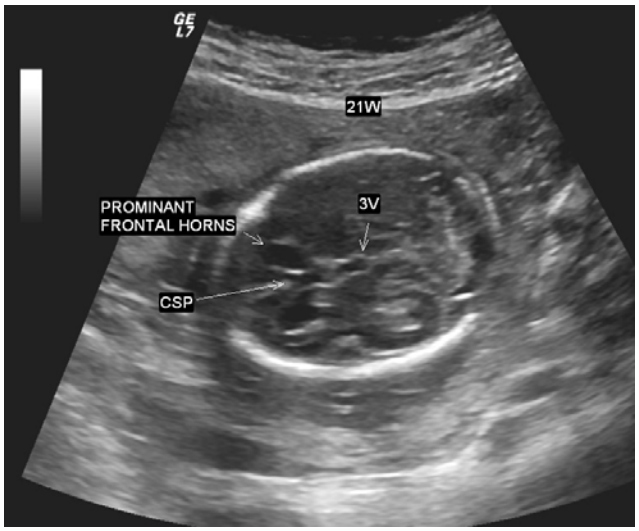
Universal Fetal Cardiac Ultrasound-
At the Heart of Newborn Well-Being
HUDSON VALLEY RADIOLOGY ASSOCIATES

MR CASE STUDY: Autopsy-proven CMV fetopathy.

HISTORY: Elderly primigravida patient with normal first trimester screen presents at 21-weeks for detailed anatomy scan. At that time, ultrasound demonstrates echogenic bowel (not shown). Intracranial assessment demonstrated a dilated third ventricle, prominent caliber to the frontal horns but normal caliber atrium of the lateral ventricles. MFM consultation reported normal appearing brain.

Image 1



Patient returned at 24w5d at which time the bony head circumference was two weeks smaller than expected (see image 2). Fetus was breech precluding transvaginal technique to optimize intracranial assessment. Employing transabdominal insonation through the anterior fontanel, multiple intraparenchymal brain calcifications were identified distributed predominantly around the ventricles (see image 3).

Image 2

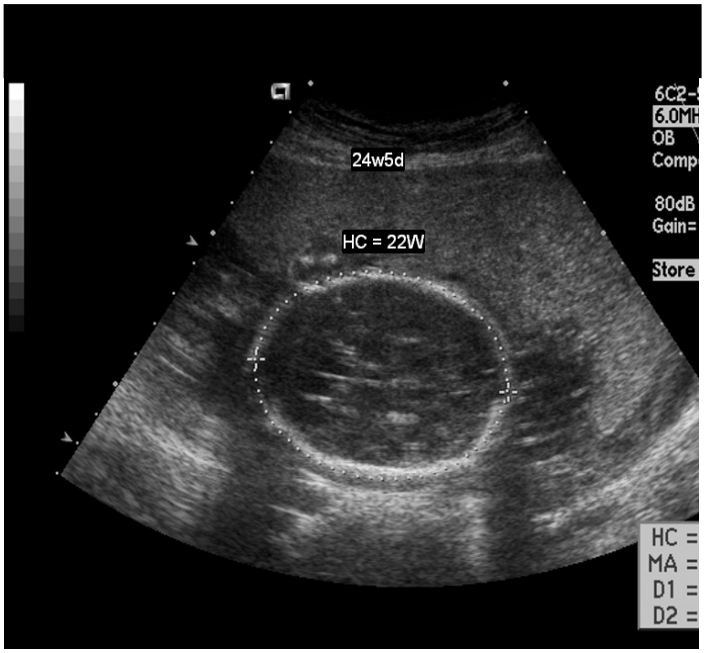
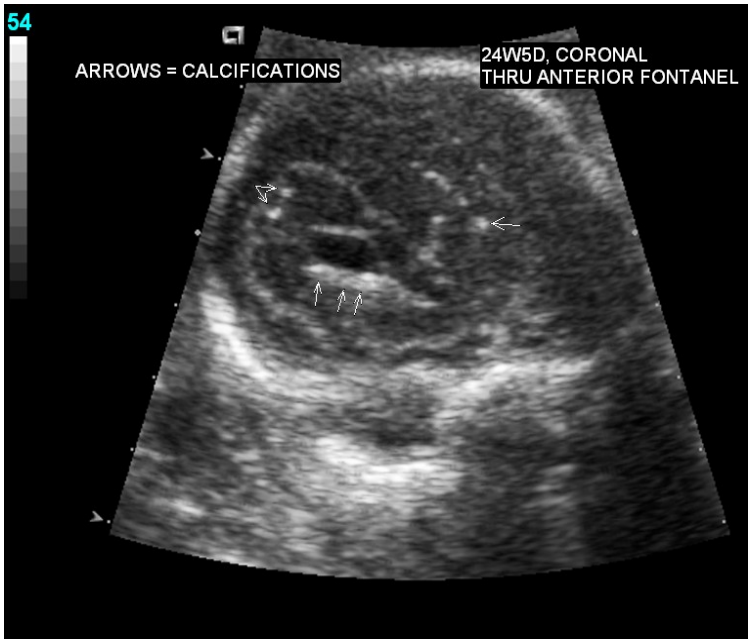


Image 3



Fetal MR was obtained. Image 4 demonstrates direct brain parenchymal biparietal diameter at 2.7 standard deviations smaller than expected for gestational age with diffuse enlargement of subarachnoid spaces, consistent with brain parenchymal microcephaly.

Image 4

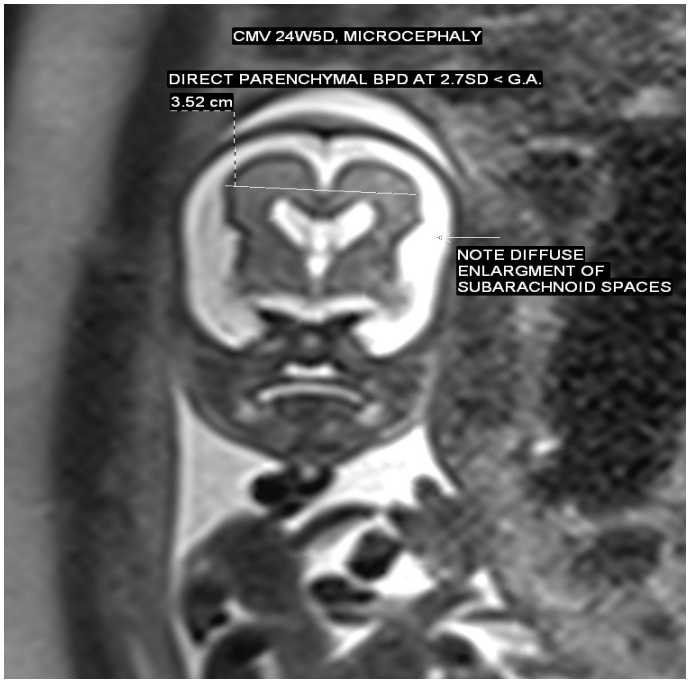


Image 5 demonstrates excessively shallow sylvian fissures for gestational age.

Image 5

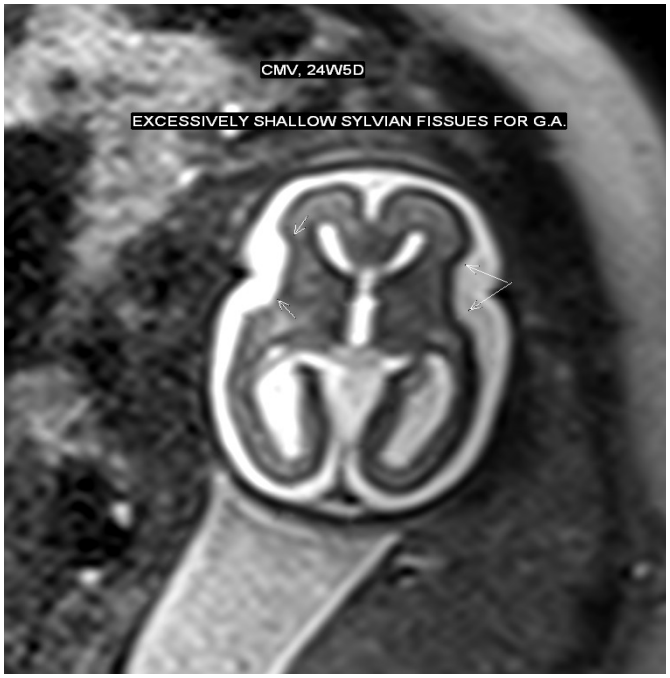


Image 6 demonstrates extensive micronodular texture to brain parenchyma effacing the normally seen multilaminar organization of brain parenchyma.

Image 6

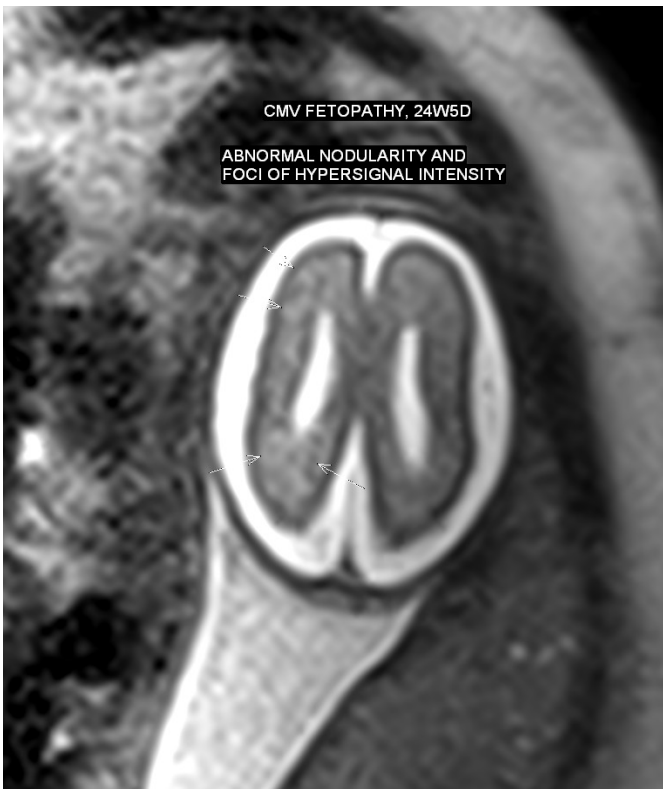
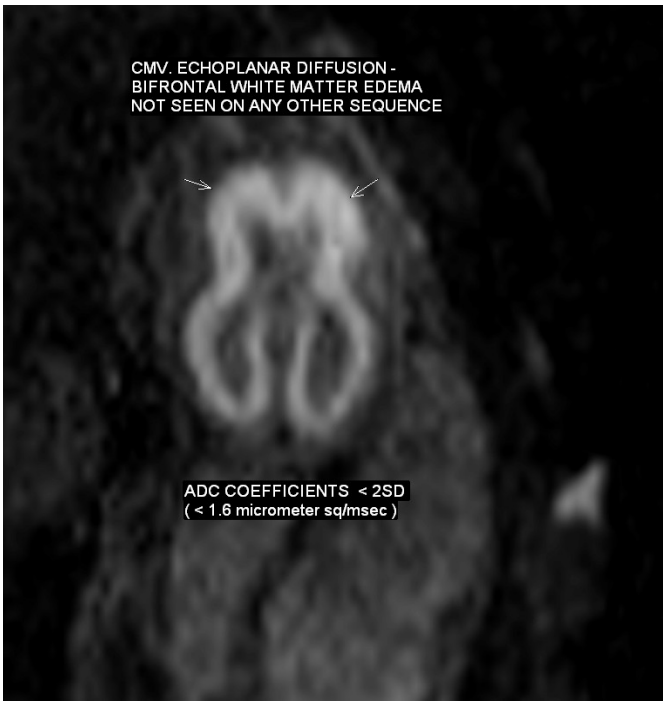


Image 7 is an echoplanar diffusion weighted sequence demonstrating bifrontal white matter edema, not seen on any other MR sequence.

Image 7



Patient terminated at 25 weeks. Autopsy demonstrated multiorgan CMV infection. Gross neuropathology inspection demonstrated diffuse symmetric cerebral atrophy. Histology demonstrated indistinct cortical ribbon and indistinct gray-white junction with multiple areas of focal polymicrogyria and extensive cytomegalic cytoplasmic inclusions with white matter congestion and marked microglial activation.

Gross and histologic findings correlate well with MR observations. The histologic observation of indistinct gray-white matter junction correlates with the effacement of the multilaminar MR pattern of normal brain organization. The extensive micronodularity seen on MR corresponds to the extensive infiltration with CMV inclusion bodies. The polymicrogyria, a neuromigrational disorder, corresponds to the delayed and poorly developed sylvian fissures. The extensive white matter congestion and marked microglial activation corresponds to the bifrontal white matter edema seen on the diffusion weighted sequence.

TEACHING POINTS:

1. Consider fetal brain MR when ultrasound measurements of the bony calvarium are less than expected. The ability of MR to directly measure brain parenchyma and to demonstrate intraparenchymal abnormalities not visible on ultrasound provides earlier, more confidant, diagnosis of clinically significant pathology.

2. Ultrasound attributes of improved intracranial assessment insonating through the anterior fontanel – brain parenchymal calcifications would otherwise have been missed.

3. The unique MR imaging attributes of echoplanar diffusion pulse sequence – a sequence capable of imaging white matter edema that may not be present on any other pulse sequence. Brain parenchymal hypersignal intensity on diffusion-weighted sequences reflects decreased diffusion of water molecules in the extracellular space from acute/subacute cytotoxic edema. Echoplanar diffusion pulse sequence is necessary in the evaluation of brain parenchymal insults of ischemic, infectious, or metabolic origin.

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