

## Fetal MRI in Early Second Trimester Pregnancy

M. Raiend<sup>1</sup>, H. Amini<sup>2</sup>, H. Ahlström<sup>1</sup>, O. Axelsson<sup>2</sup>, J. Wikström<sup>1</sup>

<sup>1</sup>Department of Radiology, Uppsala University, Uppsala, Sweden, <sup>2</sup>Department of Womens and Childrens Health, Uppsala University, Uppsala, Sweden

**Introduction:** Fetal MRI has in previous studies shown to be of value for the diagnosis of various abnormalities (1-4). These studies have however been heterogeneous with regard to fetal gestational age. Small fetal size and unrestricted movements are limiting factors for MRI in earlier parts of pregnancy. The aim of the present study was to assess the value of fetal MRI in early second trimester.

**Material and methods:** Fetuses with any detected abnormality on routine ultrasound examination were eligible for inclusion in the study. 56 fetuses with gestational age 15-22 weeks, at the time of the ultrasound, were included. MRI was performed within 1 to 3 days after the ultrasound in 38 cases, within 4-7 days in 13 cases and within 8-14 days in 3 cases. The examinations were performed on a 1.5 T scanner (Gyrosan Intera, Philips Medical Systems) using a body phased array coil. T2-weighted images were acquired in the three main planes of the fetus (sagittal, coronal, axial) with a Single-Shot Turbo Spin Echo sequence. Imaging parameters were (TR/TE/flip angle): 897 ms/ 80 ms/ 90°, with a slice thickness of 3 mm and an in-plane resolution of 1.6x2.6 mm. Imaging was performed during free breathing with respiratory gating to avoid artifacts. No pre-medication was administered. In addition, axial T1-weighted 2D magnetization prepared gradient echo images were obtained with imaging parameters (TR/TE/flip angle): 10 ms / 4.6 ms/ 15°, with a slice thickness of 8 mm and an in-plane resolution of 1.6x2.2 mm. The images were evaluated with full knowledge of the result of the preceding ultrasound examination. Abnormalities in all organ systems were registered. An assessment was made if the MRI investigation confirmed the main or secondary ultrasound findings and if any additional relevant findings were made. This was made in consensus between a referring obstetrician (HA) and two radiologists (MR,JW).

**Results:** The main ultrasound findings were CNS lesions in 7 cases, oligohydramnios in 8 cases, urinary tract abnormalities in 8 cases, limb abnormalities in 8 cases, gastrointestinal abnormalities including diaphragmatic herniations in 17 cases, and various other lesions in 8 cases. In 17 of the 56 cases (30 %), MRI added relevant findings to the ultrasound examination. Additional relevant information was obtained in 6/7 cases with CNS lesions, in 5/8 cases with oligohydramnios and in all 3 cases with diaphragmatic herniation. In 32 cases (62 %) MRI confirmed the ultrasound findings but did not add relevant information. MRI could not confirm the main ultrasound finding in 5 cases (8%). Two of these cases were fetuses with short for gestational age limbs. In one case ascites detected on the screening ultrasound examination could not be seen with MRI (but was neither present on follow-up ultrasound). In one case the abdominal ventricle could not be visualized with ultrasound, but was present on the MRI examination. In the last case, a small suspected omphalocele could not be verified with MRI.

**Conclusion:** Fetal MRI is feasible in early second trimester pregnancy. The technique is of value especially for the evaluation of CNS lesions, diaphragmatic hernias and in cases with oligohydramnios. The evaluation of limb abnormalities may be improved with increased experience and addition of three-dimensional surface renderings.



1. Caire JT, Ramus RM, Magee KP, Fullington BK, Ewalt DH, Twickler DM. MRI of fetal genitourinary anomalies. *AJR Am J Roentgenol* 2003;181:1381-5.
2. Hubbard AM, Adzick NS, Crombleholme TM, Haselgrove JC. Left-sided congenital diaphragmatic hernia: value of prenatal MR imaging in preparation for fetal surgery. *Radiology* 1997;203:636-40.
3. Levine D, Barnes PD, Robertson RR, Wong G, Mehta TS. Fast MR imaging of fetal central nervous system abnormalities. *Radiology* 2003;229:51-61.
4. Levine D, Barnewolt CE, Mehta TS, Trop I, Estroff J, Wong G. Fetal thoracic abnormalities: MR imaging. *Radiology* 2003;228:379-8

Dandy-Walker malformation in 19 week fetus, where ultrasound had shown a non-specific cyst in the posterior fossa. Sagittal image clearly shows the defect in the roof of the fourth ventricle and a rotated vermis (arrow).