

OBSTETRICS

A comparison of Doppler and biophysical findings between liveborn and stillborn growth-restricted fetuses

Sarah Crimmins, DO; Andrea Desai, MD; Dana Block-Abraham, DO; Christoph Berg, MD; Ulrich Gembruch, MD; Ahmet Alexander Baschat, MD

OBJECTIVE: The purpose of this study was to evaluate the surveillance characteristics that precede stillbirth in growth-restricted fetuses that receive integrated Doppler and biophysical profile scoring (BPS).

STUDY DESIGN: Nine hundred eighty-seven singleton pregnancies that were complicated by fetal growth restriction had multivessel Doppler scans (umbilical and middle cerebral arteries [MCA], ductus venosus, and umbilical vein) and BPS. Surveillance findings were compared between live births and stillbirths.

RESULTS: Forty-seven stillbirths occurred in 2 clusters, 37 at <34 weeks of gestation and 10 thereafter. Before 34 weeks of gestation, stillbirths had parallel escalation of umbilical artery and ductus venosus Doppler findings followed by abnormal BPS.

At ≥ 34 weeks of gestation, only a decline in MCA pulsatility index was observed, and 75% of stillbirths were unanticipated by the BPS.

CONCLUSION: Before 34 weeks of gestation, multivessel Doppler abnormality anticipates an abnormal BPS and subsequent stillbirth. After 34 weeks of gestation, stillbirths occur after MCA brain-sparing in a shorter interval than predicted by a normal BPS. Recognition of these differences in clinical behavior requires consideration for the planning of monitoring intervals in preterm and term fetal growth restriction.

Key words: biophysical profile, Doppler, fetal growth restriction, stillbirth

Cite this article as: Crimmins S, Desai A, Block-Abraham D, et al. A comparison of Doppler and biophysical findings between liveborn and stillborn growth-restricted fetuses. *Am J Obstet Gynecol* 2014;211:669.e1-10.

The prevention of stillbirth is a primary goal of antenatal surveillance. In placenta-based fetal growth restriction (FGR), characteristic Doppler and biophysical profile findings can herald fetal deterioration. Therefore, surveillance is instituted to identify fetal risks for hypoxia or stillbirth that may require intervention through delivery. The Growth Restriction Intervention Trial

demonstrated that expectant management carries an increased risk of stillbirth, which suggests that surveillance may fail to identify FGR fetuses who are at greatest risk.¹ Current surveillance strategies use either multivessel arterial and venous Doppler studies or biophysical parameters.²

Irrespective of the surveillance strategy used, there may be several reasons for surveillance failure that include gestational age differences in the manifestation of cardiovascular compromise³⁻⁵ and the inability to predict the rate of clinical deterioration when only dynamic biophysical fetal variables are assessed.^{6,7} Because fetal deterioration that results from placental dysfunction is associated with cardiovascular and behavioral abnormalities, we previously suggested the integration of Doppler and biophysical profile scoring (BPS) for surveillance of FGR pregnancies.⁸ However, one of the prerequisites for meaningful integration is to understand the clinical progression to fetal compromise when both surveillance methods are

applied concurrently. In this context, stillbirth could be considered the most certain endpoint of fetal compromise, the anticipation of which is the central motivator for fetal surveillance. Accordingly, it was the aim of this study to evaluate the surveillance characteristics that precede stillbirth in growth-restricted fetuses who receive integrated Doppler and biophysical surveillance.

MATERIALS AND METHODS

This was a retrospective, institutional review board–approved study of FGR singleton pregnancies that were monitored with a prospectively defined standard integrating Doppler and BPS surveillance at 2 referral centers for high-risk pregnancies between January 2000 and December 2012.⁹ The criteria that defined FGR included any of the following events: (1) abdominal circumference <5th percentile, (2) sonographically estimated fetal weight <10th percentile according to local reference standards,^{10,11} (3) fetal head-to-abdominal circumference ratio >90th percentile by local

From the Department of Obstetrics, Gynecology, and Reproductive Sciences, University of Maryland School of Medicine, Baltimore, MD (Drs Crimmins, Desai, Block-Abraham, and Baschat), and the Department of Obstetrics and Prenatal Medicine, Friedrich-Wilhelm University, Bonn, Germany (Drs Berg and Gembruch).

Received March 25, 2014; revised May 20, 2014; accepted June 9, 2014.

The authors report no conflict of interest.

Corresponding author: Ahmet Alexander Baschat, MD. abascha1@jhmi.edu

0002-9378/\$36.00

© 2014 Elsevier Inc. All rights reserved.

<http://dx.doi.org/10.1016/j.ajog.2014.06.022>

TABLE 1

Maternal demographics and delivery and postpartum characteristics

Characteristics	Measure
Maternal	
Age, y ^a	27.9 (16–45)
Parity, n (%)	
0	483 (48.9)
1	262 (26.5)
2	122 (12.3)
3	35 (3.5)
≥4	31 (3.1)
Race, n (%)	
White	536 (54.3)
African American/Afro Caribbean	422 (42.7)
Asian/other/not reported	16/4/7 (1.6/0.4/0.7)
Prepregnancy conditions, n (%)	
Systemic lupus erythematosus	12 (1.2)
Chronic hypertension	118 (11.9)
Pregestational diabetes mellitus	28 (2.8)
Delivery and postpartum	
Indication for delivery, n (%)	
Abnormal fetal testing	
Nonreassuring fetal heart rate	102 (10.3)
Oligohydramnios	42 (4.25)
Nonreassuring biophysical profile score	58 (5.8)
Nonreassuring Doppler parameters	130 (13.7)
Abnormal Doppler and biophysical profile score	33 (3.3)
Maternal hypertensive disorders	
Preeclampsia	79 (8.0)
HELLP (hemolysis, elevated liver enzymes, and low platelet count syndrome)	59 (5.9)
Eclampsia	2 (0.2)
Placental abruption	21 (2.1)
Elective delivery for fetal growth delay	64 (6.4)
Spontaneous onset of labor	117 (11.8)
Other	4 (0.4)
Fetal death/fetal intracerebral bleed	46/1 (4.7/0.1)
Mode of delivery, n (%)	
Vaginal	366 (37.0)
Cesarean	618 (62.6)

Crimmins. Doppler and biophysical profile in FGR stillbirths. *Am J Obstet Gynecol* 2014.

(continued)

reference values, or (4) abdominal circumference growth rate <11 mm in a 14-day interval.¹² In all pregnancies, gestational age was determined by sure last menstrual period that was confirmed by sonogram at <20 weeks of gestation. Exclusion criteria were chromosomal or structural anomalies as determined prenatally or at birth, multiple gestation, fetal infection, and/or unavailability of outcome variables.

All patients had combined Doppler and BPS surveillance. The monitoring intervals and criteria for administration of steroids and delivery planning were at the discretion of the managing obstetrician and the local standard of care. Ultrasound equipment that was capable of high-resolution grey scale pulsed-wave and color-Doppler modes with 4, 5, or 8 MHz-sector probes was used. The following testing parameters were determined after 23 weeks of gestation.

Pulsed-wave Doppler measurements of the umbilical artery (UA) at the mid-cord, middle cerebral artery (MCA), and ductus venosus (DV) were analyzed with the use of the pulsatility index (PI) to quantify arterial Doppler waveforms and the PI for veins to quantify the DV waveform.¹³ Absolute PI values were converted to z-scores; UA and DV PI z-scores >2, and MCA z-scores ≤2 (brain sparing) were considered abnormal.¹⁴ End-diastolic velocity in the UA was assessed qualitatively as positive, absent, or reversed; for the DV, atrial systolic velocity was assessed qualitatively as forward or absent/reversed. Umbilical venous pulsations in the mid-cord were also noted. It was the convention that was used to record the best value for all Doppler measurements.

A 30-minute nonstress test was performed, and heart rate reactivity was graded by gestational age criteria as defined in the latest iteration of BPS¹⁵: at 24–29 weeks of gestation, two 10-beat accelerations, each sustained for 10 seconds; at 30–36 weeks of gestation, two 15-beat accelerations, each sustained for 15 seconds; >36 weeks of gestation, two 20-beat accelerations, each sustained for 20 seconds. Two points were given if these criteria were met. No points were given if these cutoffs were not met in a

Download English Version:

<https://daneshyari.com/en/article/6145405>

Download Persian Version:

<https://daneshyari.com/article/6145405>

[Daneshyari.com](https://daneshyari.com)