
- External ventricular drainage, third ventriculostomy and choroid plexus coagulation can be carried out but are unproven in randomised trials.