ISUOG Basic Training

Distinguishing Between Normal & Abnormal Appearances of the Skull & Brain

Seshadri Suresh, India
Learning objectives 4 & 5

At the end of the lecture you will be able to:

• Describe how to obtain the 3 planes required to assess, including measuring, the fetal head correctly

• Recognise the differences between the normal & most common abnormal ultrasound appearances of the 3 planes of the fetal brain
THREE BASIC AXIAL PLANES OF THE HEAD

- **Skull**, Falx, CSP, LV
- BIOMETRY: BPD, OFD, HC
- BIOMETRY-TCD: Cerebellum/vermis

**TRANS VENTRICULAR**

**TRANS THALAMIC**

**TRANS CEREBELLAR**
Imaging the Head – The three planes - Technique

1. Identify cervical spine and occipital junction in sag plane
2. Rotate probe 90° & identify the cranial vault
3. *Gently* angulate probe to identify trans ventricular plane and trans thalamic plane
4. *Gently* rotate probe towards occiput for trans cerebellar plane – ensure CSP is also seen anteriorly
from plane 4 to 5
– (rotate &) slide minimally

from plane 4 to 6
- rotate

From plane 1 or 2 to 4 –
Identify junction of cervical spine & occiput
rotate through 90°
The most cephalad of the three planes

1. INTEGRITY: Intactness of skull
2. BONE DENSITY: poor visualization of near field
3. FALX: Interrupted by CSP
4. Occipital / posterior horn of lower lateral Ventricle
5. Frontal horns of BOTH lateral ventricles
LATERAL VENTRICLES - Technique of Measurement:

- Symmetrical axial view / Optimal zoom
- Atrium measured at the level of the glomus of choroid plexus, opposite the parieto-occipital sulcus
- Calipers placed touching the inner edge of the ventricle wall at its widest part, aligned perpendicular to the long axis of the ventricle
Measurement of Lateral Ventricles

Normal Occipital horn of lateral ventricle < 10mm
Refer if LV size is > 10mm
THE TRANSTHALAMIC PLANE Plane 5/20
Anatomical landmarks

1. Midline falx
2. Cavum septum Pellucidum
3. Both thalami in apposition separated by the falx
4. Hippocampal gyri
5. The lateral sulcus
1. Trans thalamic plane
2. Angle of insonation 90 deg to midline echoes
3. Symmetric hemispheres
4. Falx with CSP & thalamus

**Cerebellum NOT to be visualised**

**CALIPERS:** Outer to inner

Use appropriate charts
CEPHALIC INDEX -  BPD/OFD X 100
75-85 – Normal
< 75 - Dolicocephaly
>85 - Brachycephaly
# HEAD CIRCUMFERENCE CHART

Use standard reference charts
Refer if HC outside normal range for period of gestation

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CRANIAL BIOMETRY – CEREBELLAR DIAMETER

KEY POINTS

• Ensure complete visualization of CB
• Ensure anatomical landmarks – avoid steep angulation
1. Frontal horns of both LV
2. Cavum septum pellucidi
3. Thalami
4. Cerebellum
5. Cisterna magna
TRANS CEREBELLAR PLANE BIOMETRY

- Trans cerebellar diameter – Maximum Diameter in the correct plane
- Cisterna magna – vermis to inner edge of occipital bone (normal range 2.0-10.0mm)

Refer if:

TCD < 5th centile for period of gesation , Cisterna magna > 10mm
Two cerebellar hemispheres appear separated
COMMON ABNORMALITIES TO BE EXCLUDED IN THE THREE PLANES (4, 5, 6)
THE CRANIAL VAULT

ANENCEPHALY
THE CRANIAL VAULT
“LEMON” SIGN OF OPEN NTD
OTHER HEAD SHAPES

- Dolicocephaly
- Brachycephaly
- Strawberry
- Clover leaf
POOR MINERALISATION OF SKULL – REDUCED BONE DENSITY
OSTEOGENESIS IMPERFECTA

NORMAL SKULL

POOR NEAR FIELD VISIBILITY
THE CRANIAL VAULT- SKULL INTEGRITY
CEPHALOCELES

• Can occur anywhere
• Most common in the occipital region
• Meningocele / meningoencephalocele
• Varying sizes

Basic training
- Post horn >10mm
- Refer if LV size is >10 mm
- Ventricular shape “tear drop” in ACC
HOLOPROSENCEPHALY

- Several types – Alobar most severe
- Associated anomalies may be present
- Refer if Midline Falx is not visualized and ventricles are fused
Banana shaped cerebellum in Spina Bifida

Cisterna Magna > 10 mm – Mega cisterna magna
Dandy walker Malformation

TRANS CEREBELLAR PLANE ANOMALIES
TRANS CEREBELLAR PLANE ANOMALIES

Cystic hygroma

Edema – hydrops
KEY FEATURES OF PLANES 4,5,6

**Plane 4**
- **TRANS VENTRICULAR**
- Skull, Falx, CSP, LV

**Plane 5**
- **TRANS THALAMIC**
- BIOMETRY
  - BPD, OFD, HC

**Plane 6**
- **TRANS CEREBELLAR**
- BIOMETRY- TCD
  - Cerebellum/vermis

**Post fossa cyst**
- Mega cisterna Magna
- Cystic hygroma
- Scalp Edema

**Anencephaly,**
- Cephalocele
- Alobar holoprosencephaly
- Ventriculomegaly

**Basic training**
Key Take Home Points ..

• Head is imaged in three planes – Lateral ventricular plane, Trans thalamic plane & Trans cerebellar plane
• It is important to identify the specific landmarks
• Any variation in the appearances should raise suspicion of an anomaly
• Lateral ventricle > 10mm, Cisterna magna > 10mm – refer
• Head circumference < 5th centile / > 95th Centile – refer
• Trans cerebellar diameter < 5th centile or altered shape – refer
THANK YOU