



# Fetal Transabdominal Neurosonography

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## Introduction

Transabdominal ultrasound remains the gold standard for routine screening of the brain and for the detection of suspected intracranial abnormalities. Recent advancements in ultrasound technology have significantly enhanced image resolution, enabling clearer visualization of the fetal brain via the transabdominal approach. Nonetheless, when a brain abnormality is suspected or a detailed evaluation is required, transvaginal neurosonography—particularly in the hands of an experienced practitioner—remains the preferred method due to its superior visualisation of anatomical details.

**Key considerations** for transabdominal neurosonography:

- **Gestational age appropriateness:** different landmarks and biometry at different stages of gestation
- **Use of multiplanar imaging:** especially with 3D ultrasound for coronal and sagittal reconstructions
- **Acoustic window:** image optimisation and fetal position manipulation

**Key planes** used for axial transabdominal neurosonography:

- Transventricular
- Transthalamic
- Transcerebellar

**Additional planes** for detailed brain evaluation (not required by current ISUOG\* and AIUM\*\* guidelines):

- Sagittal and parasagittal planes
- Coronal planes

## Transventricular plane

- This plane is primarily used to evaluate key intracranial structures, including the **midline**, **cavum septi pellucidi (CSP)**, **lateral ventricles**, and **parieto-occipital fissures** (Figure 1).
- In this plane, the **midline structures**—specifically the interhemispheric fissure and the falx cerebri—should be clearly visualized. A normal midline is interrupted by the presence of the **CSP**. The **anterior complex** in this view includes the anterior horns of the lateral ventricles. The **CSP** itself is a rectangular, fluid-filled cavity bordered by the thin septal membranes (septi pellucidi), and it typically becomes visible after **17-18 weeks of gestation**. It may gradually narrow or disappear during the **late third trimester**. A width greater than 10 mm or an abnormal appearance of the CSP may suggest underlying anomalies, particularly involving the **corpus callosum**.
- When assessing the **lateral ventricles**, precise and consistent measurement is essential. Measurements should be obtained in a **symmetric axial plane**, ensuring no probe tilting. The **parieto-occipital fissure**, which becomes visible after **20 weeks' gestation**, should be clearly documented. Callipers must be placed in to in perpendicular to the lateral wall of the ventricle at the level of the fissure (Figure 1). A measurement of **10 mm or more** is indicative of **ventriculomegaly**, warranting further diagnostic evaluation.
- The **atrium of the lateral ventricle** should contain a prominently echogenic **choroid plexus**, which typically fills the ventricular cavity near the lateral wall. It is also important to evaluate the **contralateral ventricle**, which can be visualized by directing the ultrasound beam through the **lambdoid sutures**, providing an optimal acoustic window.

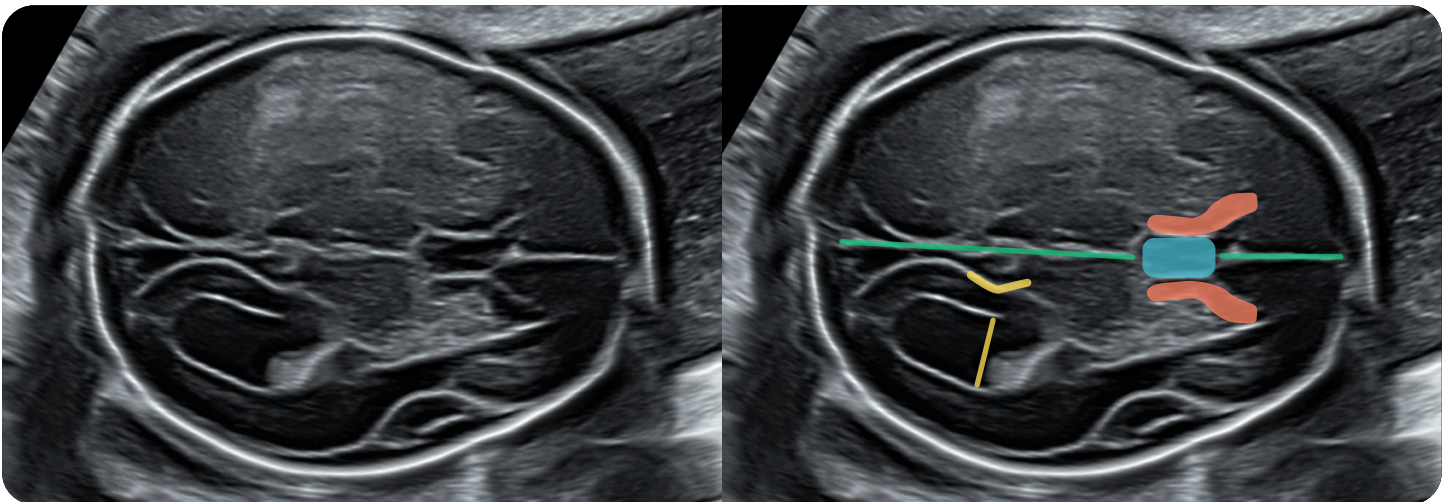


Figure 1. Transventricular plane

## Transthalamic plane

- This plane provides a clear view of the **thalami** and the third ventricle and is commonly used for obtaining **biometric measurements** such as **biparietal diameter (BPD)** and **head circumference (HC)**. These measurements are essential for evaluating fetal head size, shape, and cranial suture integrity (Figure 2).
- In this plane, the **thalami** appear as paired, symmetrical, oval structures situated centrally within the brain. Between the thalami, the **third ventricle** is visualized as a narrow, midline slit. In this plane **Sylvian fissures** can also be assessed.

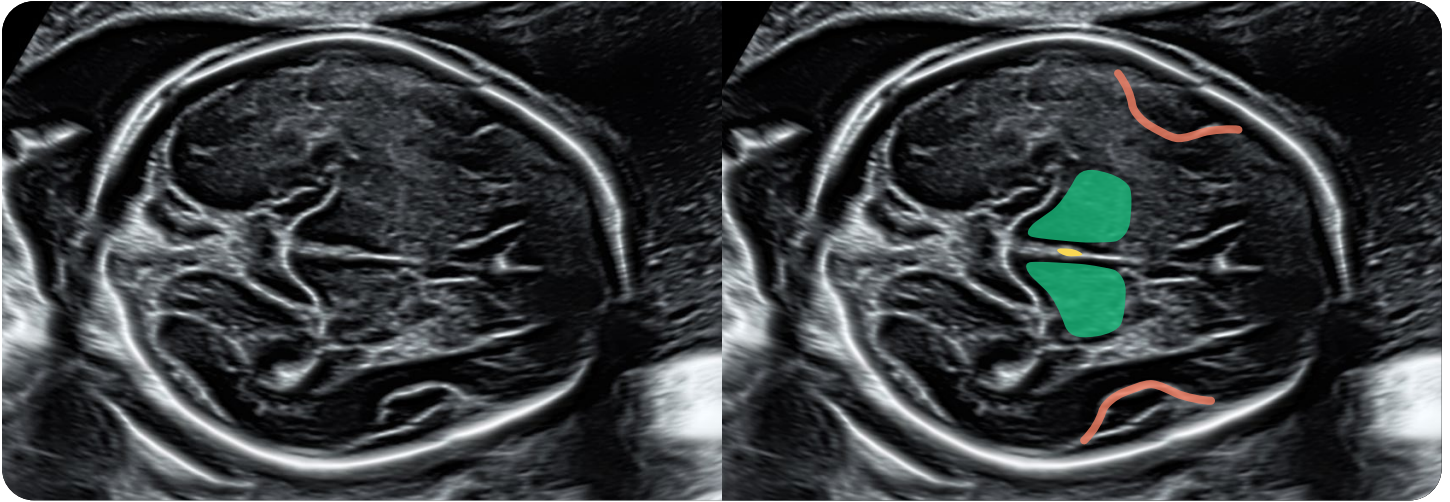


Figure 2. Transthalamic plane

## Transcerebellar plane

- This plane is used to evaluate the **posterior fossa structures**, including the **cerebellum**, **presence and integrity of the vermis**, as well as the **shape and size of the fourth ventricle** and **cisterna magna** (Figure 3). Both the presence of these anatomical features and their **biometry and morphology** should be carefully assessed and documented.
- When examining the **cisterna magna**, it is common to observe **septations**, the number of septations vary from 1 to 5 and are dural folds. Remnants of **Blake's pouch** can also be present positioned in a lower plane. When the inclination of this plane is more than 15° **communication between the fourth ventricle and cisterna magna** may be visible, particularly during scans conducted **before 20 weeks' gestation**. This finding is typically physiological and results from the **incomplete coverage of the fourth ventricle by the developing cerebellar vermis** at that stage.

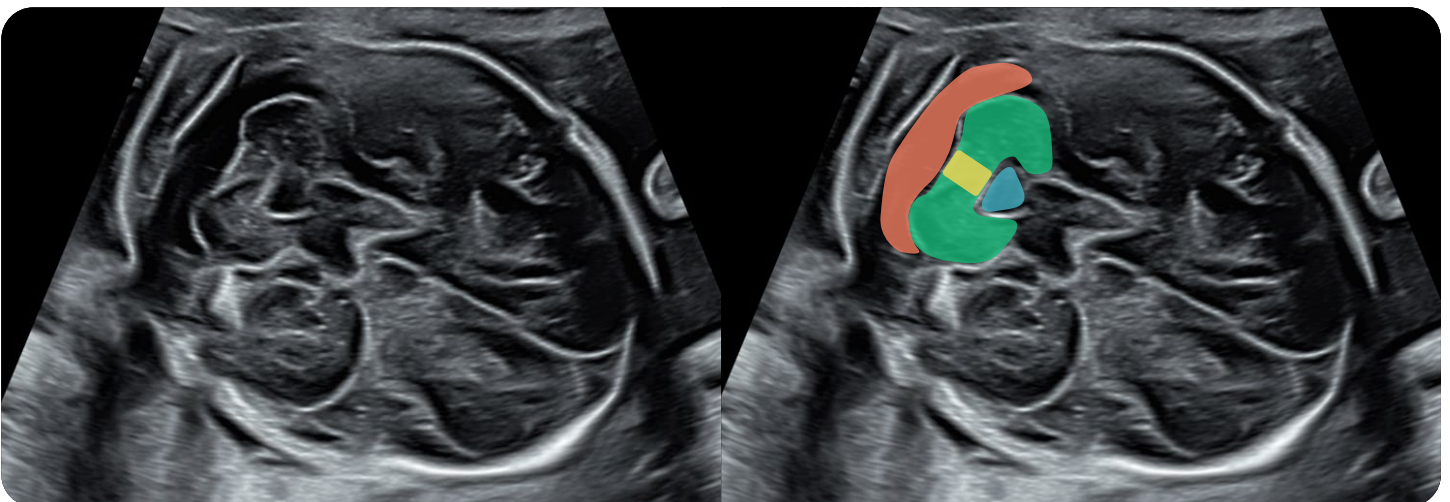


Figure 3. Transcerebellar plane

## Sagittal planes

- The midsagittal view, when obtained transabdominally, can offer a detailed evaluation of **midline brain structures**, which are essential for confirming **normal fetal brain development**. This plane is particularly valuable in the diagnosis and differentiation of structural brain anomalies, such as **commissural and posterior fossa abnormalities**.
- **Key structures** assessed in the midsagittal and parasagittal planes include:
  - **Corpus callosum:** A C-shaped, hypo-echogenic structure; assessment includes its **presence, size, and structural continuity**, all of which are vital for normal brain function.
  - **Cavum septi pellucidi (CSP):** An anechoic space located under the corpus callosum.
  - **Cavum vergae and cavum veli interpositi:** Common **normal variants** that may be visualized in this plane.
  - **Brainstem:** Evaluated for its **position and anatomical relationship** with surrounding structures, particularly the **cerebellum and vermis**.
  - **Cerebellar vermis:** Clearly seen in the midsagittal view from **18 weeks' gestation**, its presence and morphology help in ruling out posterior fossa abnormalities.
  - **Parasagittal plane:** Allows to assess the wall of the lateral ventricles and periventricular area, choroid plexus and area of caudothalamic groove.

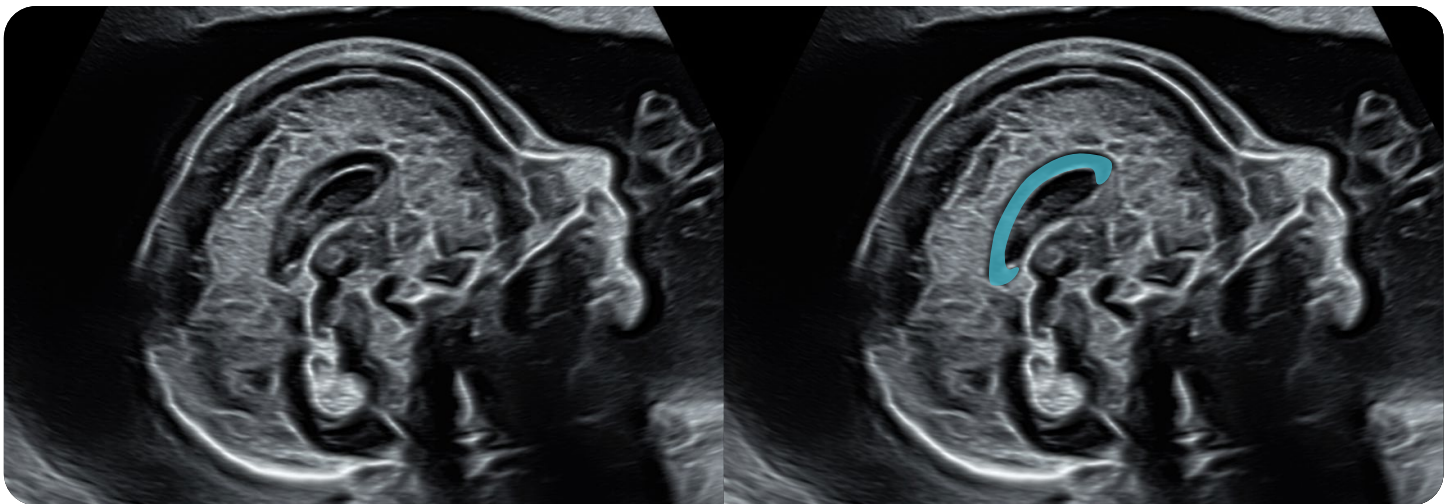


Figure 4. Sagittal plane with focus on the corpus callosum

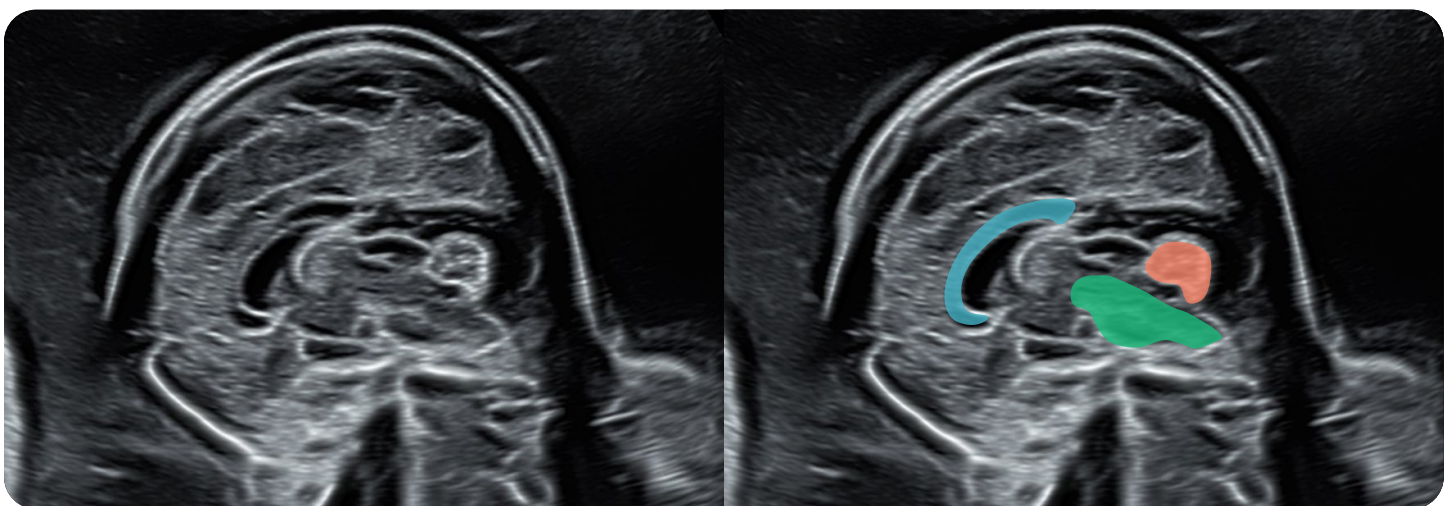


Figure 5. Sagittal plane with focus on the infratentorium

## Sagittal planes *(continued)*

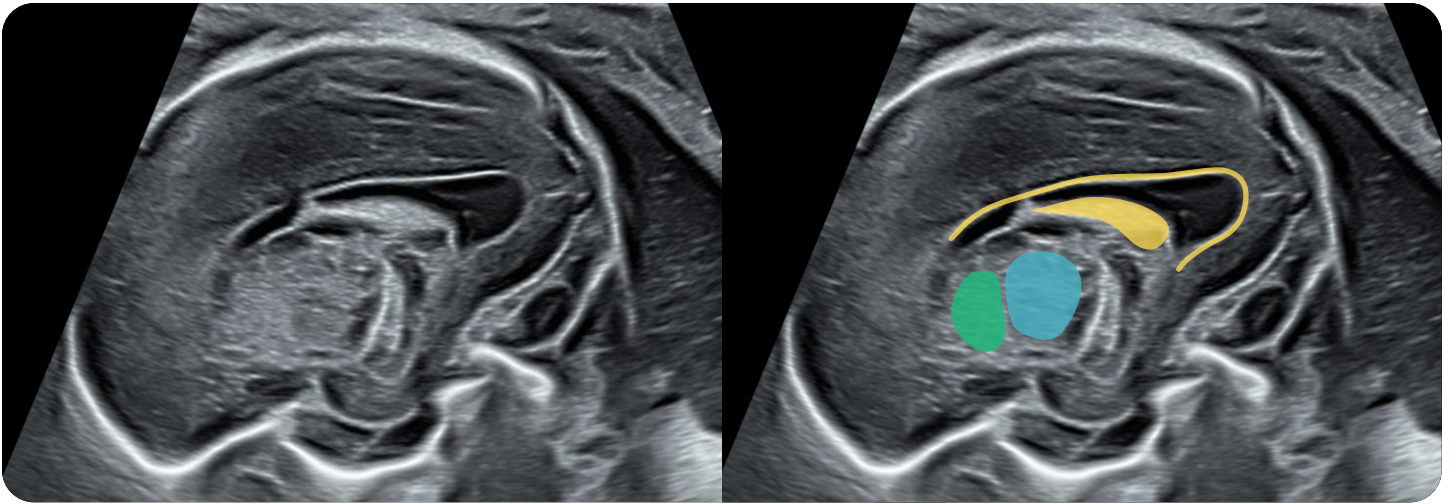


Figure 6. Parasagittal plane with focus on the lateral ventricle and caudothalamic groove

## Coronal planes

- In these planes of the fetal brain, taken by **transabdominal ultrasound**, it is possible to assess the **symmetry of the cerebral hemispheres**, the **midline**, and the **size and configuration of the lateral ventricles**. In later stages of gestation, these views also allow assessment of **cortical development patterns**.

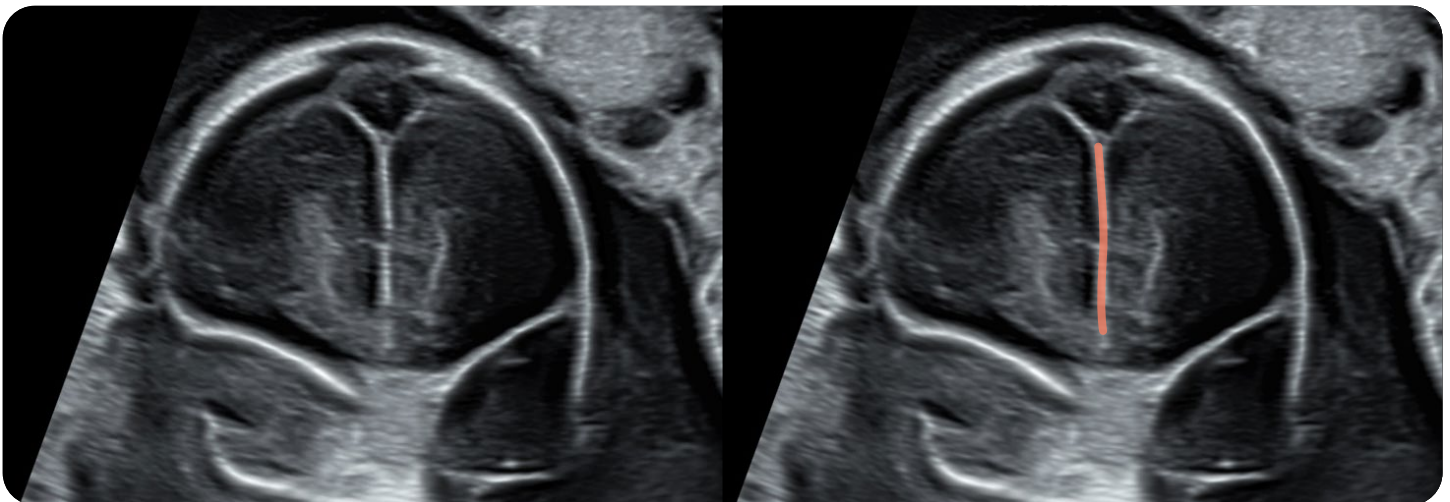


Figure 7. Coronal plane with focus on the interhemispheric fissure

## Coronal planes *(continued)*

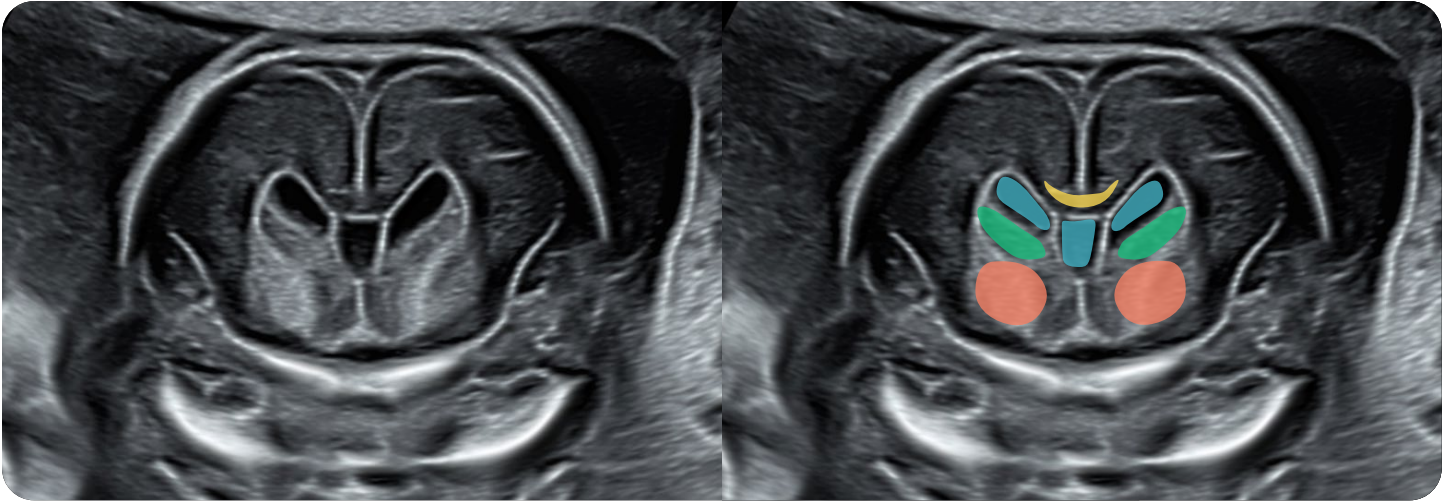


Figure 8. Coronal plane with focus on the anterior complex

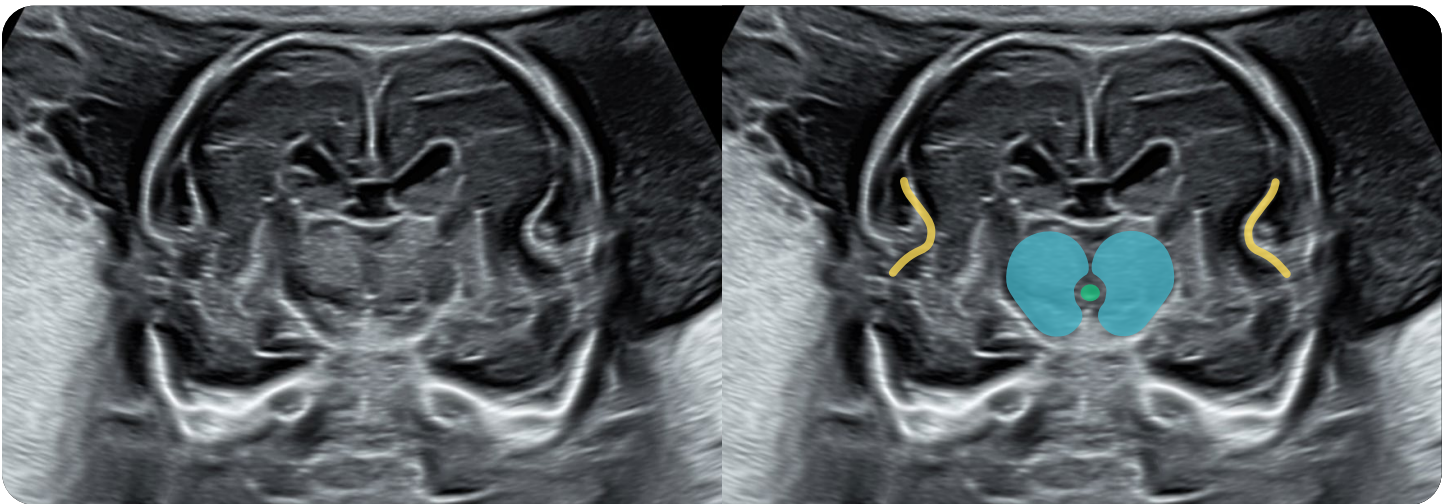


Figure 9. Coronal plane with focus on the Sylvian fissures and thalami

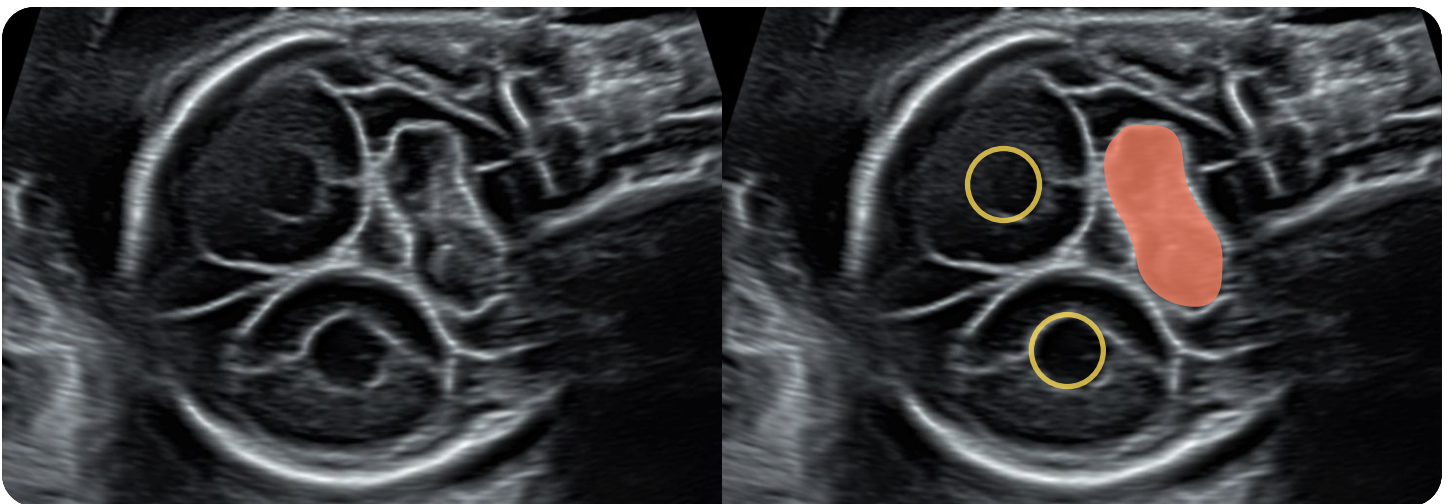


Figure 10. Coronal plane with focus on the cerebellum and posterior horns of the lateral ventricles

## Conclusion

Transabdominal neurosonography is an important part of routine fetal brain screening, providing vital information through multiple planes of assessment. While transvaginal imaging offers superior detail in expert hands, transabdominal ultrasound continues to deliver high-quality diagnostic insights, especially with modern technological advancements.

A systematic approach using standardized planes—transventricular, transthalamic, transcerebellar, ensures comprehensive evaluation of key intracranial structures across gestation. Visualization of sagittal, parasagittal and coronal planes is possible, however detailed evaluation should be performed transvaginally. Accurate image acquisition, anatomical understanding, and measurement techniques are critical for identifying normal brain development and detecting early signs of pathology. When performed correctly, transabdominal assessment is a powerful tool in prenatal neuroimaging.



\*ISUOG International Society of Ultrasound in Obstetrics and Gynecology

\*\*AIUM American Institute of Ultrasound in Medicine

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