



## Yorkshire & Humber Neonatal ODN (South) Neonatal Clinical Guideline

**Title:** Cranial ultrasound

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**Review date:** December 2026

**This clinical guideline has been developed to ensure appropriate evidence based standards of care throughout the Yorkshire & Humber Neonatal Network (South). The appropriate use and interpretation of this guideline in providing clinical care remains the responsibility of the individual clinician. If there is any doubt discuss with a senior colleague.**

### A. INTRODUCTION

#### 1. Aim of guideline

Preterm and sick neonates are at risk of brain injury, particularly in the early days following delivery. Cranial Ultrasound (Cr USS) can be used in diagnosis and monitoring of at risk neonates, helping to decide if therapeutic intervention is required to decrease the risk of neurodevelopmental impairment, and helping guide parental counselling.

The aim of this guideline is to provide a framework for which neonates require scanning, and to inform the timing and frequency of scans.

#### 2. Minimum standards where appropriate

Cranial ultrasound screening (CrUSS) protocol is useful in neonates based on current evidence-based recommendations.

### 3. Summary

|  |  |
|--|--|
| Gestational age/Birth weight                                 | Scan on Days   |
| ≤ 31 <sup>+6</sup> weeks gestation/Birth weight < 1500 grams | Day 3-7/Earlier if clinically indicated                                    |
| Further scans  | Based on results of 1 weeks scan follow Green or Red pathway as indicated. |

## B. PROCESS/FULL GUIDELINE

### 1. Background

Preterm and sick neonates are at risk of acquired brain injury, especially in the first few days of life, and are associated with significant short- and long-term morbidities. Injuries commonly seen include intraventricular haemorrhage (IVH), periventricular haemorrhagic infarction (PVHI) and white matter injury (WMI).<sup>1</sup> The risk of severe brain injury is inversely proportional to the gestational age<sup>1,2</sup>. CrUSS is an easily accessible and acceptable imaging tool to detect lesions.<sup>1</sup>

### 2. Areas outside remit if applicable

This CrUSS guideline is a guide to stable neonatal population without additional risk factors and more/earlier scans may be required based on consultant/senior clinician discretion.

### 3. Core guideline

This guideline mainly looks at routine screening for all preterm neonates < 32<sup>+0</sup> weeks' gestation.

There is no indication for routine screening of babies' ≥ 32<sup>+0</sup> weeks. <sup>1, 8, 10</sup>

This is not an exhaustive list but most indications for scanning this group are listed below: <sup>7</sup>

- ✚ Birth weight < 1500 grams<sup>5,6</sup>
- ✚ 5-minute APGAR score < 7
- ✚ Rapidly falling haemoglobin level
- ✚ Abnormal head growth
- ✚ Clinical deterioration with haemodynamic instability (hypotension requiring intervention or shock)
- ✚ Following perinatal asphyxia/trauma
- ✚ Patients on hypothermia, extracorporeal membrane oxygenation, and other support machines

- ✚ Necrotising Enterocolitis(NEC)
- ✚ Septic Shock
- ✚ CNS infection (congenital or acquired)/ Congenital Malformation
- ✚ Signs or symptoms of a central nervous system disorder (e.g., seizures, facial malformations, macrocephaly, microcephaly, and intrauterine growth restriction)
- ✚ Coagulopathy or severe thrombocytopenia
- ✚ Follow-up or surveillance of previously documented abnormalities, including prenatal abnormalities

### 3.1 Aetiology & risk factors

Preterm neonates are susceptible to brain injury, especially in the first few days of life. These injuries commonly present as intraventricular haemorrhage (IVH), periventricular haemorrhagic infarction (PVHI) and white matter injury (WMI). The risk of severe brain injury is inversely proportional to the gestational age<sup>1, 2</sup> and birth weight < 1500 grams<sup>1, 5, 6</sup>. Cranial ultrasound is a good modality to identify these injuries and can be graded using the following: The modified Papile Classification:

Grade I = Minimal IVH (sub ependymal haemorrhage)

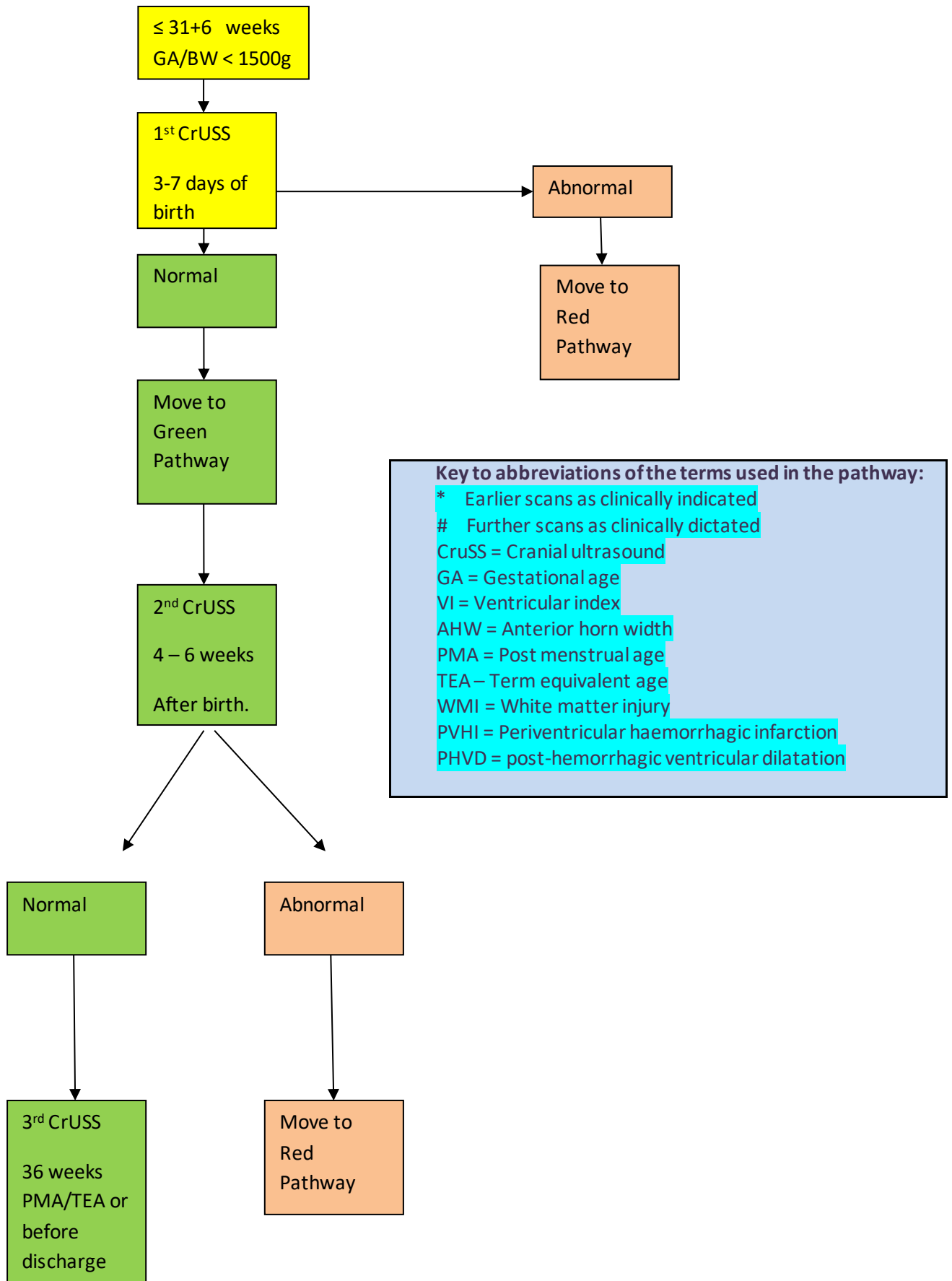
Grade II = IVH occupying 10 – 50% of ventricular area (without ventricular dilatation)

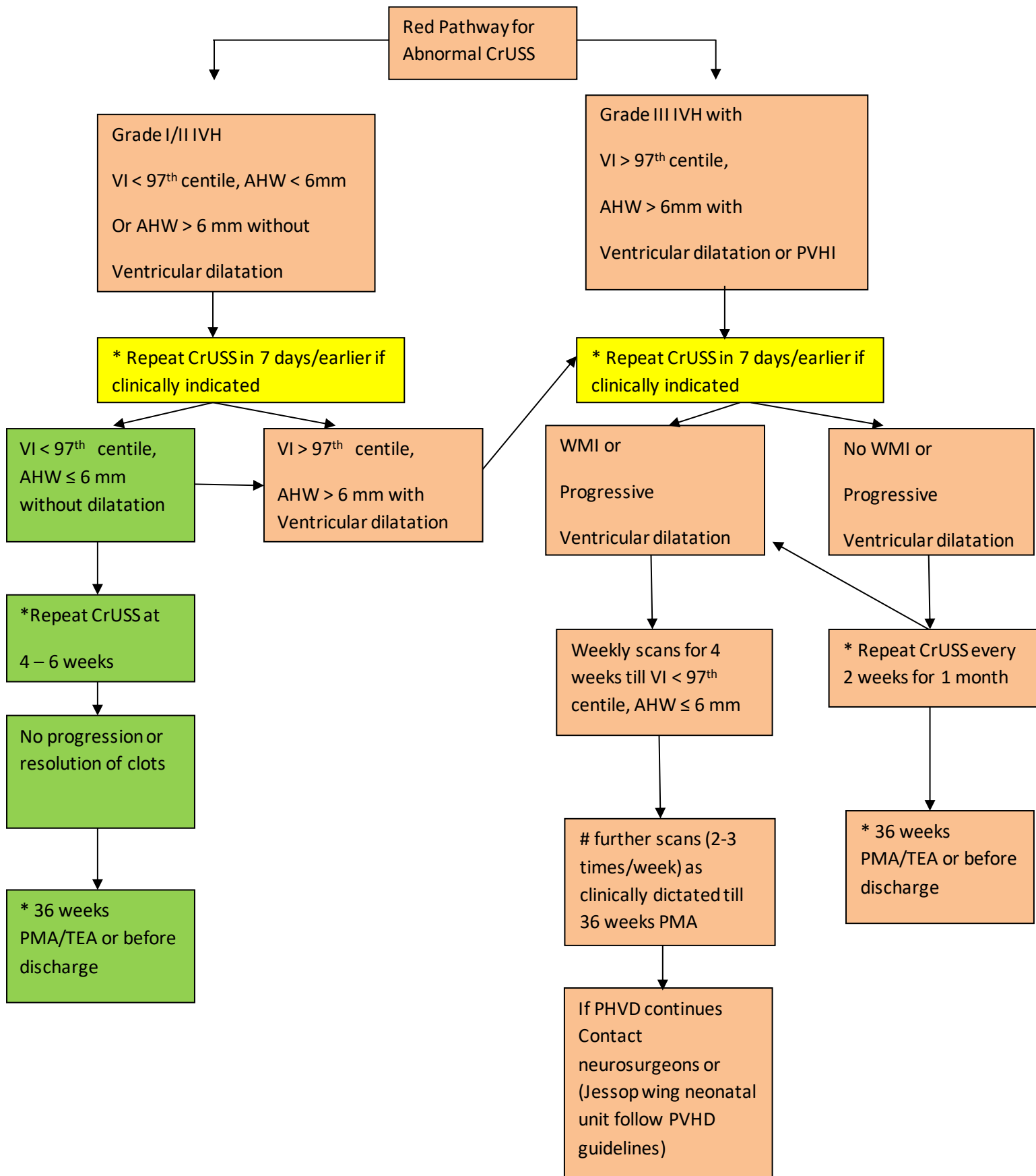
Grade III = IVH > 50% of ventricular area (with ventricular dilatation)

Grade IV = IVH with parenchymal haemorrhage

At least 2 measurements the ventricular index (VI) and anterior horn width (AHW) should be measured.

### 3.2 Investigations: CrUSS pathway





**Technical considerations: -**

1. The probe should be cleaned before and after use (as per local guidance eg. Tristel Duo)
2. Hand hygiene as per non-sterile procedure
3. New sachet of sterile gel for each patient + use gauze from the patient locker. Use a small blob of gel.
4. Use the curved probe (3-10 on GE machine) or the sector probe (12 on Phillips CX50)
5. Raise the incubator so that you aren't stooping. Minimise door opening to reduce loss of heat and humidity – you should be able to scan with only one door open. Ask for help if you are struggling with a hat (CFAM needles introduce air into the subcutaneous plane and image quality can be really poor)
6. Put a finger on the fontanelle to help locate the probe - if the fontanelle is small you will need to manoeuvre the probe to get an image. You need to be in the middle of the fontanelle (sound won't travel through bone). If the fontanelle is small, imagine you are fishing through thick ice - go to the back of the fontanelle and angle forward to look at the front of the brain...

**Images: -**

All images should have the patient's name + 1 unique identifier + date /time

- Coronal images are viewed as if looking at the patient's face (the right hemisphere is on the left-hand side of the screen)

**Take at least 5 sagittal images:**

- Sagittal images are viewed with the nose pointing towards the left hand side of the screen/image
- Midline sagittal view
- Parasagittal right and left views
- Lateral parasagittal right and left views

**Take at least 5 coronal images:** (start at the front and work back)

- Anterior to frontal horns of lateral ventricles (including orbits)
- Thorough the anterior horns of lateral ventricles at Sylvian fissure
- Through the 3rd ventricle and thalami (3 white dots – choroid plexus in the 3rd and lateral ventricles)
- Posterior horns of lateral ventricles and choroid plexus
- Posterior to ventricles and choroid plexus in occipital lobes

(Ventricular index should be measured at level of 3rd ventricle)

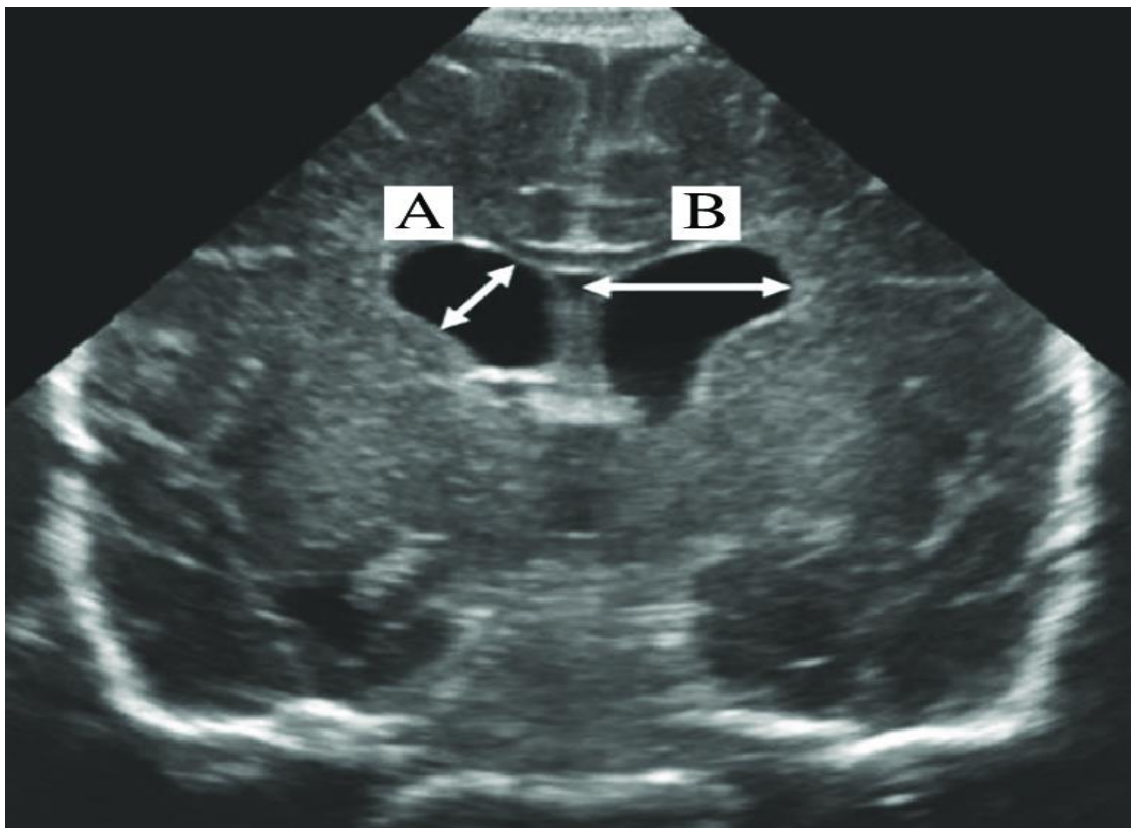
**Accessory views** (can be helpful for specific questions)

- Axial view of 3rd ventricle (transverse above the ear) – good to assess 3rd ventricle dilatation and get a reproducible measurement)

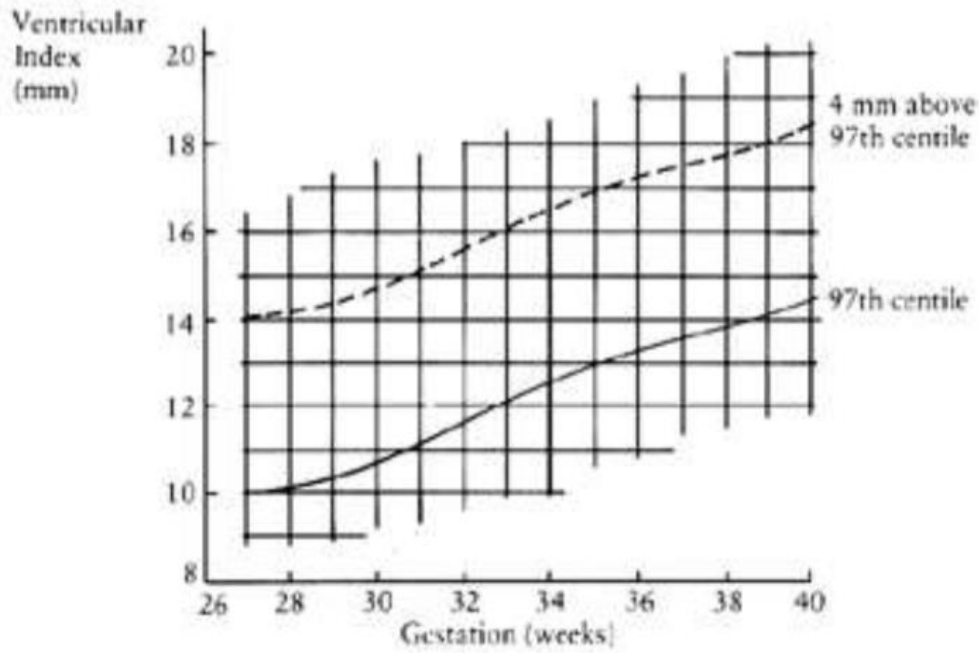
- Posterior fossa coronal (probe vertical behind the ear – look for the 4th ventricle) – check for blood in the 4th ventricle and cerebellar haemorrhages

**Ventricular index (VI):** The VI is the distance between the midline (falx) and the lateral border of the lateral ventricle at the level of foramen of Monro and is assessed in the coronal view. **B** in figure below.

**Anterior Horn Width (AHW):** The AHW of the lateral ventricles is measured in a coronal view, at the level of the third ventricle. It is the distance between the medial wall and floor of the lateral ventricle at the widest point. **A** in figure below.



## APPENDIX



Levene VI Chart (Ventricular Index Chart)<sup>12</sup>

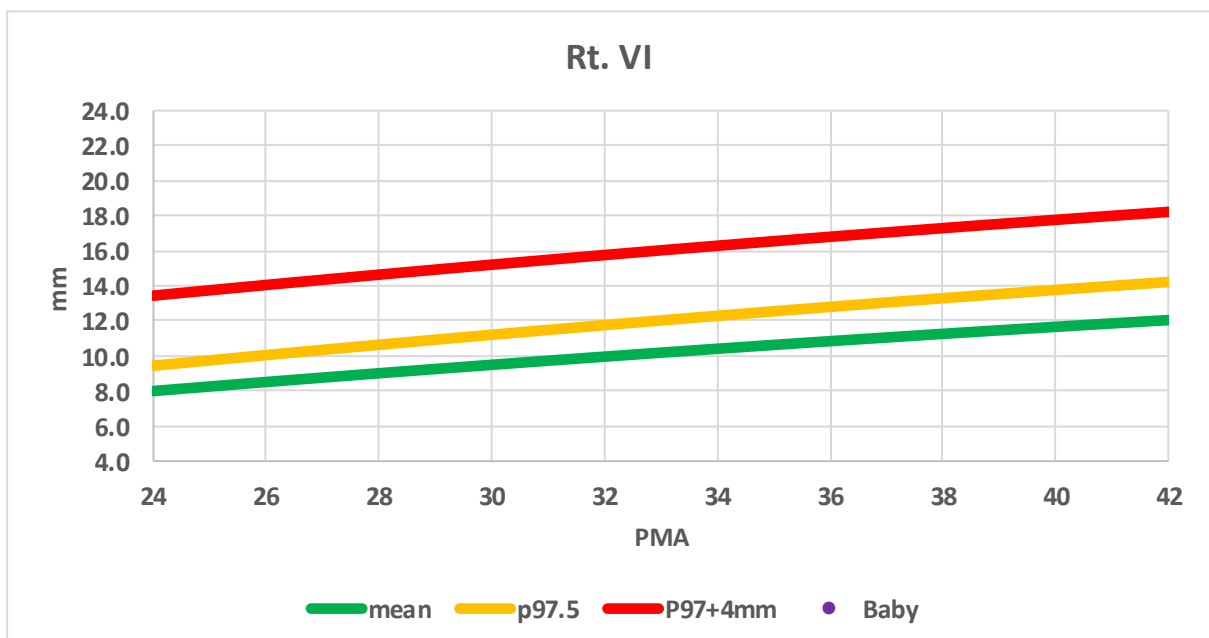
Plot right VI as **o** and Left VI as **x**

Combined VI and AHW graphs<sup>3</sup>

Low Risk █

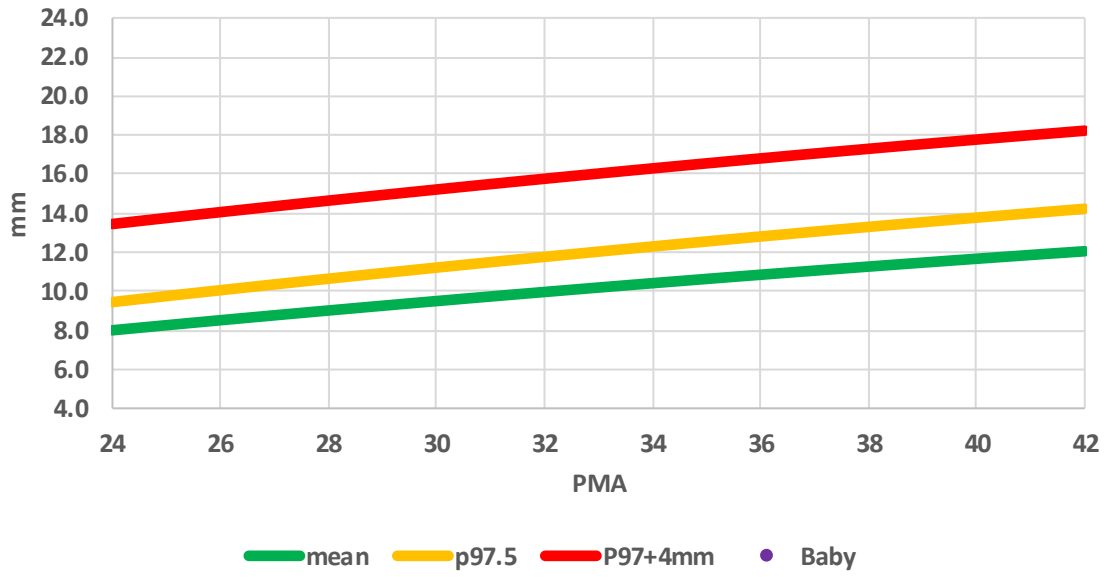
Moderate Risk █

High Risk █

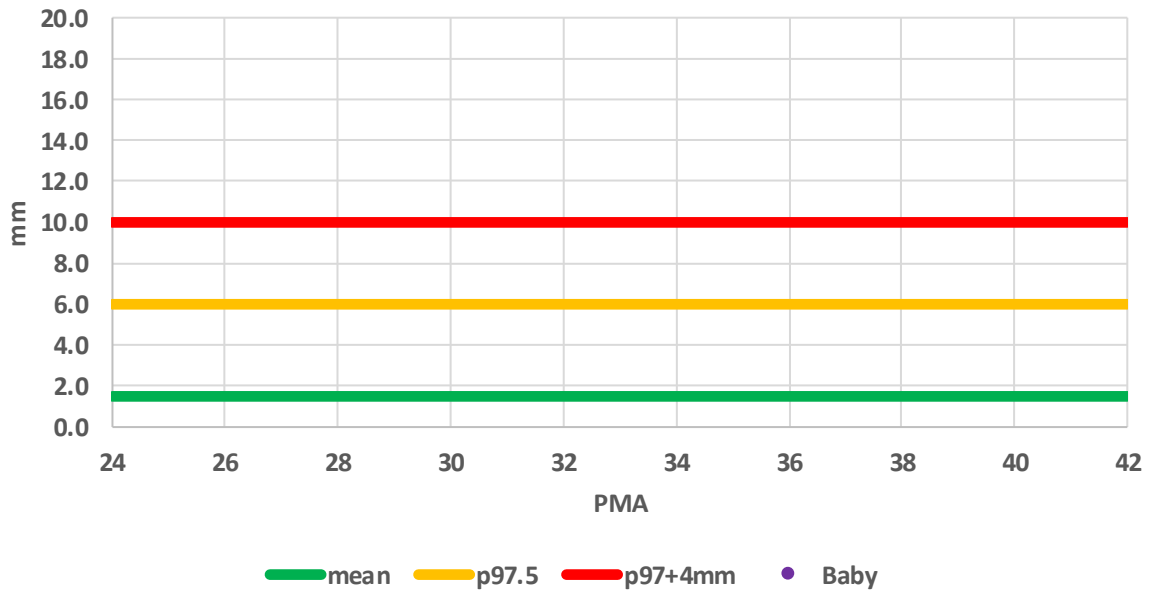




### Lt. VI



### Rt. AHW





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