OBSTETRICS

Number of episodes of reduced fetal movement at term: association with adverse perinatal outcome

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OBJECTIVE: The aims of this study were evaluation of the association of reduced fetal movements (RFM) and small-for-gestational-age (SGA) birth at term and to explore if fetal and maternal outcomes are different with single vs repeated episodes of RFM and normal fetal assessment test results.

STUDY DESIGN: This was a retrospective cohort study of all singleton pregnancies referred for RFMs at a tertiary fetal medicine unit from January 2008 through September 2014. Ultrasound and Doppler indices were obtained from a computerized ultrasound database and pregnancy outcome was collected from hospital records.

RESULTS: Of the 21,944 women with a singleton pregnancy booked for maternity care during the study period, 1234 women (5.62%) reported RFMs >36+0 weeks. Of these, 1029 women (83.4%) reported a single episode of RFM and 205 (16.6%) had ≥2 presentations for RFM. Women with repeated RFMs had a significantly higher mean uterine artery pulsatility index in the second trimester. The prevalence of SGA baby at birth in women presenting with a single episode as compared to repeated episodes of RFM was 9.8% and 44.2%, respectively (odds ratio, 7.3; 95% confidence interval, 5.1—10.4; $P < .05$).

CONCLUSION: Repeated episodes of RFMs at term are more likely to occur in women with high second-trimester uterine artery Doppler resistance indices and are strongly associated with the birth of SGA infants. Women presenting with repeated episodes of RFM should be treated as being at high risk of placental dysfunction irrespective of the results of prenatal ultrasound and Doppler assessment.

Key words: maternal outcomes, newborn outcomes, reduced fetal movements, small gestational age, uterine artery Doppler

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Reduced fetal movements (RFM) are an important and frequently seen problem in maternity care, with 6-15% of women reporting at least 1 episode of RFM during the third trimester of pregnancy.[1,2] RFM, defined as a subjective perception of significantly reduced or absent fetal activity, is emerging as an important clinical marker to identify women with high risk of stillbirth and fetal growth restriction due to placental dysfunction.[3] In fact, the majority of stillbirths seem to be preceded by a period of RFM for 3-4 days and 55% of women who have had stillbirth experience RFMs before fetal demise.[4-7] Recently it has been shown that women with RFMs have abnormal placental morphology and function, suggesting a potential association between placental insufficiency and presence of RFMs.[8,9] Several recent studies have reported that uterine artery (UtA) Doppler indices and pregnancy-associated plasma protein (PAPP)-A, both related to poor trophoblast development,[10] are associated with placenta-related complications such as preeclampsia, intrauterine growth restriction, and stillbirth.[11-17]

Assessment of women presenting with RFM is directed at identification of small fetuses due to placental dysfunction. Although women found to have normally grown fetuses are reassured, some of them will present with another episode of RFM despite normal results of tests of fetal well-being. The aims of this study were evaluation of the association of RFM and small-for-gestational-age (SGA) fetuses at term and to explore if the fetal and maternal outcomes are different in the cohort of women with repeated RFM and normal fetal assessment test results.

Materials and Methods

This was a retrospective cohort study of all singleton pregnancies referred for RFMs at a tertiary fetal medicine unit from January 2008 through September 2014. Part of this population, from 2008 through 2012, was reported in a previous study.[8] Pregnancies were dated by measurements of crown-rump length in the first trimester according to the national guidelines.[18] PAPP-A levels were measured at the time of routine 11-14 weeks' first-trimester combined screening test for Down syndrome. UtA Doppler indices were measured at the time of routine

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TABLE 1
Comparison between women with 1 or repeated episodes of reduced fetal movements at term

Demographic	Total (n = 1234)	1 RFM episode (n = 1029)	Repeated RFM (n = 205)	Significance between 1 and repeated RFMs
Maternal age	29.9 (±5.5)	30.0 (±5.5)	29.4 (±5.7)	.171
BMI	25.31 (±5.3)	25.2 (±5.2)	25.8 (±5.8)	.147
Caucasian	786 (63.9%)	670 (65.9%)	116 (57.7%)	< .05
Afro-Caribbean	189 (15.3%)	156 (15.4%)	33 (16.4%)	.704
Asian	296 (23.9%)	240 (23.6%)	56 (27.9%)	.201
Other	11 (0.9%)	8 (0.8%)	3 (1.5%)	.334
Nulliparous	704 (57.0%)	582 (57.0%)	122 (59.5%)	.116
First- and second-trimester variables				
PAPP-A MoM	1.18 (0.7–1.42)	1.15 (0.69–1.41)	1.32 (0.70–1.46)	.583
BhCG MoM	1.20 (0.65–1.47)	1.22 (0.65–1.47)	1.10 (0.64–1.37)	.131
Mean UtA PI	0.89 (±0.42)	0.87 (±0.26)	0.98 (±0.27)	< .05
Scan assessment at RFM presentation				
Gestational age first episode of RFM	38.5 (36.6–40.2)	39.0 (37.3–40.2)	36.3 (33.5–38.6)	< .05
EFW first episode of RFM	3240 (±640)	3374 (±480)	2567 (±874)	< .05
EFW centile first episode of RFM	55.76 (34.5–75.4)	57.5 (37.0–76.3)	40.1 (19.8–65.8)	< .05
Suspected SGA first episode of RFM	37 (2.9%)	21 (2.0%)	16 (7.8%)	< .05
Outcome at birth				
Gestational age delivery	40.3 (39.3–41.2)	40.4 (39.4–41.2)	40.1 (39.1–41.1)	.479
Birthweight	3367 (±508)	3418 (±465)	3113 (±622)	< .05
Birthweight centile	39.7 (19.0–67.0)	41.5 (21.4–70.6)	15.9 (3.9–53.9)	< .05
SGA	184 (15.6%)	96 (9.8%)	88 (44.2%)	< .05
SGA with EFW >10th centile	153 (12.8%)	81 (8.4%)	72 (39.3%)	< .05
Birthweight of babies with EFW >10th centile	3262 (±636)	3435 (±451)	3161 (±624)	< .05
5-min Apgar <7	19 (1.6%)	11 (1.1%)	8 (4.0%)	< .05
Stillbirths	8 (0.6%)	6 (0.6%)	2 (1.4%)	.453

Data are shown as median (±interquartile range) or number (%).

BhCG, beta human chorionic gonadotropin; *BMI*, body mass index; *EFW*, estimated fetal weight; *MoM*, multiple of median; *PAPP*, pregnancy-associated plasma protein; *PI*, pulsatility index; *RFM*, reduced fetal movements; *SGA*, small for gestational age; *UtA*, uterine artery.

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anomaly scan between 19-23 weeks of gestation in nulliparous and high-risk parous women. UtA Doppler assessment was performed transabdominally as previous described.[19] Pulsatility index (PI) of the left and the right UtA was averaged to compute mean PI and plotted against a published reference range.[19] Women with UtA PI >90th centile at the second-trimester scan were offered growth scans at 28 and 36 weeks of gestation, counseled regarding the increased risk of preeclampsia, and asked to self-refer if they developed characteristic symptoms of the disorder. Low-dose aspirin for prevention of preeclampsia was not used routinely during the study period. Seven experienced operators with >5 years' experience in obstetric ultrasound and Doppler assessment performed all the scans. Ultrasound assessments were performed using GE Voluson E8 (GE Healthcare, Zipf, Austria). Maternal characteristics, including age, body mass index (BMI), and ethnic origin, were recorded during the first visit and the outcomes of pregnancies were collected.

Women presenting 1 or >1 episode of RFM during the study period were evaluated in the fetal day assessment unit. Those presenting with RFM ≥28 weeks underwent assessment of fetal well-being. The primary reason for the fetal assessment was the first or repeated episode of RFM. Electronic fetal heart rate (computerized cardiotocography) monitoring