

CAN 50 G ORAL GLUCOSE CHALLENGE TEST PREDICT INTRAUTERINE GROWTH RETARDATION?

50 GRAM ORAL GLUKOZ TESTİ İLE İNTRAUTERİN GELİŞME KISITLILIĞI TAHMİN EDİLEBİLİR Mİ?

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Abstract

Aim: To investigate a likely association between intrauterine growth (IUGR) retardation and maternal plasma glucose level after 50 g glucose challenge test (GCT).

Materials and Method: Forty-two pregnant women with IUGR (IUGR group) and eighty pregnant women with appropriate for gestational age (control group) enrolled into the study. The results of GCT which performed between 24 to 28 weeks of pregnancy, umbilical arterial Doppler flow velocimetry, birth weights, gestational ages at the time of delivery, and 5th minute APGAR scores were compared between the groups. Statistical analyses were carried out by using the statistical packages for SPSS 15.0 for Windows.

Results: Maternal characteristics; average ages, body mass index (BMI) and gravidity were similar in both two groups. There were statistically significantly lower maternal 1-hour plasma glucose levels and birth weights in IUGR group than control group. The differences of umbilical arterial Doppler flow velocimetry, gestational ages at the time of delivery, 5th minute APGAR scores and admission to the neonatal intensive care unit (NICU) between the groups were statistically significant.

Conclusion: Low 1-hour glucose response to the 50 g glucose challenge is associated with IUGR.

Key words: hypoglycemia, 50 g glucose challenge test, intrauterine growth retardation, pregnancy

Özet

Amaç: İntrauterin gelişme geriliği (IUGR) ile 50 gram oral glukoz testi arasındaki olası ilişkinin araştırılması.

Gereçler ve Yöntem: Gebeliği IUGR ile komplike olan 42 kadın (IUGR grup) ile gebeliğinde gelişme geriliği olmayan 80 kadın (kontrol grup) çalışmaya dâhil edildi. 24-28 hafta arası yapılan 50 g oral glukoz testinin sonucu, umbilikal arter Dopler akım değerleri, doğum sırasındaki gebelik haftası ve 5. Dakika APGAR skoru her iki grupta karşılaştırıldı. İstatistiksel analizler SPSS 15 programı kullanılarak yapıldı.

Bulgular: Ortalama yaş, vücut kitle indeksi (VKI) ve gravidite gibi maternal özellikler her iki grupta da benzerdi. 1. Saat maternal serum glukoz seviyesi, IUGR grubunda kontrol grubuna göre istatistiksel olarak anlamlı daha düşük bulundu ($p=0.012$). Her iki grup için umbilikal arter dopler akımları, doğum sırasındaki gebelik haftası, 5. Dakika APGAR skoru ve yeni doğan yakın bakım ünitesine başvuru oranları arasında istatistiksel olarak anlamlı bir farklılık vardı ($p<0.001$).

Sonuç: 50 gram oral glukoz testi sonrası düşük 1. saat glukoz seviyeleri ile IUGR arasında ilişki mevcuttur.

Anahtar kelimeler: Hipoglisemi, 50 gram glukoz testi, intrauterine gelişme geriliği, gebelik

Introduction

Maternal hyperglycemia is clearly associated with poor perinatal outcomes such as fetal macrosomia, operative deliveries, shoulder dystocia and polyhydramnios (1-3). Despite there is a great interest to the maternal hyperglycemia and poor perinatal outcome by the investigators, the association between maternal hypoglycemia with perinatal outcome remains still unknown.

A relationship between maternal hypoglycemia and IUGR was firstly reported in 1979 (4). Since then, a few studies were conducted to investigate the association between maternal hypoglycemia with perinatal outcomes (5-10).

The purpose of this retrospective pilot study is to assess the association of maternal hypoglycemia during the 1-hour glucose tolerance test with IUGR. We hypothesize that a decreased 1-hour glucose tolerance test is a risk factor for IUGR and poor perinatal outcomes.

Materials and Method

This present retrospective pilot study conducted at Zekai Tahir Burak Women's Health Care Education and Research Hospital, Ankara, Turkey was carried on participants who gave birth between June 2013 and September 2013. The study was approved by Institutional Review Board of Zekai Tahir Burak Women's Health Care Education and Research Hospital, and written informed

consent was obtained from each participant (Number of the approval form: June 2013-30).

The pregnant women were divided into two groups: the IUGR group and control group. Forty-two pregnant women with IUGR and eighty pregnant women with appropriate for gestational age (control group) enrolled into the study. The fetus whose weight is less than expected based on gestational age and sex, as determined by population standards formed the IUGR group (11). Multi-fetus pregnancies, fetal structural-chromosomal anomalies, smokers and pregnant women with preeclampsia, eclampsia and systemic illness, were excluded from the study.

Serum glucose levels were studied in one hour after obtained from antecubital vein. Glucose levels were measured by using hexokinase-mediated reaction (Roche/Hitachi Modular P Chemistry Analyzer, Basel, Switzerland). Gestational age (weeks) as assessed by sonographic dates (GE Logiq 200 PRO Ultrasound Device, USA) or according to last menstrual period, or both. The average ages, BMI, gravidity, maternal 1-hour glucose serum levels, birthweights, APGAR scores, umbilical arterial Doppler velocimetry values, gestational ages and admission to the NICU were the risk factors that were evaluated.

Statistical Analysis

The mean and standard deviation (SD) were calculated for continuous variables. Chi-square (χ^2) test and Student's t test evaluated associations between the categorical and continuous variables. The normal distribution of the variables was analyzed by the Kolmogorov-Smirnov test. Two-sided P values were considered statistically significant at $P < 0.05$. Statistical analyses were carried out by using the statistical packages for SPSS 15.0 for Windows (SPSS Inc., Chicago, IL, USA).

Results

The maternal demographics of average ages, gravidity and BMI were similar between the groups (Table 1). 1-hour glucose levels were 109.00 ± 24.48 mg/dl in the IUGR group and 98.13 ± 19.05 mg/dl in the control group. 1-hour glucose

Table 1. Maternal characteristic of the study population

	IUGR (n=42)	Controls (n=80)	p-value
Age (year)	26.09±5.66	25.68±5.29	0.093
BMI (kg/M ²)	29.50±4.08	28.43±3.94	0.156
G ≤2	34 (77.2)	64 (80)	0.897
G >2	10 (22.8)	16 (20)	

Values are given as mean±standart deviation and number (percentage)

Simple t test for continuous variables and χ^2 test for categories values are used

levels were statistically significantly different between the groups ($p < 0.05$). The birth weights were 2072.04 ± 367.97 g in the IUGR group and 3266 ± 454.59 g in control group. There was a statistically significant difference between the groups ($p < 0.001$) (Table 2).

Table 2. Perinatal and peripartum outcomes

	IUGR (n=42)	Controls (n=80)	p-value
Glucose 1. Hour (mg/dl)	98.13±19.05	109.00±24.48	0.012
Birth Weight (g)	2072.04±367.97	3266±454.59	<0.001
^a Dopplervelocimetry	4.45±0.63	2.54±0.41	<0.001
Gestational age (weeks)	37.32±1.41	39.36±1.46	<0.001
^b NICU	4(5)	14(31.8)	<0.001
*APGAR scores (5th minute)	7-10	6-10	<0.001

a: Umbilical artery flow velocimetry, A/B.

b: Neonatal intensive care unit, p value was calculated by Chi-square test,

* Values were given as minimum-maximum and p value was calculated by Chi-square test

Umbilical arterial Doppler velocimetry and gestational ages were 2.54 ± 0.41 and 39.36 ± 1.46 weeks in the control group and 4.45 ± 0.63 and 37.32 ± 1.41 weeks in the IUGR group, respectively. The differences of gestational ages and umbilical arterial Doppler velocimetry for both two groups were statistically significant ($p < 0.001$, $p < 0.001$) (Table 2). Fourteen out of forty two newborns in IUGR group and 4 out of eighty newborns in the control group had admitted to the NICU ($p < 0.001$). There was a statistically significant difference for 5th minute APGAR scores between the groups ($p < 0.001$) (Table 2).

When we divided the IUGR group to the subgroups according to a glucose threshold of 88 mg/dl (hypoglycemia group) and >88 mg/dl levels, we found that, 7 out of fourteen newborn admitted to the NICU in the hypoglycemia group. There was no statistically significant difference between the subgroups in terms of admission to the NICU. When we compare 1-hour glucose levels in IUGR group as requiring the NICU, we found that; maternal 1-h glucose levels were found lower in IUGR group whose newborns had admitted to the NICU than whose newborns had not admitted to the NICU (88.14 ± 14.22 mg/dl & 101.53 ± 19.48 mg/dl, p value: 0.016).

Discussion

Almost, in the entire world, the screening test is performed with 1-hour GCT between 24-28 weeks of gestation. The likely adverse effects of maternal hyperglycemia were pointed out in several studies; however the literature related to the low maternal glucose level and pregnancy outcomes is quite restrictive and old. In the light of this information, we interest the relationship between maternal hypoglycemia and pregnancy outcomes.

In our study, firstly we detected the pregnancies with IUGR, subsequently had the medical records. We excluded the patients with concomitant systemic medical illness and preeclampsia-eclampsia. We found statistically significantly lower 1-h glucose levels after GCT in the IUGR group than control group. Despite the limited literature, we detected a retrospective study, which the groups were formed according to the maternal serum glucose level (12). They reported that; the reasons for admission to labor and delivery, mode of delivery, neonatal birth weight were similar in the hypoglycemic and control group. Pregnancy-induced hypertension, the number of patients delivering prior to 36 completed weeks of gestation secondary to preterm labor and requiring NICU in the hypoglycemia group were greater than that in the control group; however there was only a statistically significant difference between NICU admissions (12).

In a recent prospective study with large number of participants, women with hypoglycemia, (≤ 88 mg/dl) had neonates with lower birth weight than controls; however, these differences were not reflected in the incidence of IUGR which were similar in both hypoglycemic and control groups (13). Incidence of Apgar scores < 7 at 5 minutes and admission to the NICU were similar between the groups. Despite the limited number of participants, our study showed an association between the maternal hypoglycemia and admission NICU; additionally, maternal hypoglycemia was associated with low APGAR scores.

As a result, in this study, we found a statistically significantly association between low 1-hour GCT levels and IUGR, however, shortcoming of our study is the inherent bias of the retrospective design. These potential biases can only be overcome with a prospective randomized trial.

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