

Increased epicardial fat thickness is related with body mass index in women with polycystic ovary syndrome

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Abstract. – **AIM:** We aimed to investigate the relationship between PCOS and epicardial fat thickness with transthoracic echocardiography.

PATIENTS AND METHODS: PCOS patients were divided into two groups according to the lean or obesity status: PCOS patients with lean 34 subjects (BMI: 23.3±2.8; mean age: 25.5±4), PCOS patients with obese 16 subjects (BMI: 32.3±7.6; mean age: 27.2±3.7) were compared with control healthy lean subjects (BMI: 23.5±1.7; mean age: 25.9±2.2).

RESULTS: There was increased epicardial thickness in obese PCOS subjects compared to lean PCOS subjects (6.3±0.9 mm, 4.7±0.5, respectively, $p < 0.001$). However, epicardial fat thickness between lean PCOS subjects and lean healthy control groups were not significantly varied (4.7±0.5 mm, 4.5±0.5, respectively, $p = 0.6$). There was increased epicardial thickness in obese PCOS subjects compared to lean healthy control subjects (6.3±0.9 mm, 4.5±0.5, respectively, $p < 0.001$). This study showed for the first time that increased epicardial fat thickness measured using transthoracic echocardiography is associated with increased BMI in PCOS subjects.

CONCLUSIONS: Epicardial fat thickness between lean PCOS subjects and lean healthy control group were similar which indicate the importance of obesity in PCOS subjects.

Key Words:

Epicardial fat thickness, Polycystic ovary syndrome, Echocardiography.

Introduction

Like visceral abdominal fat, epicardial fat thickness, measured by echocardiography is increased in obesity. Epicardial adipose tissue might secrete vasoactive products that regulate coronary arterial tone. Various studies have highlighted the potential importance of adipose tissue in relation to inflammatory burden in cardiovascular diseases. Epicardial fat thickness is clinical-

ly related to abdominal visceral adiposity¹, coronary artery disease², subclinical atherosclerosis³, and metabolic syndrome⁴, and seems to have high capacity of local proinflammatory activity.⁵

Polycystic ovary syndrome (PCOS) is a heterogeneous disease affecting about 5-10% of the female population of reproductive age⁶. Women with PCOS represent an intriguing biological model illustrating the relationship between hormonal pattern and cardiovascular risk profile^{7,8}. Indeed, these women, even at an early age, have a clustering of cardiovascular features, such as obesity⁹, and insulin resistance¹⁰, hypertension¹¹, impaired cardiopulmonary capacity^{12,13}, autonomic dysfunction¹⁴. Based on all this data for cardiovascular disease as a marker of increased thickness of fat tissue we test the hypothesis that PCOS is associated with epicardial fat thickness irrespective of lean or obesity status. In this study we aimed to investigate the relationship between PCOS and epicardial fat thickness with transthoracic echocardiography.

Patients and Methods

Between February and November 2009 fifty patients with PCOS were consecutively enrolled to study. The diagnosis of PCOS was made according to the European Society for Human Reproduction and Embryology/American Society for Reproductive Medicine (ESHRE/ASRM) criteria for the PCOS based on the presence of two of the three following criteria: oligo- and/or anovulation, clinical and/or biochemical signs of hyperandrogenism and polycystic ovaries at ultrasound (US). PCOS patients were divided into two groups according to the lean or obesity status: PCOS patients with lean 34 subjects (body mass index (BMI): 23.3±2.8; mean age: 25.5±4),

PCOS patients with obese 16 subjects (BMI: 32.3 ± 7.6 ; mean age: 27.2 ± 3.7) were compared with control healthy lean subjects (BMI: 23.5 ± 1.7 ; mean age: 25.9 ± 2.2) (Table I). Epicardial fat thicknesses were measured by means of echocardiography with a GE VIVID 7 (Horten, Norway) instrument according to standard techniques accordance with the recommendations of the American Society of Echocardiography. Patients with diabetes mellitus, uncontrolled hypertension, low density lipoprotein level > 160 mg/dl, triglyceride level > 400 mg/dl, smokers were excluded from study.

Statistical Analysis

Analyses were performed using a statistical software package: SPSS version 17.0 for Windows (SPSS Inc., Chicago, IL, USA). Data are expressed as numbers and percentages for discrete variables and as mean \pm SD for continuous variables. Comparisons between the study and control group were made with Student's *t*-test. *p* values < 0.05 were considered statistically significant.

Results

All subjects were age matched. There was increased epicardial thickness in obese PCOS subjects compared to lean PCOS subjects (6.3 ± 0.9 vs, 4.7 ± 0.5 mm, respectively, $p < 0.001$). However, epicardial fat thickness between lean PCOS subjects and lean healthy control groups were not significantly varied (4.7 ± 0.5 vs, 4.5 ± 0.5 mm, respectively, $p = 0.6$). There was increased epicardial thickness in obese PCOS subjects compared to lean healthy control subjects (6.3 ± 0.9 vs, 4.5 ± 0.5 mm, respectively, $p < 0.001$).

Discussion

In this study we investigated whether there is not relationship between epicardial fat thickness and PCOS. This study showed that the no differences in epicardial fat thickness between lean women with PCOS and control group (without PCOS). However, obese patients with PCOS than in the control group epicardial fat thickness were increased. Obesity is an important risk factor for atherosclerotic cardiovascular disease.

Epicardial adipose tissue is a true visceral fat tissue, deposited around the heart on the free wall of the right ventricle, left ventricular apex and atrium. Previous reports indicated that epicardial adipose tissue is strongly correlated with abdominal fat deposits⁴. This study showed, for the first time, that increased epicardial fat thickness, measured using transthoracic echocardiography, is associated with increased BMI in PCOS subjects. Epicardial fat thickness between lean PCOS subjects and lean healthy control group were similar which indicate the importance of obesity in PCOS subjects. However, epicardial fat thickness between lean PCOS subjects and lean healthy control groups were not significantly varied. The biochemical properties of epicardial fat tissue suggest its possible role as a cardiovascular risk factor. Studies using epicardial fat obtained during coronary artery bypass surgery revealed that a significantly higher expression of interleukin-1, interleukin-6, tumor necrosis factor and mRNA was shown in epicardial fat than those in leg subcutaneous adipose tissue^{5,15}. Therefore, epicardial fat plays a role as a local inflammatory burden and store in patients with coronary artery disease. Jeong et al¹⁶ evaluated the relationship of echocardiographic epicardial fat to the presence and severity of coronary artery

Table I. Demographics and clinic characteristics of cases

	Obese PCOS	Lean PCOS	Lean healthy	<i>p</i> (value)
Age (years)	27.2 ± 3.7	25.5 ± 4	25.9 ± 2.2	0.307
BMI (kg/m ²)	32.3 ± 7.6	23.3 ± 2.8	23.5 ± 1.7	0.001
Waist circumference (cm)	87.7 ± 8	75.6 ± 6	76.9 ± 4	0.001
Triglyceride (mg/dl)	140.6 ± 37	120.6 ± 34	125 ± 17	0.118
HDL (mg/dl)	48.7 ± 5	50.8 ± 8	51.7 ± 5	0.433
LDL (mg/dl)	97.6 ± 18	99 ± 19	99.9 ± 11	0.926
Total cholesterol (mg/dl)	163.8 ± 23	164 ± 23	161 ± 10	0.855
Systolic BP (mmHg)	118 ± 9	115 ± 6	114 ± 7	0.260
Diastolic BP (mmHg)	76 ± 4	73 ± 4	73 ± 4	0.110
Epicardial fat thickness (mm)	6.3 ± 0.9	4.7 ± 0.5	4.4 ± 0.5	0.001

BMI: Body Mass Index (kg/m²); HDL: High Density Lipoprotein (mg/dl); LDL: Low Density Lipoprotein (mg/dl); BP: Blood Pressure (mm/hg).

disease. The patients were divided into 2 groups according to the fourth quartile of epicardial fat thickness (Group I < 7.6 mm; Group II \geq 7.6 mm). They showed that the patients with a higher epicardial fat thickness were associated with a high Gensini's score. Multivariate analysis showed that age, epicardial fat thickness, diabetes mellitus and smoking were independent factors affecting significant coronary artery stenosis.

PCOS is known to be characterized by several biochemical and metabolic alterations potentially increasing the cardiovascular diseases (CVD) risk. Early signs of vascular damage and increased cardiovascular risk (CVR) have been previously described¹⁷. Increased weight and obesity (mostly abdominal) are common in PCOS women¹⁸. Abdominal fat excess is known to be associated with increased risk of atherosclerosis¹⁹ and CVD mortality²⁰.

Conclusions

In this study we investigated whether there is a relationship between epicardial fat thickness and PCOS. This study showed, for the first time, that increased epicardial fat thickness measured using transthoracic echocardiography is associated with increased BMI in PCOS subjects. Epicardial fat thickness between lean PCOS subjects and lean healthy control group were similar which indicate the importance of obesity in PCOS subjects. Further study need to be clarified our study findings.

Conflict of Interest

None declared.

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