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Original article

The correlation of plasma omentin-1 with insulin resistance in non-obese polycystic ovary syndrome

Corrélation entre omentine-1 plasmatique et insulinorésistance dans une population non obèse atteinte de syndrome des ovaires polykystiques

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Abstract

Objectives. – Aberrant circulating adipokines are considered to be related to the pathological mechanism of polycystic ovary syndrome (PCOS). This study aims to evaluate the relationship between plasma omentin-1 levels, metabolic and hormonal parameters in the setting of non-obese Chinese women with PCOS. *Material and methods.* – This was a case-controlled, cross-sectional study of 153 non-obese (BMI < 25 kg/m^2) PCOS and 114 age-matched healthy non-obese control individuals. Levels of plasma omentin-1, fasting blood glucose, insulin and sexual hormones and ovary volume were analyzed in all subjects. *Results.* – Plasma omentin-1 levels of non-obese PCOS individuals were significantly lower than in healthy non-obese controls. Body Mass Index (BMI), homeostasis model of assessment for insulin resistance index (HOMA-IR), levels of testosterone, luteinizing hormone (LH) and follicle-stimulating hormone (FSH), LH/FSH ratio and ovary volume (OV) were significantly higher in subjects with PCOS than controls. In the HOMA-IR stratified subgroups, PCOS individuals with insulin resistance had lower omentin-1 than those without insulin resistance after BMI adjustment. Omentin-1 was negatively correlated with BMI, HOMA-IR and fasting insulin. Multiple linear regressions revealed that BMI contributed to omentin-1 levels. Ovary volume was negatively correlated to HOMA-IR but had no correlation with omentin-1. *Conclusions.* – Plasma omentin-1 concentrations were decreased in the non-obese PCOS group. Insulin resistance could further decrease plasma omentin-1 in non-obese individuals with PCOS independent of BMI status.

Keywords: Omentin-1; PCOS; BMI

Résumé

Objectives. – Les adipokines circulantes aberrantes sont considérées comme étant en rapport avec le mécanisme physiopathologique du syndrome des ovaires polykystiques (SOPK). Cette étude a pour objectif d'évaluer la relation entre les concentrations plasmatiques d'omentine-1 et les paramètres métaboliques et hormonaux chez des femmes chinoises non obèses atteintes de SOPK. *Matériel et méthodes.* – Il s'agit d'une étude transversale cas-témoins de 153 patientes non obèses (IMC < 25 kg/m^2) atteintes de SOPK et de 114 contrôles sains non obèses appariés pour l'âge. Les taux plamsmatiques d' omentine-1, la glycémie à jeun, l'insuline et les hormones sexuelles, ainsi que le volume des ovaires ont été analysés chez tous les sujets. *Résultats.* – Les taux plasmatiques d'omentine-1 des femmes non obèses atteintes de SOPK étaient significativement plus faibles que chez les témoins non obèses en bonne santé. L'indice de masse corporelle (IMC), le modèle d'homéostasie de l'évaluation pour l'indice de résistance à l'insuline (HOMA-IR), les taux de testostérone, l'hormone lutéinisante (LH) et l'hormone folliculo-stimulante (FSH), le rapport LH/FSH et le volume de l'ovaire (OV) étaient significativement plus élevés chez les sujets souffrant du SOPK que chez les témoins. Dans les sous-groupes stratifiés selon le modèle HOMA-IR, les personnes atteintes de SOPK avec résistance à l'insuline avaient un taux d'omentine-1

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supérieur à celles sans résistance à l'insuline après ajustement pour l'IMC. L'omentine-1 était corrélée négativement avec l'IMC, le modèle HOMA-IR et l'insuline à jeun. Des régressions linéaires multiples ont révélé que l'IMC avait contribué aux taux d'omentine-1. Le volume de l'ovaire était corrélé négativement au modèle HOMA-IR mais nullement avec l'omentine-1. *Conclusions.* – Les concentrations d'omentine-1 plasmatique étaient diminuées dans le groupe SOPK non obèse. L'insulinorésistance pourrait encore diminuer le taux d'omentine-1 plasmatique chez les personnes non obèses atteintes de SOPK indépendamment de l'IMC.

Mots clés : Omentine-1 ; SOPK ; IMC

1. Introduction

Polycystic ovary syndrome (PCOS) is a common endocrine disorder affecting approximately 5–10% of reproductive aged women [1,2]. It is a highly prevalent heterogeneous syndrome characterized by hyperandrogenism and chronic anovulation, presenting as variable manifestations, including oligomenorrhea, infertility, hirsutism and acne [3,4]. Although the manifestations mentioned above are the principle impulse to seek medical intervention, it is the relevant complications of PCOS, including pancreatic β-cell dysfunction, insulin resistance (IR), susceptibility to type 2 diabetes mellitus (T2DM), dyslipidemia, visceral obesity and cardiovascular diseases (CVDs), that are critical in the long-term health of this population [5–7].

Adipose tissue is an endocrine organ that secretes a large amount of biologically important substances, termed adipokines [8]. Some well-known adipokines, including leptin, adiponectin, resistin and chemerin, have been shown to impact metabolic homeostasis and mediate insulin resistance [9,10]. Omentin-1 is a novel adipokine identified from a cDNA library of visceral omental adipose tissue by Yang et al. in 2003 [11]. The omentin gene is located at 1q22-q23, the region associated with T2DM [12]. Plasma omentin-1, the major circulating isoform in human plasma, is considered to be a pleiotropic adipokine, and the alteration of its plasma levels are correlated with many disease conditions, namely obesity, insulin resistance, diabetes, chronic inflammatory conditions, carcinogenesis, and CVDs, all of which are risk factors or long-term complications of PCOS [13–18].

Because PCOS patients are vulnerable to visceral adiposity, which contributes much more than peripheral obesity to the development of hyperandrogenism and insulin resistance [19,20], this visceral fat deposit-specific adipokine is of essential interest in PCOS studies. Recently, it has been reported that the circulating omentin-1 and mRNA and protein in omental AT levels in overweight women with PCOS were decreased [21]. The strong correlation between omentin-1 and obesity is well understood. However, the BMI distribution in PCOS patients differs across populations. In women in the USA, the prevalence of overweight and obesity in PCOS patients is 24% and 42%, respectively [2], which is higher than that in Asia, wherein China and Japan reported prevalence values of 20.92% and 31.77%, respectively [22,23]. Regardless of the recommended guide for the definition of obesity in various regions, it is obvious that there are fewer Asian women with obesity and PCOS than in the Caucasian population. Furthermore, people in southern China had a lower incidence of obesity than those in the northern part of the country (5.10‰ vs. 9.29‰) [24]. Therefore, it is very important to evaluate the plasma omentin-1 levels in non-obese PCOS women in southern China.

Here, we conducted a large-scale study to investigate the relationship between plasma omentin-1 levels and insulin resistance, levels of sexual hormones and ovary volume in non-obese (BMI < 25 kg/m^2) Chinese PCOS women. The data obtained may help to reveal new insight in the relationship of omentin-1 with obesity and insulin resistance in non-obese PCOS women.

2. Materials and methods

2.1. Study population

This study is a cross-sectional case control study, and the study protocol was approved by the Ethics Committee of the First Affiliated Hospital, Guangxi Medical University. All participants provided their written informed consent to participate in this study.

We recruited 153 women aged 15–40 years with PCOS and 114 age-matched healthy controls from August 1, 2013 to June 1, 2014. All the subjects had a BMI lower than 25 kg/m^2. They were recruited from outpatient clinics of the Department of Endocrinology and Metabolism in the First Affiliated Hospital of Guangxi Medical University (Nanning, China). PCOS was defined as the presence of at least two of the three following symptoms according to the Rotterdam criteria [25], after the exclusion of other etiologies with manifestations of excess androgen, such as congenital adrenal hyperplasia, androgen-secreting tumors, hyperprolactinemia and Cushing's syndrome:

- oligo- and/or anovulation;
- clinical and/or biochemical hyperandrogenism (HA);
- ultrasound findings of polycystic ovarian appearance.

Control subjects were healthy women with regular menstrual cycles and no evidence of hirsutism, acne or endocrine dysfunction who came for a health examination.

2.2. Anthropometric and biochemical measurements

Anthropometric measurements obtained during outpatient visits to the hospital included height and weight. BMI was