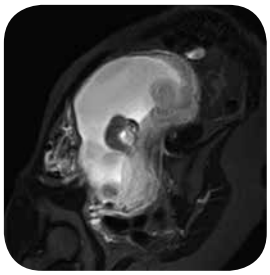

Utility of Magnetic Resonance as a Prenatal Diagnosis Method and Review of Our Experience: Case Series

Utilidad de la resonancia magnética fetal como método de diagnóstico corporal prenatal y revisión de nuestra experiencia: Serie de casos

Key words (MeSH)
Fetus
Congenital anomalies
Magnetic resonance imaging
Prenatal diagnosis

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Summary

Magnetic resonance imaging (MRI) and fetal ultrasound are complementary techniques. Fetal MRI is useful in the detection and characterization of congenital anomalies. Our objective is to show the usefulness of this diagnostic technique and to show our experience with six cases evaluated in our institution from 2013 to 2015. It includes pregnant women during the second and third trimester, remitted due to suspicion of various pathologies as detected by fetal ultrasound.

Palabras clave (DeCS)
Feto
Anomalías congénitas
Imagen por resonancia magnética
Diagnóstico prenatal

Resumen

La resonancia magnética (RM) fetal es una valiosa técnica complementaria de la ecografía prenatal, útil en la detección y caracterización de anomalías del desarrollo fetal. El objetivo es mostrar la utilidad de esta técnica diagnóstica, así como dar a conocer nuestra experiencia mediante seis casos diagnosticados en el periodo comprendido entre 2013 y 2015. Esta experiencia incluye gestantes en el segundo y tercer trimestres de gestación, remitidas por sospecha diagnóstica de diversas patologías fetales con ecografía obstétrica.

Introduction

Although ultrasound remains the initial mode of choice in the assessment of pregnancy and fetal disorders, it has certain limitations. This is why fetal magnetic resonance imaging (MRI) arises as an excellent complement to ultrasound in pregnancy, since, unlike the latter, it is not significantly limited by maternal obesity, fetal position or oligohydramnios, and the ossified skull does not restrict visualization of the brain. It also offers enhanced contrast resolution for soft tissues, is able to distinguish individual fetal structures such as lung, liver, kidney and intestine and can also provide useful information on the placenta, umbilical cord, amniotic fluid and the uterus (1). For this reason we want to present our experience for the diagnosis of fetal pathologies through six cases that arrived at our institution with obstetrical ultrasounds that showed findings suggestive of fetal pathology or inconclusive, which needed confirmation or better characterization of the findings.

Adequate moment

Current evidence has not conclusively documented deleterious effects of MRI magnetic fields of 1.5 tesla on fetal development. Guidelines for the safe and optimal use of fetal MRI established by the American College of Radiology (ACR) and the Pediatric Radiology Society (PRS) state that there is no special consideration for any trimester of pregnancy and that use of fetal

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MRI is acceptable in pregnant patients if another method of non-ionizing diagnosis is inconclusive (2). However, it is advisable to wait until 17 or 18 weeks of gestation before performing it. This period excludes the period of development of the fetus (organogenesis) (1).

Gadolinium-containing contrast medium is considered a Class C drug, which means that it has not been proven to be safe for humans. Some studies have determined that the chelates cross the placenta, penetrate the fetal circulation and remain for an indeterminate time, so the biological half life in the fetus is unknown; Therefore, it is not advisable to use it during pregnancy (2).

Case 1

A 20-year-old female, G2P1A0, with a pregnancy of 25.4 weeks according to the last menstrual period, with no pathological or gynecobstetrical history of importance, with five prenatal controls, with the last ultrasonography of malformation in the head and neck of cystic aspect (not documented in the images); A fetal MRI is performed in a 1.5 Tesla device, which reveals a lesion in the soft tissues of the left hemiface with a multiseptous cystic aspect with no involvement of the area, compatible with a facial lymphatic malformation, which was evidenced at birth (figure 1a and b).

Case 2

A 31-year-old female, G2P1A0, with a pregnancy of 24.5 weeks according to the last menstrual period, with no significant gynecobstretic antecedents, with a previous ultrasound (not documented in the images) showing moderate left pleural effusion associated with decreased ipsilateral pulmonary volume; the fetal MRI performed confirmed left pleural effusion and, additionally, ipsilateral pulmonary hypoplasia, as well as extralobar pulmonary sequestration which had not been observed by previous ultrasound study (figure 2a and b).

Case 3

A 19-year-old female, G1P0A0, with a 20.6-week pregnancy according to the last menstrual period, was referred for fetal MRI due to a finding of pulmonary hypoplasia and dextrocardia in a previous ultrasound study (not documented in the images); fetal resonance is performed 15 days after the ultrasound diagnosis, confirming the reduction of bilateral lung volume with a greater left compromise, associated with a left posterolateral diaphragmatic hernia defect with protrusion by the latter of the hepatic segments II and III, gastric chamber and intestinal loops. Additionally, presented dextrocardia. Findings are compatible with pulmonary hypoplasia secondary to Bochdalek hernia (figure 3a and b).

Case 4

A 28-year-old female, G3P2A0, with a 31.2-week pregnancy according to the last menstruation, with three previous controls, referred due to hemorrhage in the first trimester associated with 10% retroplacental hematoma at 8 weeks, which was solved in the controls Later. The last ultrasound showed probable omphalocele and gastroschisis, so fetal MRI was performed with emphasis on the gastrointestinal system, which evidenced a wall defect in the midline at the navel level where the contents of solid viscera and intestinal loops protrude contained in a thin membrane of low signal, that generates marked diminution of the abdominal circumference and confirms the omphalocele (figure 4a and b).

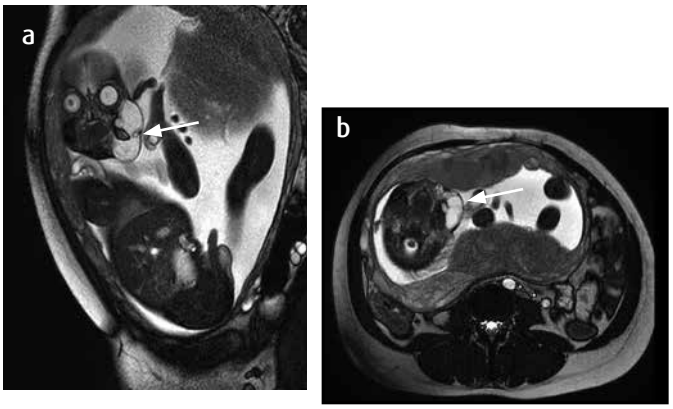

Figure 1. MRI. a) Sagittal with T2 information; b) axial with T2 information. Patient of 25.4 weeks. Injury to the facial soft tissues, with a multisepted cystic component (arrow), with a diameter of 4.0 cm × 3.6 cm × 4 cm, well defined margins, without area compression.

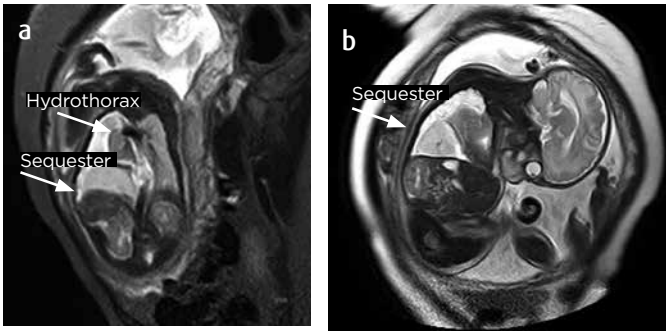

Figure 2. Patient of 24.5 weeks of gestation. MRI a) Sagittal STIR: Left pleural effusion (short arrow), decreased ipsilateral lung volume with diameters of 3.5 cm × 2.75 cm × 2.85 cm and volume of 14.6 cm 3, in relation to pulmonary hypoplasia. b) With coronal T2 information: Right infradiaphragmatic mass in the inferior and lateral aspect that shows intensity signal similar to the lungs (long arrow), measures 4.4 cm × 2.3 cm × 4.7 cm, volume of 24 cm3 with nutrient vessel from the aorta in relation to extralobar pulmonary sequestration.

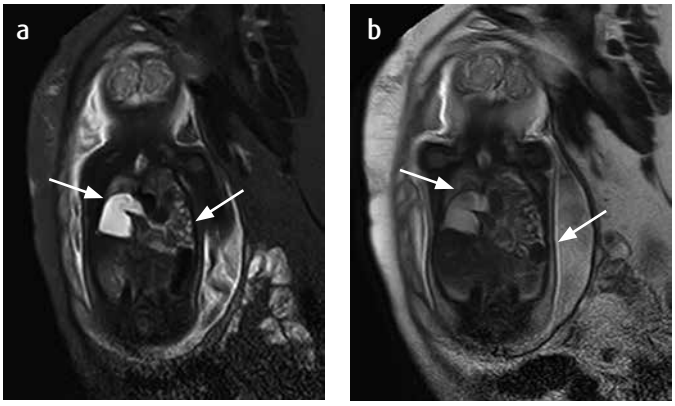

Figure 3. MRI a) Sagittal STIR; b) with coronal T2 information. Patient 20.6 weeks gestation. Thoracic anomaly due to decreased bilateral lung volume with greater left compromise is observed. Right of 2.56 cm × 1.70 cm × 2.23 cm and volume of 4.86 cm3; Left of 1.60 cm × 1.40 cm × 1.30 cm and volume of 1.51 cm3. Additionally, dextrocardia is seen. A left posterolateral diaphragmatic hernia defect is visualized with protrusion of segments II and III of the liver, gastric chamber and intestinal loops.

Case 5

A 19-year-old G1P0A0 patient, with a twin pregnancy of about 28.4 weeks according to the last menstrual period, without adequate prenatal controls, was referred for non-conclusive anomaly seen by extrainstitutional ultrasound (not documented in the images). Fetal MRI is performed with emphasis on total body image, which evidences monochorionic twin pregnancy, monoamniotic, with medial thoracoabdominal junction; both fetal heads, heart, spine and upper extremities are displayed independently for each fetus. Female pelvis shared (not visualized in the images). There is an associated diaphragmatic hernia in the right fetus, as an additional finding, compatible with ishiophage siamese (figure 5a and b).

Case 6

A 32-year-old female patient, G1P0A0, with a 22.2-week pregnancy, with no previous history, with second-trimester ultrasound with suspicion of achondroplasia, fetal MRI showing shortening of the upper and lower extremities, as well as thoracoabdominal disproportion. In subsequent ultrasound controls, a percentile is maintained much lower than expected for gestational age. At birth, the imaging findings are confirmed (figure 6a, b and c).

Discussion

In our institution, fetal MRI is performed in a 1.5 T equipment. The use of magnetic fields with higher tesla fields requires studies for its validation. The exploration begins with the pregnant patient in supine position, previous bladder emptying and fasting of four hours. The study lasts for about 30 minutes, but this may vary with the number of sequences chosen according to fetal pathology. A multi-channel surface antenna is used. After obtaining T2-weighted locator images, continuous images with a thickness of 1 mm were acquired using super-fast single-shot turbo spin echo techniques (SENSE, HASTE, SSFSE, SSTSE) and T2-weighted balanced sequences (BFFE) on three planes of the fetus (3). Additionally, axial images with T1 information, GRE, diffusion (DWI) and apparent diffusion coefficient (ADC) are obtained if it is necessary to emphasize the central nervous system (4,5). Under this protocol, fetal MRI was performed in all six patients, adapting it and emphasizing it in the suspected fetal pathology. All patients had an indication for the performance of fetal MRI for fetal pathology previously discovered on ultrasound or with inconclusive diagnoses, in order to confirm or rule out the initial pathology, to determine the associated complications, to classify the severity, as well as to provide pre and post-partum advice. Likewise, to establish the prognosis, the viability of the fetus and its possible prenatal or postnatal treatments (6).

Conclusions

The objective of fetal MRI is to detect lesions or anomalies not visualized by ultrasound or to clarify equivocal ultrasound findings. Ultrasound remains the first imaging technique in pregnant women and its results largely determine the indication for MRI. The gestational age at which fetal MRI should be performed depends on the moment of suspicion of abnormalities; we performed fetal MRI at weeks 18 and 22 of gestation (7).

Fetal MRI allows an excellent detailed visualization of the fetus in the uterus as well as pregnancy structures, thus contributing to the detection of subtle fetal anomalies and evaluation of complex lesions, to guide the prognosis and viability of the fetus and its possible prenatal or postnatal treatments (6).

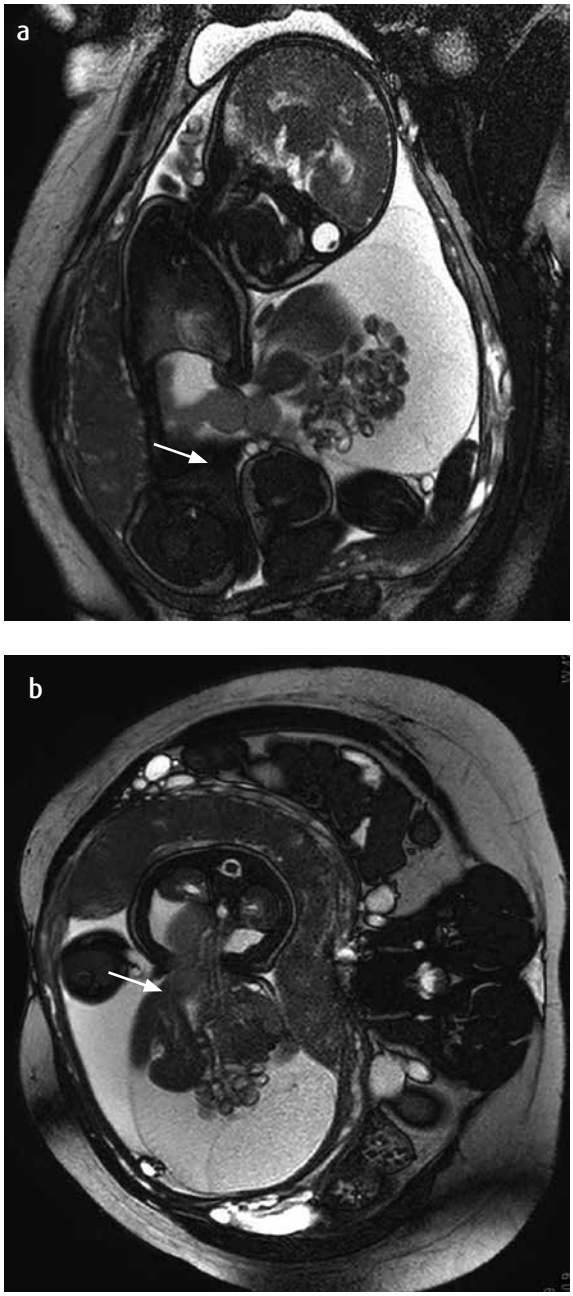

Figure 4. MRI a) with coronal T2 information; b) with axial T2 information. Patient 31.2 weeks gestation, with a midline wall defect at the level of the umbilicus, which protrudes the contents of solid viscera and intestinal loops (arrow), which are contained in a low signal membrane with ascites, which generates a marked decrease of the abdominal circumference.

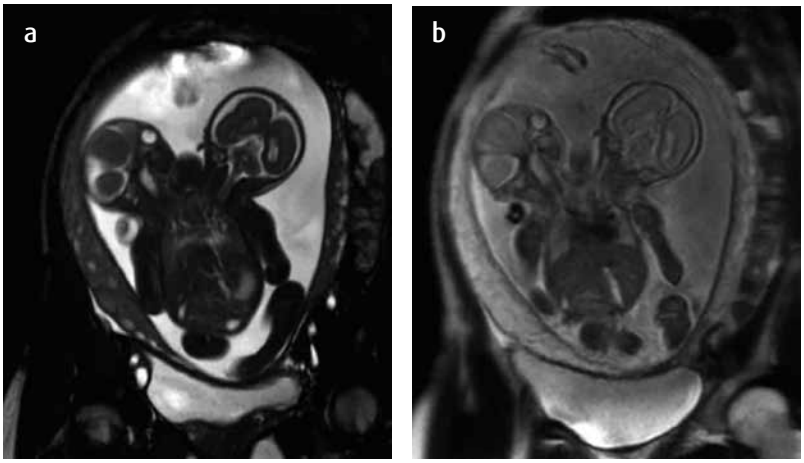

Figure 5. MRI a) Coronal STIR; b) with coronal T2 information. Patient 28.4 weeks gestation. A medial thoracoabdominal junction is seen, with both heads and separate hearts being visualized. Defined medial and medial lateral superior extremities, two lower extremities and a single cord.

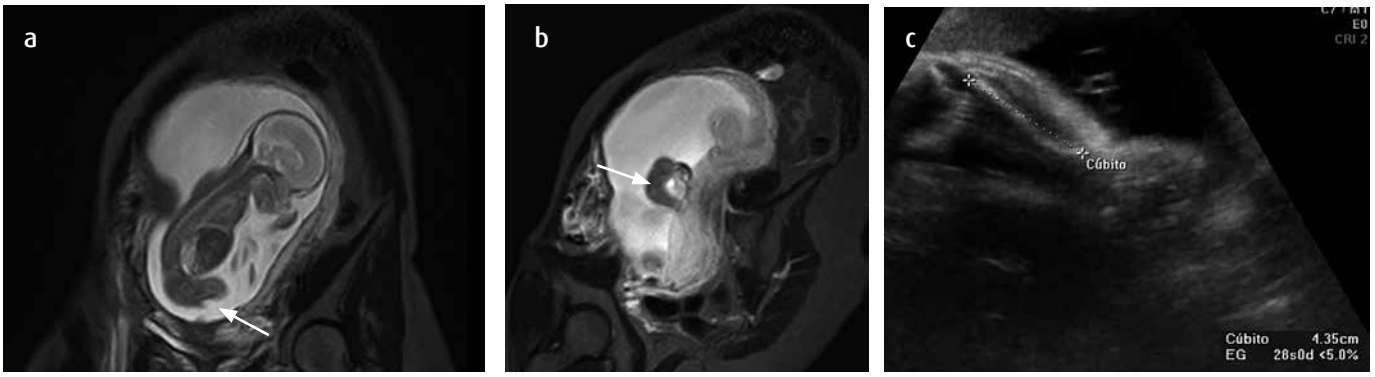

Figure 6. MRI a) with coronal T2 information; b) Sagittal STIR. Patient with a history of second-trimester ultrasound with suspected achondroplasia. Fetal MRI at 22.2 weeks: Femur shortening a) and humerus b) (arrows) bilateral. Thoracoabdominal disproportion. c) Ultrasound of obstetric detail in the third trimester, in which the length of long bones remains below the expected percentile, in relation to achondroplasia.

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