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ORIGINAL ARTICLE

The monophasic pattern in oral glucose tolerance test as a predictive risk factor of type 2 diabetes in obese paediatric patients☆

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KEYWORDS
Glucose oral tolerance test;
Obesity;
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Abstract
Introduction: The onset of obesity at young ages is strongly associated with the early development of type 2 diabetes (T2D). The shape of the curves of glucose and insulin curves during an oral glucose tolerance test (OGTT) could predict the risk of developing T2D.
Objective: To analyse the morphology of the OGTT and determine T2D risk factors in a mainly Caucasian population of children and adolescents.
Methods: Observational retrospective study including 588 patients (309 males, 279 females) with a mean age of 11.1 ± 2.8 years, and of whom 90.3% were Caucasian. Risk factors for T2D were compared in patients with a monophasic or biphasic pattern during the performance of an OGTT, as well as anthropometric and biochemical variables, insulin resistance, and beta-cell function.
Results: The shape of the glucose curve was monophasic in 50.2% of patients (50.8% male), biphasic in 48.5% (47.6% males), and indeterminate in 1.3%. The monophasic pattern showed lower insulin-sensitivity and worse beta-cell function. Patients with a biphasic pattern had a higher BMI, waist circumference, and blood pressure, although the results were not significant. Latin-American patients had significantly lower serum glucose levels with higher insulin levels during the OGTT.
Conclusions: The pattern of response to an OGTT reflects different metabolic phenotypes. Paediatric patients with a biphasic pattern have lower risk-profiling for T2D. OGTT would be useful

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to implement early intervention strategies in children and adolescents with obesity, in order to prevent the development of pre-diabetes or T2D.

PALABRAS CLAVE
Sobrecarga oral de glucosa;
Obesidad;
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La respuesta monofásica a la sobrecarga oral de glucosa como factor predictivo del riesgo de diabetes tipo 2 en pacientes pediátricos con obesidad

Resumen
Introducción: El aumento en la prevalencia de obesidad en la edad pediátrica se asocia a mayor incidencia de diabetes mellitus tipo 2 (DM2). El tipo de respuesta de la glucemia y de la insulina a la sobrecarga oral de glucosa (SOG) podría predecir el riesgo de DM2 en pacientes con obesidad.
Objetivo: Valorar la respuesta a la SOG y relacionar con factores de riesgo de DM2 en niños y adolescentes obesos.
Métodos: Estudio observacional retrospectivo sobre 588 pacientes (309 varones, 279 mujeres); 90,3% caucásicos; edad media 11,1 ± 2,8 años. Según el tipo de respuesta en la SOG se establecieron dos grupos: monofásico y bifásico. Se analizaron parámetros antropométricos, bioquímicos e índices relacionados con sensibilidad a la insulina y la función de la célula β.
Resultados: El 50,2% de los pacientes tuvieron un patrón de glucosa monofásico (50,8% varones), el 48,5% bifásico (47,6% varones) y el 1,3% indeterminado. La respuesta monofásica mostró menor sensibilidad a la insulina y peor función de la célula β; los pacientes con patrón bifásico presentaron mayor índice de masa corporal, perímetro de cintura y presión arterial, sin ser estos resultados estadísticamente significativos. Los pacientes latinos tuvieron glucemias significativamente menores en la SOG a expensas de una mayor insulinemia.
Conclusiones: El patrón de respuesta de la SOG refleja fenotipos metabólicos diferentes. Los pacientes pediátricos con un patrón bifásico tienen un perfil con menor riesgo de desarrollar DM2. Una SOG en niños y adolescentes obesos podría ser útil para implementar estrategias de intervención precoz y prevenir la aparición de prediabetes o DM2 en esta población.

Introduction

The incidence of type 2 diabetes (T2D) in adolescents has increased in recent decades in association with an increase in the prevalence of obesity in the paediatric age group.[1] Some studies have reported larger increases in specific groups of adolescents aged 15–19 years, with an incidence of T2D of 17.0–49.4 per 100,000 individuals per year,[2] even outnumbering new cases of type 1 diabetes in some ethnic groups.[3] In adults, the progression from prediabetes to T2D takes approximately 5–10 years; in paediatric patients, the progression is more rapid, which is probably related to the transient physiologic insulin resistance that occurs in puberty.[4]

Research conducted in the United States has reported a higher incidence of T2D in paediatric patients with obesity and biochemical markers of impaired carbohydrate tolerance,[5] but has been unable to establish clinical variables or specific serum levels that can accurately predict the risk of diabetes in these patients.[6] The assessment of the response of glucose and insulin levels to an oral glucose tolerance test (OGTT) provides important information to establish the individual risk of each patient.[7]

There is evidence that the risk of T2D is associated not only with baseline and 2-hour glucose concentrations in the OGTT, but also with the morphological characteristics of the glucose response curve of individual patients, which can reflect early metabolic changes that help predict the risk of future T2D.[8] Monophasic responses show a continuous and gradual increase in serum glucose levels, while biphasic responses exhibit an initial increase in glucose, followed by a decline and then a further increase at the end. In adults, the monophasic pattern has been associated with insulin resistance, impaired β-cell function and increased risk of developing T2D, while levels in individuals with normal glucose tolerance usually exhibit a biphasic pattern.[7,9] These responses reflect changes in insulin sensitivity and/or secretion, both of which play a role in T2D.[9] A study of Latino adolescents with obesity reported results similar to those described in adults, suggesting that the OGTT can contribute to the early detection of risk of T2D in adolescents.[5]

The aim of this study was to analyse the shape of the response to the OGTT in a predominantly Caucasian paediatric cohort, and assess whether there was an association between different response patterns and possible risk factors for T2D.