

Serum fructosamine for diagnosis of gestational diabetes: a perspective

Abstract

Recently, several studies proposed continuous glucose monitoring (CGM) as a reliable diagnostic test for Gestational Diabetes Mellitus (GDM). These studies have challenged the validity of Oral Glucose Tolerance Tests (OGTT) recommended by American college of Obstetricians and Gynecologists (ACOG) and American Diabetes Association (ADA) because of a lack of preparation for 3-hour OGTT with least daily intake of 150gm of carbohydrates for 3 days before testing. Moreover, OGTT results vary widely due to artificial milieu as well as changing daily carbohydrate intake, both quantity and the type, during the previous few days. Recently, we have documented subnormal and significantly lower Fructosamine concentrations in pregnant women without GDM when compared to those with GDM. Finally, we recently observed that Fructosamine compares more favorably with CGM for 2 weeks in pregnant women with abnormal 3-hour OGTT, suggestive of false positivity. Therefore, Fructosamine may be as accurate as CGM and more accurate than both Glucose Tolerance Tests.

Keywords: GDM, hemoglobin A1c, pregnancy, fructosamine, glucose, continuous monitor

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Abbreviations: HbA1c, hemoglobin A1c; GDM, gestational diabetes mellitus; OGTT, oral glucose tolerance test; ACOG, American college of obstetricians and gynecologists; ADA, American diabetes association; CGM, continuous glucose monitoring

Perspective

Determination of Hemoglobin A1C is recommended for diagnosis of diabetes in non-pregnant adults, though it has not been assessed in diagnosis of Gestational Diabetes Mellitus.¹ HbA1c may not be accurate in diagnosing GDM because it denotes the average blood glucose over 3 months' period, while the pregnancy lasts only 9 months. Alternatively, serum Fructosamine concentration expresses average blood glucose over 3 weeks and may be more accurate than HbA1c in diagnosis of GDM. However, the utility of serum Fructosamine concentration in diagnosis of diabetes has not been recommended in any population, including pregnant women. Recently, several studies proposed continuous glucose monitoring as a diagnostic test for Gestational Diabetes Mellitus.²⁻⁸ These studies have questioned the validity of Oral Glucose Tolerance Tests recommended by American college of Obstetricians and Gynecologists and American Diabetes Association because of the definitive possibility of false positives and inaccuracies of duplication of OGTT's.⁹⁻¹³ However, both ACOG and ADA continue to recommend 2 step OGTT testing: 1.) 1-hour glucose level after 50gm glucose ingestion at any time during the day (1-hour OGTT). 2.) 3-hour OGTT with 100gm glucose ingestion after an overnight fast in pregnant women with results of 1-hour OGTT \geq 140 mg/dl. Preparation with least daily intake of 150gm of carbohydrates for 3 days is recommended, though not frequently undertaken before testing for 3-hour OGTT. Moreover, many women are reluctant to be subjected to OGTT testing because of intolerance to glucose ingestion as well as the required preparation. Finally, without preparation, OGTT results vary daily because of changing total content as well as the type of carbohydrate intake during the previous few days, but especially the dinner or bedtime snack the previous day.⁹⁻¹³ Recently, we have documented serum Fructosamine concentrations are subnormal and significantly lower in pregnant women without GDM when compared to pregnant women manifesting GDM.^{14,15}

Sensitivity and Specificity indices were 88% (CI 95%, 83-94; $p < 0.001$) and 89% (CI 95%, 83-98; $p < 0.001$) respectively.¹⁶ The exact mechanism for this finding is uncertain. However, several speculative pathophysiologic explanations are likely as discussed in a previous report.¹⁴ Alternatively, the lower Fructosamine level with normal HbA1c during normal pregnancy may be attributed to the declining affinity of glucose to serum albumin compared with red blood cells.

Additionally, in a case report we have documented Fructosamine level in non-GDM range along with normal CGM results, but a positive 3-hour OGTT.¹⁷ We also demonstrated that Fructosamine was comparable to both HbA1c and continuous glucose monitoring for 2 weeks in a woman who declined the 3-hour OGTT due to previous intolerance to glucose intake during the 1-hour OGTT.¹⁸ Finally, we recently observed that serum Fructosamine compares more favorably with continuous glucose monitoring for 2 weeks in some pregnant women with abnormal 3-hour OGTT, suggestive of false positivity.¹⁹ In conclusion, CGM may be the most accurate test for diagnosis of GDM. Fructosamine may be as accurate as CGM and more accurate than both Glucose Tolerance Tests. Importantly, it is a simple and convenient test without requiring fasting, glucose ingestion or preparation

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Conflicts of interest

The authors declare no conflict of interest or financial disclosures.

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