



ORIGINAL ARTICLE

Low-carbohydrate, high-protein, high-fat diet alters small peripheral artery reactivity in metabolic syndrome patients



Jordi Merino^{a,*}, Richard Kones^b, Raimon Ferré^a, Núria Plana^a, Josefa Girona^a, Gemma Aragonés^a, Daiana Ibarretxe^a, Mercedes Heras^a, Luis Masana^a

^a Vascular Medicine and Metabolism Unit, Lipids and Atherosclerosis Research Unit, Sant Joan University Hospital, Institut d'Investigació Sanitària Pere Virgili, IISPV, Faculty of Medicine, Rovira i Virgili University, Spanish Biomedical Research Network in Diabetes and Associated Metabolic Disorders (CIBERDEM), Barcelona, Spain

^b Cardiometabolic Research Institute, Houston, USA

Received 19 September 2013; accepted 18 November 2013
Available online 21 December 2013

KEYWORDS

Low-carbohydrate diet;
Endothelial function;
Metabolic syndrome

Abstract

Background: Low carbohydrate diets have become increasingly popular for weight loss. Although they may improve some metabolic markers, particularly in type 2 diabetes mellitus (T2D) or metabolic syndrome (MS), their net effect on vascular function remains unclear.

Objective: Evaluate the relation between dietary macronutrient composition and the small artery reactive hyperaemia index (saRHI), a marker of small artery vascular function, in a cohort of MS patients.

Design: This cross-sectional study included 160 MS patients. Diet was evaluated by a 3-day food-intake register and reduced to a novel low-carbohydrate diet score (LCDS). Physical examination, demographic, biochemical and anthropometry parameters were recorded, and saRHI was measured in each patient.

Results: Individuals in the lowest LCDS quartile (Q1; 45% carbohydrate, 19% protein, 31% fat) had higher saRHI values than those in the top quartile (Q4; 30% carbohydrate, 25% protein, 43% fat) (1.84 ± 0.42 vs. 1.55 ± 0.25 , $P = .012$). These results were similar in T2D patients (Q1 = 1.779 ± 0.311 vs. Q4 = 1.618 ± 0.352 , $P = .011$) and also in all of the MS components, except for low HDLc. Multivariate analysis demonstrated that individuals in the highest LCDS quartile, that is, consuming less carbohydrates, had a significantly negative coefficient of saRHI which was independent of confounders (HR: -0.747 ; 95%CI: 0.201, 0.882; $P = .029$).

Conclusions: These data suggest that a dietary pattern characterized by a low amount of carbohydrate, but reciprocally higher amounts of fat and protein, is associated with poorer vascular reactivity in patients with MS and T2D.

© 2013 Elsevier España, S.L. and SEA. All rights reserved.

Abbreviations: T2D, type 2 diabetes mellitus; MS, metabolic syndrome; saRHI, small artery reactive hyperaemia index; EF, endothelial function; LCDS, low-carbohydrate diet score; CHD, coronary heart disease; FMD, flow-mediated dilatation; PAT, peripheral artery tonometry; CIMT, carotid intima-media thickness.

* Corresponding author.

E-mail address: jordi.merino@urv.cat (J. Merino).

PALABRAS CLAVE

Dieta baja en
hidratos de carbono;
Función endotelial;
Síndrome metabólico

Un patrón de consumo bajo en hidratos de carbono y alto en proteínas y grasas afecta a la reactividad arterial de pequeña arteria en pacientes con síndrome metabólico

Resumen

Introducción: Las dietas bajas en hidratos de carbono son muy populares para la pérdida de peso. Aunque estas puedan mejorar algunos marcadores metabólicos, en particular en la diabetes mellitus tipo 2 (DM2) o en el síndrome metabólico (SM), su efecto neto sobre la función de la pared arterial sigue siendo poco clara.

Objetivo: Evaluar la relación entre la composición de macronutrientes de la dieta y el índice de hiperemia reactiva de pequeña arteria (saRHI) en una cohorte de pacientes con SM.

Diseño: En este estudio transversal se incluyeron 160 pacientes con SM. La dieta fue evaluada mediante un registro alimentario de 3 días que se tradujo a una puntuación de dieta baja en hidratos de carbono (LCDS). Se registraron los parámetros demográficos, bioquímicos, antropométricos, y el saRHI se determinó en cada paciente.

Resultados: Los individuos en el cuartil inferior de LCDS (C1, 45% de hidratos de carbono, 19% de proteína y 31% grasa) presentaron valores más altos de saRHI en comparación a con del cuartil superior (C4, 30% de hidratos de carbono, 25% de proteínas, 43% de grasa) ($1,84 \pm 0,42$ vs. $1,55 \pm 0,25$, $p = ,012$). Estos resultados fueron particularmente semejantes en los pacientes con DM2 (C1 = $1,779 \pm 0,311$ vs. C4 = $1,618 \pm 0,352$, $p = ,011$) y en todos los componentes del SM, excepto por los niveles bajos de cHDL. En el análisis multivariante se observó que los individuos en el cuartil superior del LCDS consumían menos hidratos de carbono, tenían un coeficiente negativo de saRHI alto independiente de los factores de confusión (HR: $-0,747$; IC95%: 0,201, 0,882; $p = ,029$).

Conclusiones: Estos hallazgos sugieren que un patrón alimentario caracterizado por una baja cantidad de hidratos de carbono, pero altas cantidades de proteínas y grasas, se asocia con una menor reactividad vascular de arteria pequeña en pacientes con SM.

© 2013 Elsevier España, S.L. y SEA. Todos los derechos reservados.

Introduction

Obesity and the closely related risk cluster of metabolic syndrome (MS) increase cardiovascular (CV) risk, in turn raising the incidence and prevalence of coronary heart disease (CHD). CHD accounts for most of the deaths in developed countries, and is presently the most pernicious threat to global public health.^{1,2} Improvements in just 3 lifestyle behaviors: smoking cessation, consuming a well-balanced, healthful diet and adequate physical activity, are remarkably effective in reducing the burden of noncommunicable “degenerative diseases of civilization,” particularly obesity, MS, diabetes, CHD and cancer.^{3,4} Although components of macronutrient intake are considered healthy over a fairly wide range, their ratios have been believed to affect final body weight, overall level of cardiovascular risk, and progression of atherosclerosis.⁵ Several major scientific bodies currently recommend a low-fat, high-carbohydrate, energy-deficient diet to manage weight and associated comorbidities.^{6–8} On the other hand, diets rich in fat and protein, but low in carbohydrates, have become popular, with advocates deemphasizing the role of caloric intake in weight gain. Several best-selling books endorse this strategy of carbohydrate reduction, and maintain that weight will be lost despite isocaloric intake, accompanied by a reduction in cardiovascular risk. For over 40 years, the relative advantages of both diets, along with the effects upon cardiovascular risk, have been debated.⁹ Faster initial weight loss, perhaps related to the satiating effects of high protein consumption,¹⁰ might improve insulin sensitivity and

lipid profiles associated with low-carbohydrate diets.^{11,12} However, weight loss associated with these diets is generally not sustained beyond 1 year, and the overall effect on vascular health, closely related to cardiovascular outcomes, remains controversial.^{9,13} Several recent randomized clinical trials have studied the effect of macronutrient composition upon endothelial function (EF) using flow-mediated dilatation (FMD), with disparate results.^{12,14–24} In order to increase accuracy and predictive power, a standardized method of grading the extent of adherence to a low carbohydrate diet according to three scales of carbohydrate, fat, and protein intake, as percentages of total calories consumed, was adopted in this trial. The Low-Carbohydrate Diet Score (LCDS) provides an effective tool to classify individuals according to their relative levels of fat, protein and carbohydrate consumption, embodied in a simple number.¹³ The LCDS is based upon the percentage of energy consumed as carbohydrate, and reflects the concordance with low carbohydrate intake. The higher the individual score, the lower the carbohydrate, but the higher the protein and fat content, in that patient’s diet. LCDS has successfully been employed to show that a low carbohydrate diet is positively associated with the risk of type 2 diabetes (T2D) in a large cohort of healthy men after 20 years of follow-up.²⁵

Measurement of the peripheral arterial tonometry (PAT) hyperemic response, embodied in the small artery reactive hyperaemia index (saRHI), is a relatively new technique considered a toll reflecting endothelial and other variables upon microvascular function, dilation of the small arteries among them.^{26–28} SaRHI correlates with coronary endothelial

Download English Version:

<https://daneshyari.com/en/article/2839703>

Download Persian Version:

<https://daneshyari.com/article/2839703>

[Daneshyari.com](https://daneshyari.com)