



Original Article

Placental elasticity on patients with gestational diabetes: Single institution experience

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Abstract

Background: Gestational diabetes is defined as glucose intolerance which is first recognized in pregnancy. Oral glucose tolerance test (OGTT) is the cornerstone in diagnosing gestational diabetes. Placental elasticity evaluation is relatively new concept and is principally used for research purposes. We aimed to find any relation between placental elasticity evaluation and patients of gestational diabetes diagnosed by 75 g OGTT.

Methods: There were 91 patients took part in study, forming two groups as gestational diabetic patients (21 patients) and control group (70 patients). Elasticity of placenta was determined by acoustic radiation force impulse technology utilized by two blinded radiology specialists.

Results: We were not able to find any correlation between 75 g OGTT values and placental elasticity measurements ($p > .05$). Also placental elasticity was not found to be significantly different in two groups ($p > .05$).

Conclusion: Placental elasticity measurement on the 24th–28th weeks does not seem to be a marker for identification of gestational diabetes. Copyright © 2017, the Chinese Medical Association. Published by Elsevier Taiwan LLC. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Keywords: Elasticity; Gestational diabetes; Placenta

1. Introduction

Diabetes is the most common complication of pregnancy. Depending on the time of diagnosis, women with diabetes can be classified as pre-gestational or gestational diabetes. Gestational diabetes mellitus (GDM) is defined as glucose intolerance with onset during pregnancy, with no known previous history.¹ Prevalence of GDM is around 5–10%, with an increase of about 40% between 1989 and 2004.²

OGTT is one of the most recommended ways of testing insulin tolerance of a pregnant patient who has not been diagnosed as diabetic prior to pregnancy, according to criteria of the American College of Obstetrics and Gynecology (ACOG) and other associations such as the American Diabetes Association (ADA).^{3,4} Testing can be done either with the one step testing approach such as 75 g OGTT testing, or the two step testing approach with initial 50 g OGTT testing followed by a 100 g OGTT if needed.

Acoustic radiation force imaging (ARFI) is an ultrasonography based technique of propagation of acoustic waves in attenuating tissues to establish values of elasticity. With increasing acoustic frequencies, the tissue does not respond fast enough to the transitions between positive and negative pressures. With this technique, however, we have more insightful

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information about the stiffness of tissue to which the technology is applied. The development of ARFI lead to some placental research performed on mostly pre-eclamptic patients; there even has been a recent study done on patients with GDM.^{5,6}

Our aim is to find any correlation between placental elasticity and GDM screening results from 75 g OGTT. To the best of our knowledge, this will be the first study done with 75 g testing, to identify a different approach to GDM testing.

2. Methods

This was a prospective single-blinded case–control study done on Baskent University Istanbul Education and Research Hospital between September 2015 and October 2016. During the 24th–28th week of pregnancy, patients were asked to have an ARFI testing performed on their placental tissues. Patients with multiple pregnancies, placenta located on the posterior side of the uterine wall, patients with other systematic disorders such as pre-gestational diabetes, hypertension, and rheumatological diseases are excluded from the study. A total of 91 patients agreed to participate, and provided appropriate consent.

GDM testing was done with 75 g oral glucose solution. A diagnosis of GDM was established when any of the following results were obtained: fasting ≥ 92 mg/dl (5.1 mmol/L), 1 h glucose level ≥ 180 mg/dl (10.0 mmol/L), or 2 h glucose level ≥ 153 mg/dl (8.5 mmol/L). Patients diagnosed with GDM were initially and if possible treated only with nutritional therapy. If nutritional therapy was not effective or inadequate for achieving the target glucose levels (fasting ≤ 95 mg/dl, 1 h ≤ 140 mg/dl, 2 h ≤ 120 mg/dl), then insulin therapy was initiated following consultation with an endocrinology specialist.

Two blinded radiologists with more than 10 years experience each in the field participated in this study by doing the ARFI examination on the day of GDM testing. The radiologists were completely unaware of patient glucose testing results as sonographic examinations were performed in the first hour interval of the OGTT process. We used an Acuson S2000 Ultrasound System (Siemens, Erlangen, Germany) with a C6-1Mhz convex probe for color Doppler ultrasonography (CDU), ARFI and resistivity index measurements. Placental measurements were obtained with patients lying on their backs. Following initial evaluation of placental maturation, resistivity index measurement was done from the arterial flow sample points on the peripheral part of the placenta using CDU. A region of interest (ROI) box was used to acquire standard 1 cm² areas for ARFI measurement, based on the umbilical cord insertion point and two other regions which were at least 2 cm away from the insertion point. Measurements were done on the sagittal plane from areas that are clearly seen by performer. Special attention was devoted to not having any vessel formation inside of the ROI during measurement. The mean of three measurements was calculated and used for statistical purposes. Pictures showing an example of how to measure elasticity and placental resistivity index have been presented below (Figs. 1 and 2).

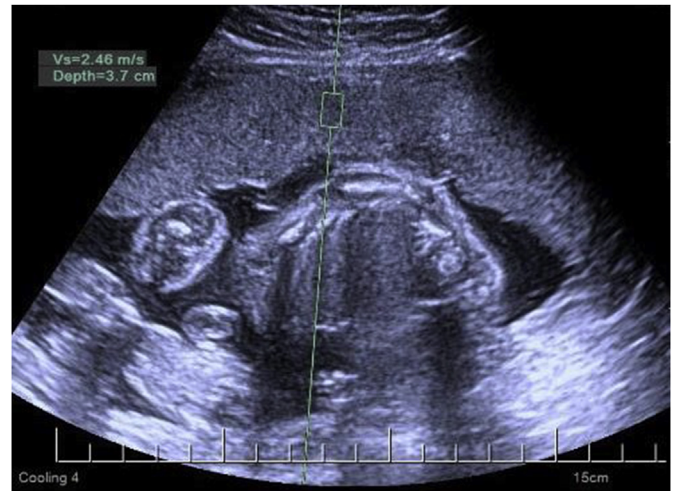


Fig. 1. Sample measurement for ARFI and placenta elasticity.

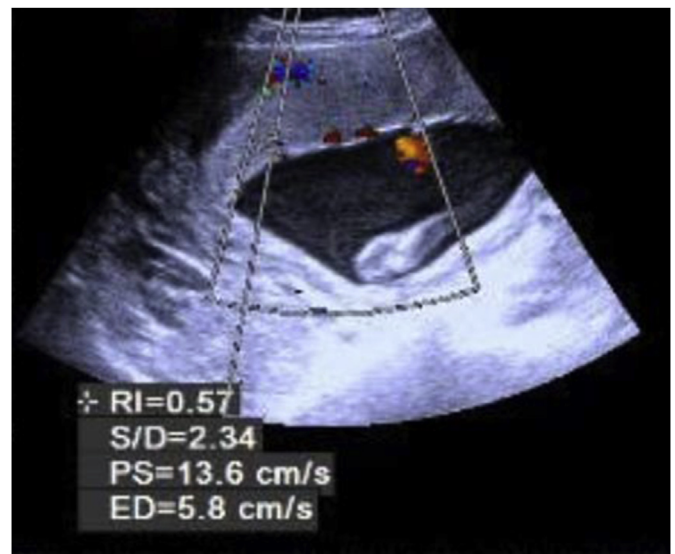


Fig. 2. Sample measurement on calculating resistivity index from placenta.

Statistical Package for the Social Sciences (SPSS) version 23.0 (IBM Co, Chicago IL, USA) was used for statistical analyses. Mann–Whitney U-test, independent sample t test and Pearson's correlation tests were used where appropriate. *p* value $< .05$ was considered to be statistically significant. Baskent University IRB department provided approved this study, with id number of KA16/267.

3. Results

Patients were divided into two groups. Patients with GDM were referred to as the study group, with 21 patients enrolled whereas patients with normal OGTT values were referred to as the control group, with 70 patients enrolled. The incidence of GDM in the whole group was found to be 23%. The mean age of the study group was 32.60, and the mean age of the control group was 29.32 with a significant difference from study group

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