The first-trimester fetal central nervous system: a novel ultrasonographic perspective

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Case Notes

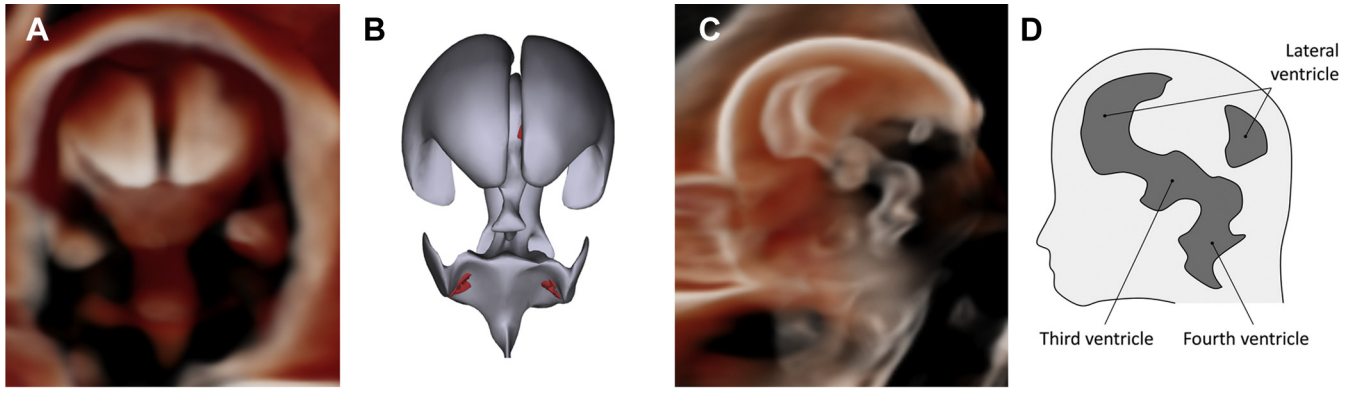
A 32-year-old nulliparous pregnant woman presented for a routine first-trimester obstetric ultrasound scan that demonstrated a viable intrauterine pregnancy with a crown-rump length of 67 mm (13 weeks and 1 day gestation). On 2-dimensional imaging using a WS80 Elite system (Samsung Medison Ltd, Seoul, Republic of Korea), all fetal anatomical structures examined appeared normal within the limitations of the examination and gestation. A 3-dimensional (3D) volume of the fetus was obtained by sagittal and coronal acquisition and examined using Crystal Vue and Realistic Vue software (Samsung-Medison, Korea),[1] which revealed a novel 3D impression of the fetal ventricular system comparable to digitally reconstructed embryological models[2] (Figure).

Comment

The fetal central nervous system and, in particular, ventricular system, is usually difficult to examine in any great detail in the first trimester as it is rapidly changing. Furthermore, visualization of the anatomical complexity of the central nervous system is limited by image resolution.[3] The technical challenges of imaging the fetal brain during the first trimester have been evidenced by the difficulty of implementing routine first-trimester examination of posterior fossa intracranial

FIGURE

Three-dimensional perspective of the first-trimester fetal ventricular system



A, Coronal view with Crystal Vue and Realistic Vue software (Samsung-Medison, Korea). **B**, Digital reconstruction of ventricular system of stage-23 human embryo from 3-dimensional atlas of human embryology.[2] **C**, Sagittal view with software. **D**, Schematic drawing of ventricular system as presented in sagittal plane.

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translucency as a screening test for open neural tube defects.[4] A further limitation is that thorough knowledge of both sonoembryology and the use of 3D multiplanar reconstruction and analysis are required to obtain diagnostic 3D images.

Crystal Vue and Realistic Vue (Samsung-Medison, Republic of Korea) are image-contrast enhancement and rendering software particularly effective at enabling perception of depth while preserving context and surface information. As demonstrated in this case, they allow visualization of the entire fetal ventricular system in a completely new way and enable imaging of structures not usually seen using standard 2-dimensional or 3D methods. The relatively simple use of this software may help to improve our understanding of neurodevelopmental changes in the first trimester. In addition, it may provide insight into pathognomonic markers of ventricular system anomalies and thus enable identification and diagnosis of fetal central nervous system abnormalities well before the second trimester. ■

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