

Changes of glucose tolerance after delivery in women with gestational diabetes

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Summary

We investigated glucose tolerance after cesarean section in 24 women with gestational-onset diabetes (group A), in 18 women with an adverse pregnancy outcome (group B), and in 19 healthy pregnant women (group C). Glucose tolerance was performed within six days as well as six weeks after delivery. Eleven (45.8%) women in group A, five (27.8%) in group B and one (5.2%) in group C showed glucose intolerance immediately after delivery. Six weeks after delivery, 18 (75%) women in group A showed normal glucose tolerance (NGT), four (16.6%) impaired glucose tolerance (IGT) and two (8.3%) diabetes according to WHO criteria. NGT showed 16 (88.8%) women in group B, and 19 (100%) in group C, while two (11.1%) women in group B presented with IGT.

We conclude that a glucose tolerance test both immediately and six weeks after delivery is useful not only in women who have gestational diabetes but also in women with an adverse pregnancy outcome.

Key words: Gestational diabetes; Postpartum period; Adverse pregnancy.

Introduction

Carbohydrate intolerance during pregnancy is a significant problem associated with fetal complications including macrosomia and an increased likelihood of developing diabetes in later life [1]. The incidence of carbohydrate intolerance during pregnancy is higher than that usually estimated, affecting 6.7-9.1% of pregnant women [2]. The recurrence rate of gestational diabetes in a subsequent pregnancy is about 35% and depends on many factors; e.g., age, parity and weight gain between the pregnancies [3].

Women who have carbohydrate intolerance during pregnancy require no insulin postpartum. However, a preventive medical approach for the investigation of glucose tolerance should be undertaken postpartum, as a proper retrospective diagnosis is important for the future health [4]. Additionally, if an antenatal oral glucose tolerance test (OGTT) has been omitted and an adverse pregnancy outcome occurs, the possibility of gestational diabetes is raised and an OGTT performed in the puerperium can distinguish the patients with or without antecedent gestational diabetes [5, 6]. On the contrary the normal outcome of a pregnancy does not exclude gestational diabetes [7].

The aim of this study was to investigate glucose tolerance immediately in the puerperium and six weeks after delivery in patients with gestational-onset diabetes, in those with an adverse pregnancy outcome as well as in those who had a normal pregnancy outcome for the identification of the rate of the women who remained with impaired glucose tolerance or already had clinical diabetes after delivery.

Material and Methods

Our study population consisted of 61 pregnant women between 38 and 40 weeks of gestation. Group A had a mean gestational age of 38.6 (38-39.5) weeks and consisted of 24 women who had gestational carbohydrate intolerance detected for the first time during pregnancy. The diagnosis of gestational diabetes was based on Carpenter and Coustan [8] criteria where, after a 100 g oral glucose load two or more of the following plasma glucose values were met or exceeded: Fasting 95mg/ml, 1 h 180 mg/ml, 2 h 155 mg/dl and 3 h 140 mg/dl.

Group B had a mean gestational age of 39.2 (39-40) weeks and consisted of 18 women who did not have an OGTT during the period of pregnancy but they had some risk factors related to the possible presence of gestational carbohydrate intolerance during the pregnancy. The factors are shown in Table 1. Group C had a mean gestational age of 39.4 (39-40) weeks and consisted of 19 healthy women who had a normal OCTT during the pregnancy. These patients did not have any risk factor related to the presence of impaired glucose tolerance and they delivered a baby with birth weight within the normal ranges (mean \pm SD 3,380 \pm 156 g).

All women delivered by cesarean section. A 50 g oral glucose tolerance test was performed within six days after delivery. When we found a plasma glucose level of 162 mg/dl or more one hour after the oral glucose load together with a two-hour level of 126 mg/dl or more, we considered the patient to have glucose intolerance.

Table 1. — Risk factors related to the possible presence of carbohydrate intolerance in group B patients.

Risk Factor	n	%
Previous unexplained intrauterine death	2	11.1
Previous unexplained neonatal death	1	5.5
Family history of diabetes	14	77.7
Polyhydramnios	3	16.7
Birth weight > 4000 g	7	38.8

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Each woman was instructed to return six weeks later after fasting from 8.00 p.m. on the previous night. She should have had an adequate diet containing 150 Kcal of carbohydrates in the three preceding days. Venous blood was drawn for the fasting plasma glucose level. She was then given a drink containing 75 g of glucose which was followed by plasma glucose determination after two hours time. We classified our patients as having absence of impaired glucose tolerance, impaired glucose tolerance or diabetes according to the World Health Organization (WHO) criteria [9] as follows. a) Women with fasting plasma glucose levels <140 mg/dl and 2 h later <140 mg/dl were classified as having absence of impaired glucose tolerance, b) women with fasting plasma glucose level <140 mg/dl but 2 h later a plasma glucose level between 140-198 mg/dl as having impaired glucose tolerance and c) women with a fasting plasma glucose level >140 mg/dl and 2h later ≥ 198 mg/dl, as having diabetes.

Results

The clinical characteristics of our subjects are shown in Table 2. No significant differences were noted between the three groups regarding age, gestational age, body mass index (Kgr/m²) hematocrit and mode of delivery.

The incidence of patients who presented with impaired or normal glucose tolerance after the administration of 50 g glucose within six days after delivery is shown in Table 3.

Eleven (45.8%) patients in group A, five (27.8%) in group B and one (5.2%) in group C fulfilled our criteria and they were characterized as having impaired glucose tolerance.

All patients received 75 g of glucose six weeks after delivery. We found that although most of the patients (75%) with gestational-onset diabetes presented with normal glucose tolerance, four (16.7%) patients presented with impaired glucose tolerance and two (8.3%) presented with diabetes. We also found that only two (11.1%) of the group B patients presented with impaired glucose tolerance and none with diabetes while, none of the group C patients presented with impaired glucose tolerance or diabetes (Table 4).

Table 2. — *Clinical characteristics and mode of delivery of the subjects.*

	Group A	Group B	Group C	P
Age (years)	28 \pm 2.3	30 \pm 1.2	29 \pm 2.1	NS
Gestational age (weeks)	38.6 (38-39.5)	39.2 (39-40)	39.4 (39-40)	NS
BMI (Kgr/m ²)	27.2 \pm 0.3	25.92 \pm 4.91	24.86 \pm 5.91	NS
Maternal hematocrit	37.2 \pm 0.3	35.92 \pm 0.7	36.4 \pm 0.4	NS
Mode of delivery	C.S.	C.S.	C.S.	NS

NS: No significant difference

CS: Cesarean Section

Table 3. — *The rate of impaired and normal glucose tolerance after administration of 50 g glucose in our study population.*

	Impaired glucose tolerance		Normal glucose tolerance	
	1 h > 162 mg/dl	2 h > 126 mg/dl	1 h < 162 mg/dl	2 h < 126 mg/dl
	n	%	n	%
Group A	11	45.8	13	54.2
Group B	5	27.8	13	72.2
Group C	1	5.2	18	94.8

Table 4. — *Glucose tolerance in the three groups of patients after six weeks of delivery according to WHO criteria.*

	Normal		Impaired		Diabetes	
	Fasting < 140 mg/dl 2 h < 140 mg/dl		Fasting < 140 mg/dl 2 h 140-198 mg/dl		Fasting \geq 140 mg/dl 2 h \geq 198 mg/dl	
	n	%	n	%	n	%
Group A	18	75	4	16.7	2	8.3
Group B	16	88.9	2	11.1	—	—
Group C	19	100	—	0	—	0

Discussion

Routine glucose tolerance testing for gestational diabetes mellitus during pregnancy identifies a group of women who have glucose tolerance in the upper end of the population distribution at a time when most individuals are insulin-resistant from the metabolic changes of pregnancy. Long-term follow-up studies indicate that at least 30-50% of those women will develop diabetes at some time after the index pregnancy [10, 11]. However, most women with gestational diabetes become euglycemic within the first few days postpartum. Up to 19% of women with gestational diabetes will continue to have abnormal glucose tolerance postpartum, either falling outside the normal ranges or into the categories of impaired glucose tolerance or overt diabetes mellitus. Oats and Beischer [12] have reported that six weeks' postpartum the incidence of abnormal glucose tolerance was 30% in women who had gestational diabetes and delivered by cesarean section. Catalano *et al.* [13] found that 6 \pm 2 weeks after delivery 23% of the patients with gestational diabetes presented with abnormal results. Tan *et al.* [14] indicated that the incidence of persistent glucose intolerance six weeks after delivery was 23.2% among 208 women who had gestational diabetes. Recently, a total of 788 women with gestational diabetes were evaluated 3 - 6 months after delivery by Pallardo *et al.* [15]; they found that 21.6% of the patients presented with impaired glucose tolerance, while 5.4% presented with diabetes.

According to our results six weeks after delivery the incidence of impaired glucose tolerance in patients with gestational diabetes was 16.7%. The incidence of diabetes was 8.3% while most of our patients (75%) presented with normal glucose tolerance. The incidence of the above patients who presented with impaired glucose tolerance within six days after delivery was 45.8%.

Studies have found an incidence of abnormal glucose tolerance immediately after delivery to be between 30 and 43% in cases with gestational diabetes [6, 12].

In this study, 19 women who had normal antenatal glucose tolerance were tested for glucose intolerance immediately after delivery; one of them presented with an abnormal test which returned to normal at the examination six weeks later. We consider, as do other authors, that postpartum glucose screening is not warranted for women with normal glucose tolerance during pregnancy [12, 16, 17].

Many pregnant women are not tested for gestational diabetes although they or their offspring may show signs suggestive of antecedent hyperglycemia. In this study the incidence of abnormal glucose tolerance was 27.8% immediately after delivery and 11.1% six weeks after delivery in women with an adverse pregnancy outcome. We consider as many authors do that if a glucose tolerance test has not been performed prenatally, the test is still worthwhile in the immediate puerperium if the possibility of gestational diabetes has been raised by an adverse pregnancy outcome [5, 12].

We conclude that a postnatal glucose tolerance test is necessary not only in cases with gestational diabetes but in cases with adverse pregnancy outcome for identification of those women with impaired glucose tolerance or diabetes. These women as Beischer *et al.* [4] had mentioned need consultation and must be entered for continuation in a follow-up program.

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