Clin Investig Arterioscler. 2018;xxx(xx):xxx–xxx

Sociedad Española de Arteriosclerosis

CLÍNICA E INVESTIGACIÓN EN ARTERIOSCLEROSIS

www.elsevier.es/arterio

ORIGINAL ARTICLE

An increase in epicardial fat in women is associated with thrombotic risk☆

Lourdes Basurto Acevedo[a,*], Susana Barrera Hernández[a], María de Jesús Fernández Muñoz[b], Renata Patricia Saucedo García[a], Ana Karen Rodríguez Luna[a], Carlos Martínez Murillo[c]

[a] *Unidad de Investigación Médica en Enfermedades Endocrinas, Hospital de Especialidades del Centro Médico Nacional Siglo XXI, IMSS, Mexico City, Mexico*
[b] *Servicio de Cardiología, Hospital de Especialidades del Centro Médico Nacional Siglo XXI, IMSS, Mexico City, Mexico*
[c] *Servicio de Hematología, Hospital General de México Dr. Eduardo Liceaga, Mexico City, Mexico*

Received 29 July 2017; accepted 20 October 2017

KEYWORDS
Epicardial adipose tissue;
Type-1 plasminogen activator inhibitor;
Obesity

Abstract
Introduction: A decrease in fibrinolytic activity and an increase in the thickness of the epicardial adipose tissue have been observed in patients with coronary artery disease. The aim of this study was to determine the association between epicardial adipose tissue and fibrinolytic activity by measuring the concentration of plasminogen activator inhibitor-1 (PAI-1).
Methods: A cross-sectional study was conducted on 56 apparently healthy women aged 45–60 years. Anthropometric measurements and biochemical determinations were performed on all participants. The fibrinolytic activity was determined by measuring PAI-1 by ELISA. Epicardial thickness was assessed by transthoracic echocardiography.
Results: The concentration of PAI-1 was directly associated with the thickness of the epicardial adipose tissue ($r = 0.475$, $p = 0.001$), glucose, triglycerides, insulin resistance, body mass index (BMI), visceral adipose tissue and total body fat. The multivariate regression analysis indicated that epicardial fat independently predicts the concentrations of PAI-1.
Conclusions: Women with thicker epicardial adipose tissue have reduced fibrinolytic activity due to presenting increased PAI-1 levels, and consequently greater thrombotic risk.

DOI of original article: https://doi.org/10.1016/j.arteri.2017.10.004
☆ Please cite this article as: Basurto Acevedo L, Barrera Hernández S, Fernández Muñoz MJ, Saucedo García RP, Rodríguez Luna AK, Martínez Murillo C. El incremento de la grasa epicárdica en mujeres se asocia a riesgo trombótico. Clin Investig Arterioscler. 2018. https://doi.org/10.1016/j.arteri.2017.10.004
* Corresponding author.
E-mail address: lbasurtoa@yahoo.com (L. Basurto Acevedo).

2529-9123/

PALABRAS CLAVE
Tejido adiposo epicádico;
Activador del plasminógeno tipo-1;
Obesidad

El incremento de la grasa epicárdica en mujeres se asocia a riesgo trombótico

Resumen
Introducción: En pacientes con enfermedad coronaria se ha observado una disminución de la actividad fibrinolítica y aumento del grosor del tejido adiposo epicárdico. El objetivo del estudio fue determinar la relación entre la grasa epicárdica y la actividad fibrinolítica, midiendo la concentración del inhibidor del activador del plasminógeno tipo-1 (PAI-1).
Métodos: Estudio transversal que incluyó a 56 mujeres aparentemente sanas, con edad de 45-60 años. A las participantes se les realizaron mediciones antropométricas y bioquímicas, la actividad fibrinolítica se determinó midiendo PAI-1 por la técnica de ELISA. El grosor epicárdico se evaluó por ecocardiografía transtorácica.
Resultados: La concentración de PAI-1 se asoció directamente con el grosor del tejido adiposo epicárdico (r = 0,475, p = 0,001), glucosa, triglicéridos, resistencia a la insulina, IMC, tejido adiposo visceral y grasa corporal total. El análisis de regresión multivariado indicó que la grasa epicárdica predice en forma independiente el valor de PAI-1.
Conclusiones: Las mujeres con incremento de tejido adiposo epicárdico muestran menor actividad fibrinolítica por presentar niveles aumentados de PAI-1 y, en consecuencia, un posible mayor riesgo trombótico.

Introduction

In Mexico, according to the Encuesta Nacional de Salud y Nutrición de Medio Camino 2016 (ENSANUT MC) [2016 Medio Camino National Survey of Health and Nutrition], the prevalence of overweight and obesity in females is 75.6% and higher in the 40-to-79 age group.[1] Obesity represents a major risk factor for coronary artery disease; a body mass index (BMI) > 29 increases the likelihood of suffering a cardiovascular event three-fold.[2,3] Coronary artery disease is associated more with abdominal obesity than with BMI, suggesting that cardiovascular risk does not only depend on the amount of adipose tissue, but also how it is distributed.[4] Abdominal visceral adipose tissue produces a large number of pro-inflammatory adipokines with local and systemic effects which favour the development of cardiovascular disease.[5]

Epicardial adipose tissue is another reservoir of visceral fat. It is located in the atrioventricular and interventricular sulci and extends through the apex, surrounding the coronary arteries. One of the characteristics of this type of epicardial adipose tissue is that it shares circulation with the myocardium.[6] In healthy individuals, epicardial adipose tissue provides the myocardium with the lipids necessary for oxidation and obtaining energy and protects it from lipotoxicity.[7,8] In conditions such as obesity, epicardial fat dysfunction occurs and more pro-inflammatory adipokines are produced, potentially participating in the process of coronary atheromatosis.[9,10]

Cardiovascular risk increases considerably in women over the age of 50.[11] Among other factors, this is caused by the decrease in oestrogen production leading to a redistribution of body fat which results in a pattern of abdominal obesity, and changes in haemostasis and serum lipid profile, which all lead to the creation of a pro-thrombotic state.[12,13]

One thrombotic risk marker is plasminogen activator inhibitor-1 (PAI-1), which is the main protein involved in fibrinolysis.[14] In patients with obesity and metabolic syndrome, the concentration of PAI-1 is increased.[15] That increase leads to a state of hypofibrinolysis as tissue plasminogen activator (t-PA) is inhibited and fibrin deposits increase in the atherosclerotic plaque, eventually forming an occlusive thrombus.[14,16,17]

The aim of this study was to determine the relationship between epicardial fat and fibrinolytic activity by measuring PAI-1 concentration in women aged 45 to 60.

Material and methods

We carried out a cross-sectional study in 56 apparently healthy women aged 45–60 who attended the Medical Research Unit in Endocrine Diseases of the Hospital de Especialidades del Centro Médico Nacional del Instituto Mexicano del Seguro Social (IMSS) [Mexican Institute for Social Security National Medical Centre Specialist Hospital], from February 2013 to August 2016. None of the participants were taking hormone therapy. Women with established diagnosis of diabetes, renal and hepatic failure, endocrine disorders, haematological diseases, previous history of cardiovascular disease and thrombosis were excluded from the study. This study protocol was approved by the IMSS Specialist Hospital Research Committee. The participants were informed and signed the corresponding consent form.

Medical assessment

Medical history and anthropometric measurements were taken from all patients. Weight and height were measured without shoes and wearing light clothes using scales and a