PostScript

LETTER

Magnetic resonance imaging measurement of fetal lung volume does not match postnatal survival

We read with interest the paper by Bonfils *et al*¹ in which the authors report the prognostic interest of fetal lung volume (FLV) in congenital diaphragmatic hernia (CDH). FLV was measured by magnetic resonance imaging (MRI) and expressed as the ratio of the measured FLV to the expected FLV at the same gestational age given by the normative curve.² In this study, including 22 neonates with CDH, the best FLV ratio cut-off was 30%, with a mean sensitivity of 0.83 (range 0.55–0.95) and a specificity of 1 (range 0.72–1). Ten neonates had an FLV ratio <30% and all of them died.

We conducted a retrospective study of full-term neonates with a prenatal diagnosis of isolated CDH between November 2003 and March 2006. The FLV ratio was measured by MRI (1.5-T, Siemens Medical System, Rennes Cedex, France). All neonates were inborn and managed as previously described,³ the main goal being early postnatal control of persistent pulmonary hypertension of the neonate (PPHN). Seven fetuses were evaluated. Results are expressed as mean (standard deviation (SD)). Table 1 shows the main characteristics of the population. The FLV ratio was 29% (SD 10%). One baby died at day 1 of postnatal age and the FLV ratio was 17%. For the other babies, the FLV ratio was 31% (SD 10%) and all of them survived. Among those six survivors, three had an FLV ratio <30% (17%, 22%, 28%). Table 2 shows the MRI characteristics and postnatal outcomes in the babies.

CDH is traditionally associated with a poor outcome, especially when it is associated with polymalformation, abnormal karyotype and prematurity. Prenatal diagnosis permits the delineation of early isolated CDH, which is associated with a better outcome. In isolated CDH, the central issue remains PPHN with pulmonary hypoplasia. For years, ultrasonographers and radiologists have tried to link prenatal measurements to postnatal prognosis. No single antenatal sign has been shown to accurately predict death in fetuses with isolated CDH.

FLV ratio measured by MRI can now be used routinely in clinical practice to evaluate the importance of pulmonary hypoplasia. However, in our hands, the FLV ratio does not seem to be a good predictor of individual postnatal outcome. Bonfils *et al* referred to three investigations: one study⁴ reported no statistical difference in FLV between survivors and non-survivors in a retrospective study of 41 cases, but FLV was not expressed as a percentage of an expected value. Mahieu-Caputo *et al*⁵ reported a relationship between FLV and survival in 13 cases of CDH. The FLV ratio was significantly lower in neonates who died (median 26%, range 6–63%) than in those who survived (median 46%, range 35–56%). Paek *et al*,⁶ evaluating 11 fetuses with CDH, reported four fetuses with an FLV ratio <40%, three of whom died. Another study⁷ reported a 25% FLV ratio to be the threshold below which survival

was significantly worse (19%; $p = 0.008$) and above which survival was significantly better (60%; $p = 0.011$) than the global survival rate (40.3%). For this threshold, sensitivity was 0.79 and specificity 0.64. However, the authors pointed out that the FLV ratio should be used very carefully, notably because of serious ethical issues.

In all these series, the survival rate of infants with CDH was between 40% and 73% for an FLV ratio between 29% and 42%. In our team, the prenatal discussions with obstetricians and parents never took into account the FLV ratio. Nevertheless, in our series, the survival rate of infants with isolated CDH is now established at around 92%.³ High survival rates may alter the prognostic value of an isolated indicator. Our data do not support the strong association

reported between the FLV ratio and survival. The FLV ratio does not permit individual prognosis, suggesting again that pulmonary hypoplasia may not be the only determining factor in the survival of fetuses with isolated CDH as long as PPHN is controlled.

In conclusion, we think that the determination of measured/expected FLV ratio cut-off alone is not sufficient to delineate high-risk patients with isolated CDH. The clinical use of this statistical indicator could induce inaccurate information to parents or exaggerated indication of prenatal intervention. The major issue is ethical. The clinical use of the FLV ratio could lead to an inappropriate increased demand for termination of pregnancy.

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Table 1 Description of the seven patients in the study

	Average or n
Maternal and obstetric data	
Mother's age (years)	24 (12, 23–36)
Parity	1.6 (0.5, 1–2)
Term at diagnosis (weeks of gestation)	28 (7, 22–39)
Polyhydramnios	n = 2
Ultrasound data (n)	
Left-sided CDH	5
Stomach herniation	5
Liver herniation	4
MRI data	
Gestational age at MRI (weeks)	34 (3, 32–40)
FLV ratio	29 (10, 17–45)
Neonatal data	
Term at birth (weeks of gestation)	38 (1, 37–40)
Birth weight (g)	3000 (238, 2800–3500)

Values are mean (SD, range) unless specified. CDH, congenital diaphragmatic hernia; MRI, magnetic resonance imaging; FLV ratio, fetal lung volume ratio (measured FLV to the expected FLV).

Table 2 Magnetic resonance imaging characteristics and postnatal outcome in the seven patients

Patient	Gestational age at MRI (weeks)	FLV ratio (%)	Outcome
1	36	45	Survivor
2	33	22	Survivor
3	32	17	Survivor
4	33	28	Survivor
5	32	17	Deceased
6	40	32	Survivor
7	33	42	Survivor

FLV ratio, fetal lung volume ratio (measured FLV to the expected FLV); MRI, magnetic resonance imaging.

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CORRECTION

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