At 6 months of age the infant was healthy and doing well.

Comment

The appearance of a solid and cystic mass by ultrasonography elsewhere on the outer surface of the fetus led to a differential diagnosis including teratoma, hemangioma, and mesenchymal sarcoma. With the use of Doppler velocimetry, we demonstrated that the mass had a low-resistance blood flow. Similar results were obtained in a case of a craniofacial hemangioma.[1] We speculate that low vascular resistance as evaluated by Doppler ultrasonography could differentiate vascular lesions such as hemangiomas from neoplasias such as teratomas. However, further Doppler studies of fetal tumors are necessary to substantiate the potential of this diagnostic modality.

The size of the mass did not suggest that soft tissue dystocia was likely. However, a cesarean section was performed because the risk of trauma to a very vascular mass lesion existed. Hemangiomas in the newborn have been noted to have a microangiopathic anemia and thrombocytopenia caused by trauma of the blood elements as flow occurs through the vascular lesion.[2] Therefore abdominal delivery may be appropriate in the management of rare external masses of the fetus.

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Relationship of fetal biophysical profile and blood gas values at cordocentesis in severely growth-retarded fetuses

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In 14 severely growth-retarded fetuses the biophysical profile score was analyzed in relation to blood Po_2, pH, oxygen saturation, and oxygen content in samples obtained by cordocentesis. The data suggest that the biophysical profile score can predict the degree of fetal acidemia. (AM J OBSTET GYNECOL 1990;163:569-71.)

Key words: Biophysical profile, cordocentesis, fetal blood gases, intrauterine growth retardation

The biophysical profile is widely used for the assessment of fetal well-being. All previous studies with the biophysical profile have related the results of the test with outcome of pregnancy or with cord blood gas levels at delivery.[1,2] This study examines the relationship between the biophysical profile and fetal blood gas levels in samples obtained by cordocentesis.

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Patients and methods

In 14 severely growth-retarded fetuses that were referred to our unit for further assessment at 25 to 39 weeks' gestation, the biophysical profile was studied immediately before umbilical venous blood sampling. The methods and definitions for fetal tone, fetal gross body movements, fetal breathing movements, amniotic fluid volume, and fetal heart rate reactivity were those described by Manning.[1] Cordocentesis was performed without maternal sedation or fetal paralysis. All fetuses were anatomically and chromosomally normal. The fetal blood gas and hemoglobin levels (grams per deciliter) were measured by Radiometer ABL 330 (Copen-

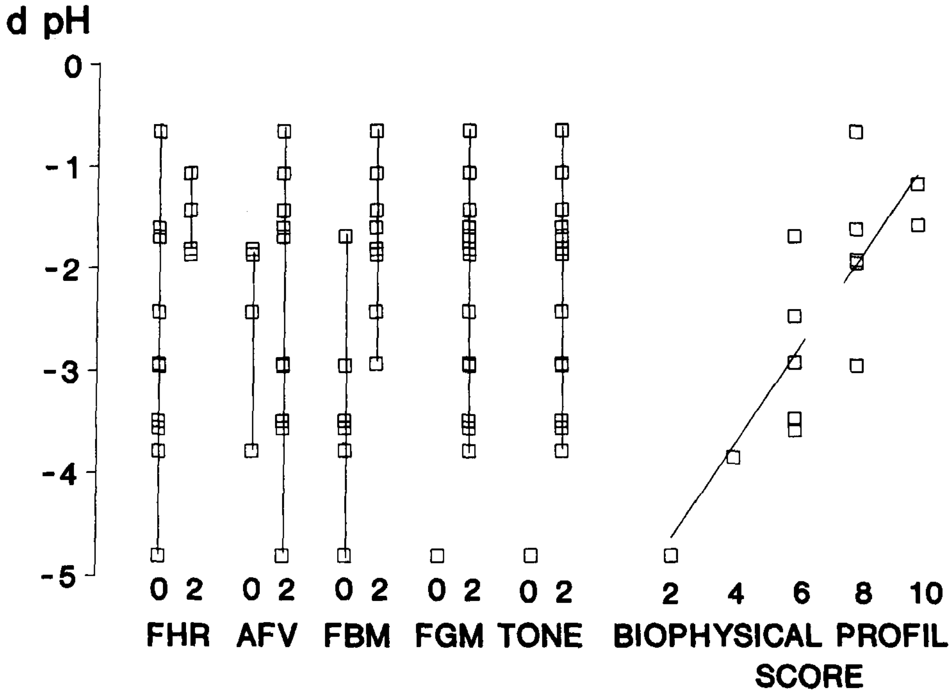

Fig. 1. Relation of umbilical venous acidemia (change in pH in SDs from normal mean for gestation) and fetal heart rate *(FHR)* pattern, amniotic fluid volume *(AFV)*, fetal breathing movements *(FBM)*, fetal gross body movements *(FGM)*, fetal tone *(left)*, and total biophysical profile score *(right*; $r = 0.812, p < 0.001$) in 14 severely growth-retarded fetuses.

Table I. Umbilical venous blood sample data, biophysical profile, and outcome of 14 severely growth-retarded fetuses

	Umbilical venous blood data							*Biophysical profile*					*Outcome*		
Case no.	*GA (wk)*	*Po_2 (mm Hg)*	*Pco_2 (mm Hg)*	*pH*	*Sat (%)*	*Hb (gm/L)*	*O_2c (mmol/L)*	*AFV*	*Tone*	*FGM*	*FBM*	*FHR*	*Outcome*	*Wk*	*Gm*
1	25	17.3	42.7	7.34	41	12.6	3.097	2	2	2	0	0	LB	29	580
2	27	23.8	50.3	7.32	64	10.3	3.967	2	2	2	0	0	IUD	34	600
3	28	24.7	38.2	7.40	62	15.8	5.809	2	2	2	2	0	NND	30	800
4	28	28.3	34.6	7.37	72	7.8	3.350	2	2	2	0	0	NND	29	880
5	29	28.0	44.6	7.37	71	12.4	5.281	2	2	2	2	0	LB	30	630
6	29	36.5	44.7	7.28	87	9.5	4.952	2	0	0	0	0	LB	30	950
7	30	27.4	41.4	7.33	72	7.7	0.332	2	2	2	2	0	LB	30	1015
8	30	21.0	39.5	7.31	57	12.3	4.171	2	2	2	0	0	LB	30	836
9	32	30.7	38.6	7.34	78	12.7	5.908	0	2	2	2	0	LB	33	1330
10	32	22.8	41.5	7.35	59	14.8	5.242	0	2	2	2	2	LB	32	1020
11	33	8.1	52.6	7.30	9	14.2	0.734	0	2	2	0	0	LB	33	1330
12	36	26.9	45.2	7.37	69	13.2	5.446	2	2	2	2	2	LB	37	1840
13	37	25.6	45.9	7.35	67	15.7	6.269	2	2	2	2	2	LB	37	1463
14	39	28.5	42.6	7.34	74	18.5	8.185	0	2	2	2	2	LB	39	1540

GA, Gestational age in completed weeks; *Sat*, saturation; *Hb*, hemoglobin; *O_2c*, oxygen content; *AVF*, amniotic fluid volume; *FGM*, fetal gross body movements; *FBM*, fetal breathing movements; *FHR*, fetal heart rate pattern; *LB*, live birth; *IUD*, intrauterine death; *NND*, neonatal death.

hagen, Denmark) and Coulter S-plus counter (Coulter Electronics, Luton, England), respectively. The oxygen saturation and oxygen content were calculated. The individual values of the growth-retarded fetuses were subtracted from the appropriate mean for gestation of our reference ranges and expressed as Δ values in SDs [normal ranges: $Po_2 = 62.3 - 0.81 \times$ weeks (mm Hg), SD = 7.51, $n = 268$; $Pco_2 = 28.1 + 0.25 \times$ weeks (mm Hg), SD = 3.23, $n = 268$; pH = $7.47 - 0.002 \times$ weeks, SD = 0.03, $n = 268$; oxygen saturation = $1.013 - 0.007 \times$ weeks (%), SD = 0.06, $n = 268$; hemoglobin = $7.6 + 0.18 \times$ weeks (gm/L), SD = 1.2, n = 555; oxygen content = 5.36 + 0.03 × weeks (mmol/L), SD = 0.73, n = 194].

Results

Fetal blood sampling data, the biophysical profile score, and pregnancy outcome are given in Table I. The biophysical profile score was significantly correlated to Δ pH ($n = 14$, $r = 0.840$, $p < 0.001$; Fig. 1) but not to Δ Po_2 ($r = 0.25$), Δ Pco_2 ($r = -0.25$), Δ oxygen saturation ($r = 0.25$), Δ hemoglobin ($r = 0.34$), or Δ oxygen content ($r = 0.48$). Although the indices of oxygenation (Po_2, oxygen saturation, oxygen content) were lower in the group of fetuses with nonreactive fetal heart rate or absent fetal breathing movement than in the group with reactive fetal heart rate and the presence of fetal breathing movement, the differences were not statistically significant.

Comment

This preliminary study in a group of highly compromised growth-retarded fetuses suggests that the biophysical profile score can predict the degree of fetal acidemia and confirms the findings of Vintzileos et al.[2] that fetal heart rate reactivity and fetal breathing movements are the first, whereas fetal gross body movement and tone are the last biophysical activities to be compromised during acidemia. If the aim of antenatal testing is to diagnose fetal acidemia, more useful information is obtained from the sequential examination of the individual components of the biophysical profile score than the total score. A reactive fetal heart rate was always associated with a pH above the 2.5th percentile. A nonreactive fetal heart rate can be investigated further by sonography for the diagnosis of oligohydramnios, which was always associated fetal acidemia. However, absence of oligohydramnios, certainly for fetuses of <32 weeks' gestation, does not exclude acidemia. Subsequent sonographic examination for fetal tone and activity will help distinguish between acidemic and nonacidemic fetuses in the majority of cases; indeed, absence of tone and fetal gross body movements may identify a subgroup of severely acidemic fetuses. Further improvement of the biophysical profile score may be obtained by quantification of the incidence of movements and use of a fetal heart rate classification that takes into account the gestational effect on reactivity.

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