



Correlation between pre- and postnatal cerebral magnetic resonance imaging

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ABSTRACT

Objectives To evaluate the diagnostic accuracy of fetal cerebral magnetic resonance imaging (MRI) on a large cohort and to compare pre- and postnatal MRI data.

Methods This prospective study included all cases referred to our unit for fetal cerebral MRI examination between June 2006 and December 2009 and which underwent at least one postnatal MRI examination. Cases in which there was termination of pregnancy, fetal death or stillbirth were excluded. The pre- and postnatal diagnoses established by MRI were compared and divided into five subgroups: same diagnosis on pre- and postnatal MRI (Group 1); same diagnosis but different appearance related to the natural course of the disease (Group 2); different diagnosis (related to limitations of fetal MRI) (Group 3); same diagnosis but with additional findings discovered on postnatal MRI examination (Group 4); or same diagnosis but different appearance related to the natural course of the disease (as in Group 2) and associated with additional findings discovered on postnatal MRI examination (Group 5). The prognostic impact of a possible disagreement between pre- and postnatal findings was evaluated.

Results One hundred fetuses were included. Fetal MRI was performed at a mean gestational age of 33 (range, 24–39) weeks and postnatal MRI at a mean age of 3.5 months. There were 53 cases classified as Group 1, 32 in Group 2, four in Group 3, 10 in Group 4 and one in Group 5. Thus, in 15 cases (Groups 3–5), there were discrepancies between pre- and postnatal findings (mostly related to corpus callosum anatomy, cortical and migration disorders). The discrepancy was judged to have a prognostic impact in 9/15 cases. Two

postnatal MRI examinations were performed in eight cases, in one of which the second examination showed subependymal heterotopia which were not detectable on the first examination.

Conclusion Pre- and postnatal MRI data showed good agreement in 85% of cases. There was disagreement with a prognostic impact in 9% of cases. Copyright © 2011 ISUOG. Published by John Wiley & Sons, Ltd.

INTRODUCTION

Fetal magnetic resonance imaging (MRI) has been developing in common prenatal practice for more than 20 years. The brain has always been a main field of application. So far, the diagnostic accuracy of fetal cerebral MRI has not been evaluated on a large series. Several studies have focused on the correlations between fetal MRI and neuropathological findings^{1–5}, but very few studies have compared pre- and postnatal MRI findings^{6–9}. In this study, our purpose was to analyze the prenatal MRI findings of a large cohort of fetuses, to evaluate its diagnostic accuracy and to compare prenatal with postnatal MRI data.

SUBJECTS AND METHODS

In this prospective study we included all fetuses referred to our institution and fulfilling the following criteria: (1) a fetal cerebral MRI examination performed between June 2006 and December 2009 (in cases with two MRI examinations, the results of the last one were taken into account); (2) neither termination of pregnancy, fetal death nor stillbirth; (3) at least one postnatal MRI examination

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performed (if two examinations were performed, the results of both were analyzed). Fetuses not fulfilling these criteria were excluded from the study. Institutional Review Board approval was obtained for this study and women gave their informed consent to participate.

For all cases, the ultrasonographic and/or clinical indications and gestational age at time of fetal MRI were recorded. Fetal MRI was performed on a 1.5-Tesla unit (Achieva Philips Medical Systems, Best, Netherlands) 30–40 min following fetal sedation achieved by maternal oral administration of flunitrazepam (1 mg). Fetal brain examination was performed using a phased-array abdominal coil, T1-weighted spin echo (SE), spectral presaturation inversion recovery (IR), fat-saturated sequences (693/14/2; flip angle, 90°; matrix, 256 × 125; field of view, 320 mm; section thickness, 4 mm; acquisition time, 2 min 56 s) and T2-weighted single-shot turbo SE sequences (15 000/120/1; flip angle, 90°; turbo SE factor, 102; matrix, 256 × 170; field of view, 300 mm; section thickness, 2 mm; acquisition time, 45 s). In some cases, T2* and diffusion weighted imaging (DWI) sequences were added.

The quality of the fetal MRI was evaluated and scored: as 'good' when there was absence of fetal motion artifacts, symmetry of the acquisition plane in at least two planes and good T1 contrast quality; as 'fair' in cases with slight fetal motion artifacts and/or asymmetry of the acquisition plane in at least two planes and/or poor contrast quality on T1-weighted images; and as 'poor' in cases with marked fetal motion artifacts and asymmetry of the acquisition plane in at least two planes and/or poor contrast quality on T1-weighted images.

In our institution, when fetal cerebral MRI is performed and when an abnormality is detected, all parents are offered the chance to meet and talk with a pediatric neurologist. A clinical follow-up is also offered, including a first examination by a pediatric neurologist at about 2 months of age (or sooner according to the clinical status evaluated by the neonatologists) and other subsequent examinations, at a rate depending on the clinical findings, usually once a year. In addition, cerebral MRI is performed at about 3 months of age, although it may be performed sooner and even repeated according to the clinical findings. We collected prospectively the clinical and imaging data, but the results of the clinical examinations were not taken into account and will be analyzed in another study. The gestational age at birth and the child's age at the time of postnatal MRI were recorded. Postnatal brain examination included T1, T2, T2*, T1 IR and DWI sequences.

The pre- and postnatal examinations were interpreted by two radiologists (C.G. and A.D.). The interpretations made at the time of the prenatal scan were used for comparison between prenatal and postnatal findings. The postnatal scans were read with knowledge of the prenatal data. In case of a disagreement between the two readers, a consensus was reached. The pre- and postnatal diagnoses established by MRI were compared and divided into five subgroups: Group 1: same diagnosis pre- and postnatally;

Group 2: same diagnosis but different appearance related to the natural course of the disease (e.g. increased or decreased ventricular dilatation, cyst volume, pericerebral space, decreased hemorrhage, increased clastic lesions); Group 3: different diagnosis (related to limitations of fetal MRI); Group 4: same diagnosis but associated with additional findings discovered on postnatal MRI examination; Group 5: same diagnosis but different appearance related to the natural course of the disease and associated with additional findings discovered on postnatal MRI examination.

In Groups 2–5, the prognostic impact was evaluated by a pediatric neurologist (M.L.M., T.B.) on the basis of relevant published data and a personal 13-year experience in the field of prenatal counseling with systematic postnatal follow-up and management of cerebral abnormalities.

RESULTS

During the study period, 509 fetal cerebral MRI examinations were performed in our institution and of these, 100 children fulfilled the inclusion criteria. Their indications for fetal MRI, which was performed at a mean gestational age of 33 (range, 24–39) weeks' gestation, are listed in Table 1. The quality of fetal MRI was considered good in 76 cases, fair in 23 cases and poor in one case.

The children were born at a mean gestational age of 39 (range, 33–42) weeks. The first postnatal MRI was performed at a mean age of 3 months and 18 days (range, 1 day–16 months). In eight cases, a second postnatal MRI was performed at a mean age of 6 months and 21 days (range, 9 days–17 months).

The pre- and postnatal diagnoses were subdivided as follows: normal; midline malformations (including partial and complete callosal agenesis, septal agenesis, inter-hemispheric cyst or lipoma, cephalocele); gyration and

Table 1 Indications for fetal magnetic resonance imaging (MRI) based on clinical or ultrasound findings in the study population (*n* = 100)

Indication	n
Midline malformation	31
Ventricular dilatation	25
Posterior fossa abnormalities	17
Subependymal cysts	5
Arachnoid cyst	4
Hemorrhagic disorders	3
Macrocrania	3
Cytomegalovirus seroconversion	2
Polyhydramnios	2
Vascular malformations	2
Hydrops fetalis	1
Choroid plexus cyst	1
Fetal alcohol syndrome	1
Fetal anemia	1
Gyration disorders	1
Fetal akinesia	1

In some cases there was more than one indication for MRI.

migration disorders (including tuberous sclerosis); posterior fossa abnormalities, including megacisterna magna and developmental, ischemic and hemorrhagic lesions; ischemic and/or hemorrhagic supratentorial disorders, including white matter abnormalities; cysts, including subependymal and arachnoid cysts (including arachnoid cysts of the posterior fossa); ventricular dilatation and pericerebral space enlargement; vascular malformations, including vein of Galen aneurysmal malformation and pial arteriovenous fistulas. The numbers of cases in each subgroup are given in Table 2. Certain fetuses and children presented with several lesions.

Comparison between pre- and postnatal data resulted in the following subgroups: there were 53 cases in Group 1 (Figures 1, S1 and S2), 32 in Group 2 (Figure 2 and S3), four in Group 3 (Figure 3), 10 in Group 4 (Figures 4 and 5) and one in Group 5 (Figure S4).

In Group 2, it was considered that the difference between pre- and postnatal findings had no prognostic impact. Indeed, the diagnosis was the same pre- and postnatally, and the parents had already been informed during prenatal counseling that a ventricular dilatation or a cyst may increase or decrease in size during the follow-up period.

In 15 (15%) cases (Groups 3–5), there were discrepancies between pre- and postnatal MRI diagnosis; their details are summarized in Table 3. In nine of these 15 (9%) cases, the different data observed during the postnatal period had a prognostic impact.

Moreover, it is noteworthy that in four cases, the prenatal MRI examination was normal, while the postnatal MRI examination was normal in nine cases (Table 2). In two of the four cases considered normal on prenatal MRI, there was good agreement between pre- and postnatal data, while in the other two cases there was not, postnatal examination revealing a mild old hemorrhage in a choroid plexus in one case and partial callosal agenesis in the other (Case 2, Table 3). In seven cases, the postnatal MRI examination was normal while the prenatal MRI examination had showed: mild ventriculomegaly ($n = 3$), enlarged pericerebral space ($n = 1$), retrocerebellar cyst ($n = 1$), megacisterna magna ($n = 1$) or white matter

Table 2 Pre- and postnatal magnetic resonance imaging (MRI) diagnoses in the study population

MRI diagnosis	Prenatal (n)	Postnatal (n)
Normal	4	9
Midline malformation	37	40
Gyration and migration disorder	10	14
Posterior fossa anomalies	16	16
Ischemic and/or hemorrhagic supratentorial disorders	13	15
Cysts (subependymal; arachnoid)	(5; 10)	(5; 9)
Ventricular dilatation and pericerebral space enlargement	30	26
Vascular malformations	2	2

In some cases there was more than one finding on MRI.

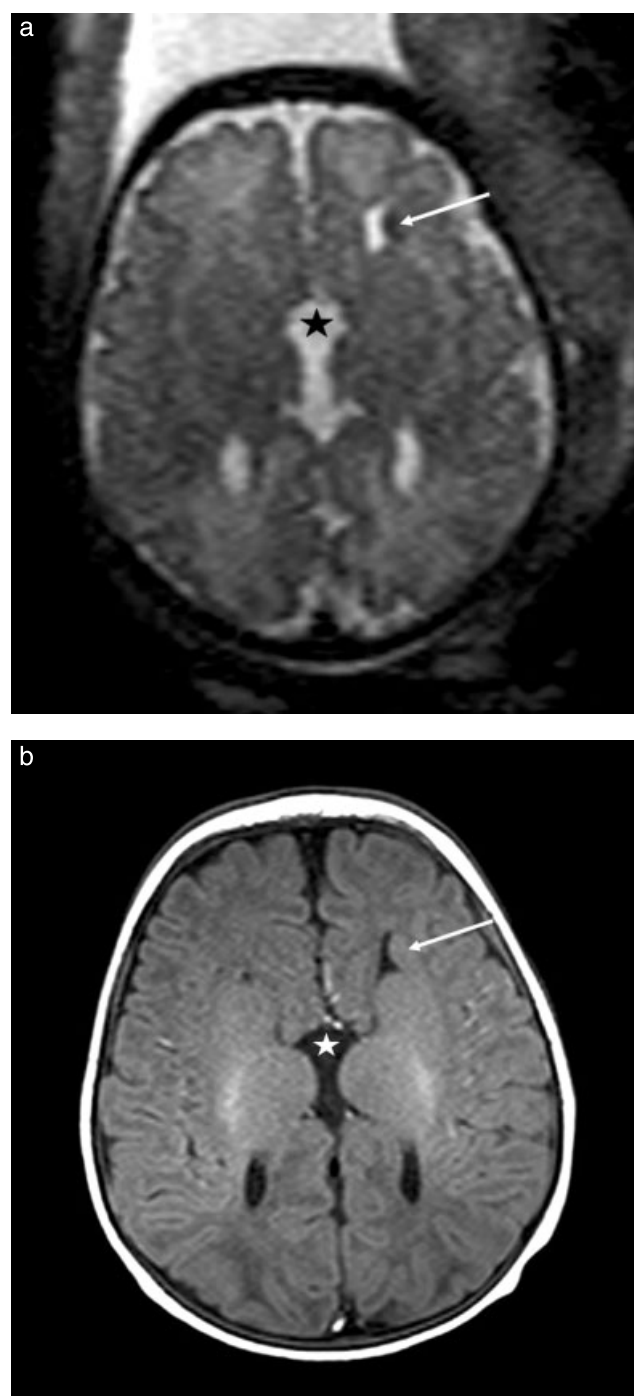


Figure 1 Complete callosal agenesis with subependymal heterotopia in a Group 1 patient (same diagnosis on pre- and postnatal magnetic resonance imaging). (a) Axial T2-weighted slice at 34 weeks' gestation showing the upward extension of the third ventricle (*), the parallelism of the lateral ventricles and the indentation of the left frontal horn (arrow), in keeping with subependymal heterotopia. (b) T1-weighted axial slice showing the same findings (*, arrow) observed 1.5 months after birth.

abnormalities ($n = 1$, Case 1, Table 3). In all except two of these cases (Cases 1 and 2, Table 3), these discrepancies were considered to be related to the natural course of the disease and without prognostic impact, these cases being classified as Group 2.

In eight cases, children underwent two postnatal MRI examinations. The results are summarized in Table 4.



Figure 2 Arachnoid cyst in a Group 2 patient (same diagnosis on pre- and postnatal magnetic resonance imaging but different appearance related to natural course of the disease). (a) Sagittal T2-weighted slice at 32.5 weeks' gestation, demonstrating an arachnoid cyst located above the vermis, behind the quadrigeminal plate. (b) Sagittal T1-weighted slice 7 months after birth, showing a marked increase in size of the cyst.

In six of these cases (Cases 16–21), the two postnatal examinations were in good agreement, although in four of them (Cases 16, 18, 19 and 20) the second postnatal

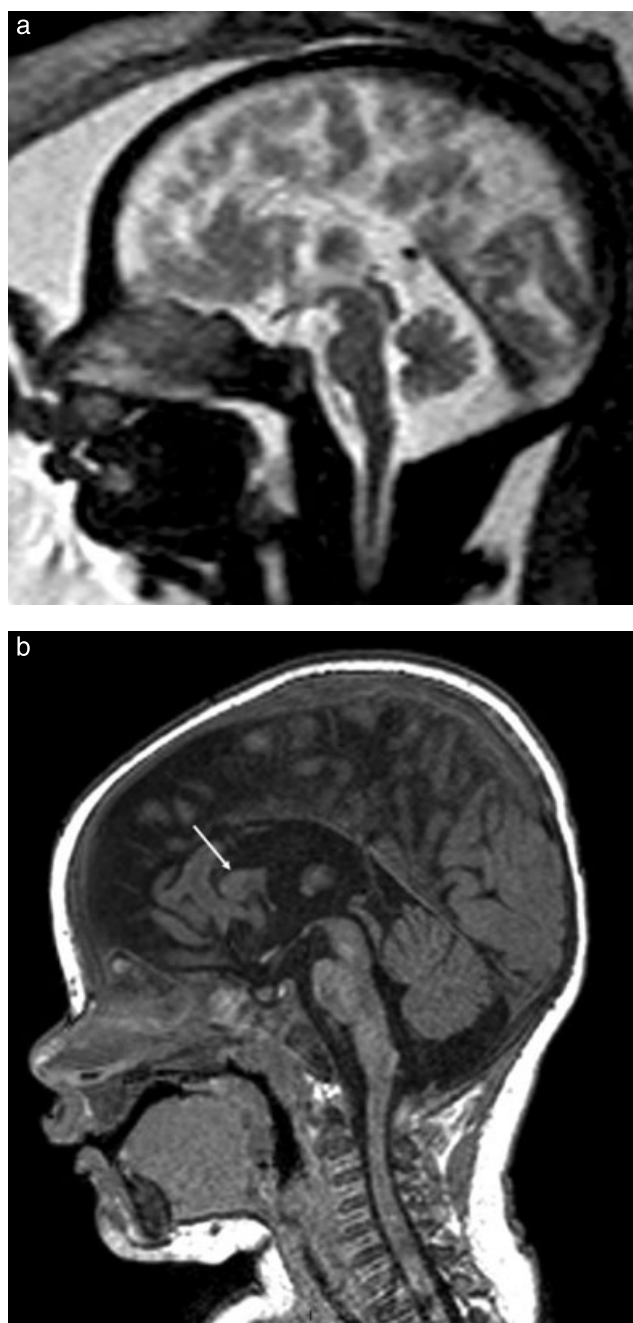


Figure 3 Callosal agenesis in a Group 3 patient (different diagnosis on pre- and postnatal magnetic resonance imaging) (Case 3, Table 3). (a) T2-weighted sagittal slice at 35 weeks' gestation; callosal agenesis was considered complete. (b) T1-weighted sagittal slice 5 months after birth; the genu of the corpus callosum is visible (arrow), indicating callosal agenesis to be partial.

MRI examination showed increased ventricular dilatation, increased volume of an arachnoid cyst or increased size of ischemic lesions. In one case (Case 13), the second postnatal MRI examination at 17 months revealed subependymal heterotopia that were not visible on the first examination performed at 1.5 months (Figure 5). In another case (Case 14), the second postnatal MRI at 2 months revealed a marked frontal subcutaneous lipoma, which was not connected to the interhemispheric lipoma and which was not visible on the first examination performed at 5 days (Figure S4).



Figure 4 Frontal cephalocele in a Group 4 patient (same diagnosis on pre- and postnatal magnetic resonance imaging but with additional findings discovered postnatally) (Case 8, Table 3). (a) T2-weighted axial slice at 24 weeks' gestation showing a frontal left cephalocele (arrow). (b) T2-weighted axial slice 1 month after birth showing several parenchymal heterotopia (dotted arrow) visible in the right frontal lobe.

DISCUSSION

Since the advent of fetal cerebral MRI, about 20 years ago, many studies have focused on comparing MRI and ultrasonography findings. There has been a consensus in the literature that fetal cerebral MRI contributes considerably and reveals many abnormalities overlooked

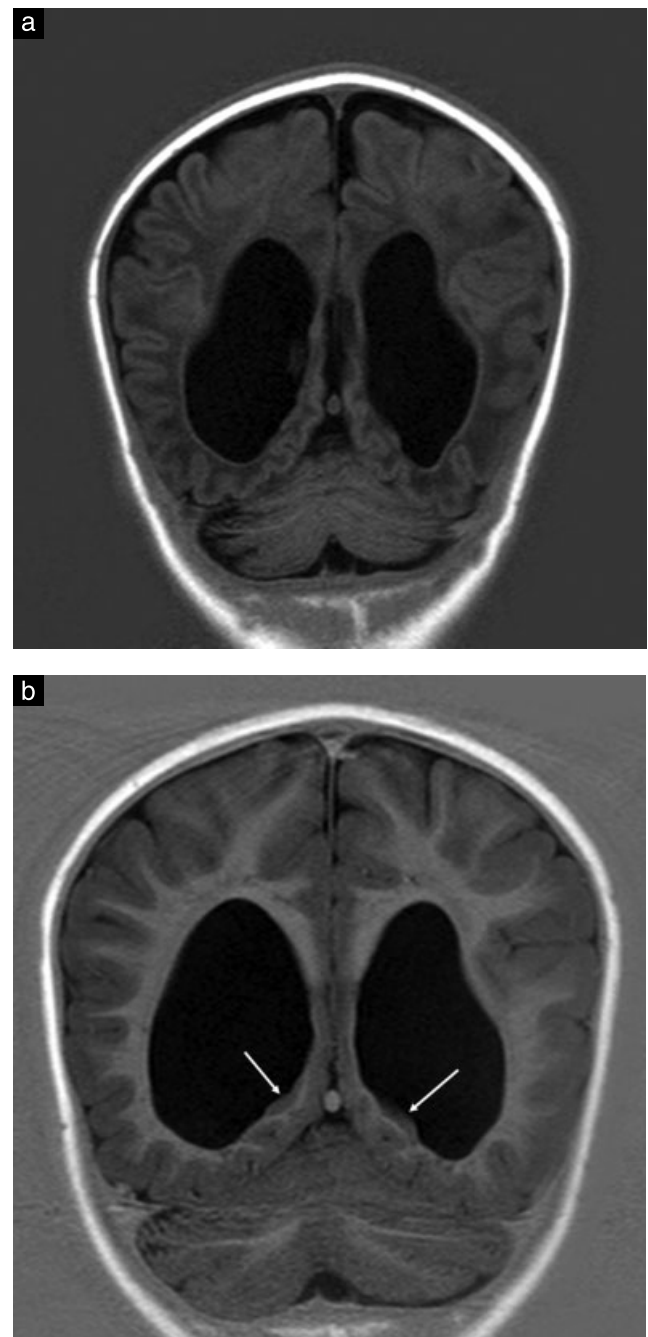


Figure 5 Ventricular dilatation, vermian dysgenesis, partial callosal agenesis and periventricular heterotopia in a Group 4 fetus (same diagnosis on pre- and postnatal magnetic resonance imaging but with additional findings discovered postnatally) (Case 13, Tables 3 and 4). (a) T1 IR-weighted coronal slice 1.5 months after birth, showing marked ventricular dilatation. (b) T1 IR-weighted coronal slice at 17 months, showing associated bilateral subependymal heterotopia (arrows).

by ultrasound, though the rate of disagreement between the two techniques is exceedingly variable, depending on the sonographer's skill and possible technical problems related to maternal habitus and amniotic fluid volume. In articles comparing the two techniques, MRI has always been considered the gold standard. However, it is noteworthy that few articles have focused on the diagnostic accuracy of fetal cerebral MRI. There are two

Table 3 Summary of the 15 cases with discrepancies between pre- and postnatal magnetic resonance imaging (MRI) findings (Groups 3–5)

Case	Group	Prenatal MRI			Postnatal MRI	
		Age (GW)	Quality	Diagnosis	Age	Diagnosis
1*	3	35 + 4	Good	Focal white matter abnormality	4 mth	Normal
2*	3	34 + 0	Good	Normal	2 mth + 16 days	Partial callosal agenesis
3	3	34 + 6	Good	Complete callosal agenesis	5 mth	Partial callosal agenesis
4	3	28 + 1	Good	Complete callosal agenesis	4 mth	Partial callosal agenesis
5	4	35 + 5	Fair	Ventricular dilatation, megacisterna magna	5 mth	Ventricular dilatation, arachnoid cyst of the posterior fossa
6*	4	27 + 6	Good	Partial callosal agenesis, interhemispheric cyst	1 y + 4 mth	Partial callosal agenesis, interhemispheric cyst, polymicrogyria
7*	4	37 + 0	Poor	Ventricular dilatation, diffuse white matter abnormalities	2 mth + 11 days	Ventricular dilatation, double cortex
8*	4	24 + 0	Good	Anterior cephalocele	1 mth	Anterior cephalocele, frontal heterotopia
9*	4	32 + 5	Fair	Ventricular dilatation	4 mths	Ventricular dilatation, partial callosal agenesis
10	4	35 + 3	Good	Ventricular dilatation	5 mth + 15 days	Ventricular dilatation, arachnoid cyst of the posterior fossa
11*	4	30 + 4	Good	Complete callosal agenesis	2 mth	Complete callosal agenesis, non-visibility of olfactory bulbs
12	4	26 + 0	Good	Kinking brainstem, gyration disorders, ventricular dilatation, marked vermian hypoplasia	17 days	Kinking brainstem, gyration disorders, ventricular dilatation, marked vermian hypoplasia, thick cortex
13	4	31 + 0	Good	Ventricular dilatation, vermian dysgenesis, partial callosal agenesis	1.5 mth (1 st MRI) 17 mth (2 nd MRI)	First MRI: same diagnosis Second MRI: same diagnosis and periventricular heterotopia
14*	5	31 + 0	Good	Interhemispheric lipoma, complete callosal agenesis	5 days (1 st MRI) 2 mth (2 nd MRI)	Interhemispheric lipoma, complete callosal agenesis, frontal polymicrogyria; increased subcutaneous lipoma (on 2 nd MRI)
15*	4	34 + 4	Good	Arachnoid cyst of the posterior fossa	2 mth	Arachnoid cyst of posterior fossa, cerebellar hemisphere hypoplasia

*Cases with differences in postnatal data from prenatal data considered to be of potential prognostic impact. GW, gestational weeks; mth, months; y, years.

ways to evaluate fetal MRI diagnostic accuracy: either by comparing MRI findings with neuropathological findings or by comparing pre- and postnatal MRI data. The results of the few studies which have done so are summarized in Table 5^{1–9}.

In our study, prenatal MRI could be performed at a mean gestational age of 33 weeks rather than earlier, because, according to French legislation, termination of pregnancy is allowed until birth. Gyration and migration disorders and white matter abnormalities are more likely to be detected late in pregnancy, which is why we favored this gestational age.

The fact that in 23 cases the quality of the MRI examination was considered fair and in one case it was considered poor can be ascribed to the usual difficulties encountered when performing fetal MRI, mostly being related to motion artifacts, particularly on T1 sequences. The occurrence of such difficulties is usually not stressed in articles dealing with fetal MRI.

Pre- and postnatal MRI data showed good agreement in 85 cases. In 32 of these (Group 2), while postnatal MRI revealed certain changes in abnormalities detected by fetal MRI, these could be attributed to the natural course of certain anomalies over time. It is well known that

ventriculomegaly may resolve spontaneously or increase throughout pregnancy or after birth^{7,10,11}. Spontaneous resolution or progression of arachnoid cysts over time is also well documented^{12,13}. Similarly, changes in appearance of hemorrhagic or clastic lesions are well known. Such changes may be observed soon after birth or only later, at the time of a second scan, as seen in Cases 16, 18, 19 and 20 (Table 4). In these four patients, who underwent two postnatal MRI examinations, we observed changes in abnormalities that had been detected both during the prenatal and during the early postnatal examination.

In 15 additional cases (Groups 3–5, Table 3), postnatal MRI revealed abnormalities which had been overlooked by fetal MRI. In six cases, there were discrepancies related to the corpus callosal anatomy or associated anomalies in the setting of callosal agenesis. A very partial agenesis (of the rostrum) was overlooked in two cases (Cases 2 and 9), while in two other cases (Cases 3 and 4), callosal agenesis considered to be complete in the prenatal period turned out to be partial (Figure 3), a small part of the genu being visible on postnatal MRI. These mistakes can be ascribed to a lack of contrast resolution of fetal MRI compared with postnatal MRI and might be prevented in the future

Table 4 Magnetic resonance imaging (MRI) data for the eight cases which underwent two postnatal MRI examinations

Case	Prenatal MRI			Postnatal MRI			
	GA	Quality	Diagnosis	First postnatal MRI		Second postnatal MRI	
				Age	Diagnosis	Age	Diagnosis
13	31	Good	Ventricular dilatation, vermian dysgenesis, partial callosal agenesis	1.5 mth	Ventricular dilatation, vermian dysgenesis, partial callosal agenesis	17 mth	Ventricular dilatation, vermian dysgenesis, partial callosal agenesis, periventricular heterotopia
14	31	Good	Interhemispheric lipoma, complete callosal agenesis	5 days	Interhemispheric lipoma, complete callosal agenesis, frontal polymicrogyria	2 mth	Interhemispheric lipoma, complete callosal agenesis, frontal polymicrogyria, frontal subcutaneous lipoma
16	32	Fair	Ventricular dilatation	5 days	Ventricular dilatation	5 mth	Increased ventricular dilatation
17	35 + 3	Good	Type 1 Chiari malformation	7 days	Type 0 Chiari malformation	6 mth + 23 days	Type 0 Chiari malformation
18	34	Good	Hemispheric arachnoid cyst	4 days	Hemispheric arachnoid cyst	2 mth	Increased hemispheric arachnoid cyst
19	34	Good	Vein of Galen aneurysmal malformation	2 days	Vein of Galen aneurysmal malformation, ischemic damage	9 days	Vein of Galen aneurysmal malformation, increased size of ischemic lesions
20	33 + 3	Good	Arachnoid cyst	1 mth	Enlarged arachnoid cyst	5 mth	Further enlarged arachnoid cyst compared with 1 st postnatal MRI
21	31 + 4	Good	White matter abnormalities, megacisterna magna	4 mth + 26 days	White matter abnormalities	15 mth	White matter abnormalities

GA, gestational age in weeks; mth, months; y, years.

by use of diffusion tensor imaging. We considered that the limitations of fetal MRI had a prognostic impact in the first two cases but not in the last two, partial callosal agenesis sharing, in our experience, the same prognosis as complete callosal agenesis¹⁴. In one case (Case 11), the absence of olfactory bulbs associated with corpus callosal agenesis was overlooked by prenatal MRI, performed at 30 + 4 weeks. In our experience, the olfactory bulbs can be seen with MRI in 80–91% of cases between 30 and 34 weeks' gestation¹⁵. In this case, the postnatal data had a prognostic impact in so far as the prognosis of corpus callosal agenesis is considered to differ depending on whether the finding is isolated¹⁶. In two other cases, fetal MRI showed callosal agenesis to be associated with an interhemispheric cyst (Case 6) or an interhemispheric lipoma (Case 14). In both cases, additional polymicrogyria was discovered after birth. This abnormality carries a different prognosis because of the increased risk of epilepsy¹⁷.

Another cortical abnormality was overlooked prenatally in Case 12. On fetal MRI at 26 weeks' gestation, we detected severe anomalies, including a kinked brainstem, marked ventricular dilatation and absence of sulcation, suggesting lissencephaly. The parents elected not to terminate pregnancy. After birth, cortical thickening was well demonstrated by MRI. However, we did not consider that this new finding was likely to worsen the prognosis; the kinked brain stem already had a very poor

prognosis, this malformation being an indication of severe neurodysgenesis¹⁸.

In three cases, migration disorders were overlooked by fetal MRI. In one case (Case 7), the examination quality was poor due to fetal movements. This fetus was referred for ventriculomegaly and the white matter seemed abnormal. The woman was offered another examination but refused. After birth, a double cortex pattern was observed. In retrospect, it was just visible on the prenatal examination. In Case 8, fetal MRI was performed at 24 weeks' gestation following sonographic detection of a frontal cephalocele. Only T2 sequences were performed. At the age of 1 month, several frontal parenchymal heterotopia were discovered, facing the cephalocele (Figure 4). One might hypothesize that, had fetal MRI been performed much later during pregnancy, such abnormalities would have been more easily identified, using T1 and T2 sequences. However, as mentioned above, in studies comparing pre- and postnatal findings^{4,8}, heterotopia are often overlooked in fetuses, and this was borne out by our observations. In these last three cases, we considered that the presence of heterotopia worsened the prognosis, particularly due to the risk of epilepsy^{19,20}. In the third case (Case 13), it is noteworthy that subependymal heterotopia were missed not only by fetal MRI but also by the first postnatal MRI, performed at the age of 6 weeks, in a child with marked ventricular dilatation. It is likely that, with development of myelination by the time of the second examination, heterotopia were more easily detected. We

Table 5 Summary of studies investigating correlation between fetal cerebral magnetic resonance imaging (MRI) and autopsy or postnatal MRI findings

Reference	Correlation of prenatal data with:	Fetuses (n)	GA at fetal MRI (weeks, median (range))	Type of cerebral lesions investigated by study	Fetuses with lesions not detected by fetal MRI (n)
Brisse <i>et al.</i> ¹ (1998)	Postnatal MRI Autopsy	2 18	29 (21.5–35)	Corpus callosum agenesis	Errors between partial and complete callosal agenesis (4) Gyration anomalies (2) Migration disorders (2) Hypoxo-ischemic injury (4)
Tang <i>et al.</i> ⁴ (2009)	Postnatal MRI Autopsy	8 4	26 (20–37)	Corpus callosum agenesis	Dorsal defect of the pons, small foci of white matter injury* Periventricular heterotopia overdiagnosed by fetal MRI (2)
de Laveaucoupet <i>et al.</i> ² (2001)	Autopsy	3	30 (29–32)	Ischemic lesions	—
Garel <i>et al.</i> ³ (2004)	Autopsy	28	32 (23–39)	Ischemic lesions	Polymicrogyria (2) Ischemic lesions (2)
Tilea <i>et al.</i> ⁵ (2007)	Autopsy	25	31 (24–36)	Posterior fossa anomalies	Cerebellar dysplasia (6) Destructive lesions (1) Cerebellar hemispheres hypoplasia (1)
Limperopoulos <i>et al.</i> ⁸ (2008)	Postnatal MRI	39	NA	Posterior fossa anomalies	Cerebral heterotopia (4) Brainstem hypoplasia (1) Cerebellar hypoplasia (3) Superior vermis dysplasia (2) Posterior fossa hemorrhage (1)
Senapati <i>et al.</i> ⁹ (2010)	Postnatal MRI	53	NA	Ventriculomegaly	Dysgenetic corpus callosum (15) Polymicrogyria (9) Schizencephaly (1) Hemimegalencephaly (1) Periventricular nodular heterotopia (5) Cerebellar hypoplasia (1)
Falip <i>et al.</i> ⁷ (2007)	Postnatal MRI	76	33 (28–38)	Ventriculomegaly	Subependymal pseudocysts (4) Arachnoid cyst (4) White matter abnormalities (14)
Blaicher <i>et al.</i> ⁶ (2004)	Postnatal MRI	13	30 (21–39)	Different types of lesions	Aqueductal stenosis (1) Pontocerebellar hypoplasia (1)

*n not specified in Tang *et al.*⁴. GA, gestational age; NA, not available.

did not consider this new observation to have prognostic impact, given that this child had already presented with severe malformations involving the cerebellum and the corpus callosum.

In two fetuses (Cases 5 and 10), an arachnoid cyst of the posterior fossa was observed on postnatal MRI. In both cases, it was located posteriorly and exerted a mild mass effect on the distal insertion of the tentorium cerebelli. In Case 10 it was missed on prenatal MRI, while in Case 5 it was misdiagnosed as megacisterna magna. We have already reported a few similar cases⁷, suggesting that arachnoid cysts may be overlooked in fetuses when they are located in physiologically enlarged pericerebral spaces, such as the temporal fossa or megacisterna magna. We did not consider the presence of arachnoid cysts in these locations to have prognostic impact.

In Case 15, the fetus presented with an arachnoid cyst of the posterior fossa, which was considered isolated. Mild hypoplasia of one cerebellar hemisphere was diagnosed at the age of 2 months. This is in keeping with other studies^{8,9} reporting cerebellar hypoplasia being overlooked by prenatal MRI. In agreement with the literature,

we considered that this finding could possibly impact on prognosis²¹, even if the vermis was not involved²².

A limitation of this study, due to its prospective nature, is that the postnatal MRI examinations were interpreted by two radiologists who were not blinded to the prenatal findings.

In conclusion, in this large series of 100 cases, we found discrepancies between pre- and postnatal MRI findings in 15% of cases, and judged these to have prognostic impact in 9% of cases. Most discrepancies were related to the corpus callosum anatomy (partial vs. complete agenesis) or to cortical and migration disorders. Furthermore, we observed that in some conditions (ventriculomegaly, arachnoid cysts), postnatal findings may differ in appearance but without prognostic impact, as a result of the natural course of the disease.

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SUPPORTING INFORMATION ON THE INTERNET



Figures S1–S4 may be found in the online version of this article.