

OBSTETRICS

Screening approach for gestational diabetes in twin pregnancies

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OBJECTIVE: The objective of this study was to evaluate the ideal cutoff for the glucose challenge test (GCT) in twin pregnancies undergoing screening for gestational diabetes mellitus (GDM).

STUDY DESIGN: A historical cohort of patients with twin pregnancies were identified from 1 maternal-fetal medicine practice from 2005 through 2013. All patients were administered a 1-hour, 50-g GCT between 24-28 weeks' gestation. All patients with a GCT of ≥ 130 mg/dL underwent a 3-hour, 100-g oral glucose tolerance test. The diagnosis of GDM was made if 2 of the 4 values on the oral glucose tolerance test were abnormal (Carpenter and Coustan). The testing characteristics of the GCT for diagnosis of GDM were evaluated using 3 selected cutoffs: ≥ 130 , ≥ 135 , and ≥ 140 mg/dL. We excluded all patients diagnosed with GDM < 24 weeks.

RESULTS: In all, 475 patients with twin pregnancies underwent a GCT between 24-28 weeks. The incidence of GDM was 6.5%. The positive screen rate using the 3 selected cutoffs were: ≥ 130 mg/dL, 34.7%; ≥ 135 mg/dL, 28.6%; and ≥ 140 mg/dL, 23.4%. A GCT cutoff of ≥ 135 mg/dL maintained 100% sensitivity, with a specificity of 76.4%. Using this cutoff, the positive predictive value was 22.8% and the negative predictive value was 100%. Compared to a cutoff of ≥ 130 mg/dL, a cutoff of ≥ 135 mg/dL resulted in 6.1% less patients testing positive while maintaining the same 100% sensitivity.

CONCLUSION: In twin pregnancies, the optimal 1-hour, 50-g GCT screening cutoff appears to be ≥ 135 mg/dL.

Key words: gestational diabetes, glucose challenge test, glucose tolerance test, twins

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Gestational diabetes mellitus (GDM), or carbohydrate intolerance beginning in pregnancy, is a common medical complication of pregnancy, affecting approximately 6-7% of women.¹⁻³ As pregnancy progresses, multiple mechanisms are implicated in the development of insulin resistance and pathogenesis of GDM including increased levels of human placental lactogen, estrogen, cortisol, prolactin, and progesterone.⁴ Despite the recommendation by some organizations to adopt a 1-step, 2-hour, 75-g oral glucose tolerance test (OGTT) approach to GDM screening,⁵ the American

EDITORS' ★ CHOICE

Congress of Obstetricians and Gynecologists (ACOG) currently accepts the 2-step diagnostic approach in screening between weeks 24-28 of pregnancy utilizing a nonfasting 1-hour, 50-g glucose challenge test (GCT) followed by a diagnostic fasting 3-hour, 100-g OGTT for women who exceed a designated GCT cutoff, typically 130-140 mg/dL.¹ In singleton gestations, GDM can lead to adverse pregnancy outcomes such as preeclampsia, macrosomia, birth injury, and cesarean delivery.⁶⁻⁸

Twins currently represent 3.3% of all US live births.⁹ Twin pregnancy itself appears either not to increase the risk of GDM,¹⁰⁻¹² or only increase the risk by 1-2%.^{13,14} In twins, there is a hypothesis that the increase in placental mass and thus in diabetogenic hormones may play a role in the etiology of GDM.^{11,15-17} However, the accuracy of screening for GDM in twin pregnancies is uncertain. In twin pregnancies, normal physiologic changes are amplified,^{18,19} which may change the characteristics of the GCT and therefore affect the screen-positive rates leading to excessive testing and increased cost with no real improvement in the accuracy of diagnosis. Yogeve et al²⁰ reported results of GCT in 529 twin pregnancies compared to 14,268 singleton pregnancies and found that twin pregnancies were significantly more likely to have a GCT ≥ 130 mg/dL, ≥ 140 mg/dL, and false-positive, even after adjustment for maternal age, parity, and fetal sex.

Currently, the ideal cutoff for the GCT is unknown. Typically, the cutoffs reported have ranged from 130-140 mg/dL with varying sensitivities and

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specificities described.²¹ A higher cutoff could lower the sensitivity, but a lower cutoff could lower the specificity. In twin pregnancies specifically, data regarding the ideal GCT cutoff are lacking. The purpose of the present study was to estimate the ideal cutoff for the 1-hour, 50-g GCT in twin pregnancies undergoing screening for GDM.

MATERIALS AND METHODS

We performed a historical cohort study to compare 3 different GCT screening threshold values (≥ 130 , ≥ 135 , and ≥ 140 mg/dL) for the diagnosis of GDM in twin pregnancies. After Biomedical Research Alliance of New York Institutional Review Board approval was obtained, the charts of all patients with twin pregnancies delivered by a single maternal-fetal medicine practice from June 2005 (when our electronic medical

record was established) through June 2013 were reviewed. Baseline characteristics and pregnancy outcomes were obtained from our computerized medical record. Gestational age was determined by last menstrual period and confirmed by ultrasound in all patients. The pregnancy was redated if there was a >5 -day discrepancy up to 14 weeks or a >7 -day discrepancy after 14 weeks. If the pregnancy was the result of in vitro fertilization, gestational age was determined from in vitro fertilization dating. Patients whose GCT was <24 weeks or >28 weeks were excluded. We also excluded patients with a diagnosis of GDM <24 weeks.

Patients underwent the 1-hour GCT with a 50-g nonfasting oral glucose load between 24–28 weeks' gestation. During the study period, all patients with a GCT of ≥ 130 mg/dL underwent a 3-hour, 100-g OGTT. GDM was diagnosed if 2

of 4 values were abnormal on the OGTT, based on Carpenter and Coustan²² cutoffs: fasting, ≥ 95 mg/dL; 1 hour, ≥ 180 mg/dL; 2 hours, ≥ 155 mg/dL; and 3 hours, ≥ 140 mg/dL.

The primary outcome was the diagnosis of GDM. Sensitivities, specificities, positive predictive values, negative predictive values, and likelihood ratios of testing were calculated using the 3 different GCT threshold values of ≥ 130 , ≥ 135 , and ≥ 140 mg/dL. A receiver operator characteristic (ROC) plot was created. Since patients with a GCT <130 mg/dL did not undergo a glucose tolerance test (GTT), we created a ROC for all patients with a GCT ≥ 130 mg/dL, as well as a ROC for all patients.

RESULTS

In all, 475 patients with twin pregnancy underwent a GCT between 24–28 weeks' gestation. The baseline characteristics of the population studied are shown in Table 1. The population was mostly nonobese and Caucasian. Most pregnancies were conceived via assisted reproduction and approximately half were advanced maternal age.

The glucose testing results are summarized in Table 2. The mean gestational age at testing was 26.1 ± 1.0 weeks and the mean GCT value was 121.6 ± 27.3 mg/dL. Using a GCT cutoff of ≥ 130 mg/dL, 165 of 465 (34.7%) screened positive. With a GCT cutoff of ≥ 135 mg/dL, 136 of 475 (28.6%) screened positive. With a GCT cutoff of ≥ 140 mg/dL, 111 of 475 (23.3%) screened positive. Overall, 31 patients (6.5%) were diagnosed with GDM.

The testing characteristics of the GCT based on the 3 different cutoffs are shown in Table 3. All 3 cutoffs had a high sensitivity. However a cutoff of ≥ 140 mg/dL would have failed to identify 2 of 31 (6.5%) patients who ultimately were diagnosed with GDM. Therefore, the sensitivity for this cutoff was only 93.5%. Cutoffs of ≥ 130 and ≥ 135 mg/dL both had 100% sensitivity. However, the cutoff of ≥ 135 mg/dL had a higher specificity, higher positive predictive value, and higher positive

TABLE 1

Baseline characteristics of population of twin pregnancies

Characteristic	Value
No. of patients	475
Maternal age, y	34.1 ± 4.3
Maternal age ≥ 35 y	207 (43.6%)
Nulliparous	303 (63.8%)
Conception	
Spontaneous	120 (25.3%)
Ovulation induction	52 (11.0%)
In vitro fertilization	302 (63.7%)
Multifetal pregnancy reduction	36 (7.6%)
Caucasian	412 (87.5%)
Prepregnancy BMI, kg/m ²	23.3 ± 4.3
Prepregnancy obesity (BMI ≥ 30 kg/m ²)	33 (6.9%)
Chorionicity	
Dichorionic-diamniotic	397 (83.36%)
Monochorionic-diamniotic	71 (14.9%)
Monochorionic-monoamniotic	7 (1.5%)
Gestational age at delivery, wk	35.8 ± 2.5
Birthweight, larger twin, g	2485 ± 510
Birthweight, smaller twin, g	2201 ± 505

BMI, body mass index.

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