

ULTRASOUND LECTURE SERIES

— Presented by —

AIUM • CREOG • ACOG • ACOOG



Ultrasound of the Normal Fetal Neuraxis

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Gynecology

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Course Objectives

After completing, the student should be able to identify normal fetal central nervous system (CNS) anatomy in following planes:

- Transventricular view
- Transthalamic view
- Transcerebellar view
- Sagittal views: cranium
- Coronal views: cranium
- Orthogonal views: normal spine

Cranial Anatomy

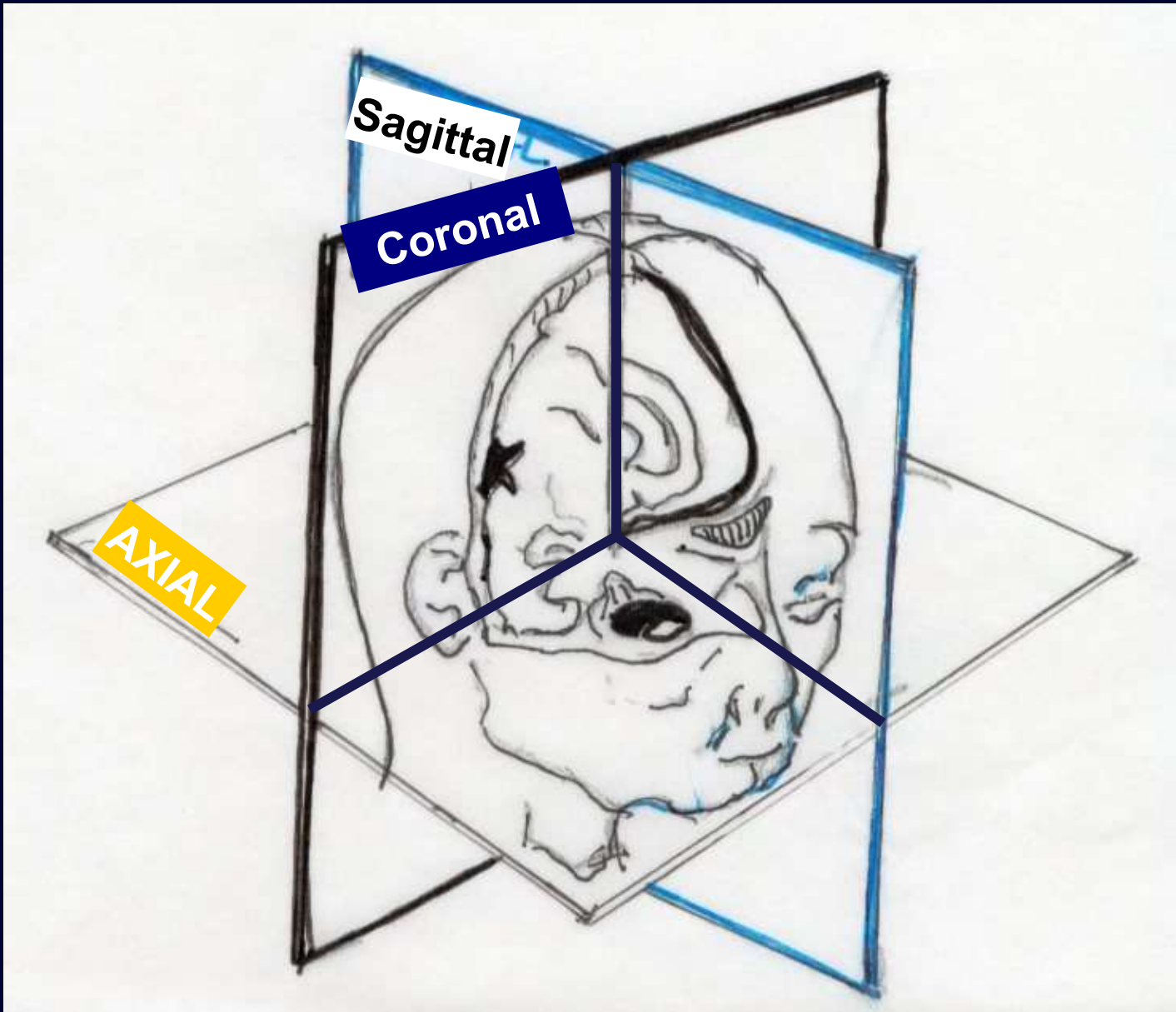
Importance of Proficiency in Imaging Cranial Anatomy

- Biparietal diameter (BPD) with views of the fetal brain routinely imaged
- Cranial anomalies common
- Failure to appreciate normal anatomy:
 - Missed diagnosis
 - False-positives

CNS Imaging

Orthogonal Planes

- Axial
- Sagittal
- Coronal

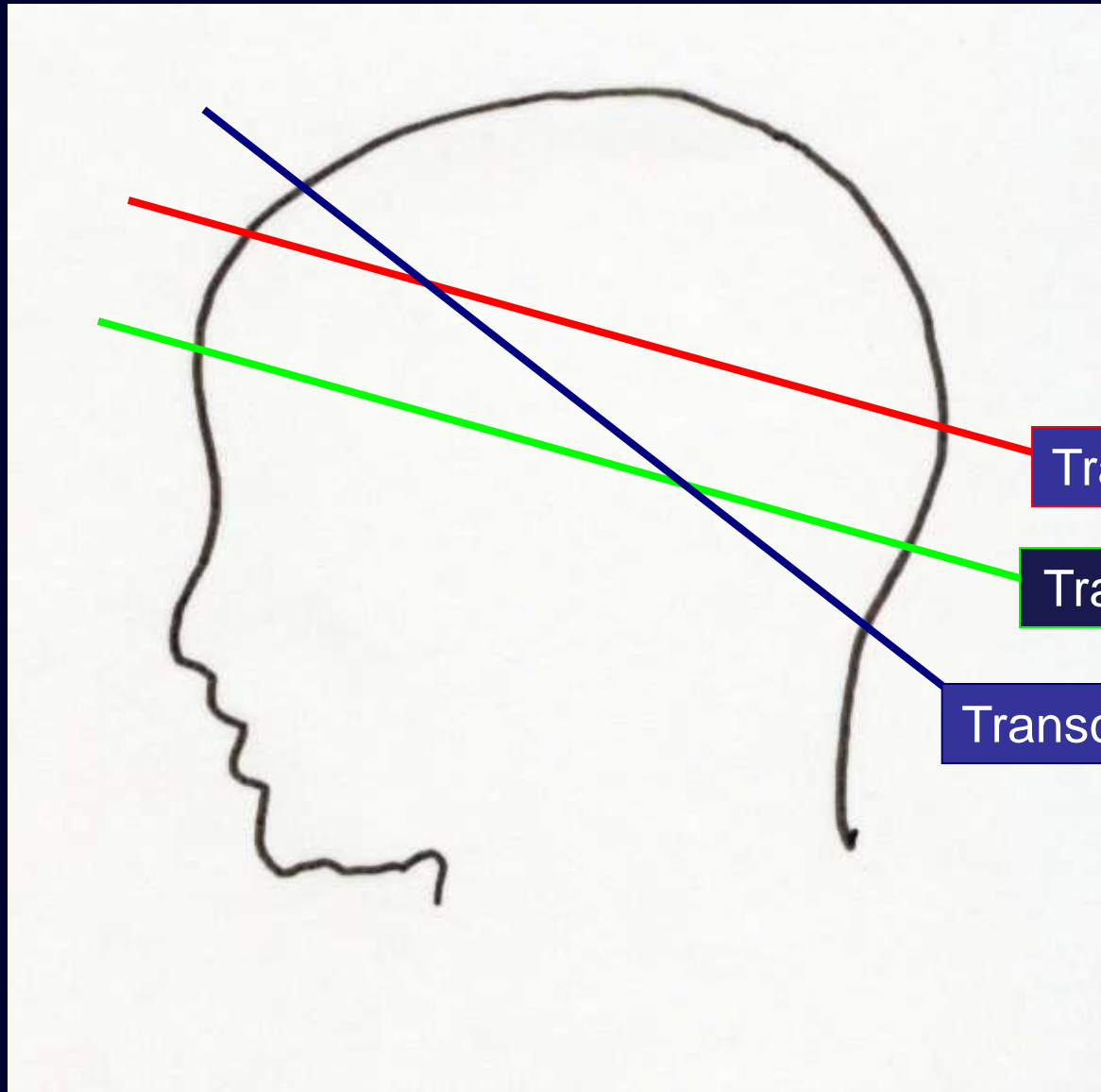


Segmentation Based on Imaging Plane

Plane	Division of Cranial Anatomy
Axial	Superior/inferior
Coronal	Anterior/posterior
Sagittal	Left/right

Scan Planes: Anatomic Structures Visualized

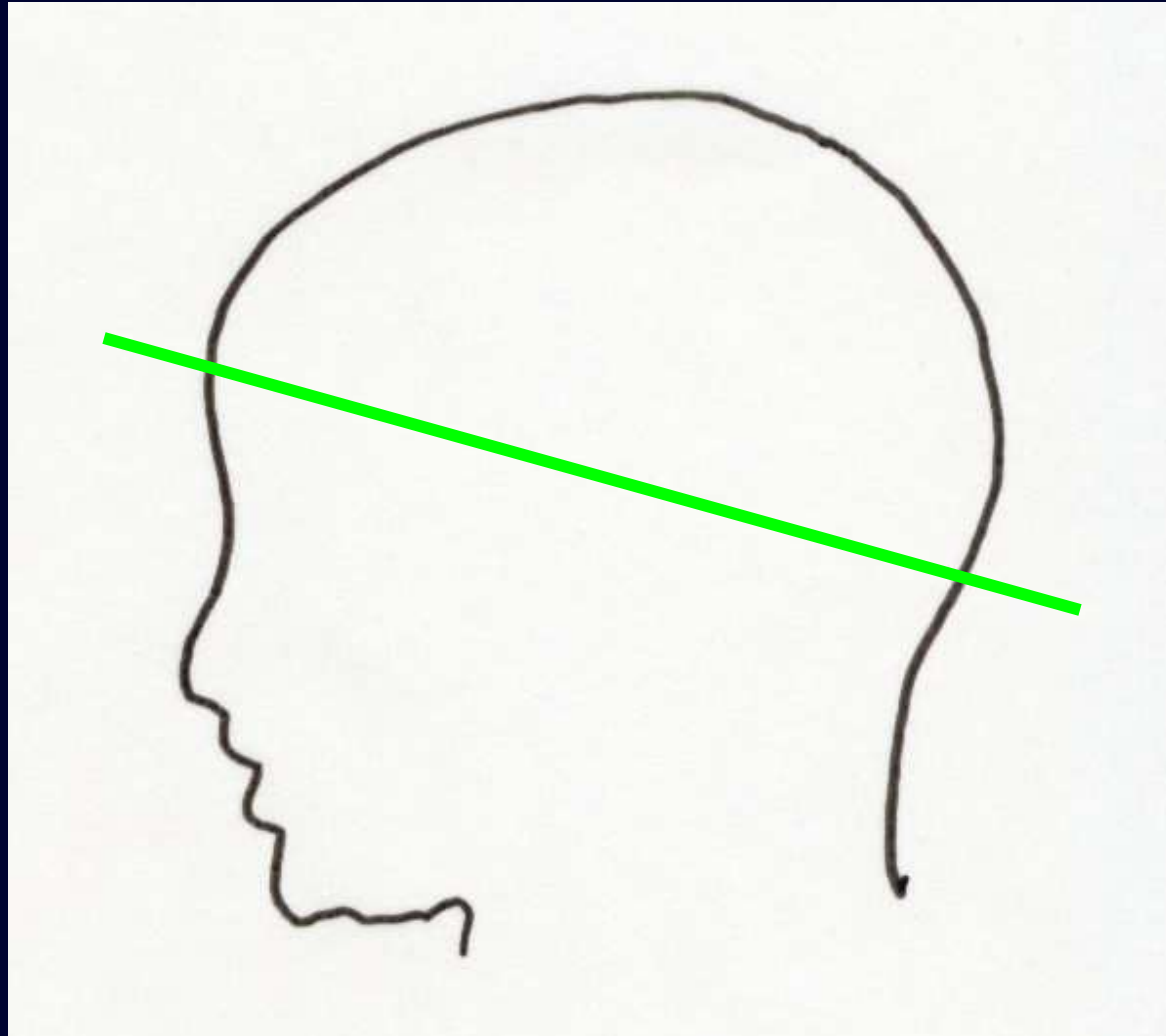
Axial Views



Transventricular

Transthalamic

Transcerebellar



Transthalamic

Transthalamic (BPD) View

Structures Visualized

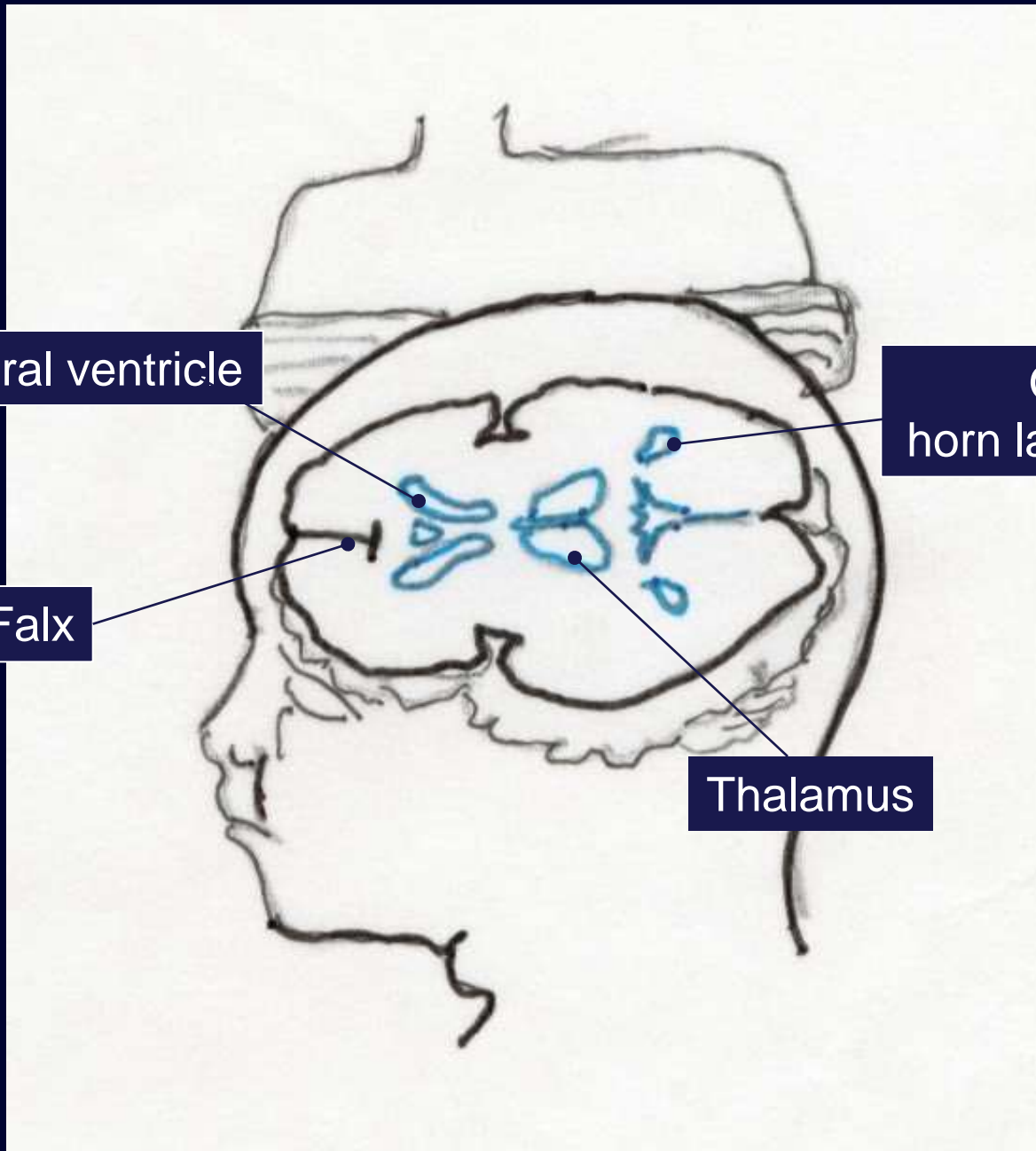
- Thalami
- Anterior falx
- Cavum septum pellucidum
- Third ventricle (often)

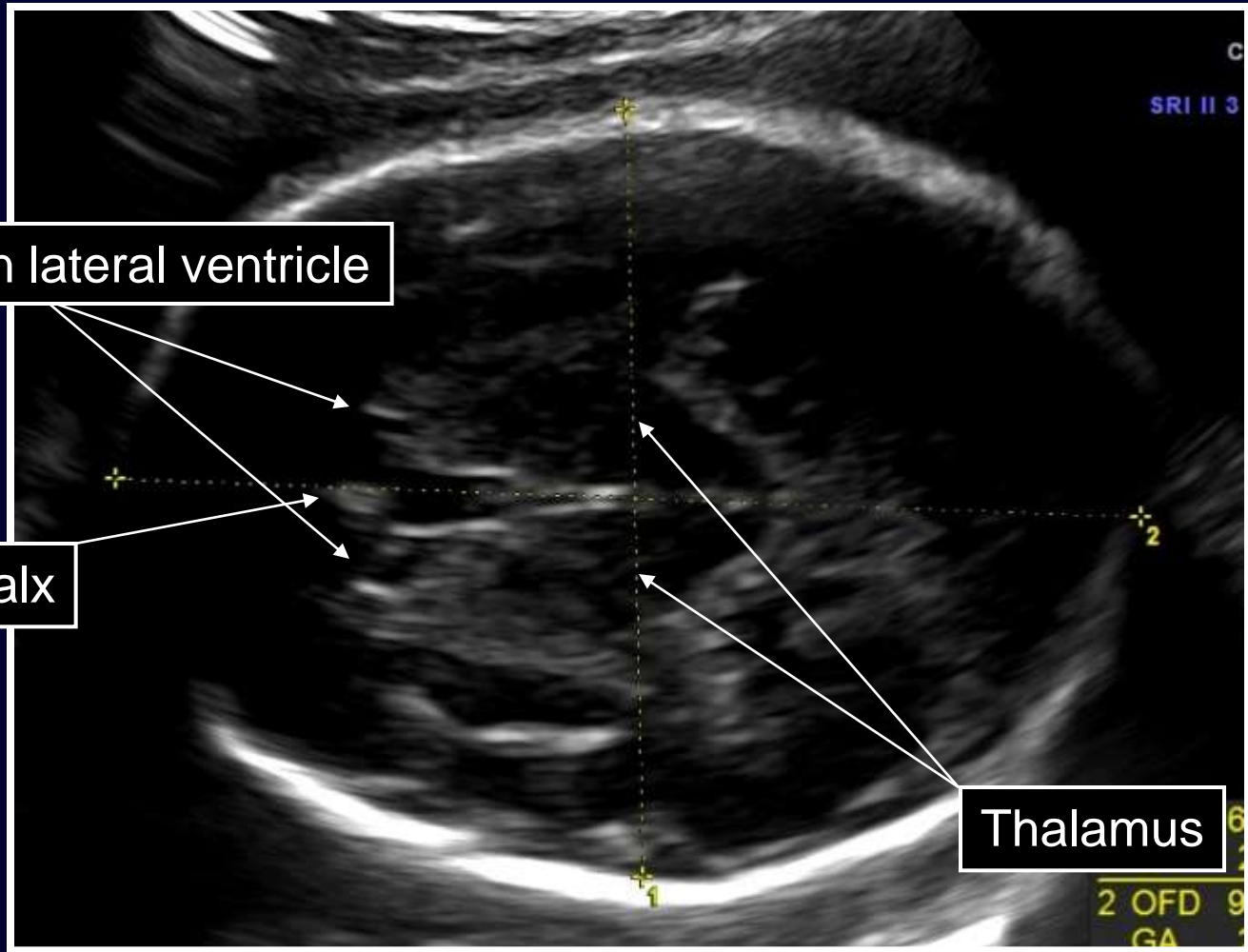
Anterior horn lateral ventricle

Occipital
horn lateral ventricle

Falx

Thalamus



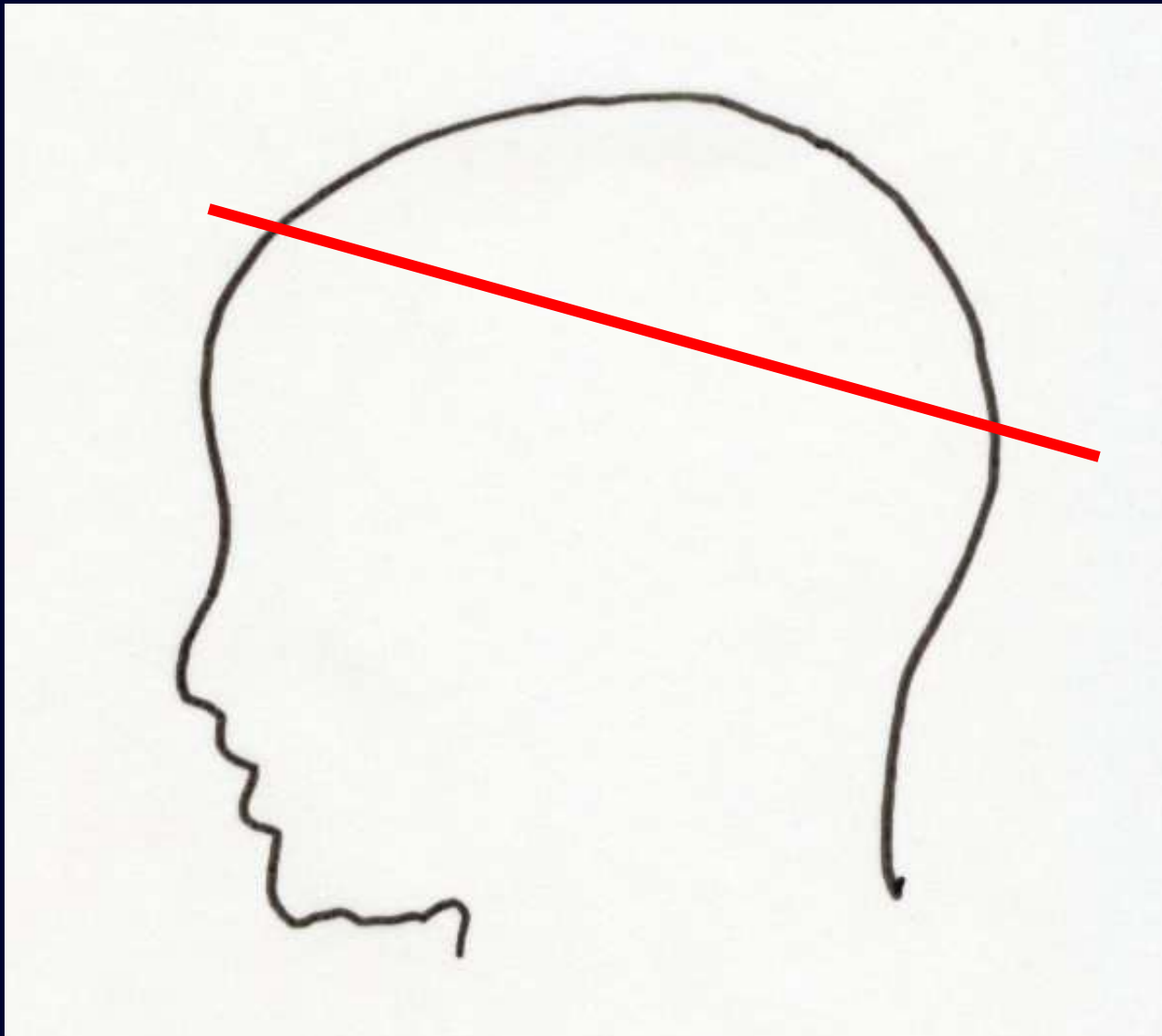


Anterior horn lateral ventricle

Falx

Thalamus

Transthalamic



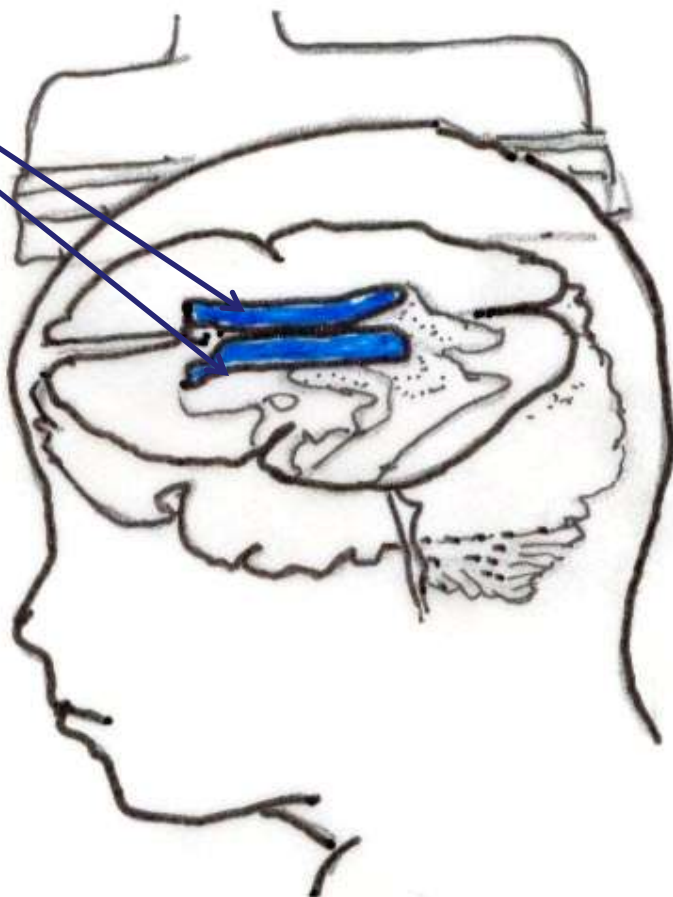
Transventricular

Transventricular View

Structures Visualized

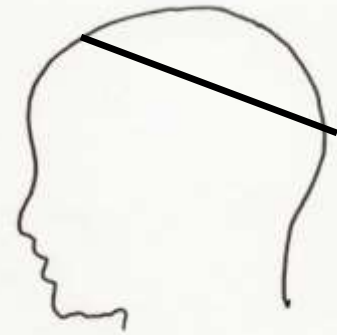
- Lateral ventricles
- Falx
- Choroid plexus
- Cerebral mantle

Lateral ventricle

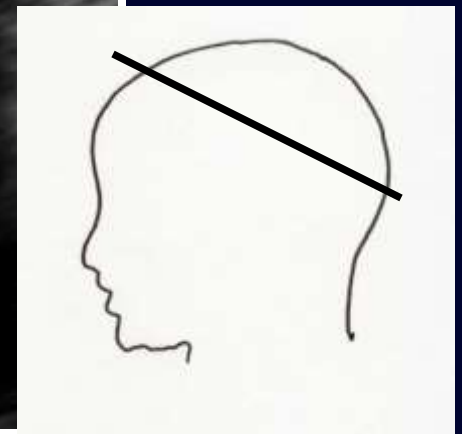
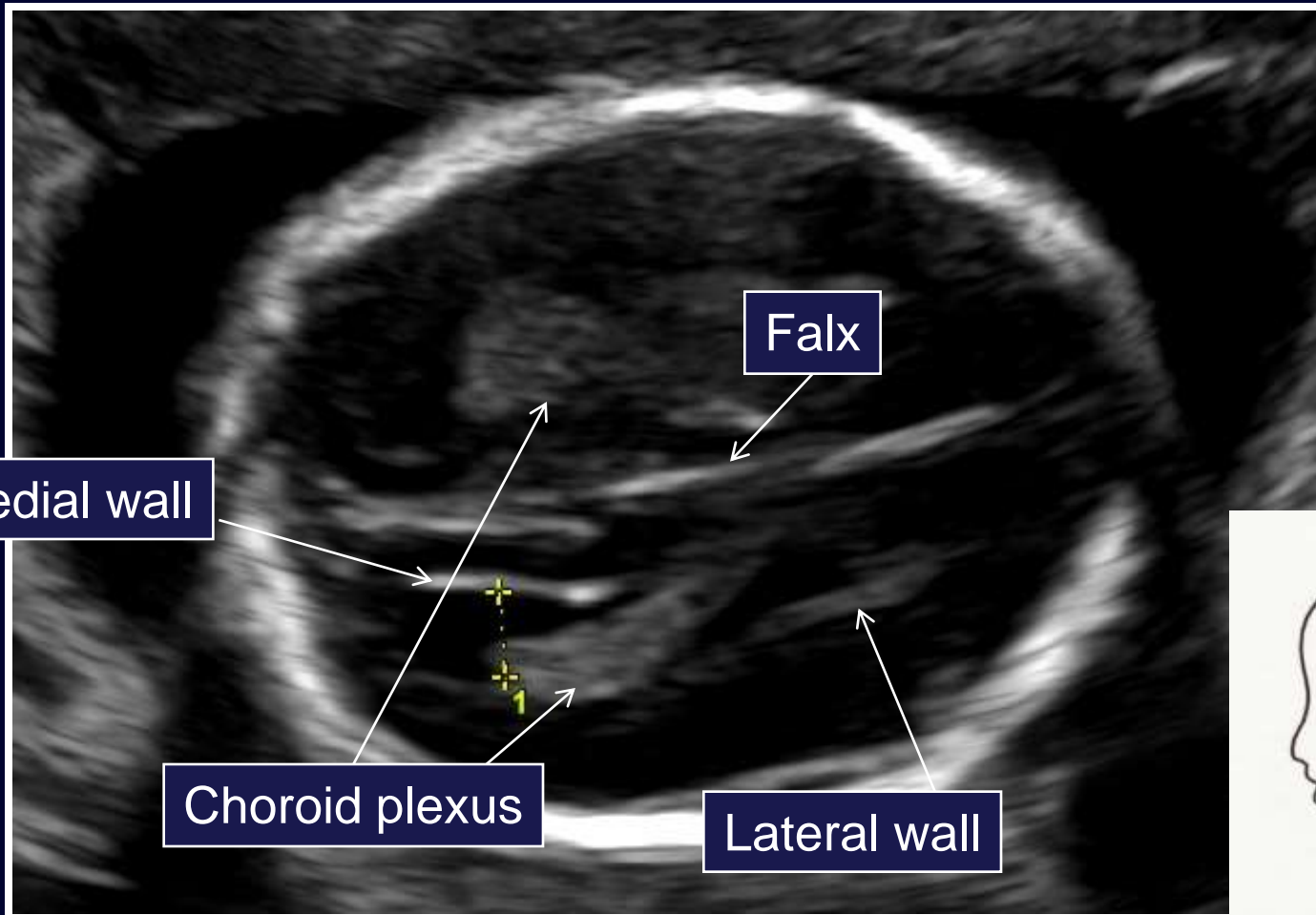


Cerebral mantle

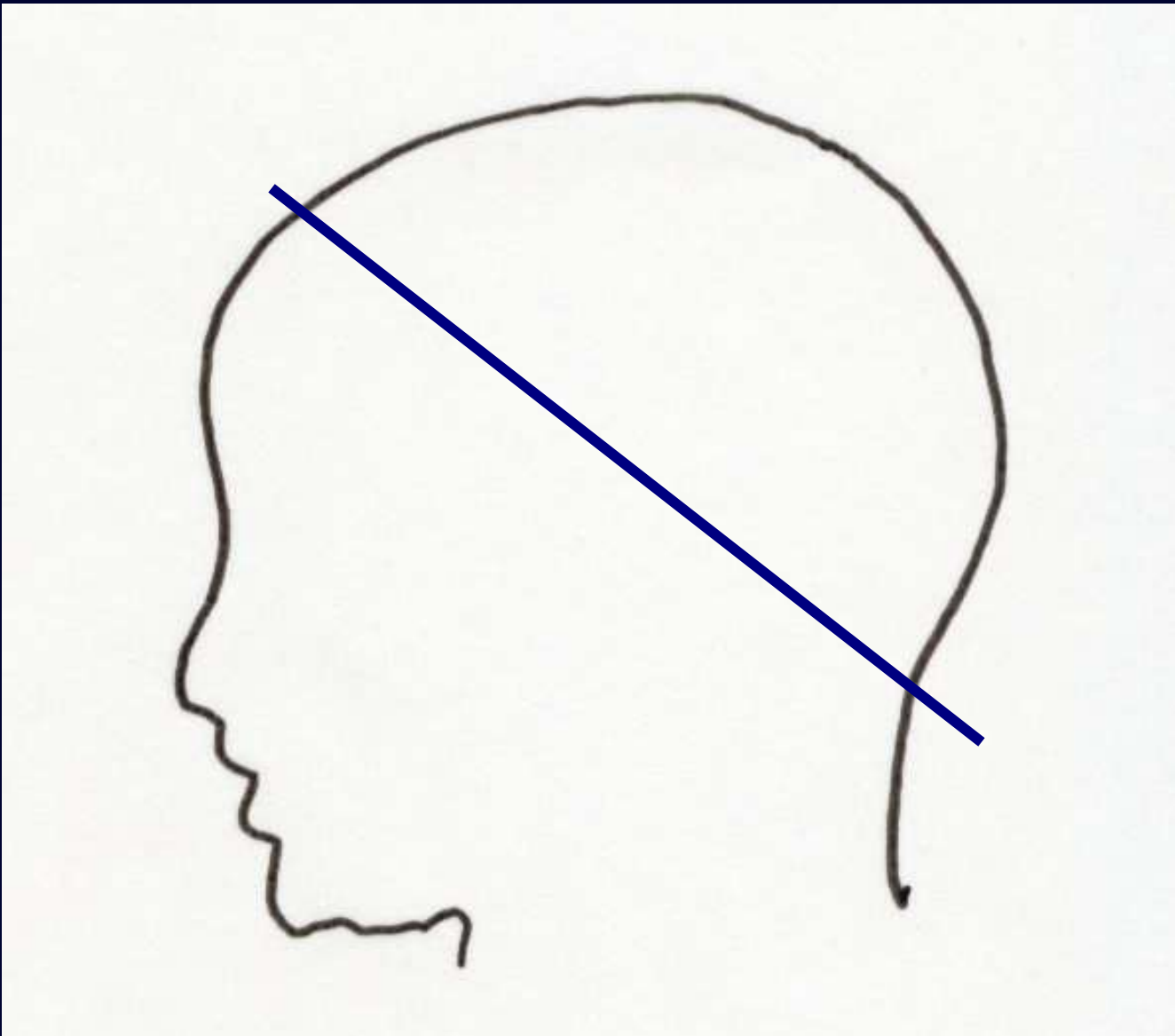
Ventricle



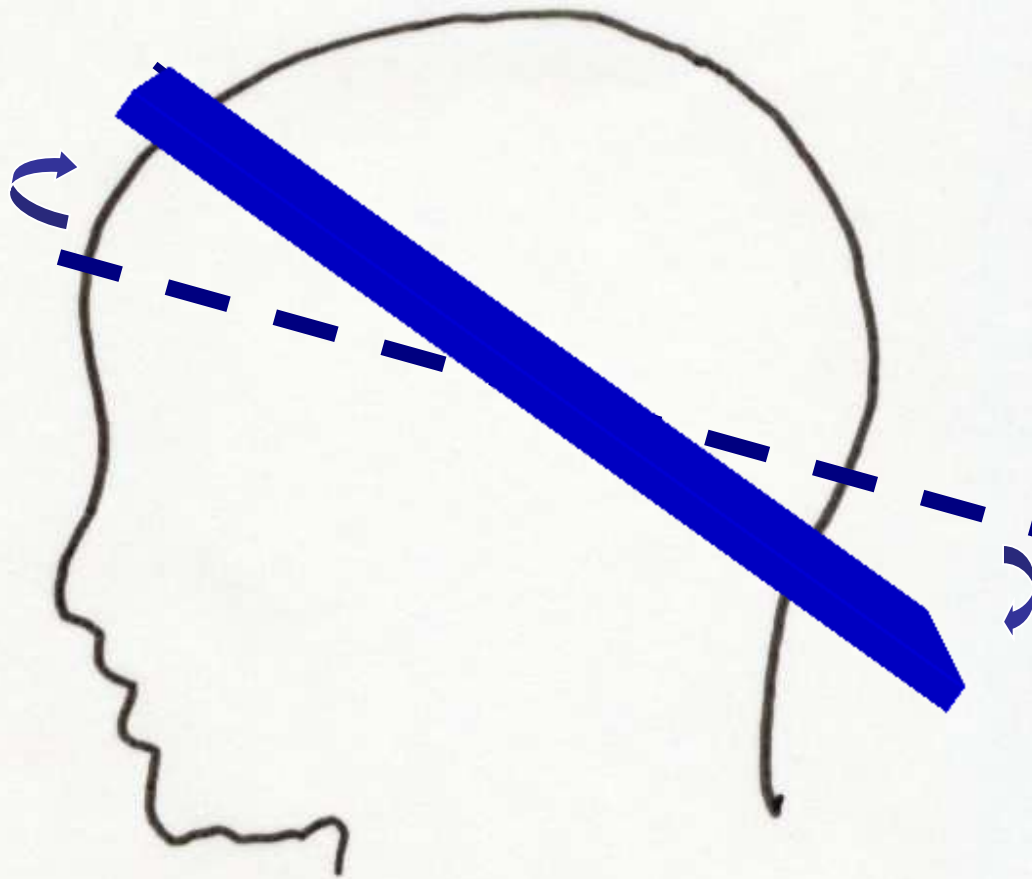
Lateral Ventricle



Posterior Fossa



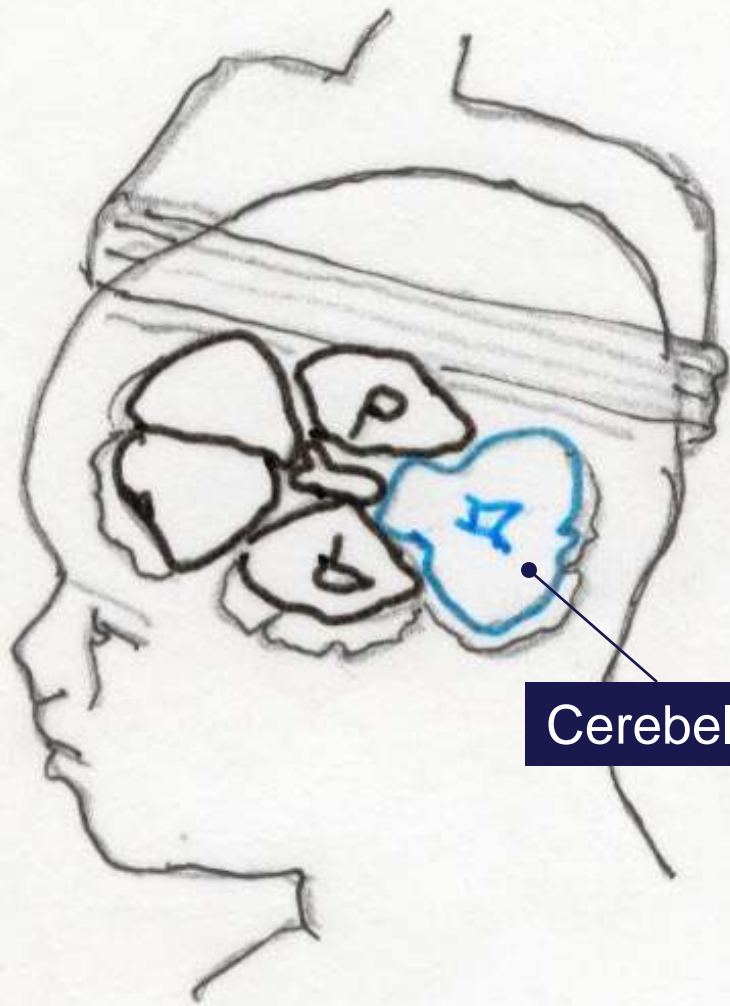
Transcerebellar



**BPD or
transthalamic**

Transcerebellar

Obtaining Cerebellum

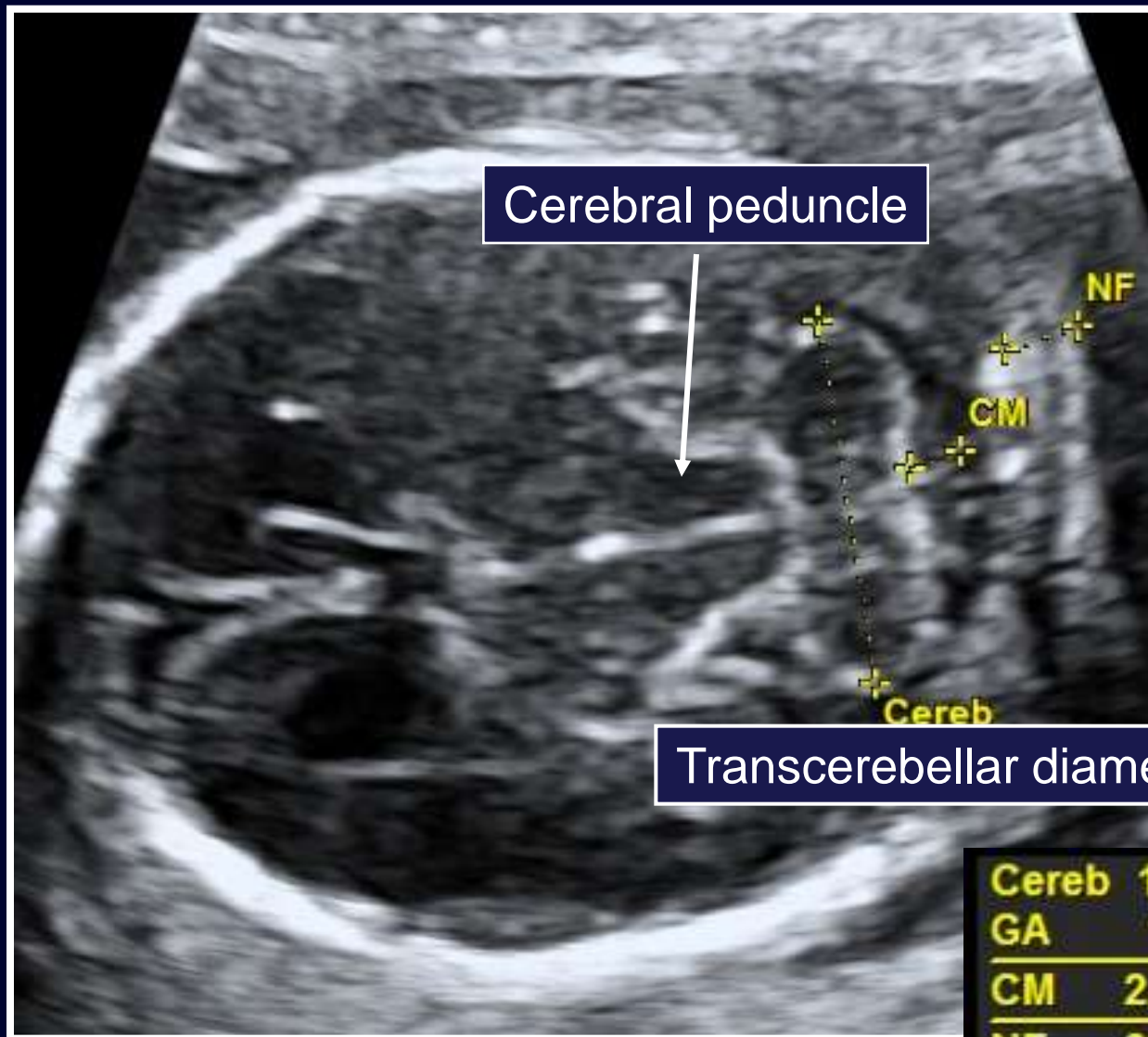


Cerebellum

Transcerebellar View

Structures Visualized

- Cerebellar hemispheres
- Cerebral peduncles
- Vermis (mid-line) of cerebellum
- Cisterna magna
- Fourth ventricle
- Some anterior cranial structures also visualized in this view

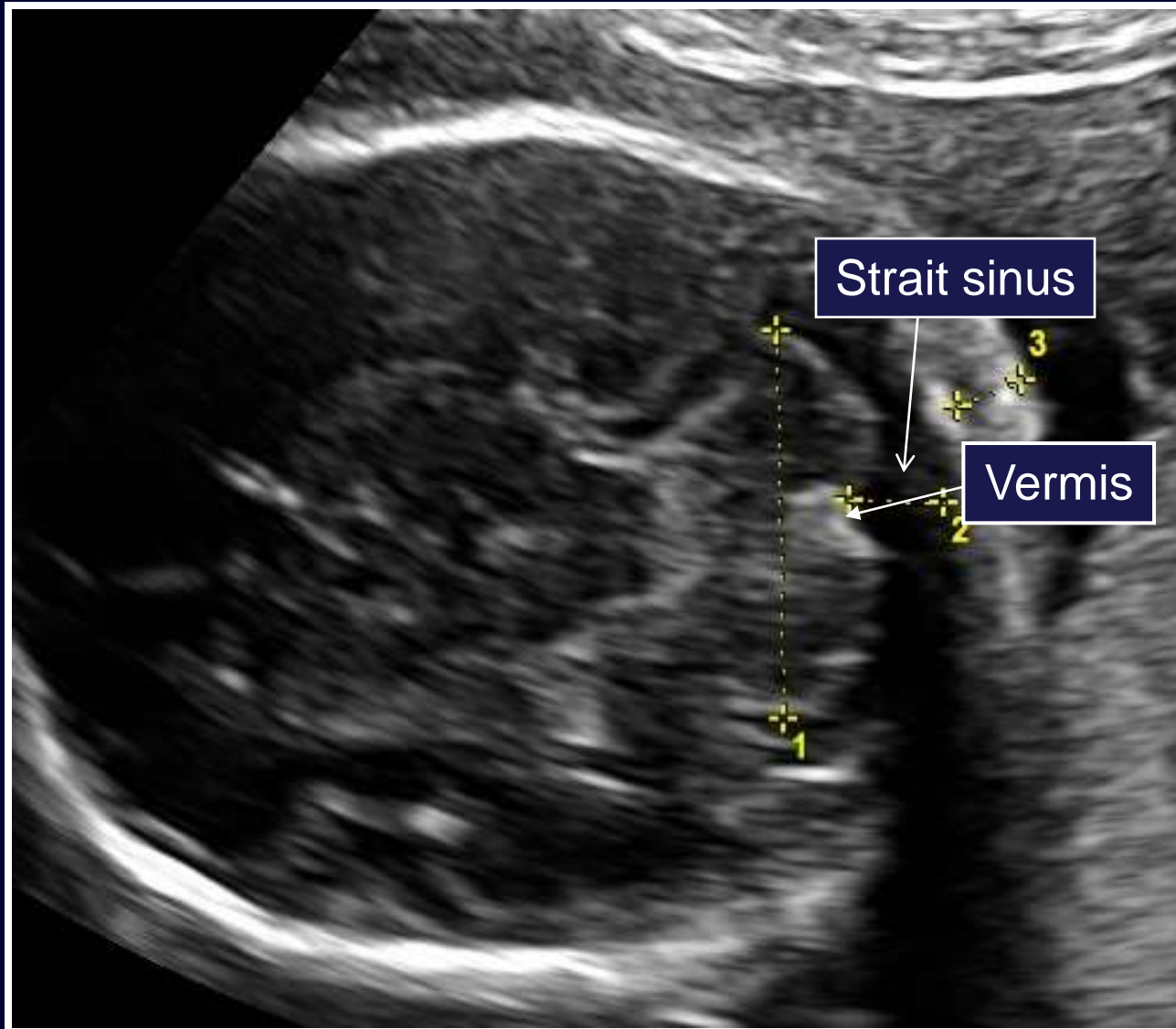


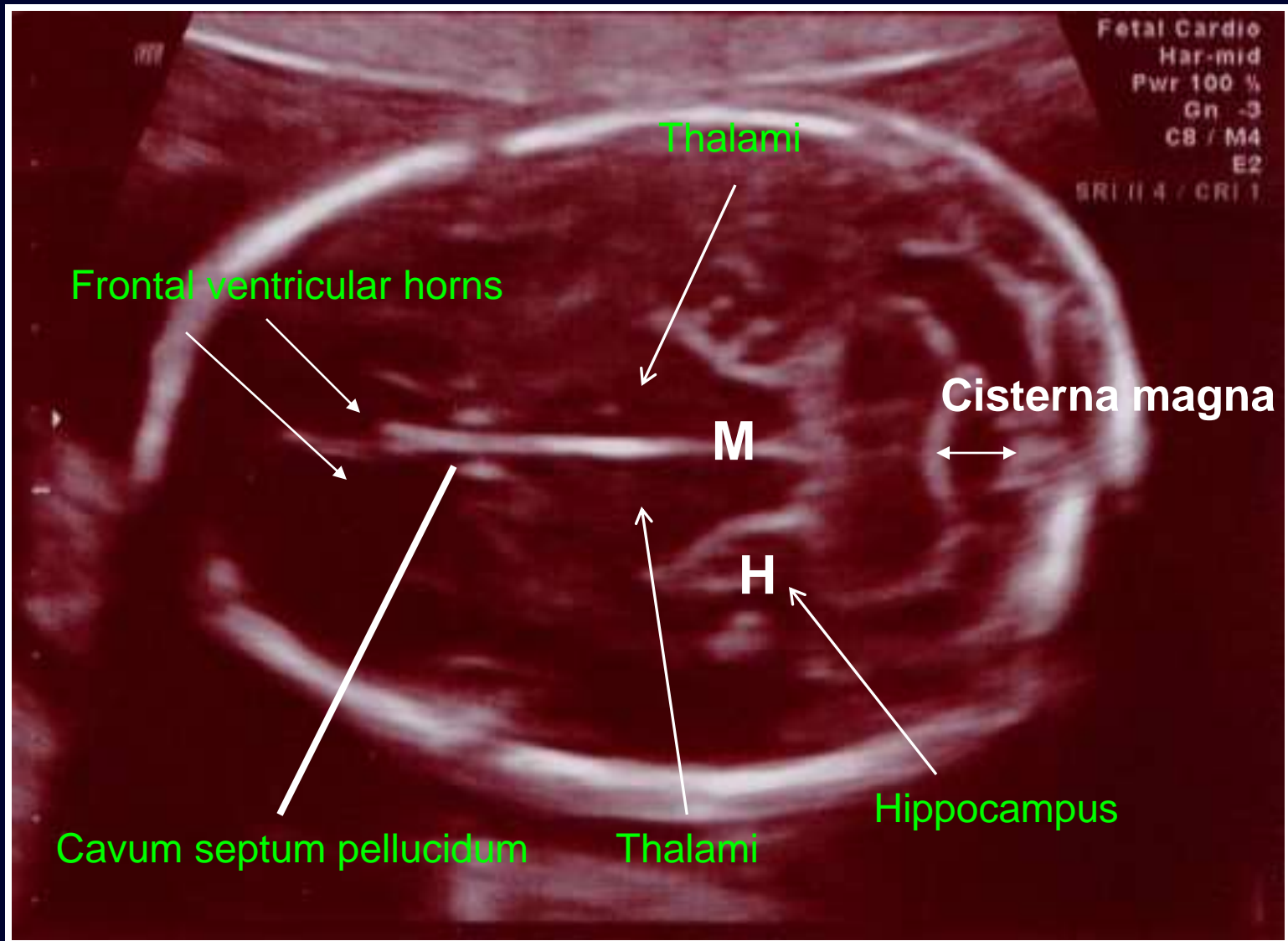
Cerebral peduncle

Transcerebellar diameter

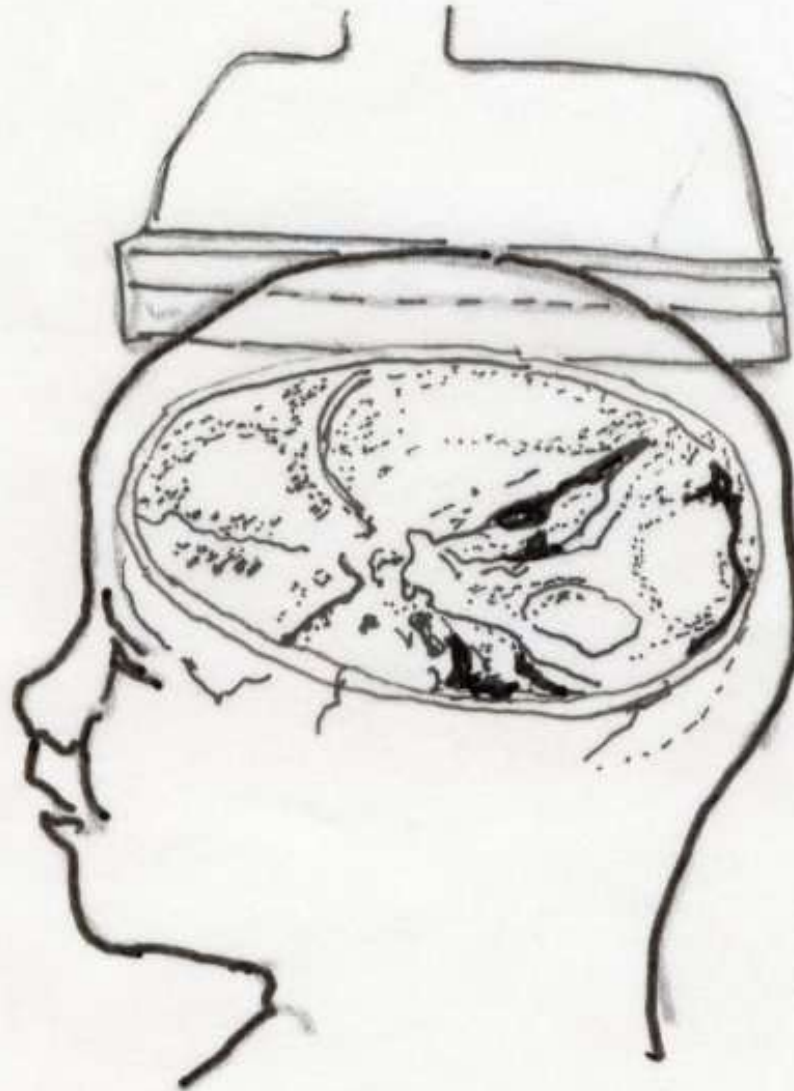
Cereb	1.81cm
GA	17w6d
CM	2.61mm
NF	3.74mm

Cerebellum





Base of the Cranium

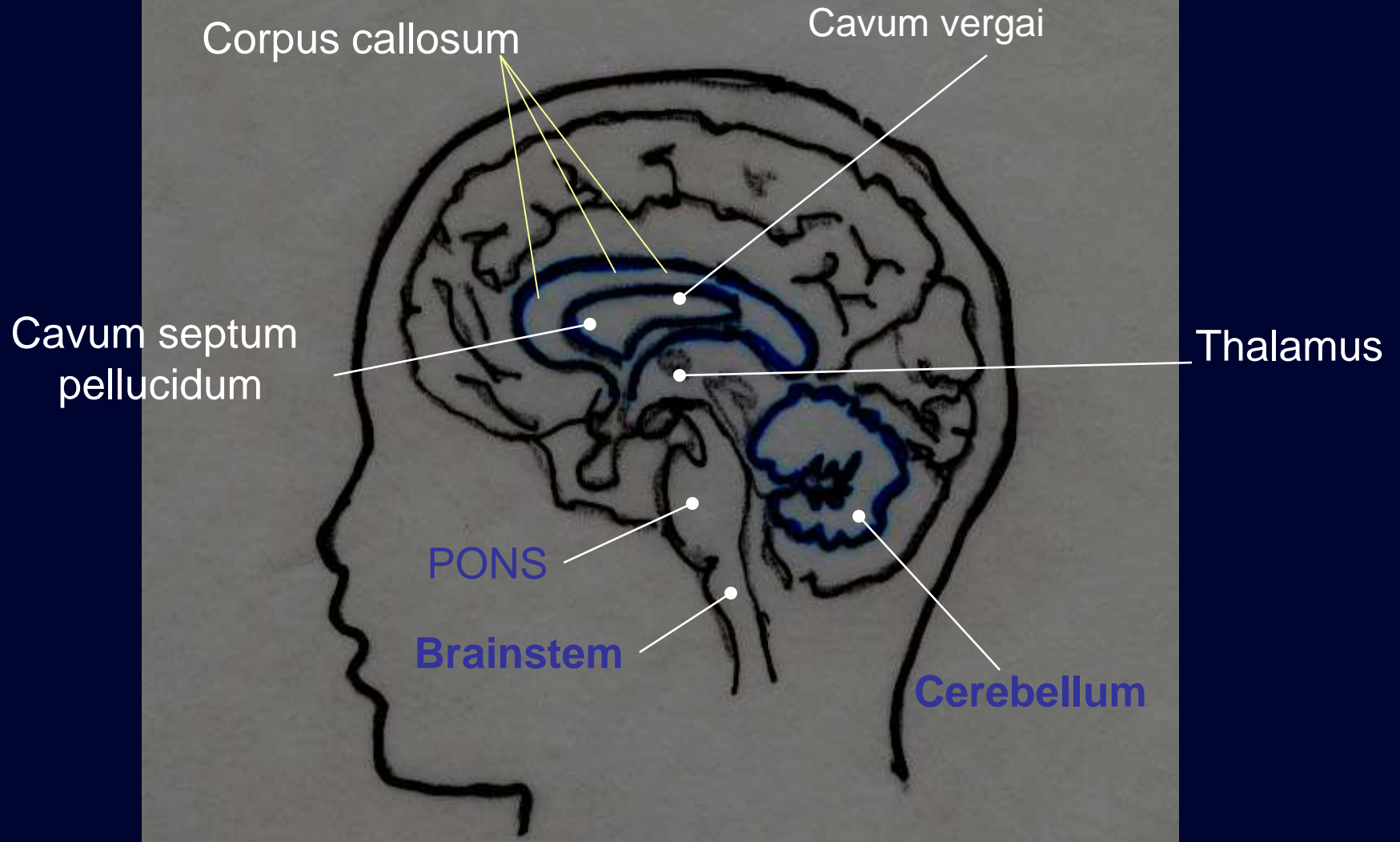


Sagittal Views

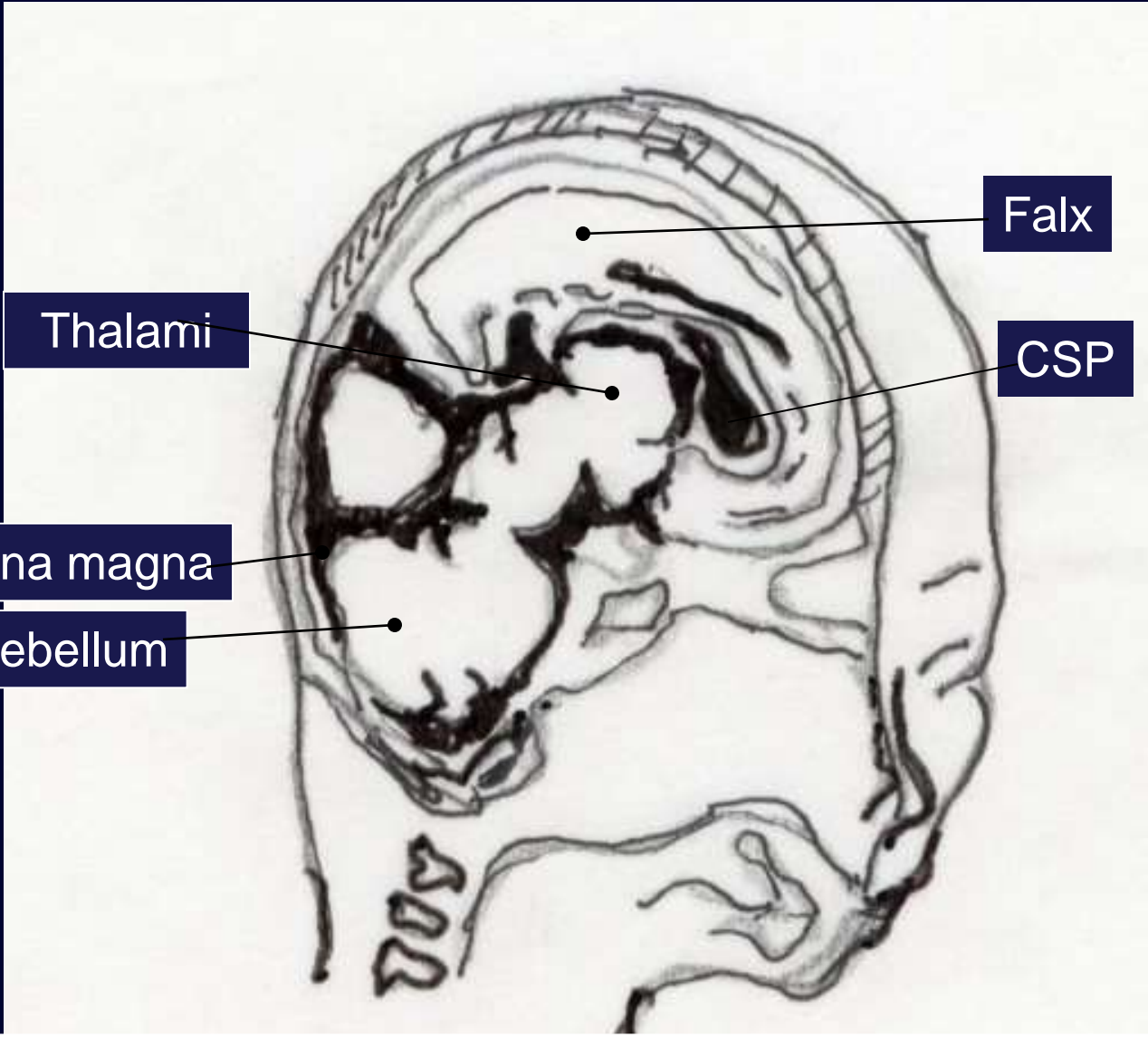
Sagittal View

Landmarks Visualized

- Corpus callosum
- Cavum septum pellucidum
- Cavum vergi
- Thalamus
- Choroid plexus

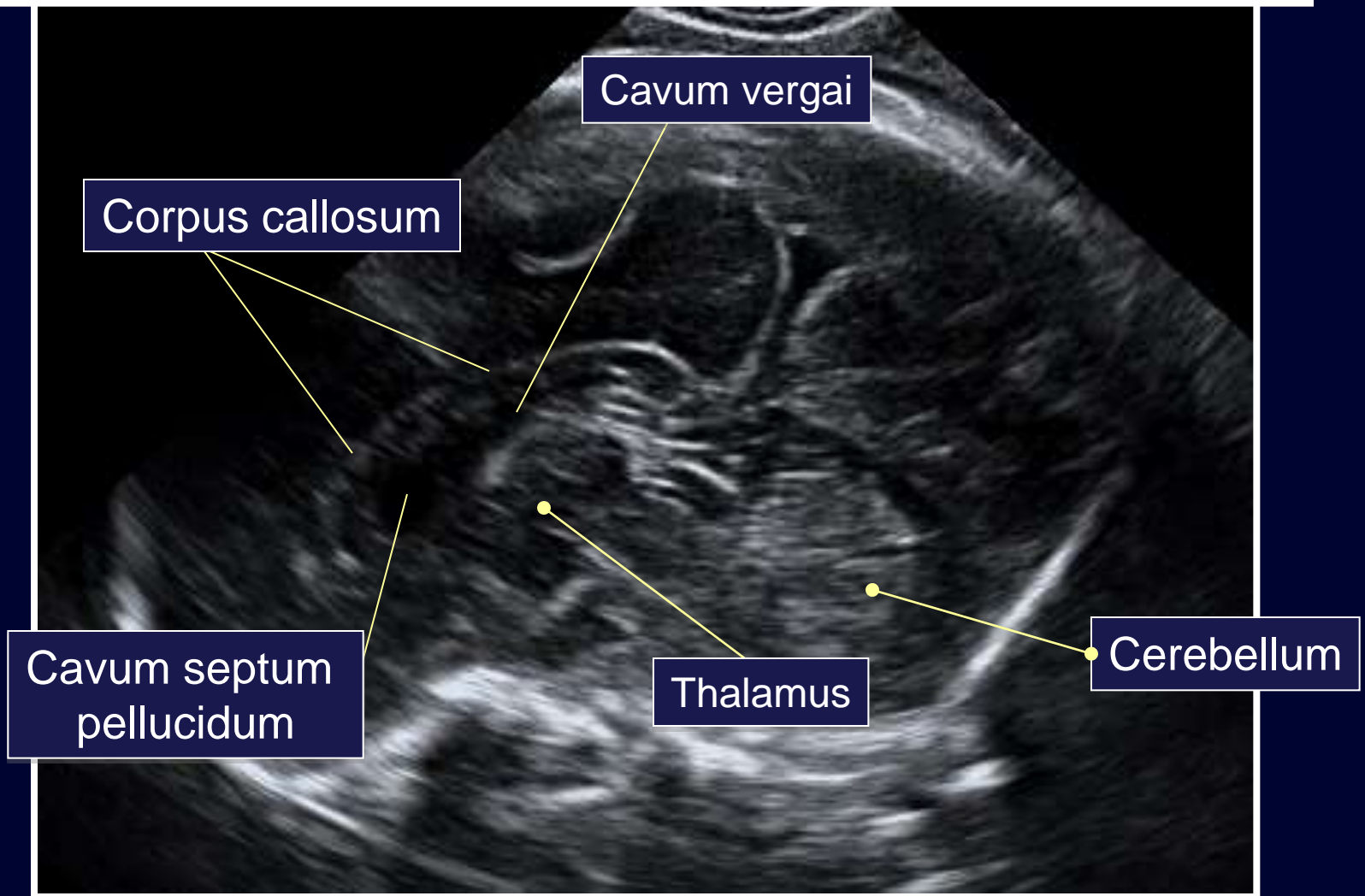


Midline

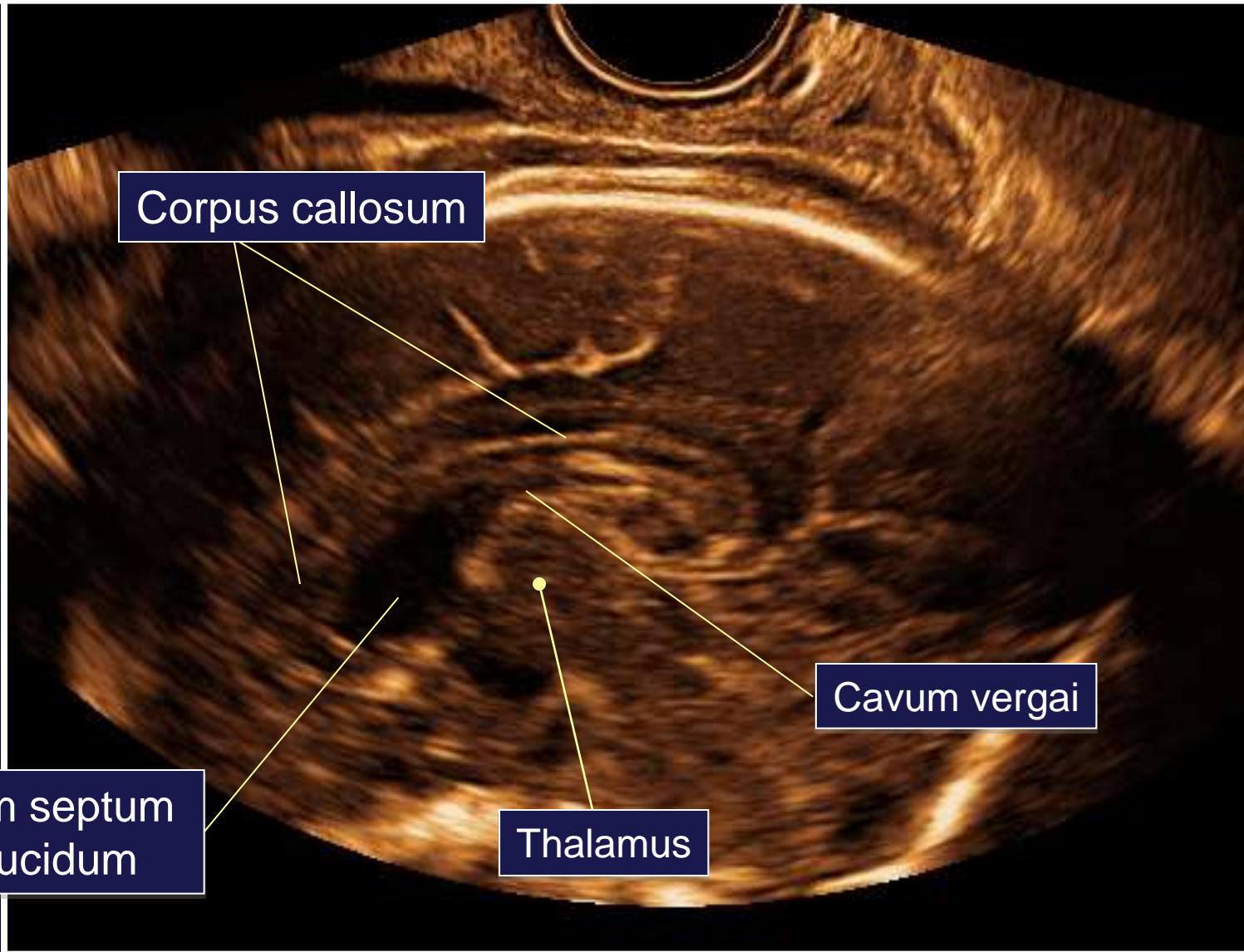


Sagittal

Ultrasound: Midline Sagittal



Ultrasound: Midline Sagittal



Corpus callosum

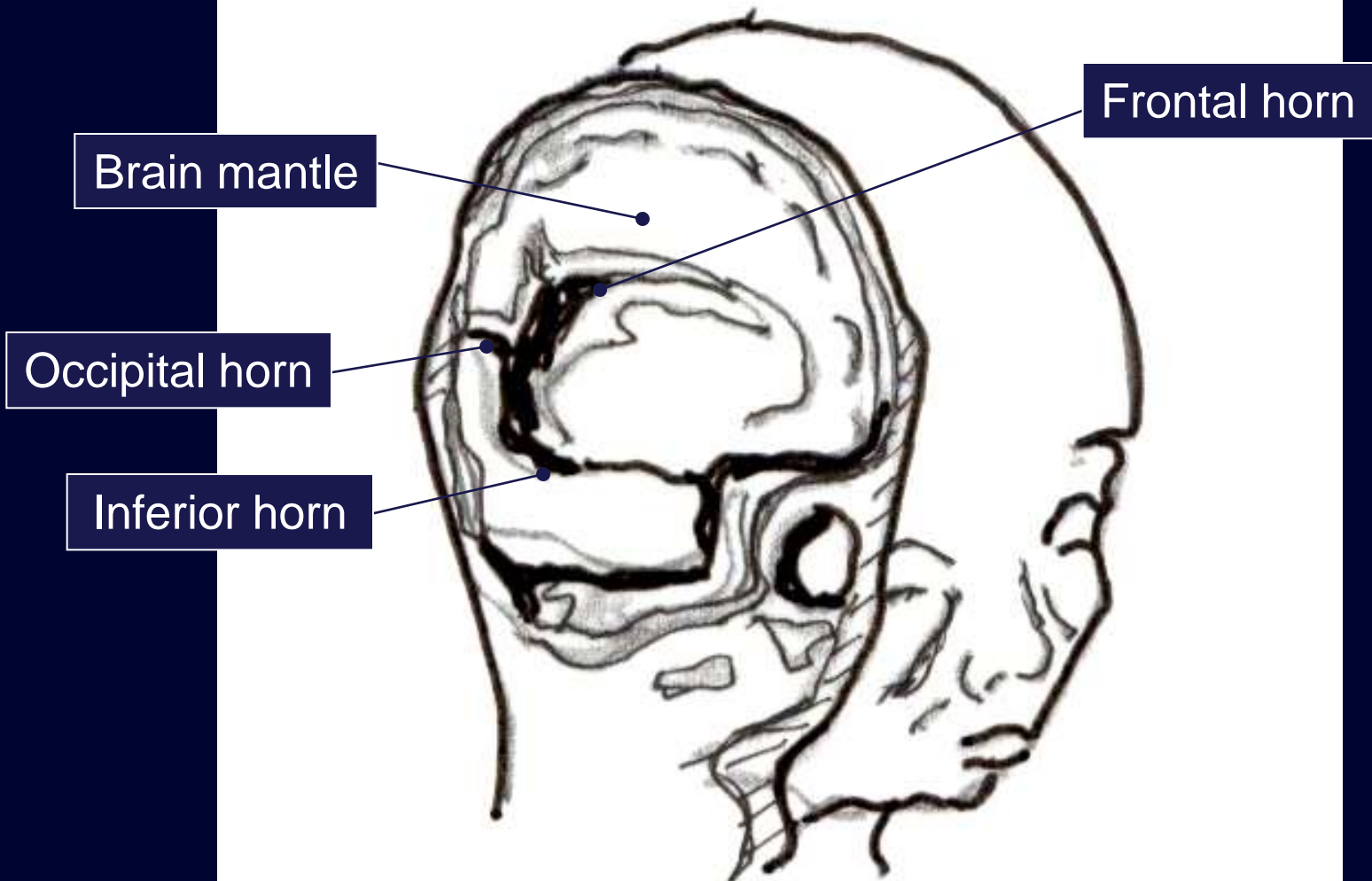
Cavum septum
pellucidum

Thalamus

Cavum vergai

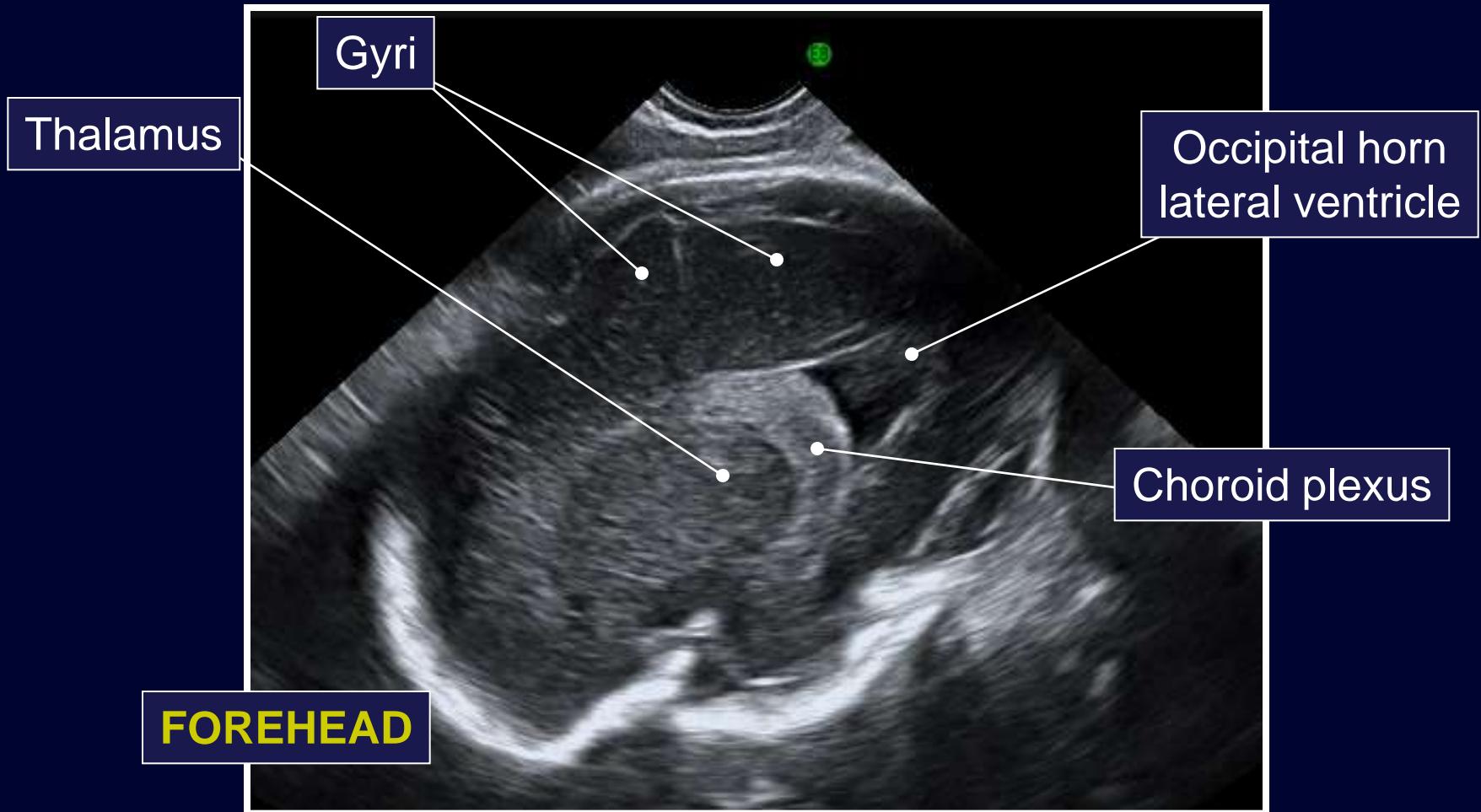
Cavum Septum Pellucidum

- Between anterior horn and body of lateral ventricles, bounded superiorly by the corpus callosum.
- Contains cerebrospinal fluid (CSF) but usually noncommunicating with the lateral ventricle.
- Present in all fetuses, but the two bordering leaflets fuse, and space disappears after birth.

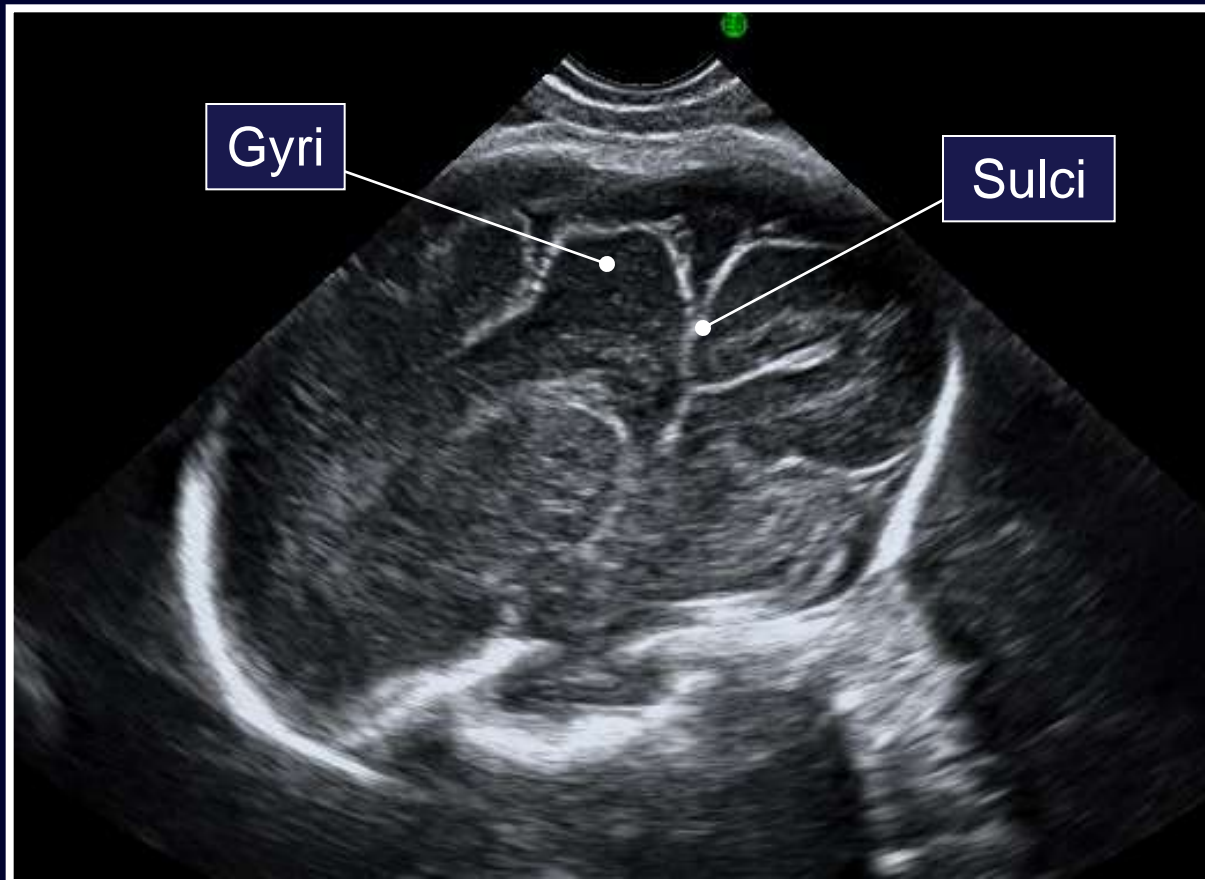


Parasagittal

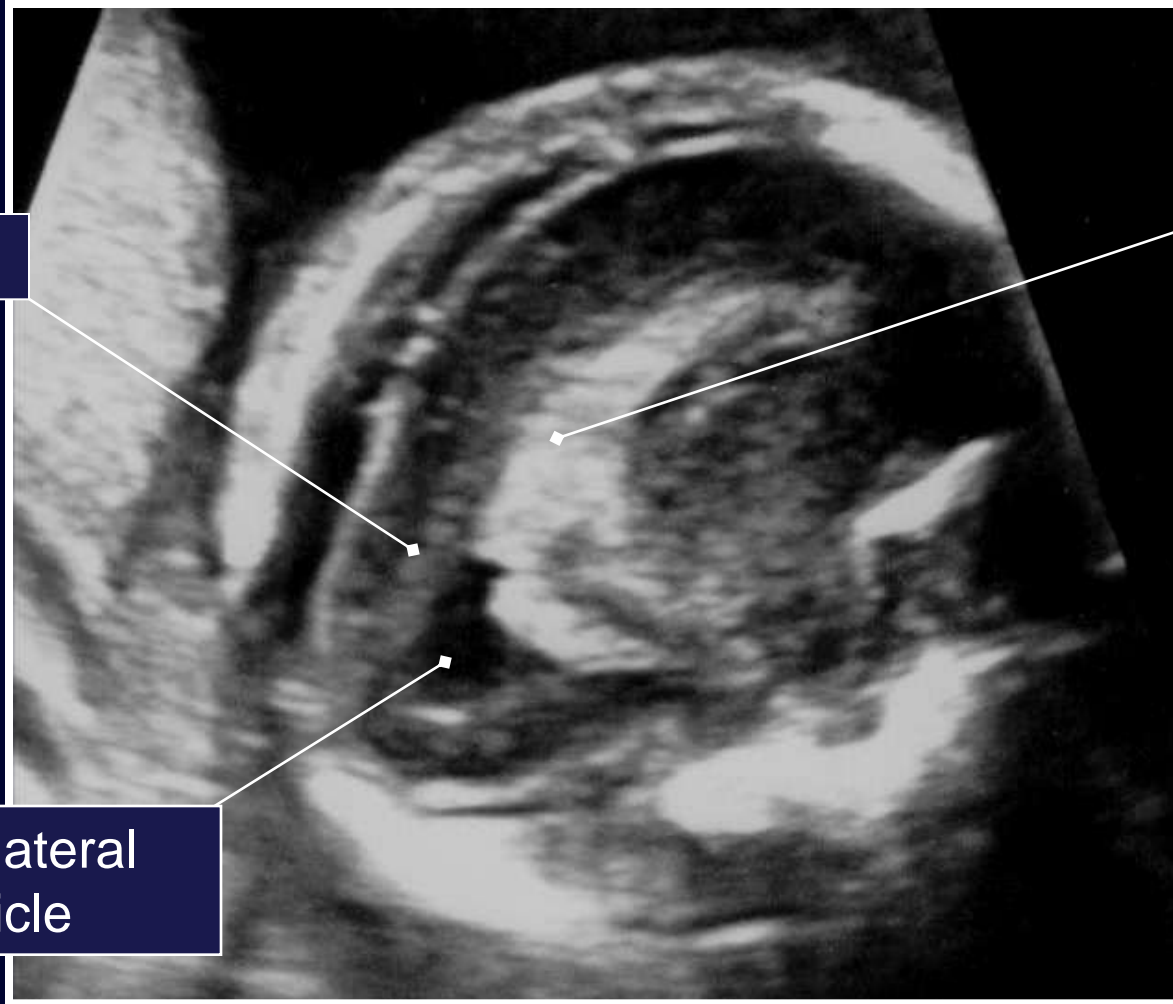
Ultrasound: Parasagittal View



Cerebral Cortex



Parasagittal View



Cortex

Choroid
plexus

Atrium, lateral
ventricle

Sagittal View: First Trimester

Sagittal First Trimester



Diencephalon

Mesencephalon

Rhombencephalon

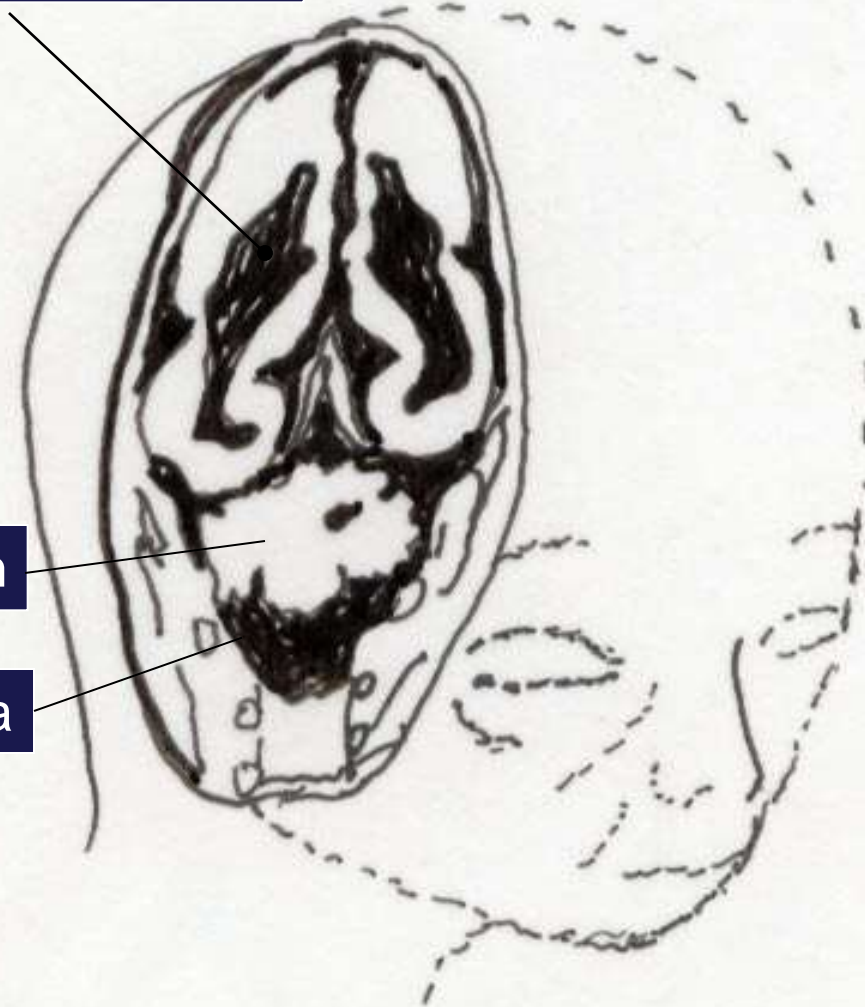
Normal primary cerebral vesicles

Coronal Views

Occipital horn lateral ventricle

Cerebellum

Cisterna magna



Posterior Coronal (Occipital)

Posterior Coronal (Occipital)



Occipital horn of lateral ventricle

Cerebellum

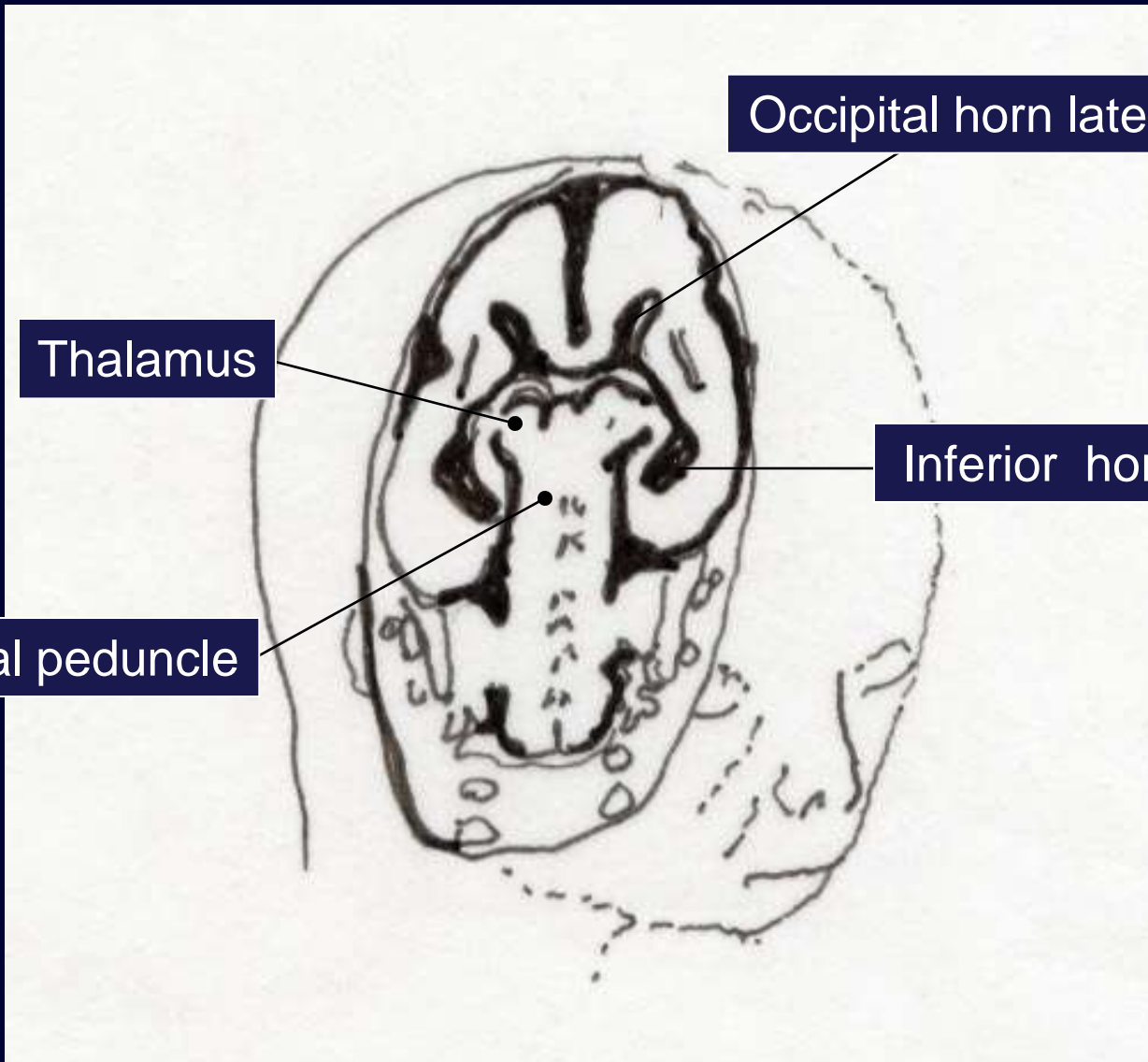
Posterior Coronal View

Cerebellum



Fourth ventricle

Vermis



Occipital horn lateral ventricle

Thalamus

Inferior horn lateral ventricle

Cerebral peduncle

Posterior Coronal View

Corpus callosum

Falx cerebri

**Cavum septum
Pellucidum**

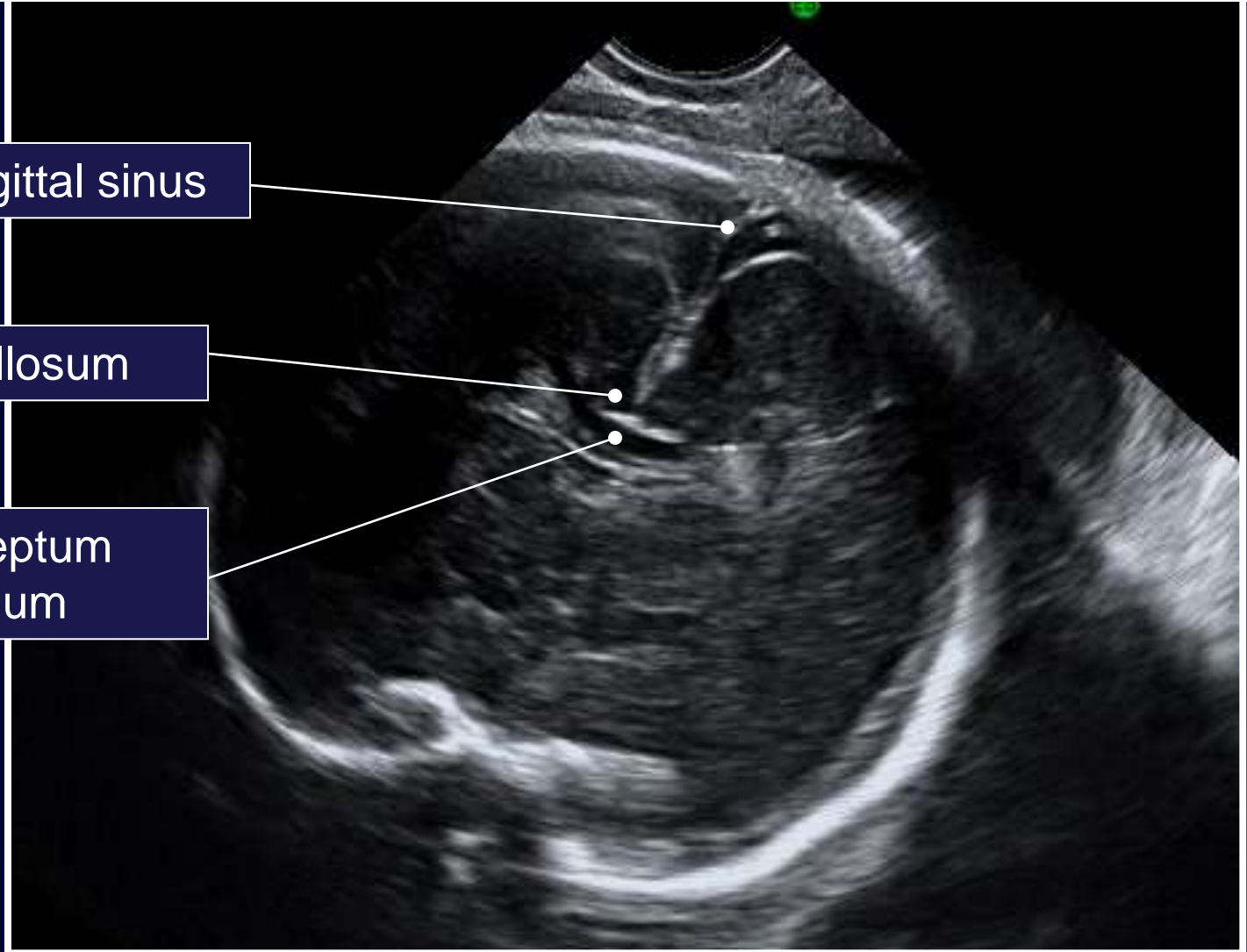
Anterior Coronal View

Ultrasound: Coronal View

Superior sagittal sinus

Corpus callosum

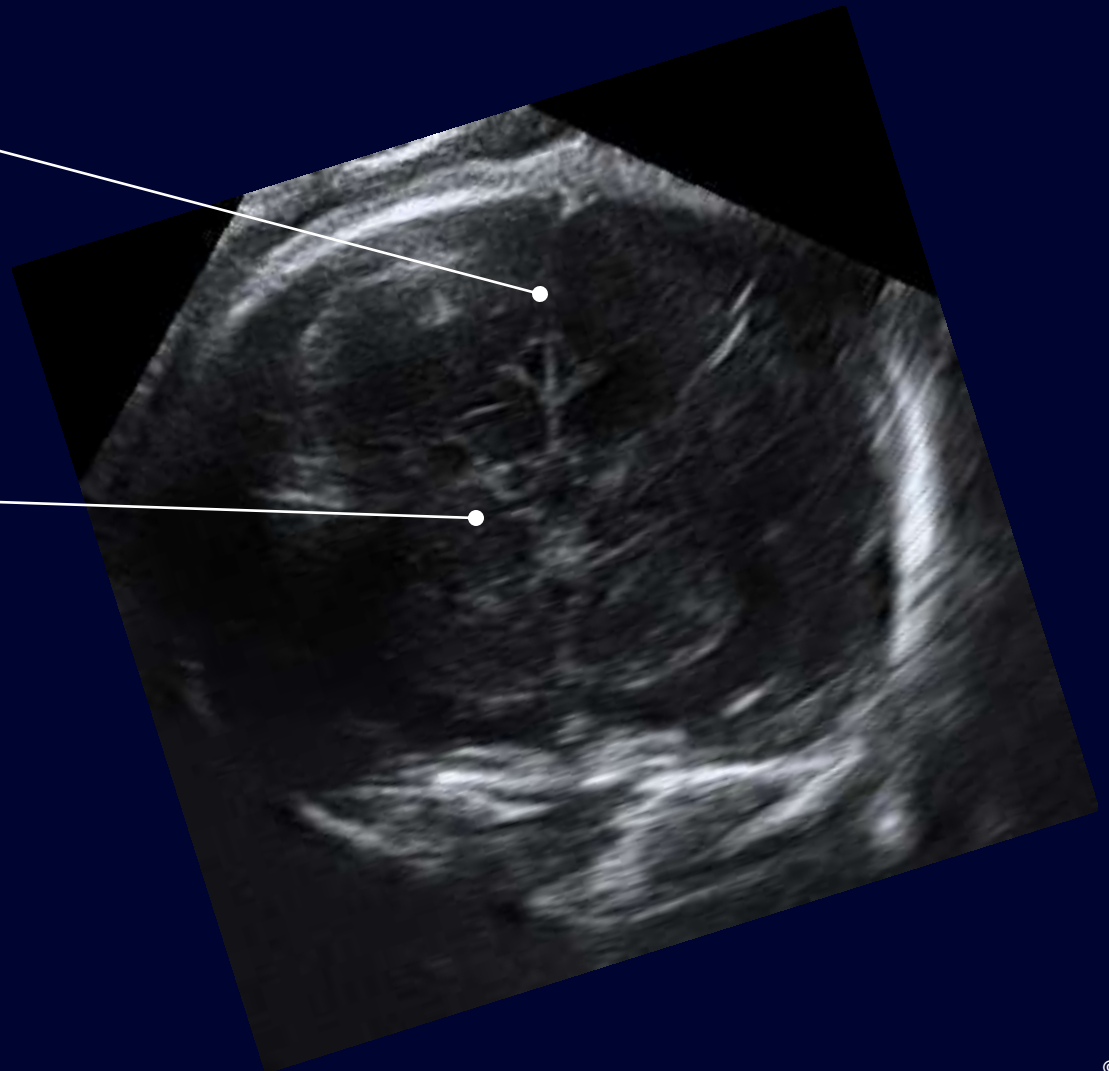
Cavum septum
pellucidum

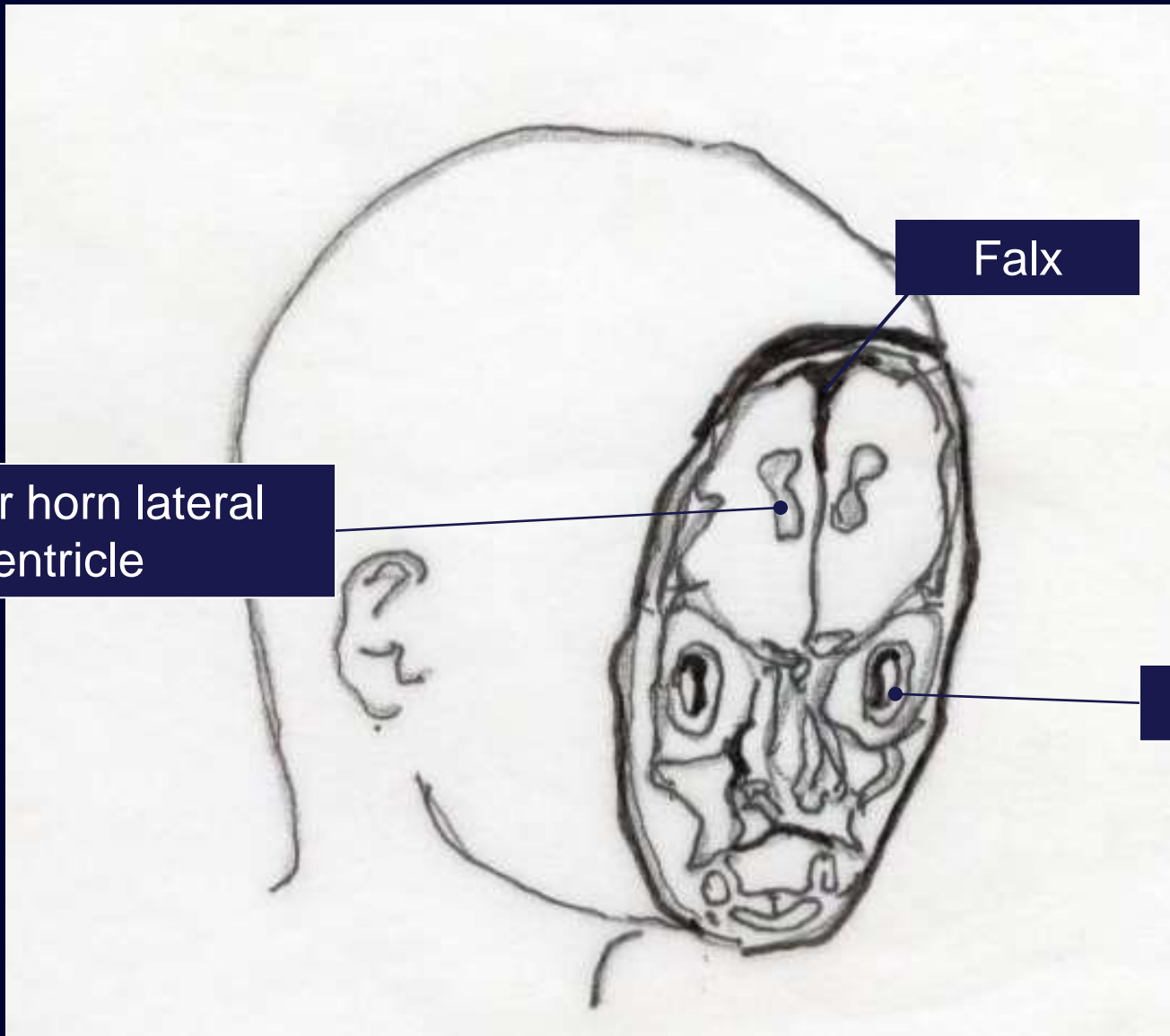


Ultrasound: Midcoronal View

Falx/interhemispheric
space

Thalami





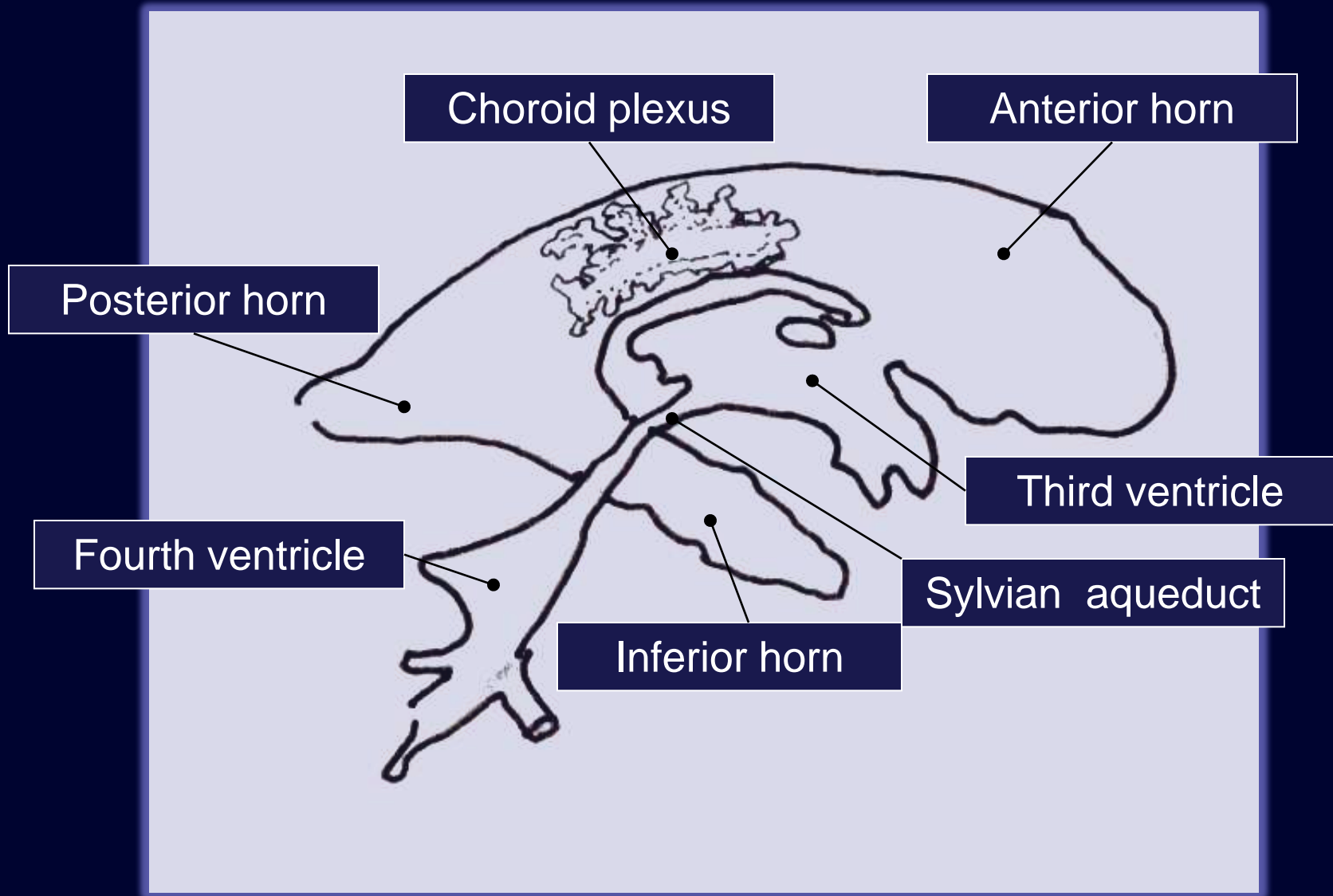
Anterior horn lateral ventricle

Falx

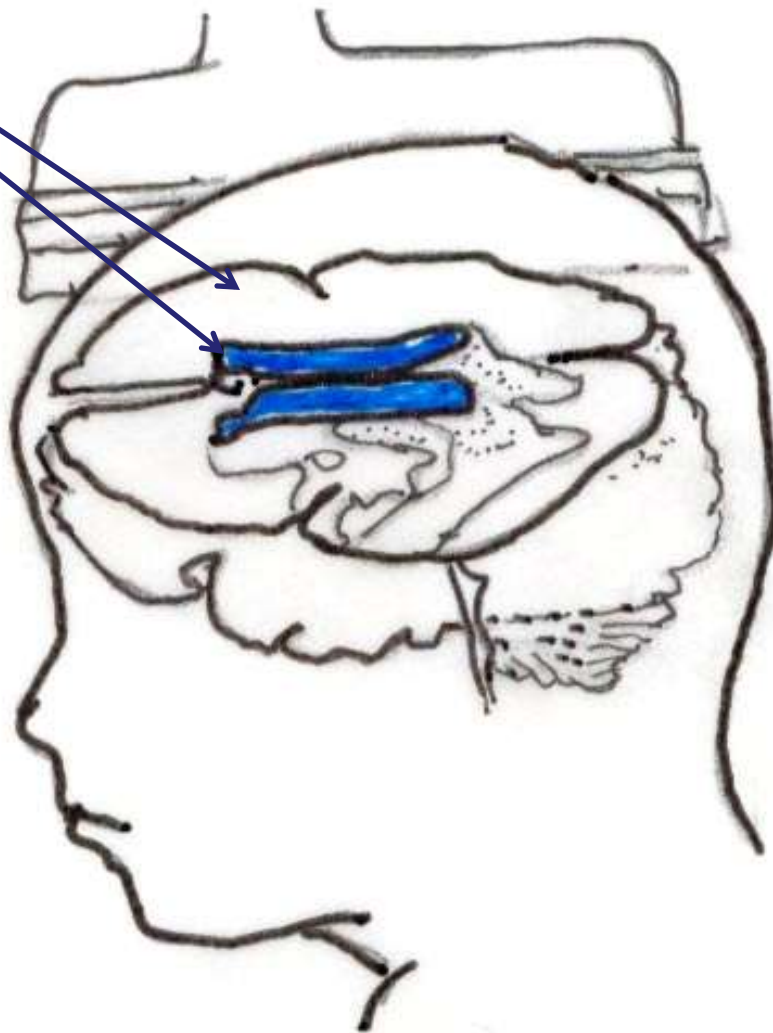
Orbits

Anterior Coronal View

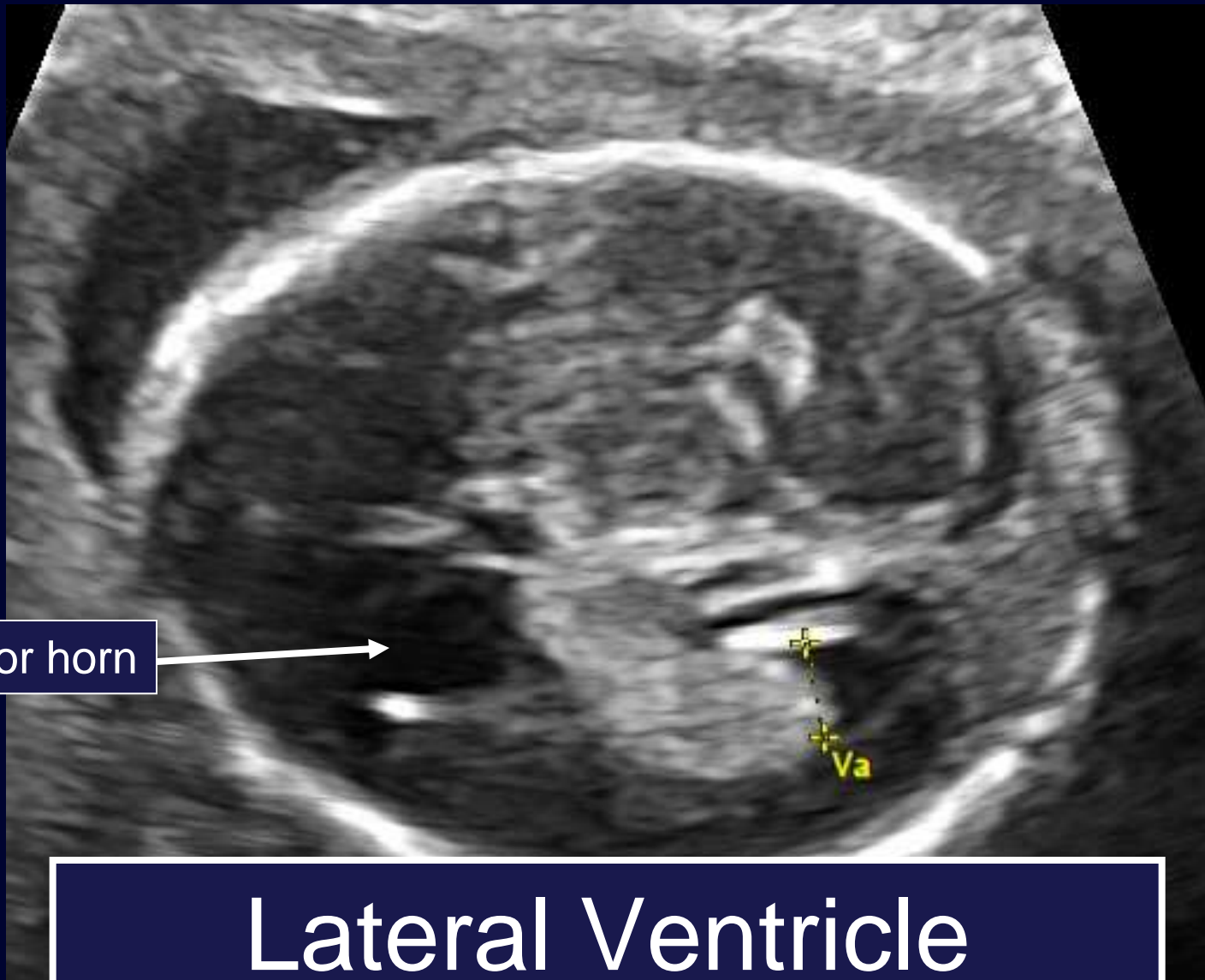
Ventricular System



Lateral ventricle



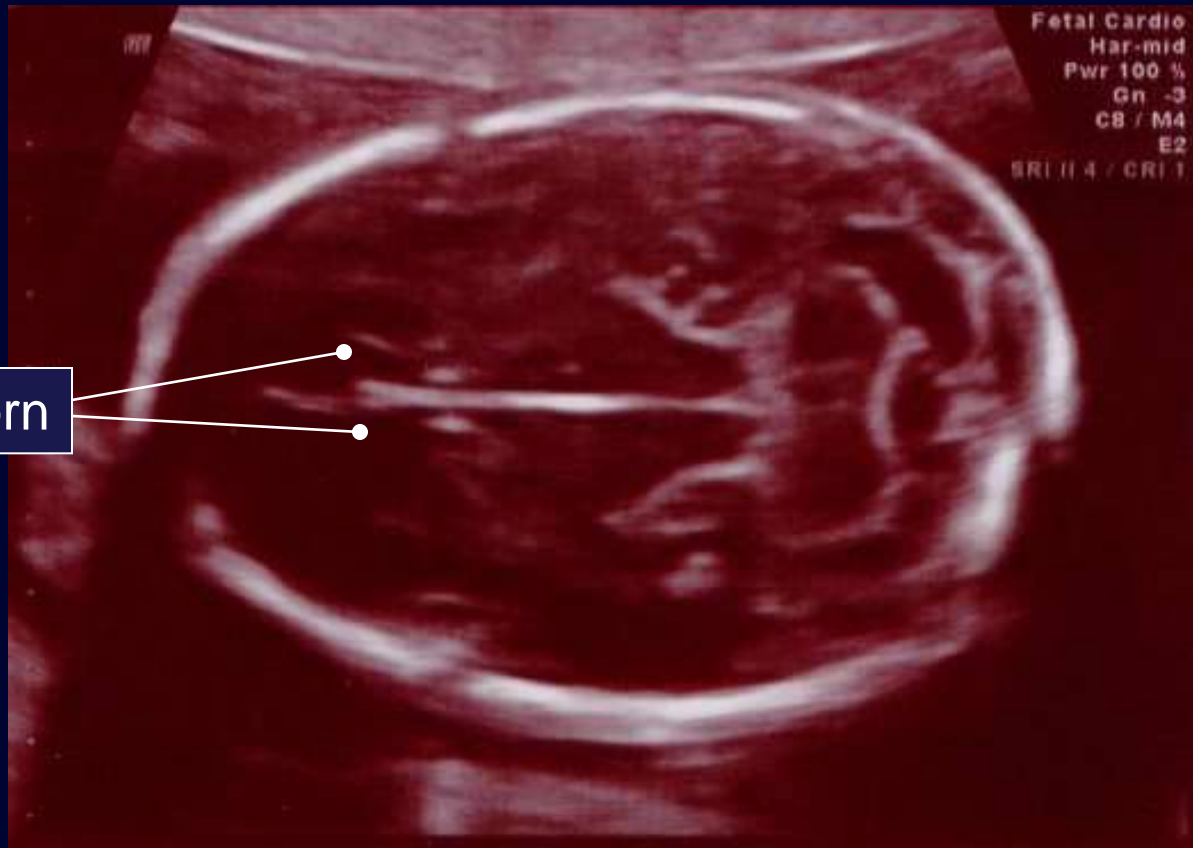
Anterior Horn: Axial View



Anterior horn

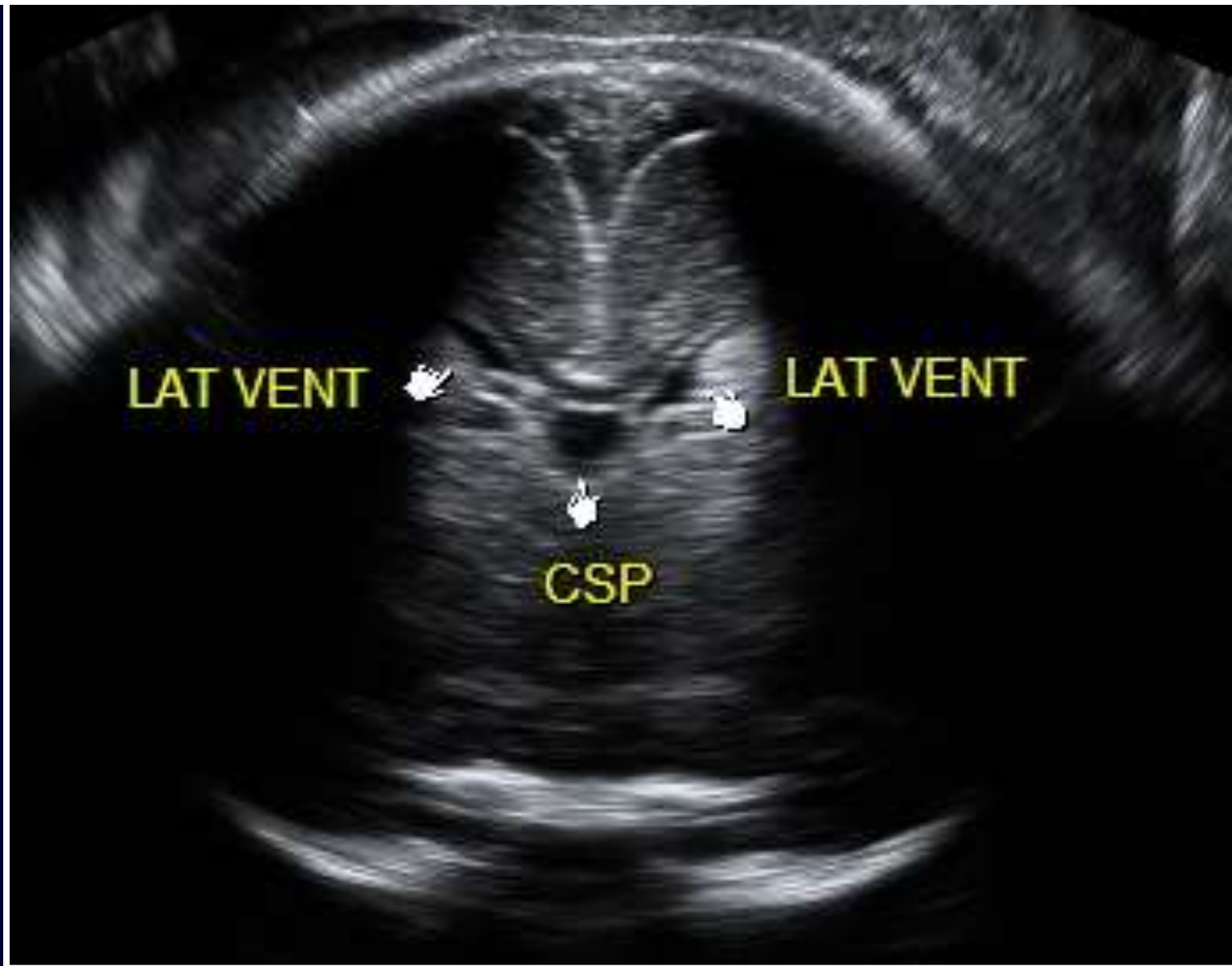
Lateral Ventricle

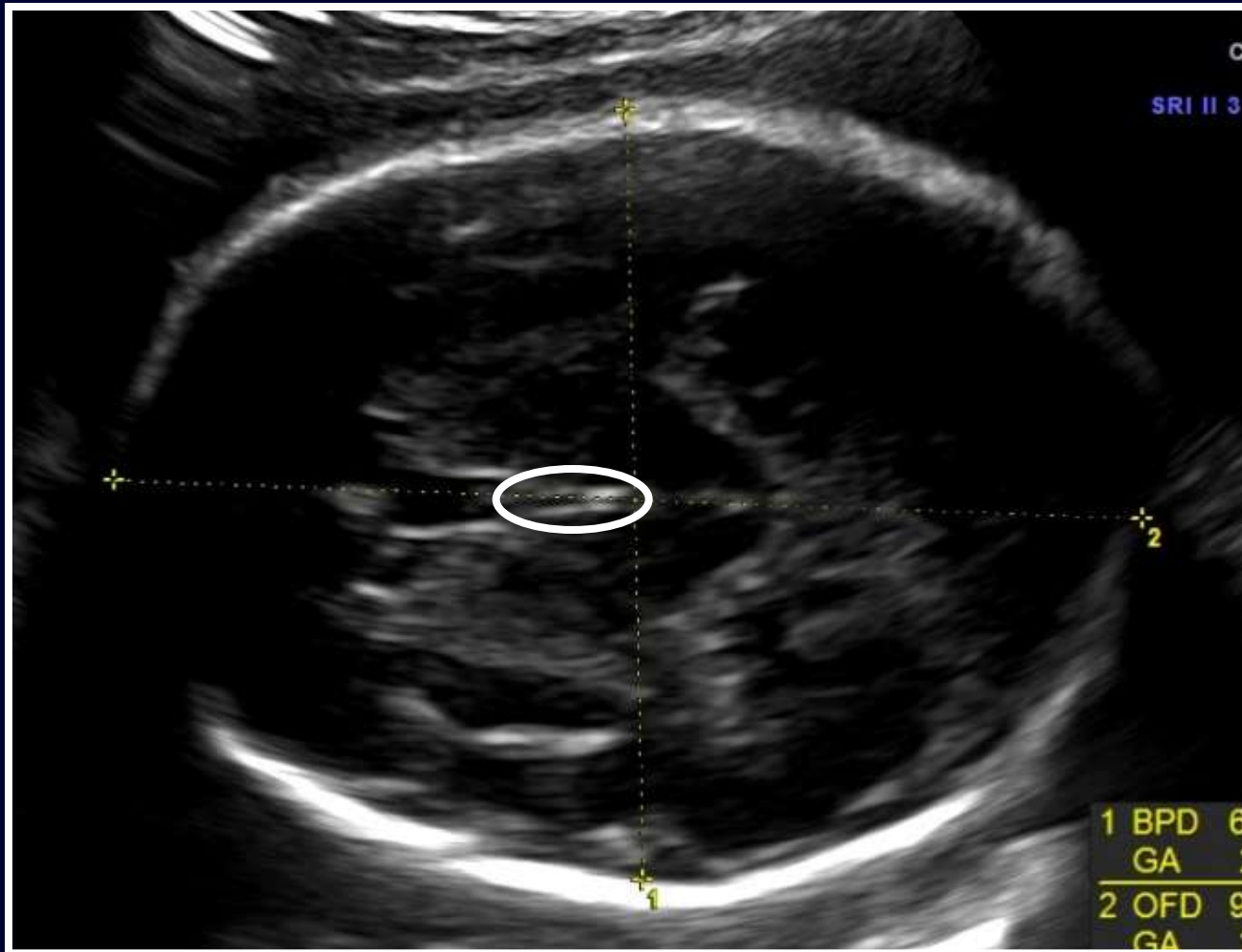
Anterior Horn: Axial View



Lateral Ventricle

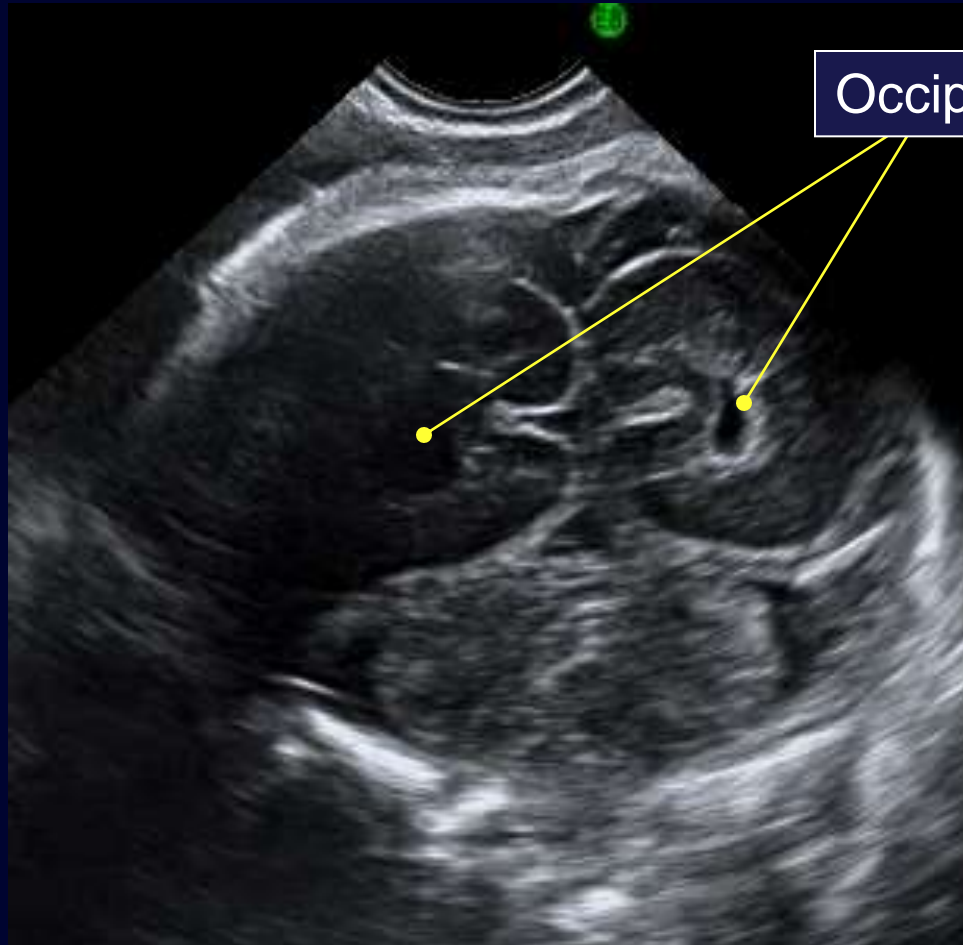
Ultrasound: Anterior Coronal View





Third Ventricle

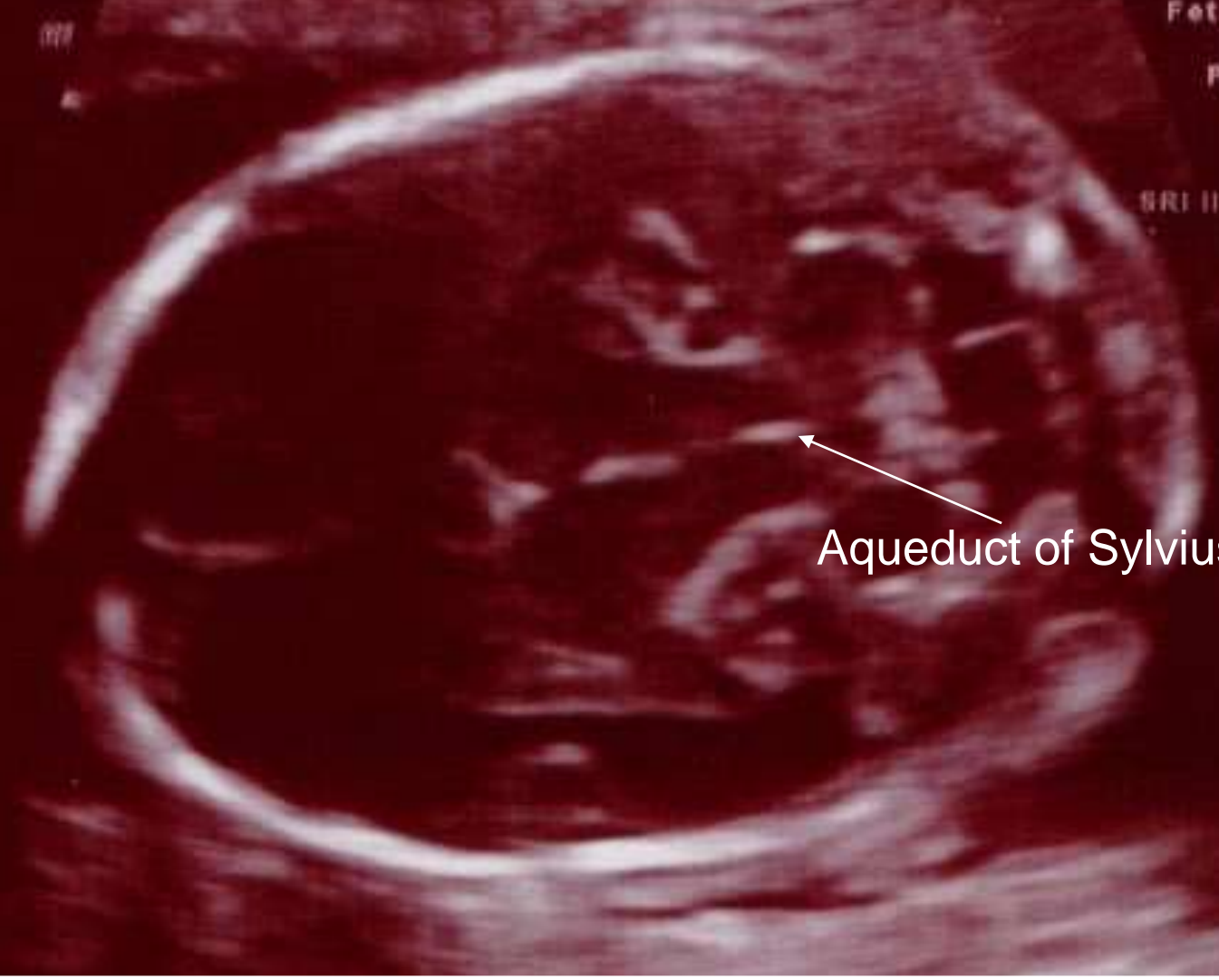
Posterior Coronal View



Occipital horns

Occipital Horn Lateral Ventricle

Fetal Cardio
Mar-mid
Pwr 100 %
Gn -3
CB / M4
E2
SRI II 4 / CRI 1



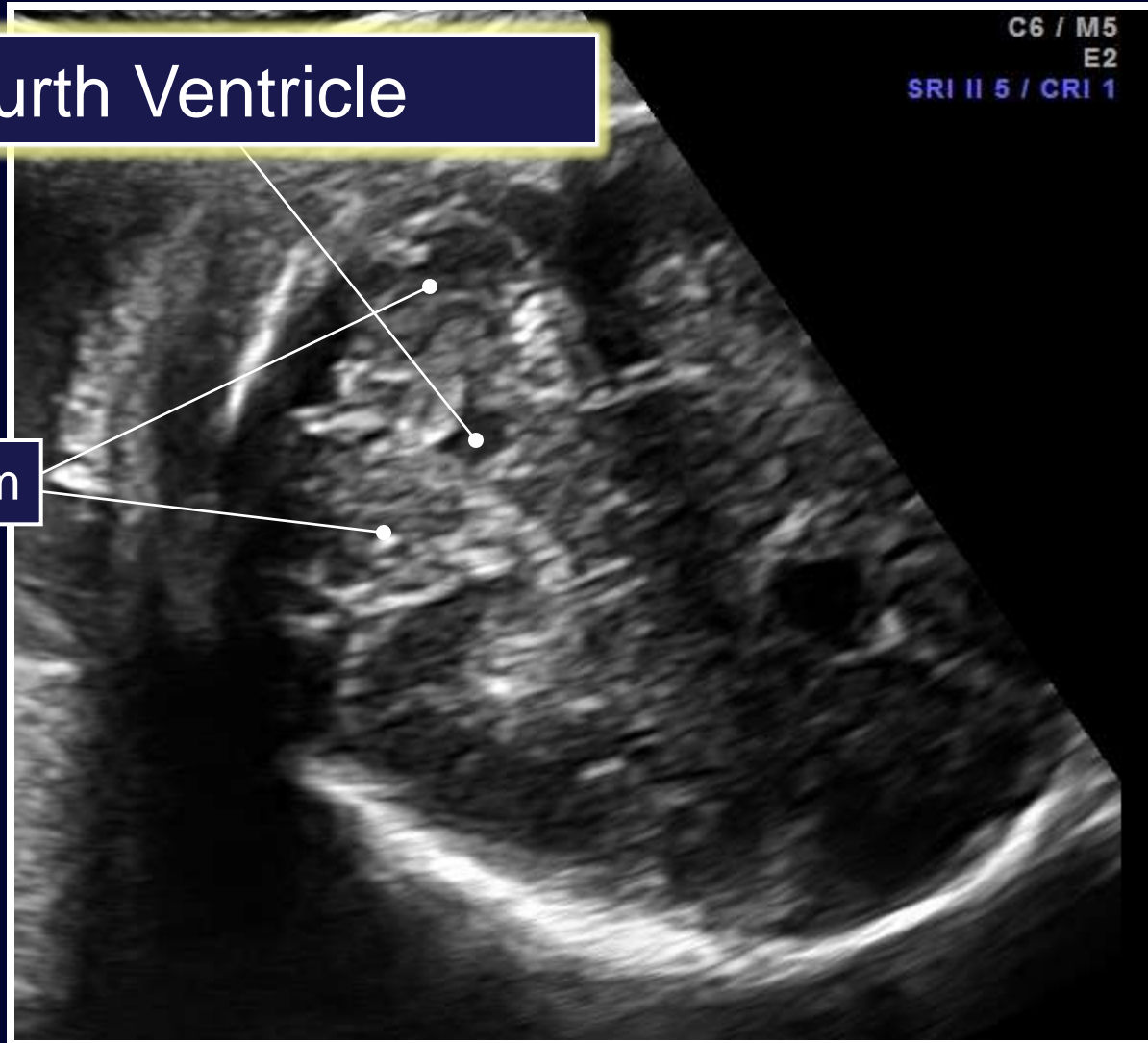
Aqueduct of Sylvius

Aqueduct of Sylvius

Axial View

Fourth Ventricle

Cerebellum



Sagittal View

Fourth Ventricle



Cerebellum

Fetal Spine

Anatomy of Vertebra

Spinous process

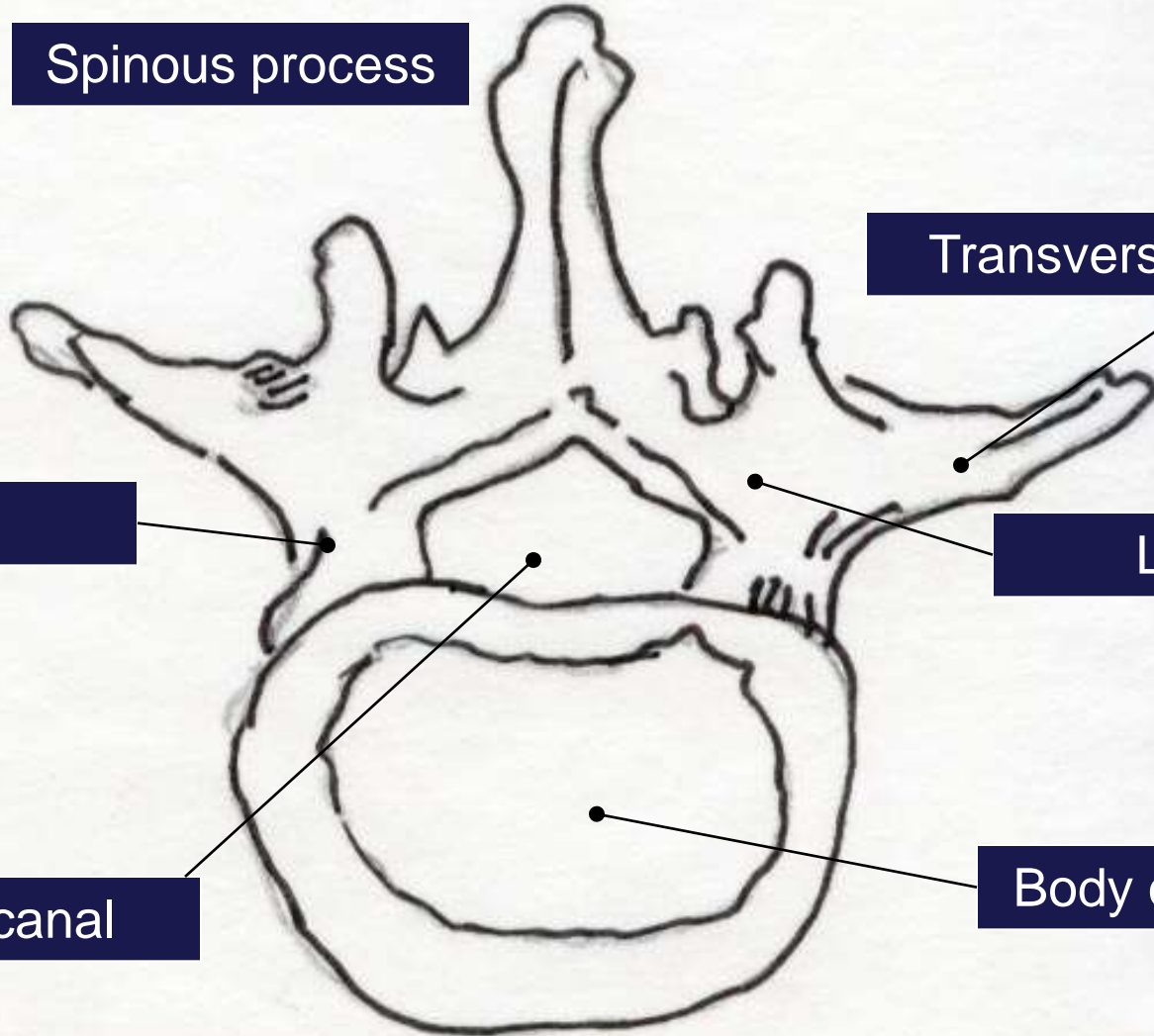
Transverse process

Pedicle

Lamina

Spinal canal

Body of vertebra

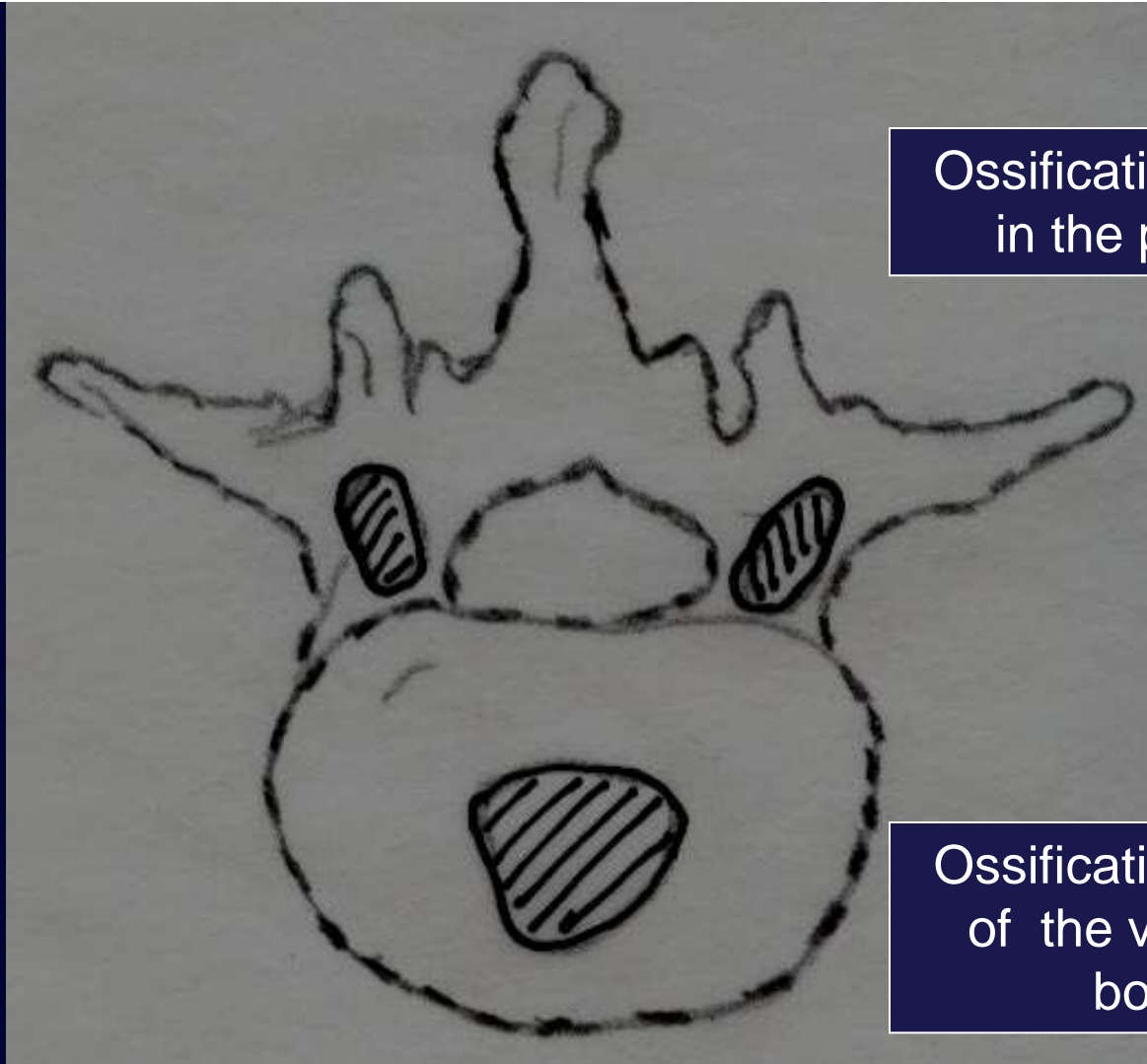


Imaging of the Fetal Spine

Ossification Centers Visualized

- Body (centrum)
- Lamina-pedicle junction (base of transverse process)

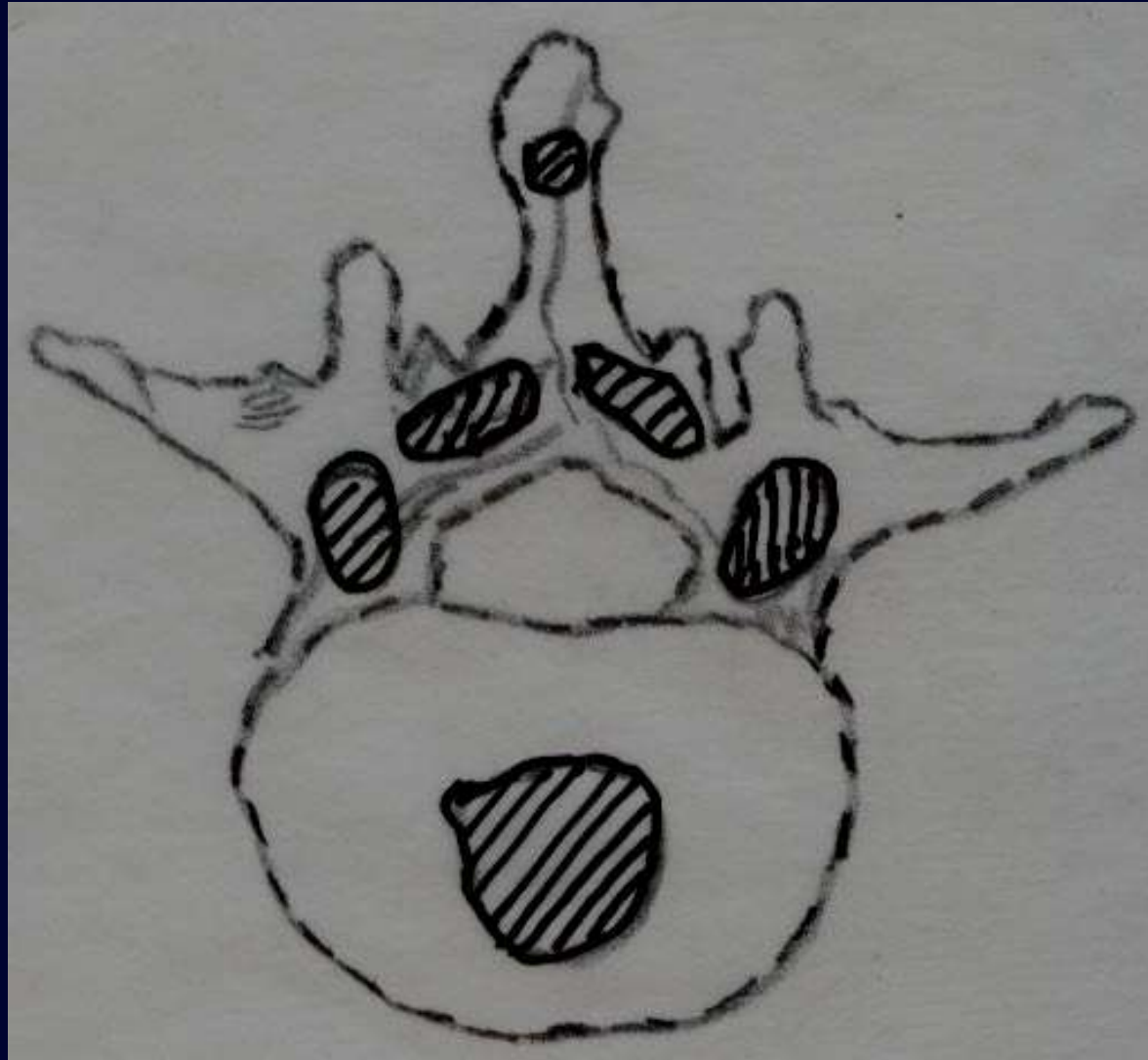
Early Ossification Centers



Ossification center
in the pedicle

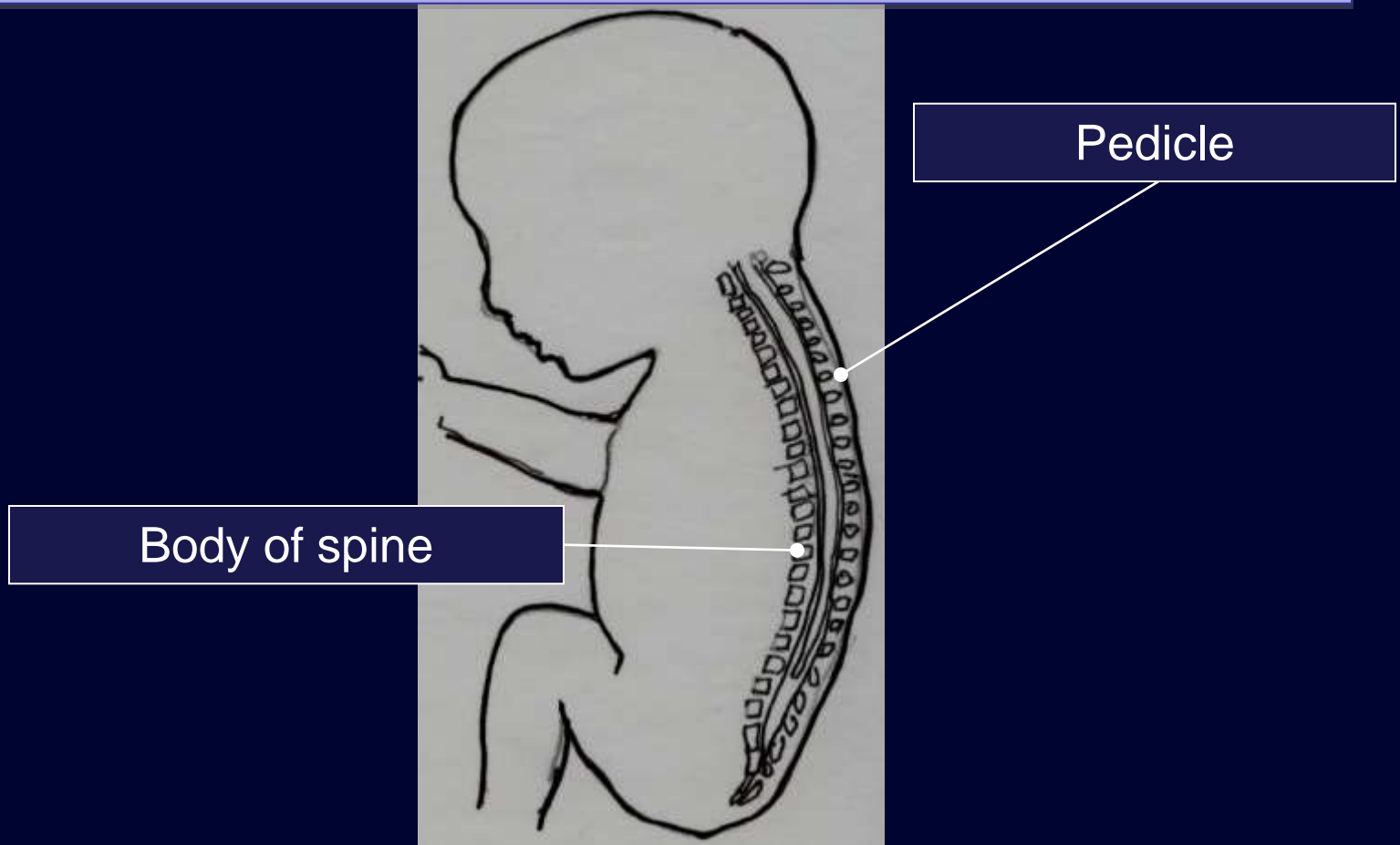
Ossification center
of the vertebral
body

Ossification Centers: Later in Pregnancy



Ossification Center

Sagittal View



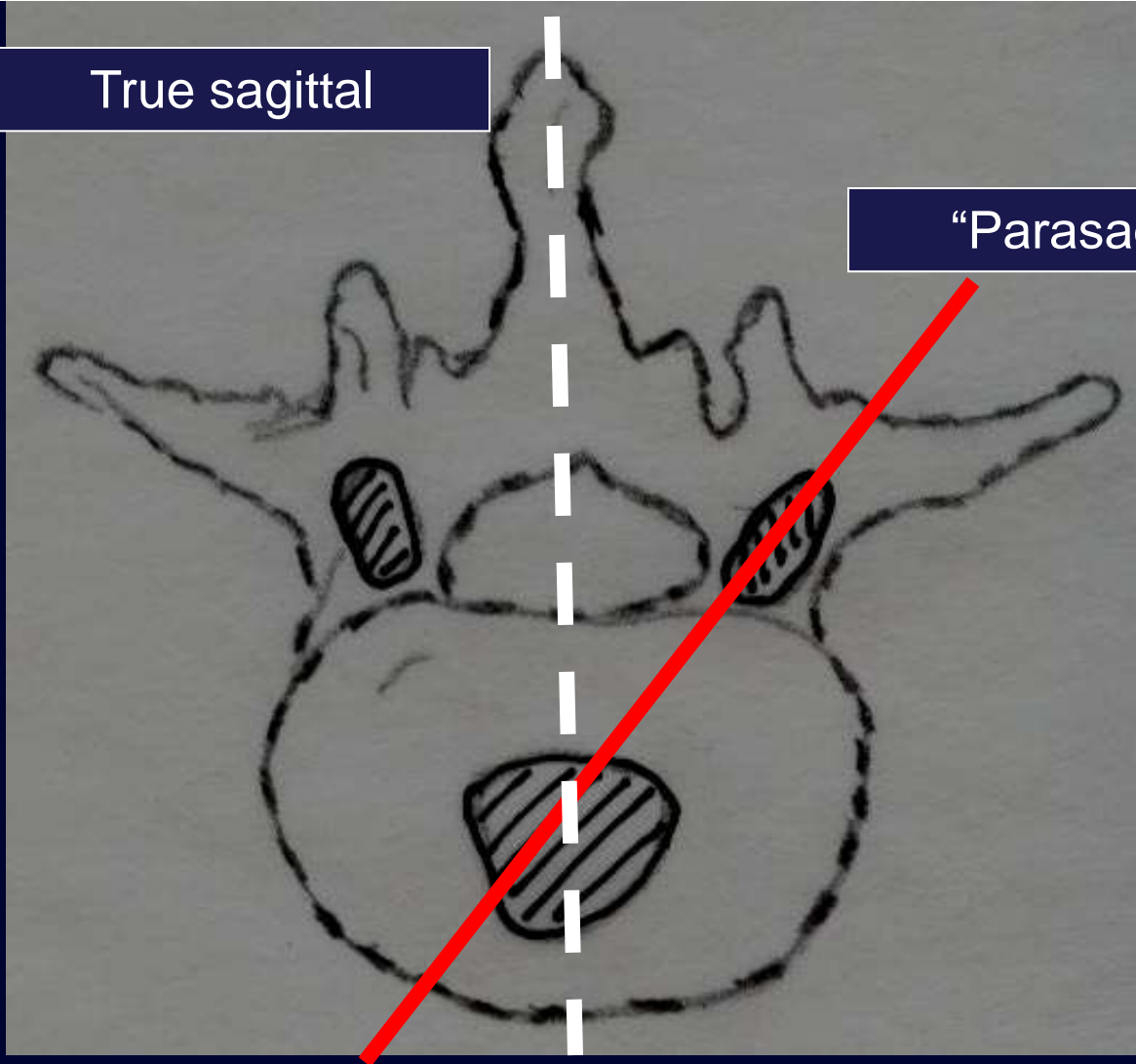
Body of spine

Pedicle

Sagittal Planes

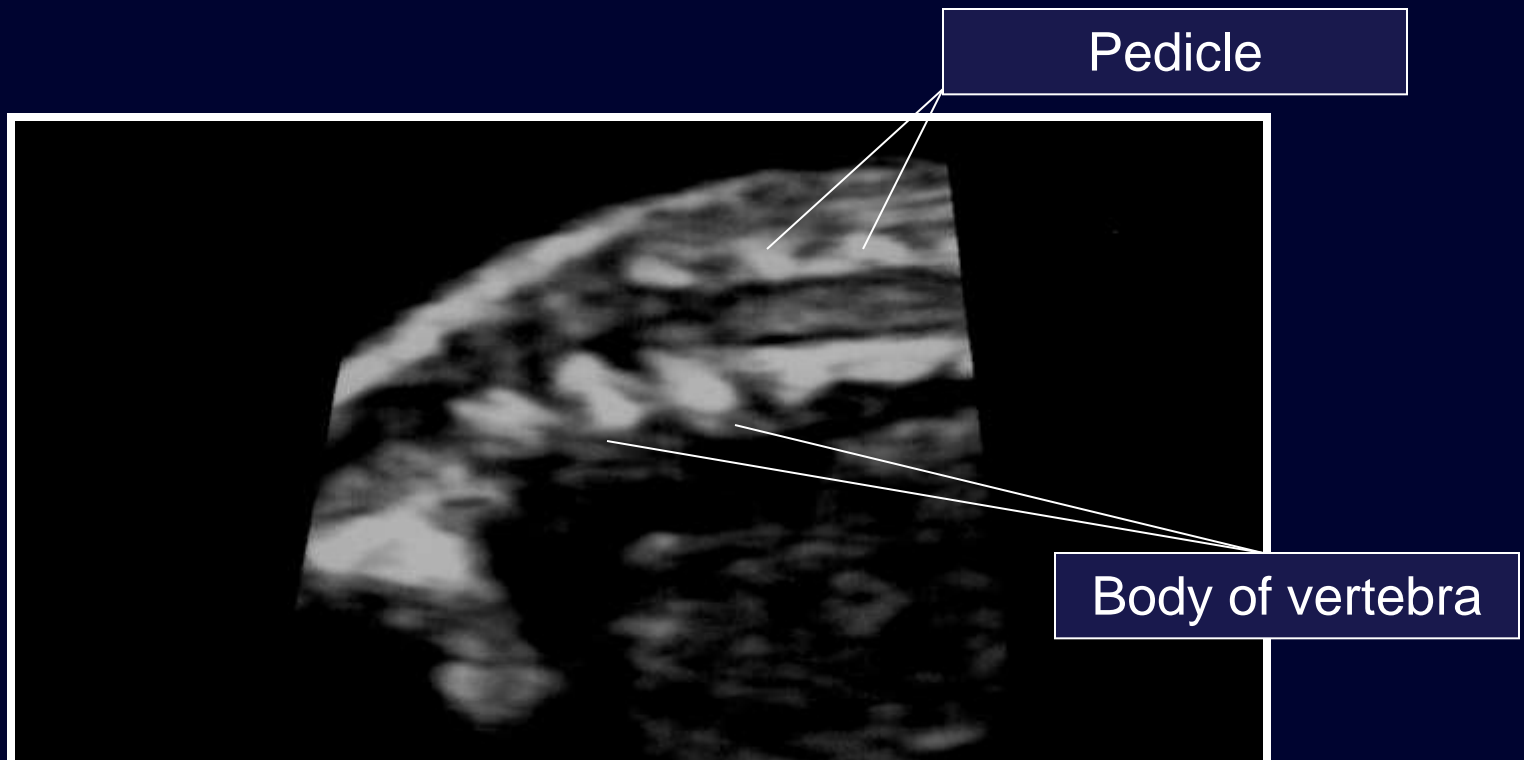
True sagittal

“Parasagittal”



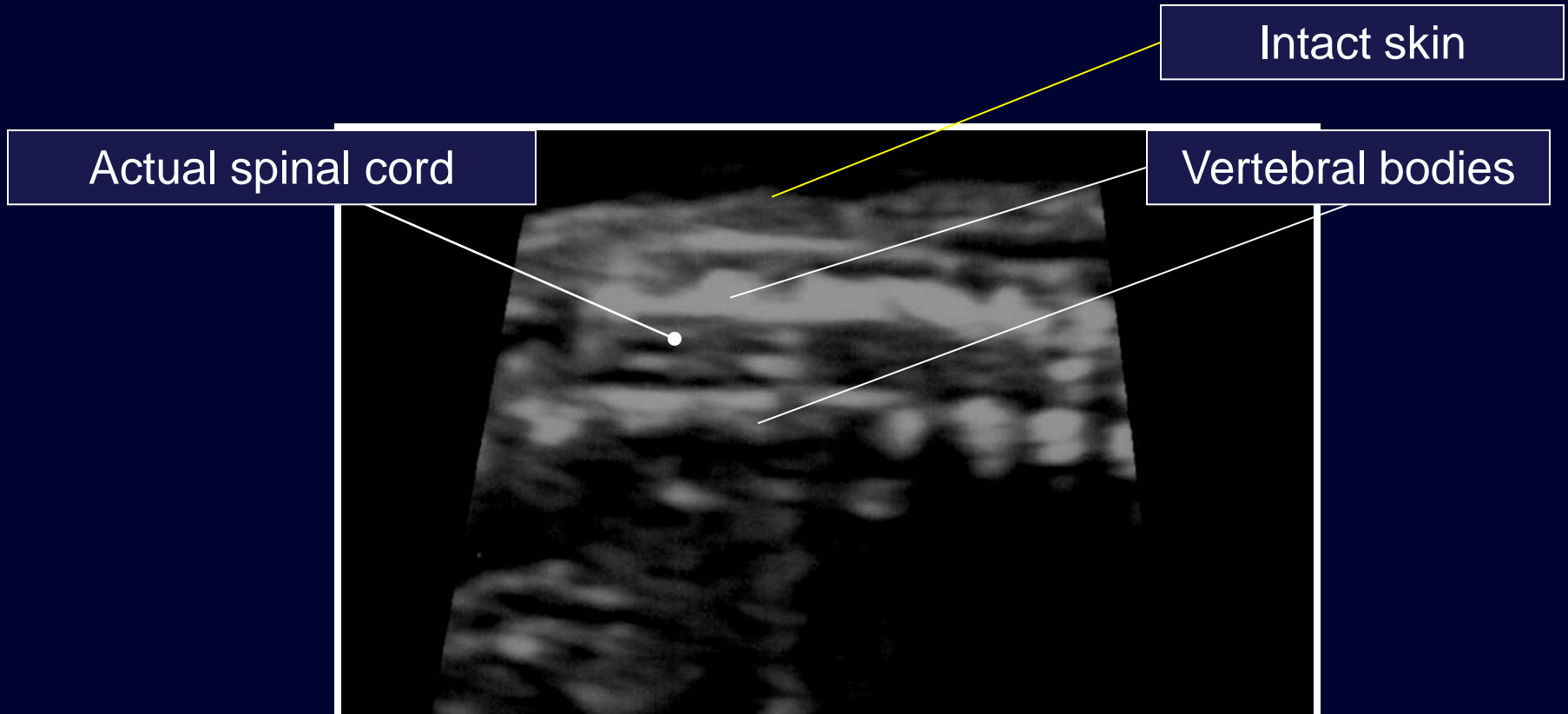
Ossification Centers

Lumbosacral Spine



Sagittal View

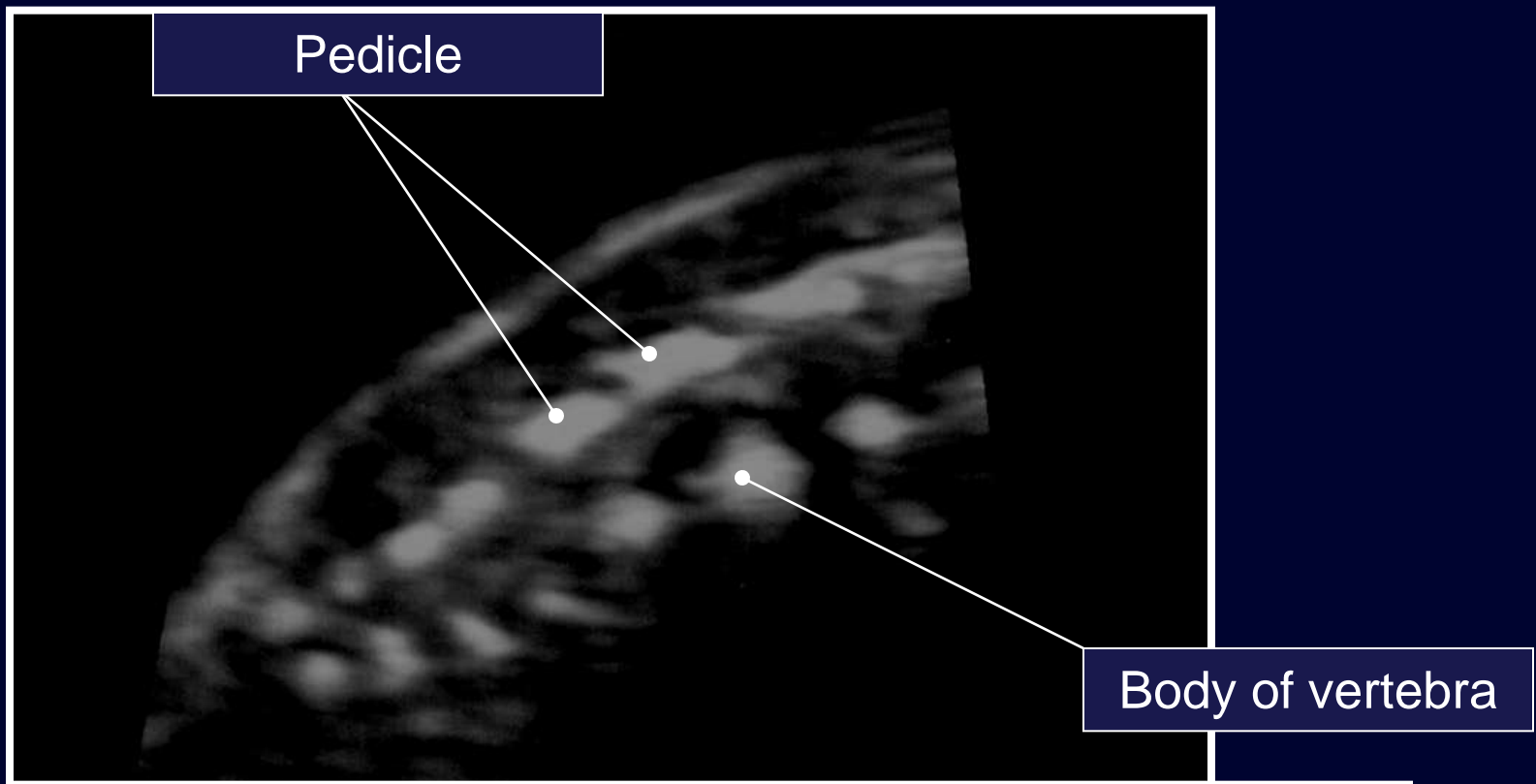
Spinal Cord



Sagittal View

Ossification Centers

Lumbosacral Spine



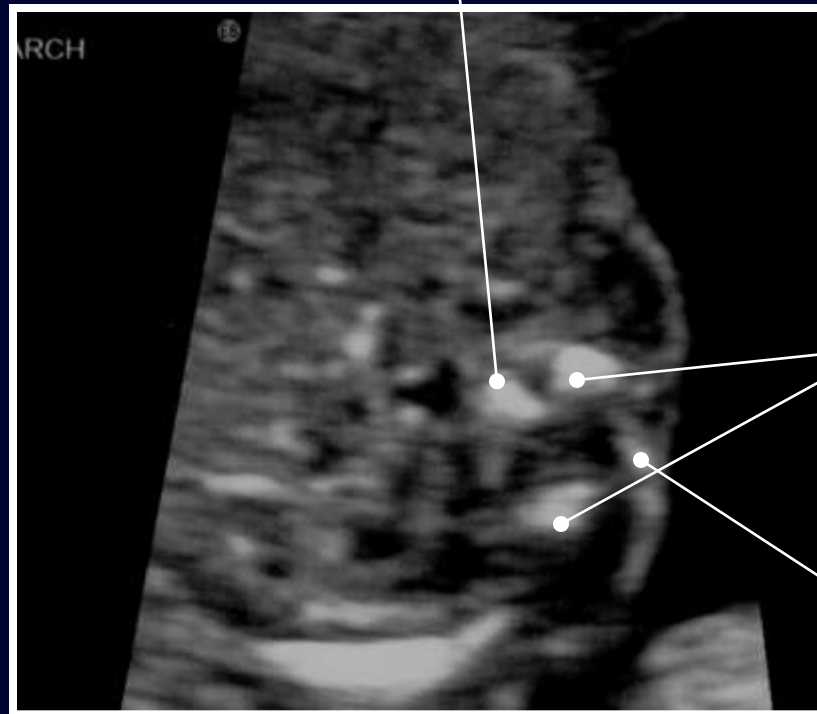
Sagittal View

Axial View

Vertebra

Axial View

Body of vertebra



Pedicles

Skin

Coronal View

Imaging of the Fetal Spine

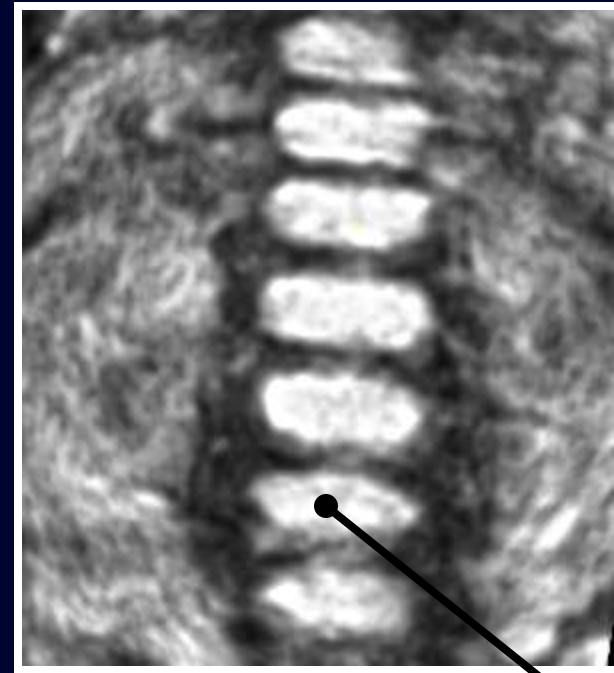
Coronal View

- Posterior ossification centers seen
- “Rail track” appearance
- Ossification centers wider apart as you go distally
- Landmarks for counting vertebrae:
 - Last rib = T12
 - Top of iliac wing = S1

Ossification Centers

Lumbosacral Spine

Pedicle

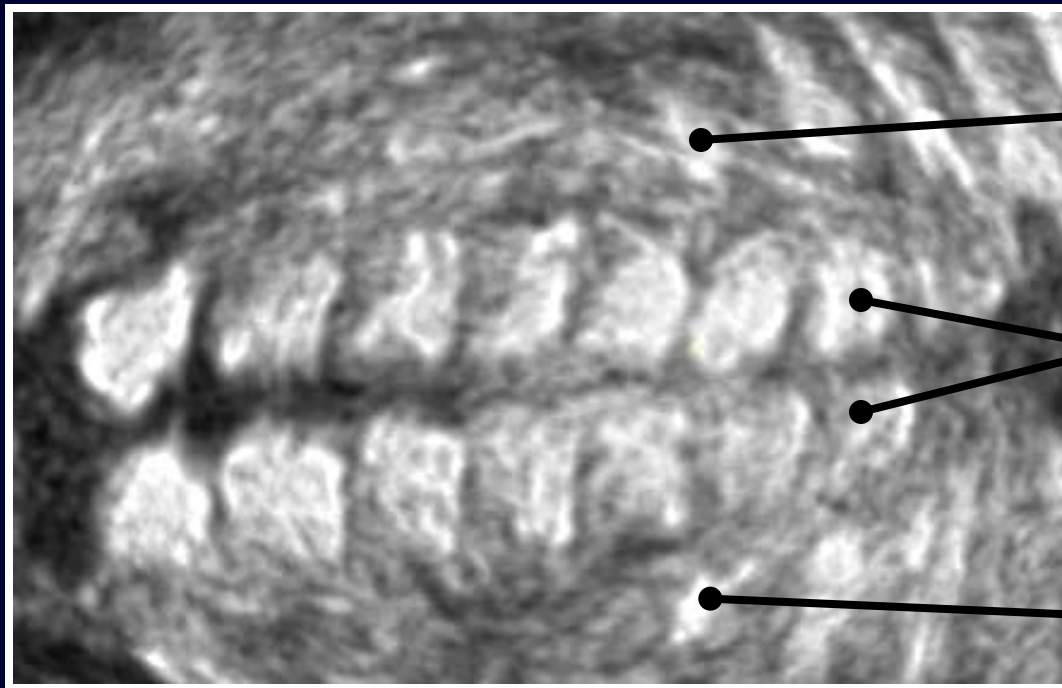


Body of vertebra

Coronal View

Fetal Vertebrae

12th Rib



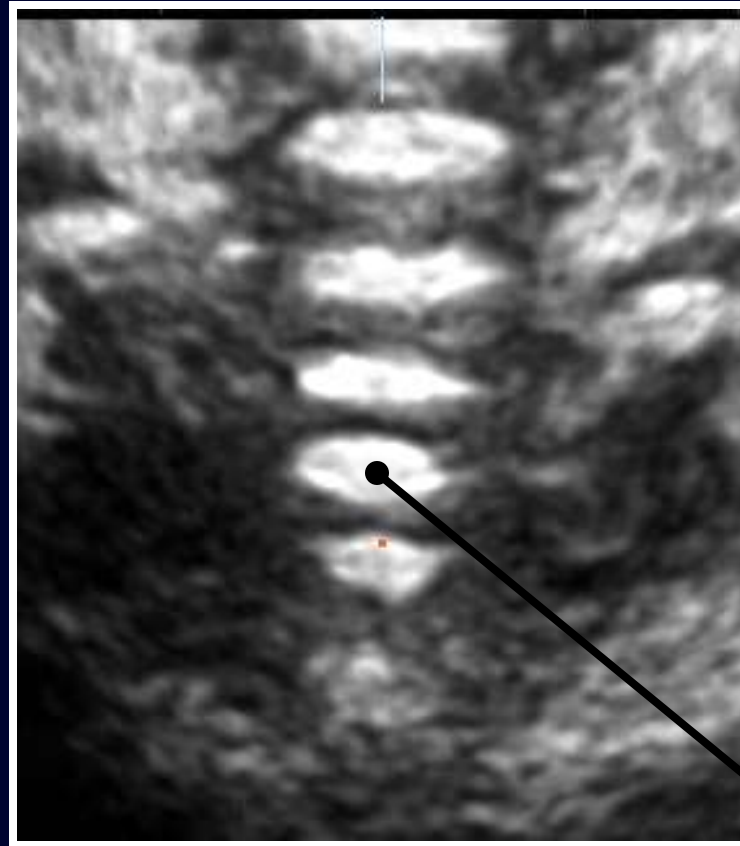
12th rib

Pedicles

12th rib

Coronal View

Sacral Vertebrae



Body of vertebra

Coronal View

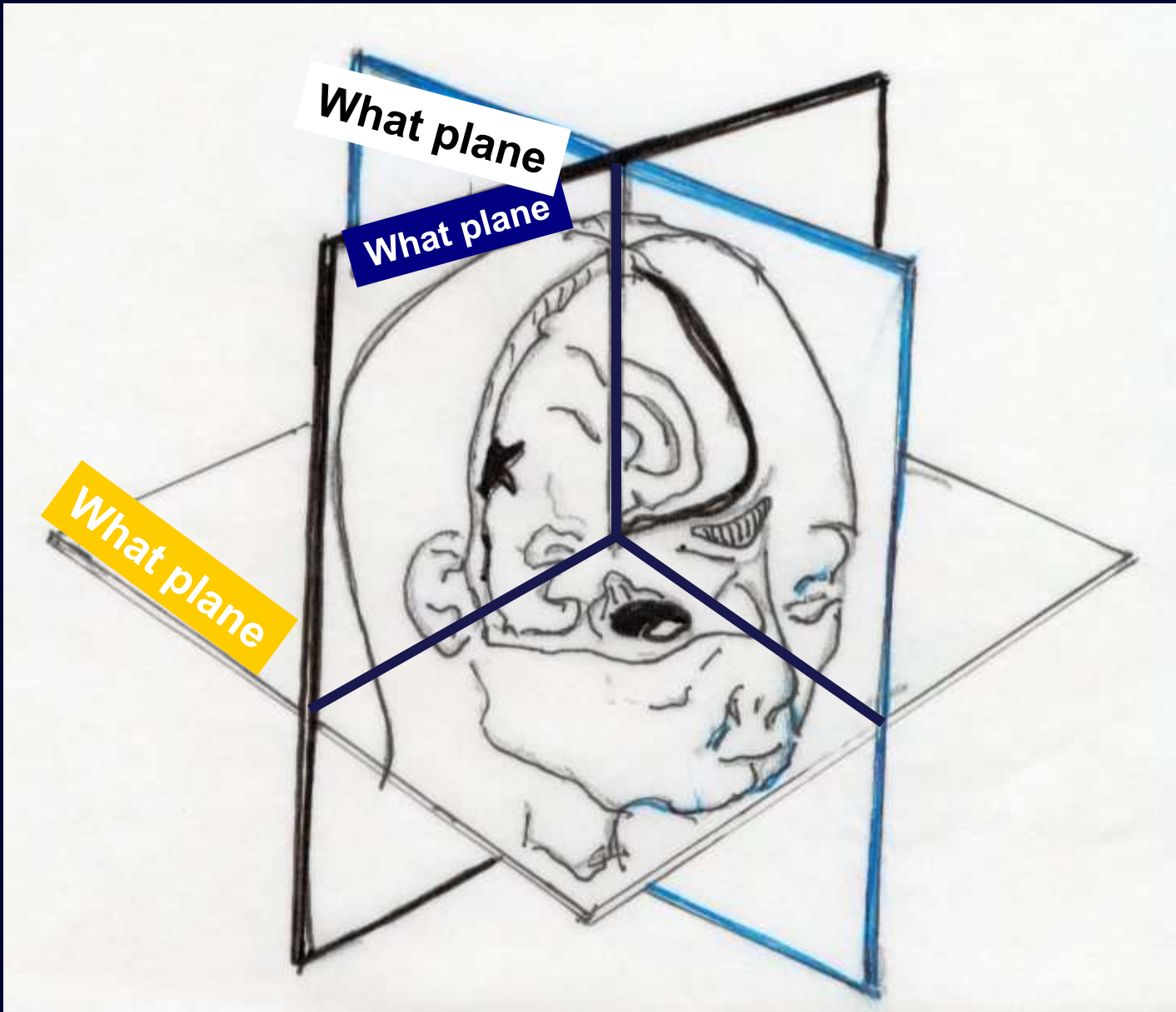
Conclusions

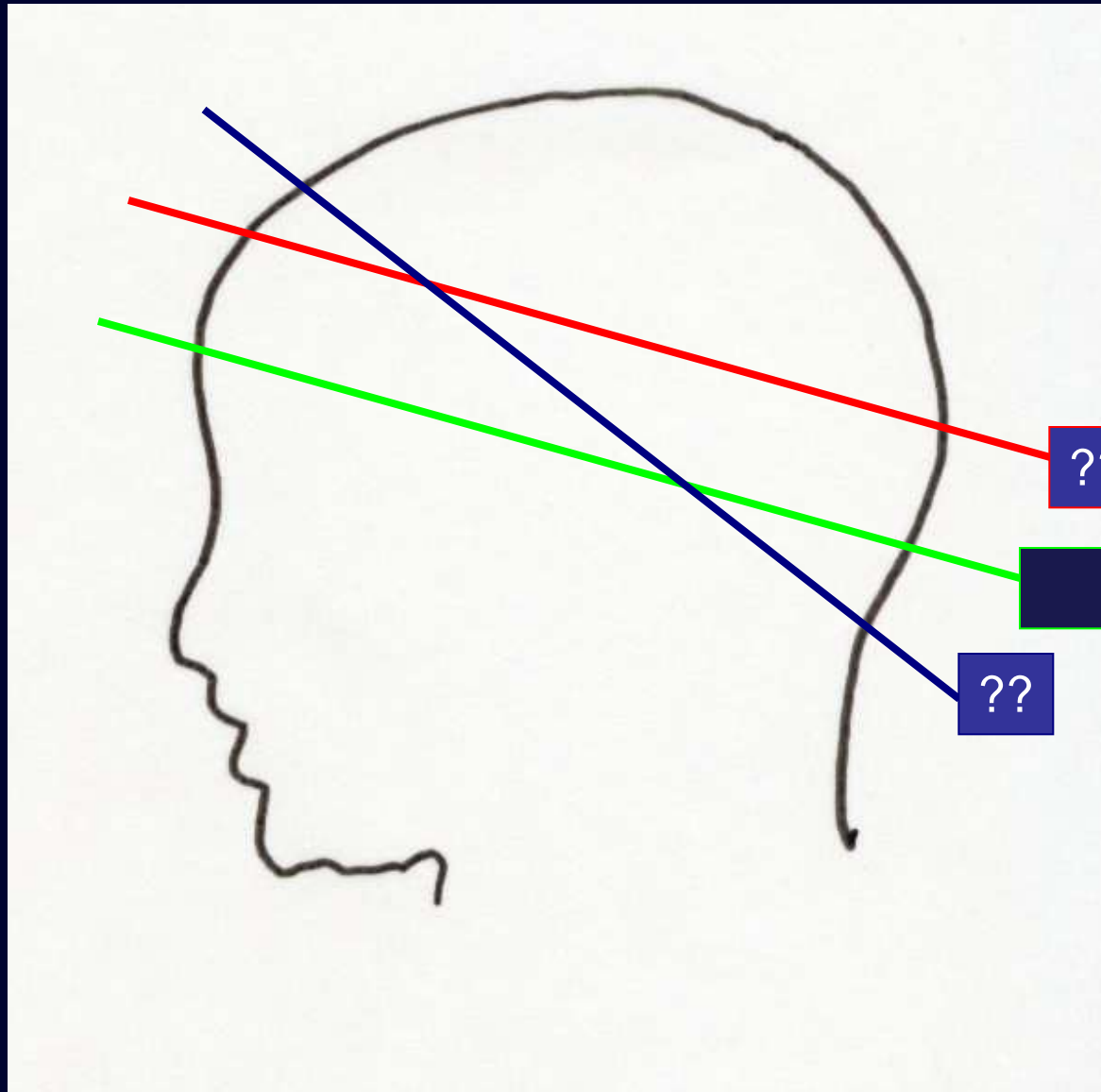
- Familiarity with imaging of the normal CNS is a basic ultrasound skill.
- Be mindful of maturity-related changes in appearance
- Always attempt a transvaginal scan for a vertex fetus in which there is concern about the cranium.
- Same for a breech fetus in which you are worried about the spine.

Thank you!

Quick Quiz

Identify these structures:

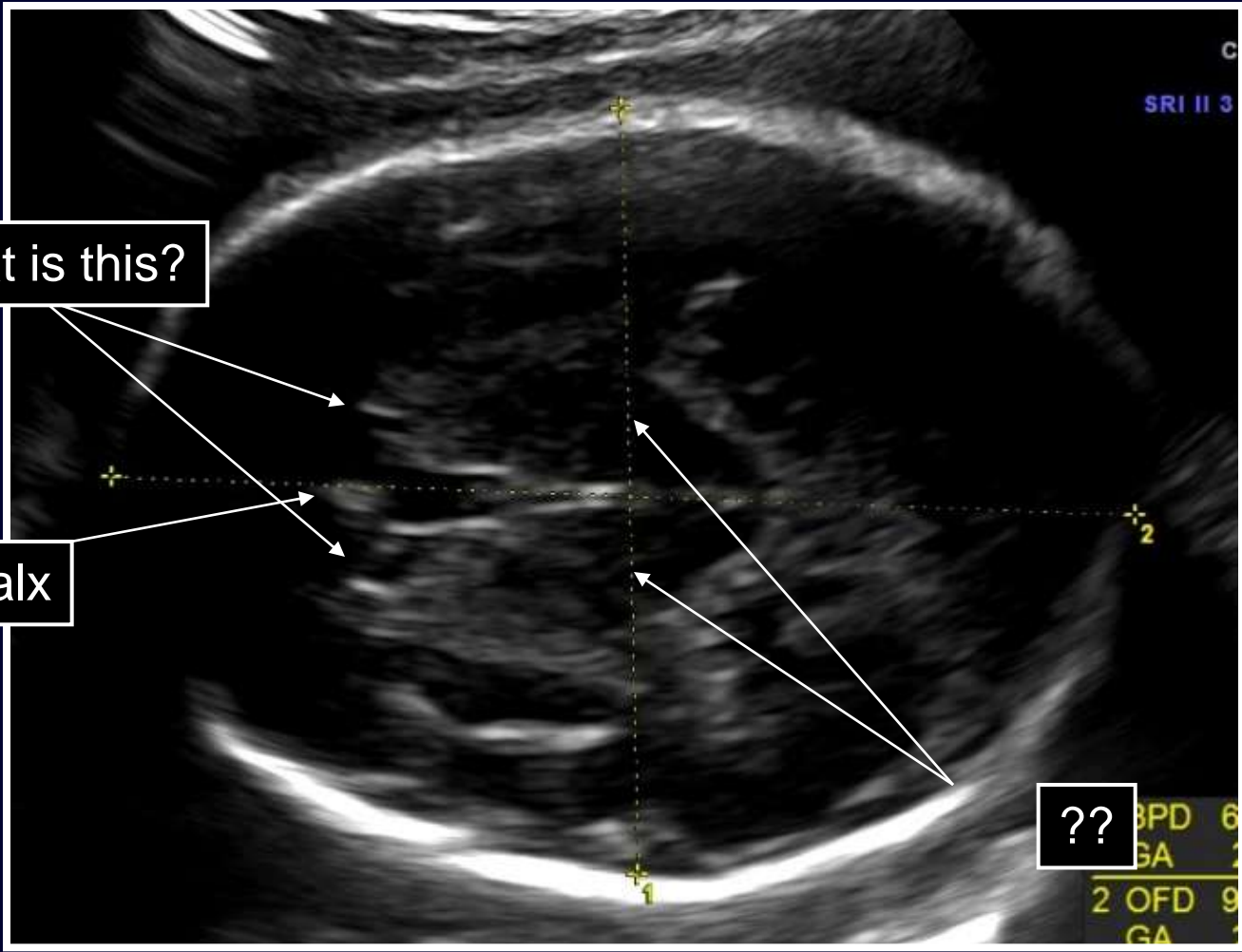




What is this?

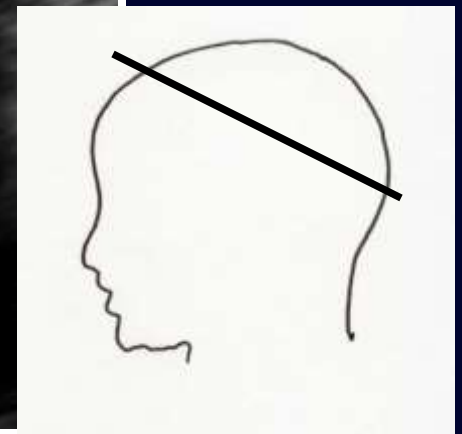
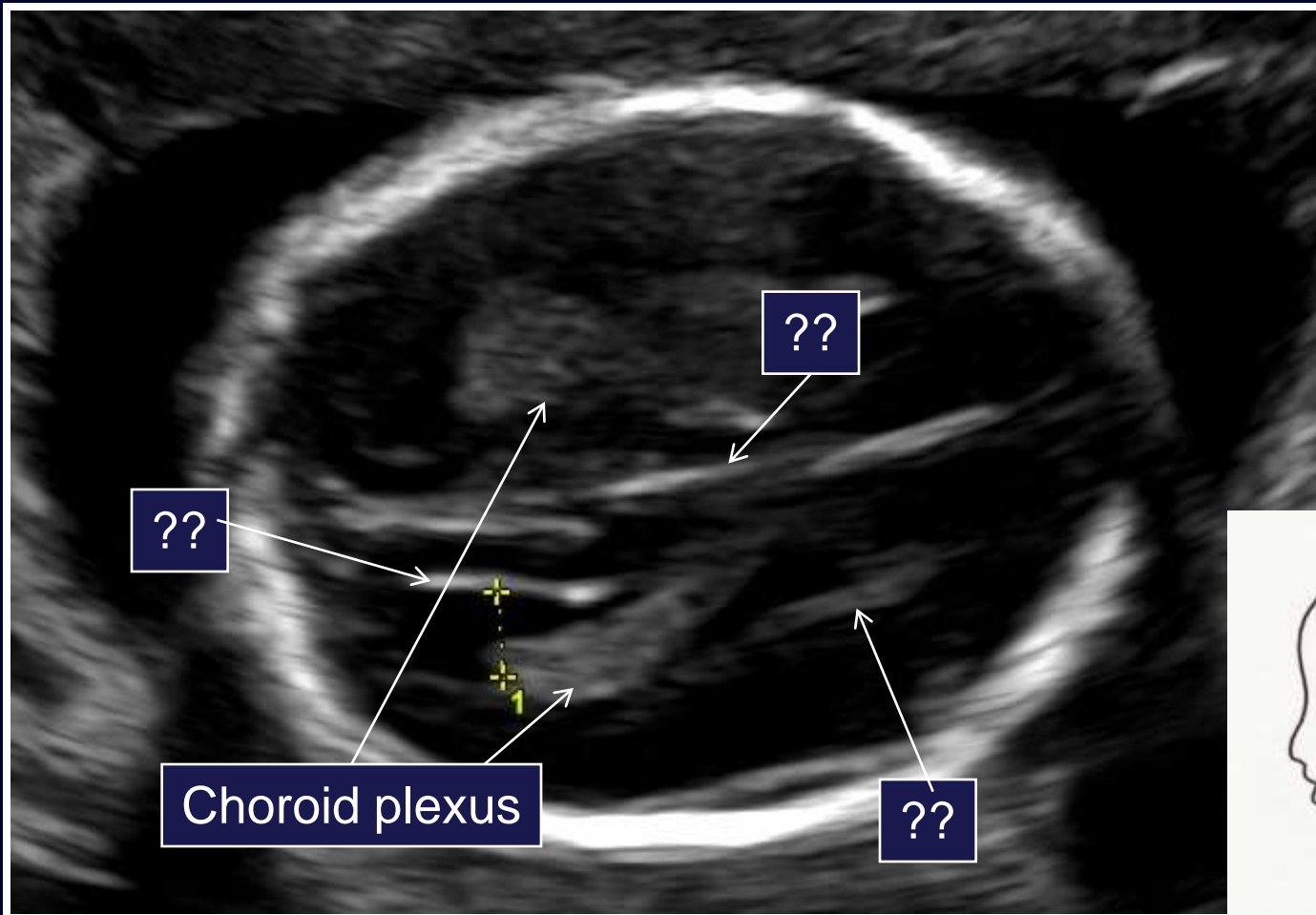
Falx

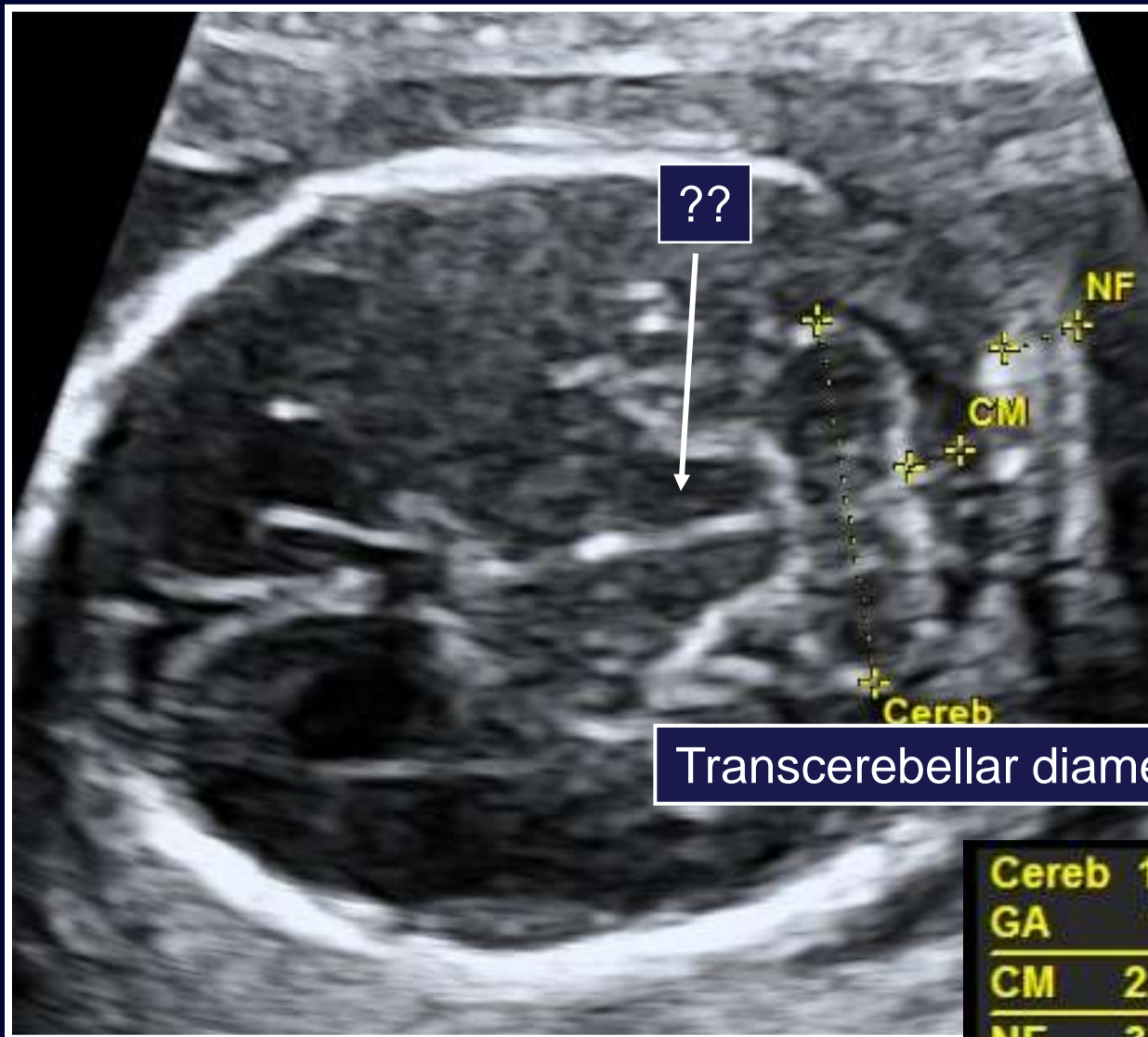
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What View?

What View?

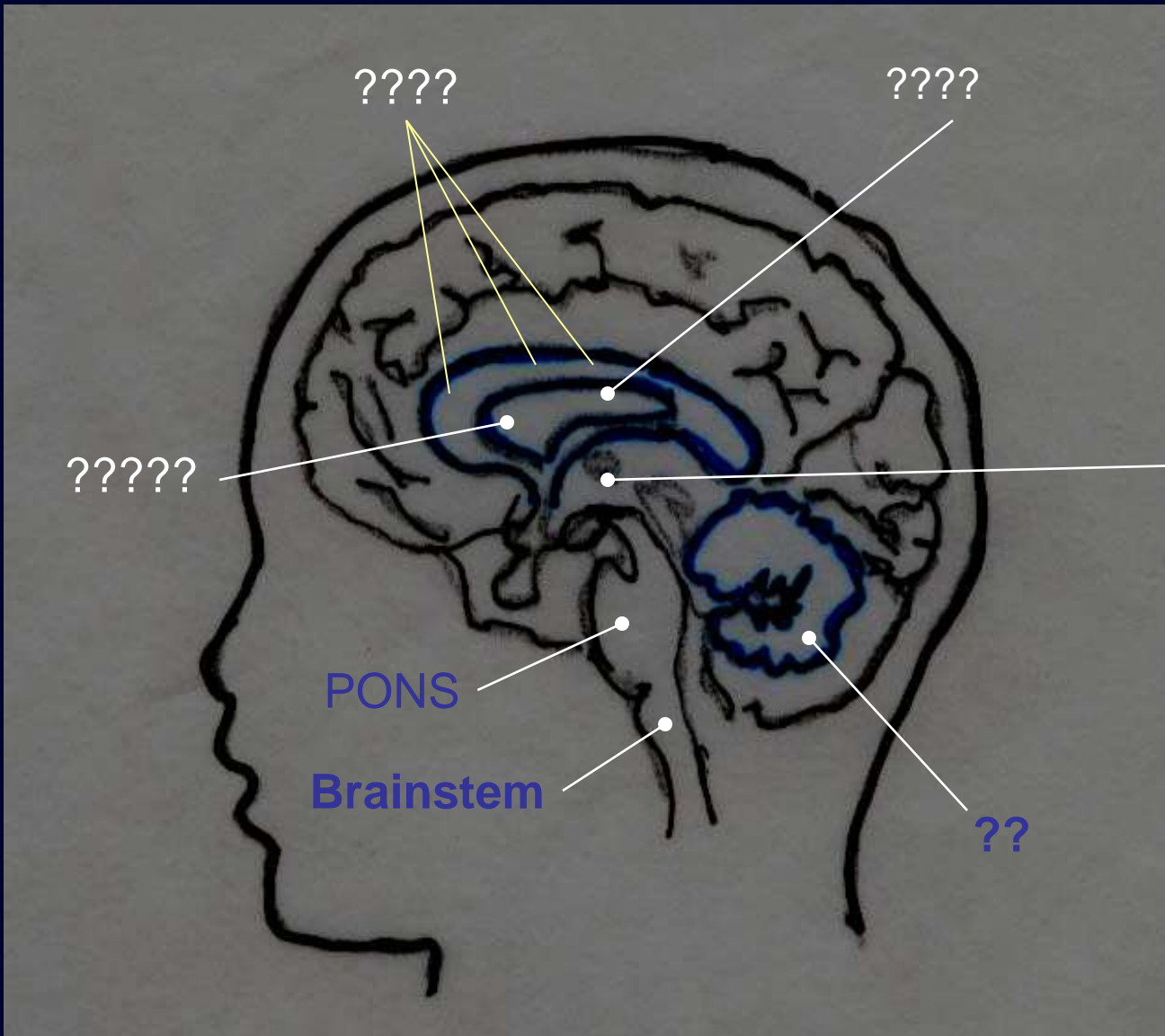




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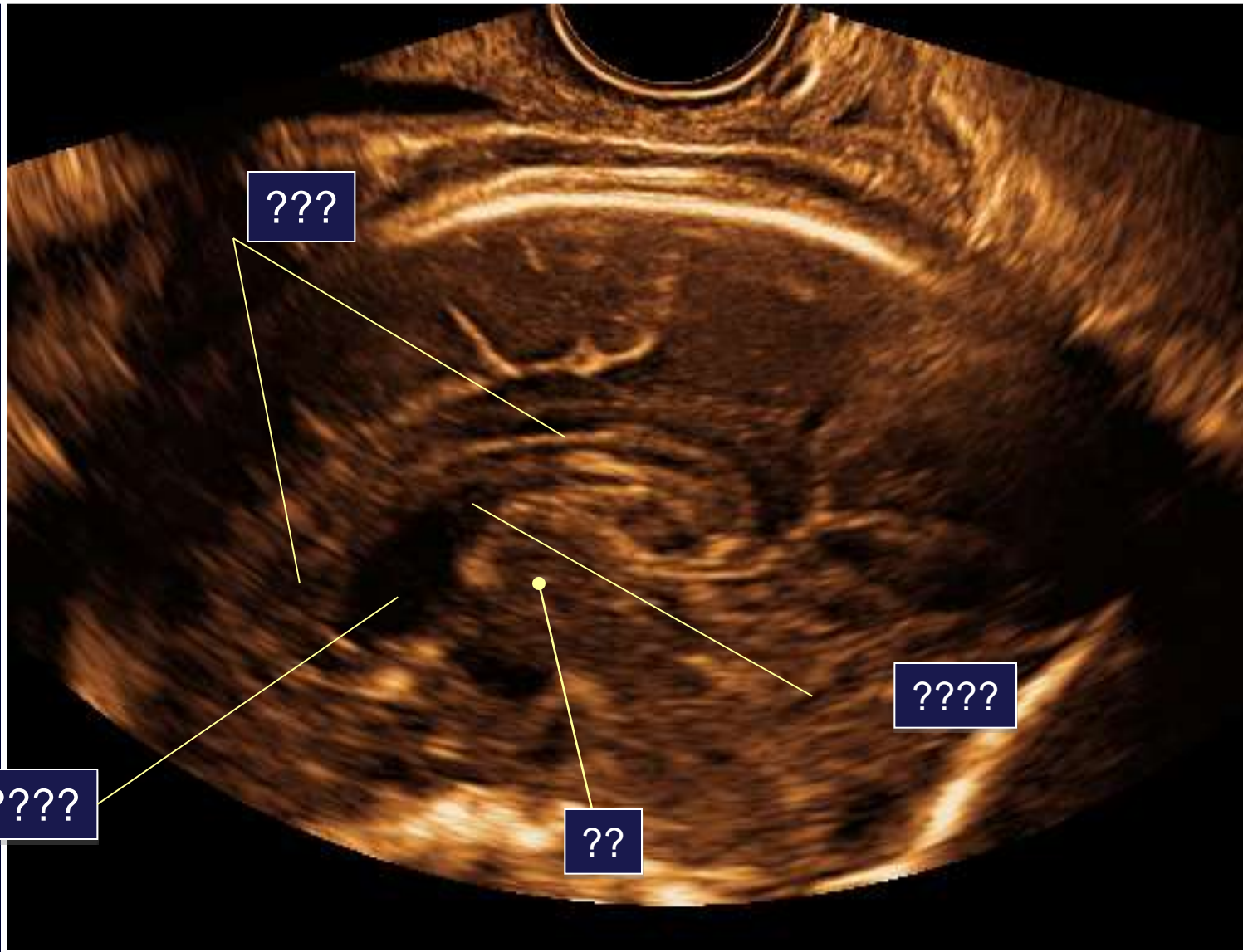
Transcerebellar diameter

Cereb	1.81cm
GA	17w6d
CM	2.61mm
NF	3.74mm



Midline

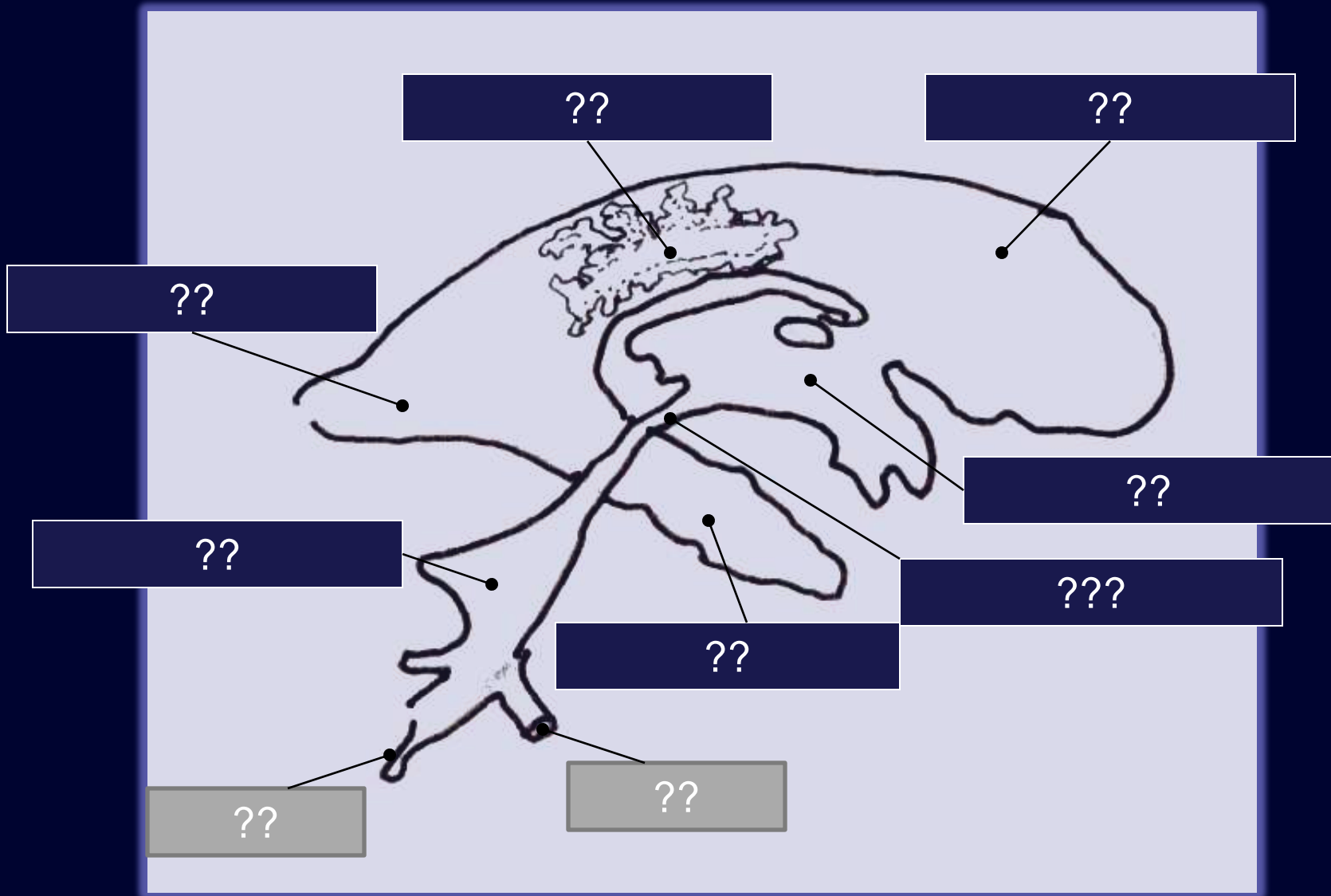
Ultrasound: Midline Sagittal

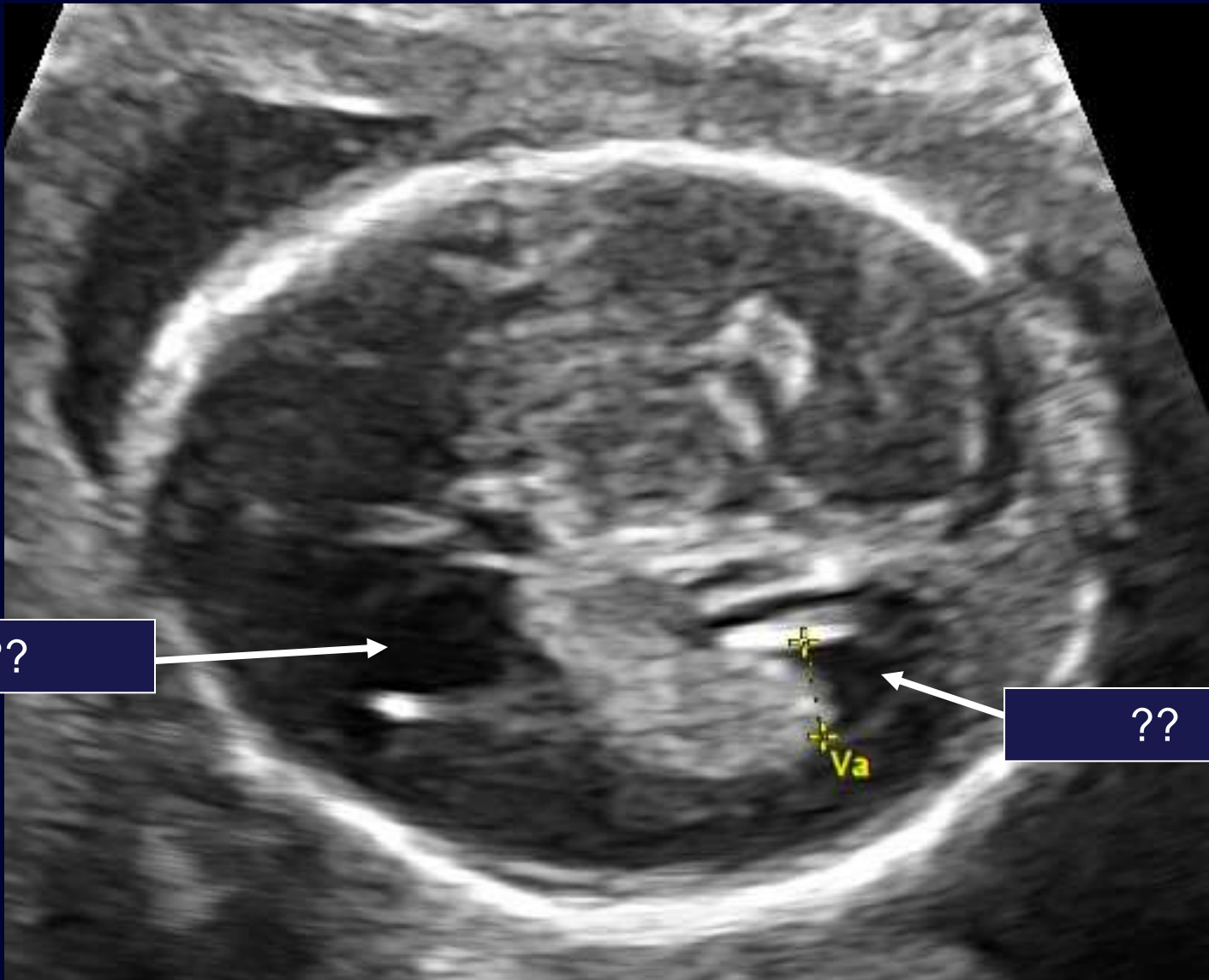


Sagittal First Trimester



What is the diagnosis?



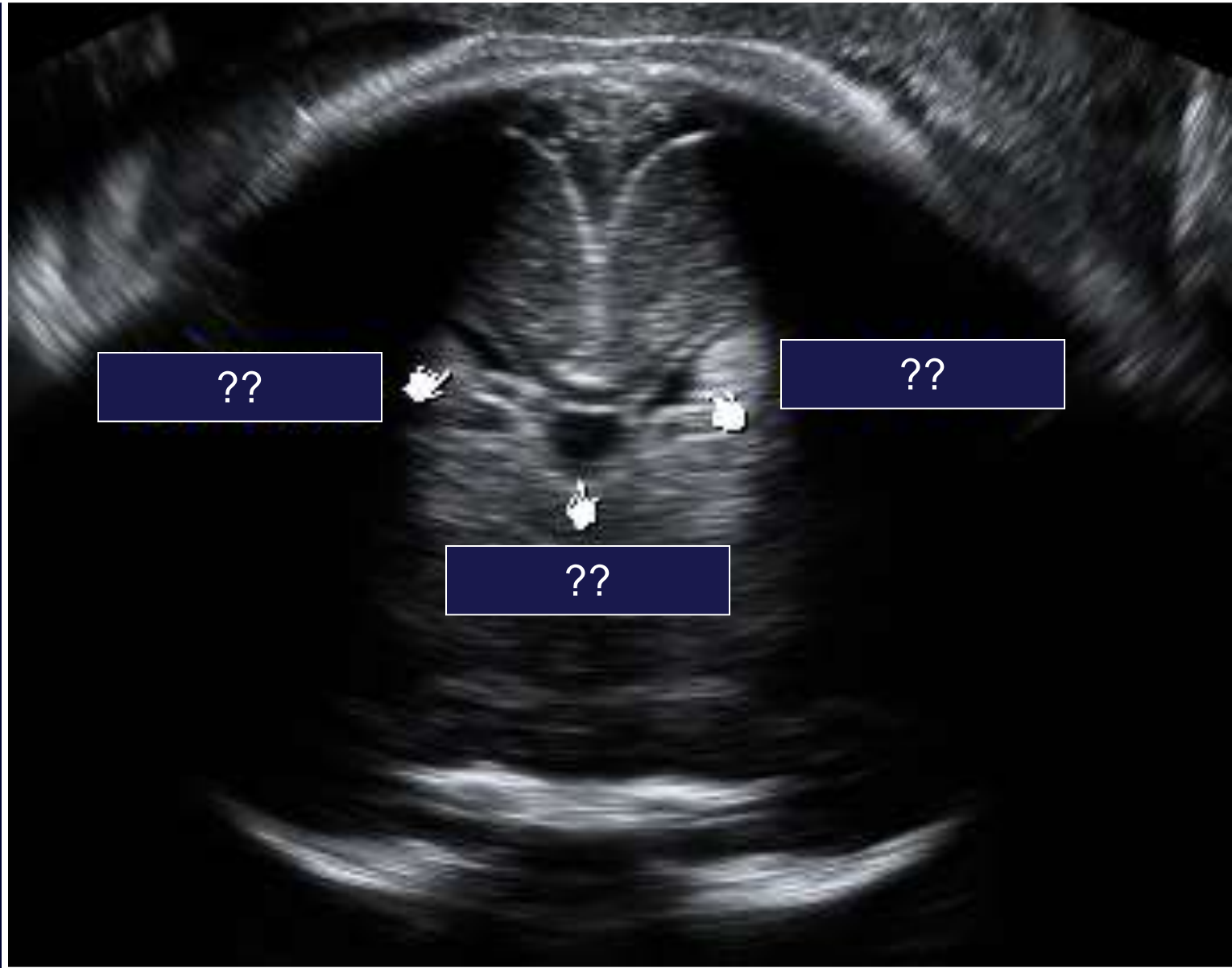


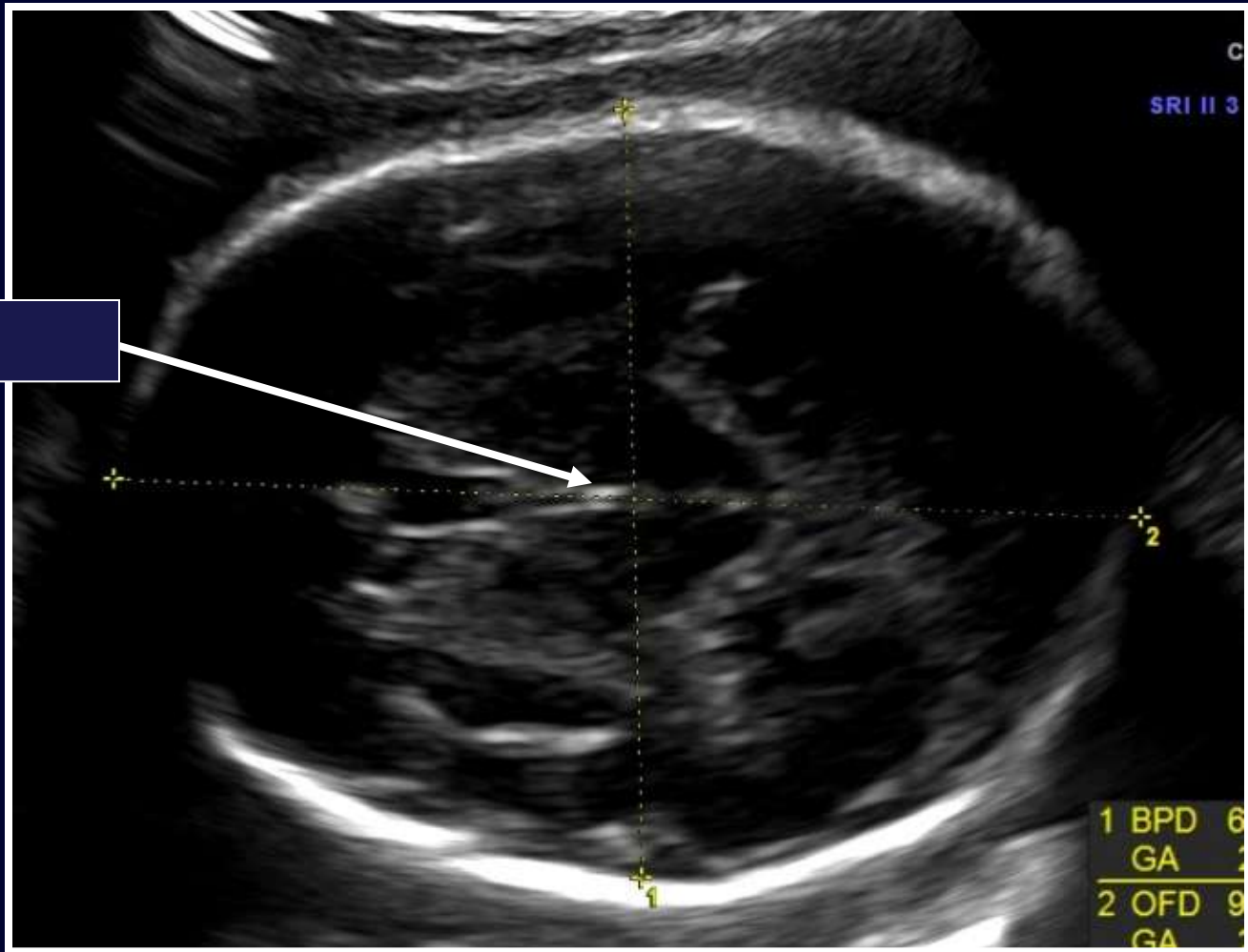
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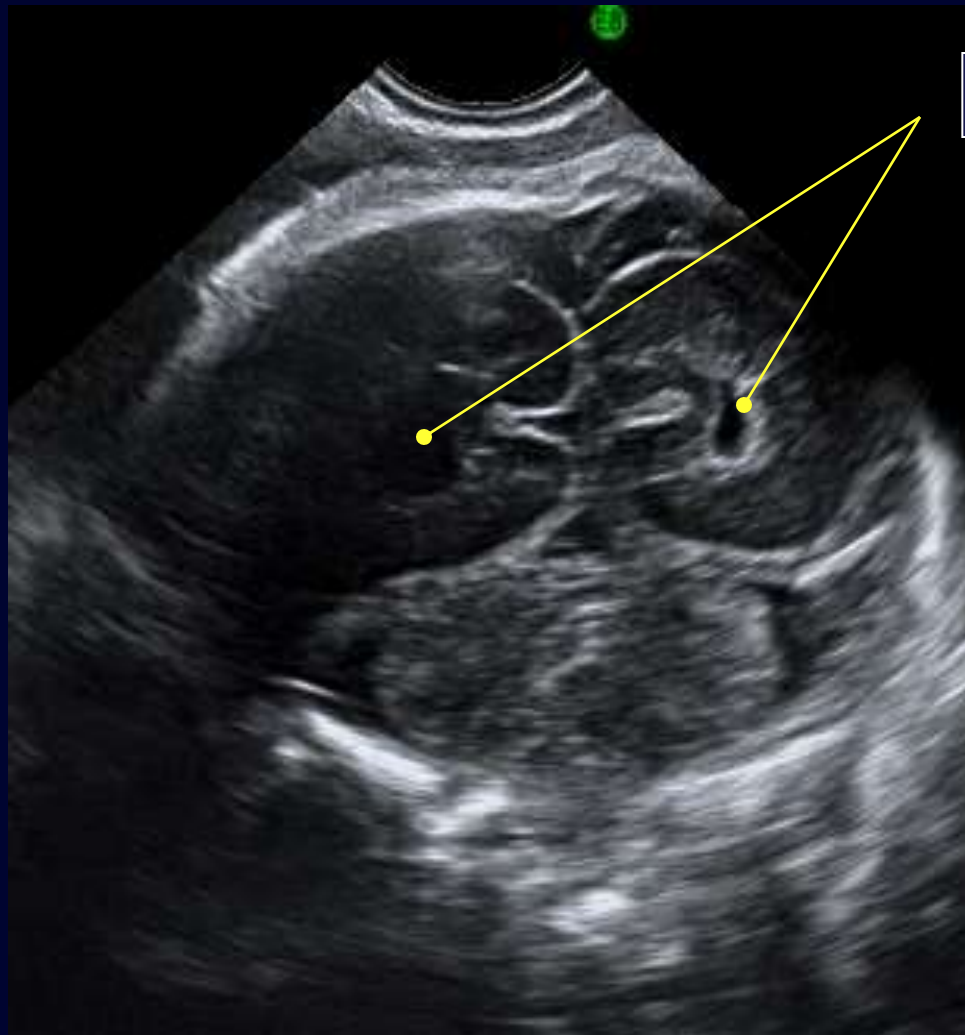
Va

Ultrasound: Anterior Coronal View





Posterior Coronal View



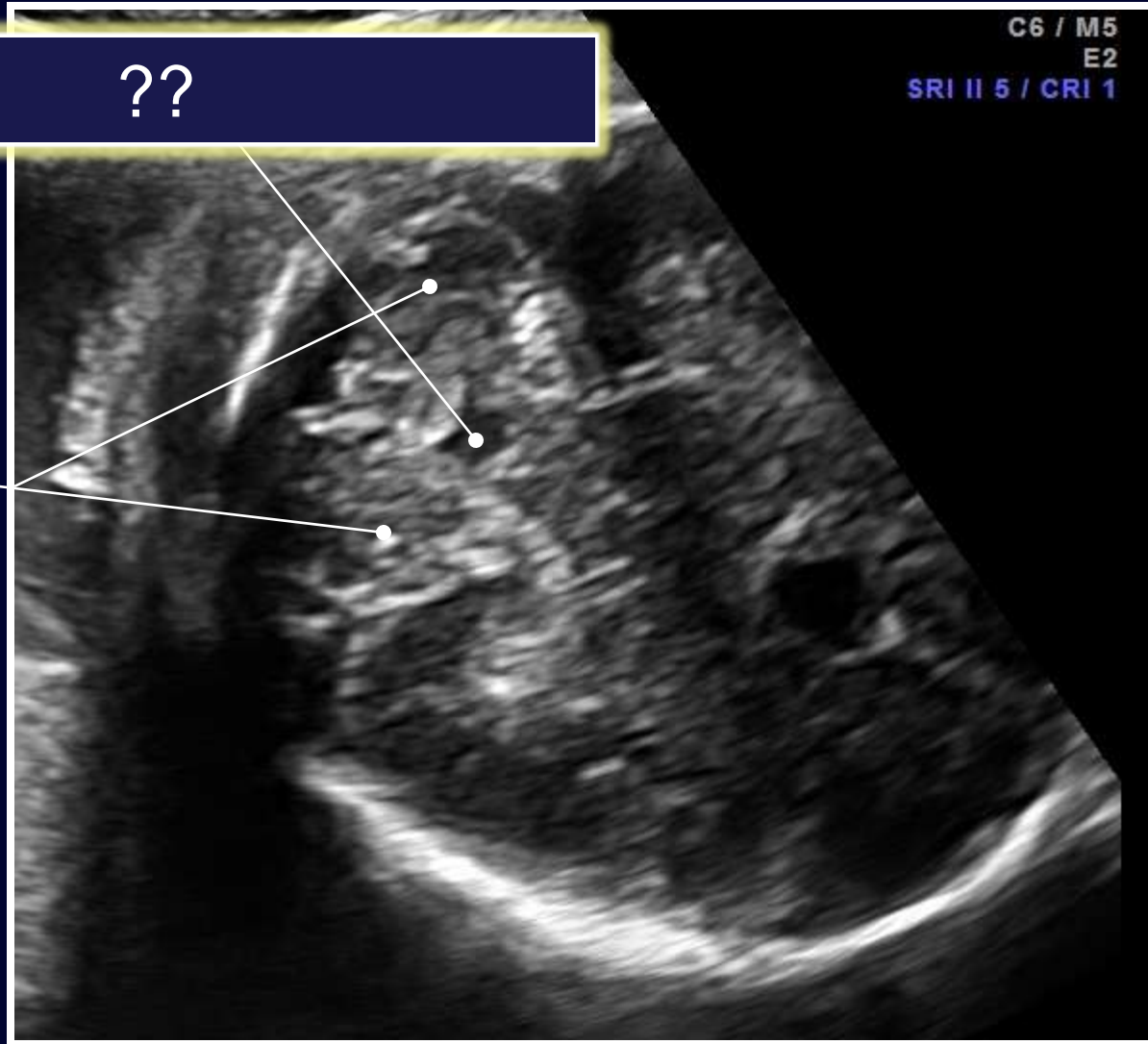
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Fetal Cardio
Har-mid
Pwr 100 %
Gn -3
CB / M4
E2
14 / CRI 1

??

??

Axial View



Anatomy of Vertebra

