ORIGINAL ARTICLE

Intima-media thickness and flow-mediated dilatation in the diagnosis of coronary artery disease in perimenopausal women

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KEY WORDS

coronary artery disease, endothelial function, women, flow-mediated dilatation

ABSTRACT

INTRODUCTION Noninvasive diagnosis of coronary artery disease (CAD) in perimenopausal women is a considerable challenge for the clinical practice.

OBJECTIVES The aim of the study was to investigate whether ultrasound examination of the endothelial function and arterial remodeling can be useful for CAD risk assessment in perimenopausal women.

PATIENTS AND METHODS The study involved 65 women with chest pain and positive stress test. Based on the results of coronary angiography, they were divided into 2 groups: a study group with coronary lesions (n = 32) and a control group without coronary lesions (n = 33). The mean age was 50.3 ±3.2 years (study group: 50.3 ±3.5 years; control group: 50.2 ±3.0 years; $P = 0.9$). Atherosclerotic risk factors were analyzed in all patients. The ultrasound examination was used to assess early atherosclerotic remodeling of the artery by measuring the intima-media thickness (IMT) and endothelial dysfunction by measuring the flow-mediated dilatation (FMD).

RESULTS The IMT was significantly higher in the study group compared with controls (0.059 ±0.01 mm vs. 0.049 ±0.01 mm, respectively; $P < 0.001$); FMD was significantly lower in the study group compared with controls (6.53 ±0.98 vs. 7.89 ±0.85, respectively; $P < 0.001$). For IMT, the area under the receiver operating characteristic curve (AUROC) was 0.73 (95% confidence interval [CI] 0.6–0.85; $P < 0.001$); therefore, this parameter cannot be used as a predictor of CAD. FMD with the AUROC of 0.85 (95% CI 0.76–0.94; $P < 0.001$) had a good predictive value for CAD.

CONCLUSIONS Evaluation of IMT and FMD in perimenopausal women can be a useful noninvasive diagnostic tool for CAD risk assessment.

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INTRODUCTION Noninvasive diagnosis of coronary artery disease (CAD) in perimenopausal women still remains a considerable challenge for clinical practice. Although CAD prevalence is much lower in women than in men (aged ≤55 years), anginal chest pain occurs more often in women. Moreover, electrocardiographic stress test is less specific and less sensitive in women, and its role in the diagnosis of CAD in this patient group is limited.[1] Therefore, in women aged ≤55 years, the diagnosis of CAD based on the symptoms and a stress test is affected by a large number of false-positive results.

There is an established association between the presence of atherosclerotic lesions and the risk of cardiovascular events.[2] A positive correlation between endothelial dysfunction and atherosclerotic plaque formation has been observed in numerous experimental and clinical studies.[3,4] Vascular endothelium plays an important role in the regulation of vascular wall tension, it can influence platelet activity and leukocyte adhesion.[5-7] Endothelial dysfunction enhances thrombus formation and development of atherosclerosis.[8] Hypertension, smoking, diabetes and insulin resistance, hypercholesterolemia, hyperhomocysteinemia, age, postmenopausal period,

obesity, lack of physical activity, psychological stress, and infection/inflammation are the factors that can lead to endothelial dysfunction.[9-14] The level of endothelial dysfunction is an atherosclerotic risk index and has a prognostic value; moreover, numerous authors reported its correlation with the risk of atherosclerotic cardiovascular events.[15-18]

Based on the available data, we assumed that endothelial dysfunction correlates with the rate of atherosclerotic lesion progression.[19-21] The aim of the study was to evaluate whether endothelial dysfunction can be a useful parameter that determines a higher probability of CAD in perimenopausal women with a positive result of an electrocardiographic stress test.

PATIENTS AND METHODS

Patients The study was designed according to the epidemiological-clinical control protocol. It involved 65 women with chest pain and a positive stress test result admitted to our department for elective coronary angiography. Exclusion criteria were as follow: a history of acute coronary syndrome, CAD confirmed by coronary angiography or multi-slice computed tomography, unstable angina, heart failure (New York Heart Association class III and IV), cancer, autoimmune diseases, chronic kidney disease (stages III to V according to the calculated glomerular filtration rate), diagnosed hepatic cirrhosis, active hepatitis or any hepatic injury with alanine transaminase >80 IU/ml, significant valvular heart disease, atrial fibrillation, use of oral contraceptives, or hormone replacement therapy. Based on the coronary angiography results, all patients were divided into 2 groups: a study group with obstructive coronary lesions (n = 32) and a control group without coronary artery lesions (n = 33). The mean age was 50.3 ±3.2 years and did not differ significantly between the groups (50.3 ±3.5 in the study group; 50.2 ±3.0 in controls; $P = 0.9$).

Angiographic criteria Patients with coronary artery stenosis ≤10% of the vessel cross-section area were considered as not having lesions and included in the control group. Patients with coronary artery stenosis of ≥50% of the vessel cross-section area were included in the study group. Patients with coronary artery stenosis of >10% to <50% were not enrolled into the study.

The following cardiovascular risk factors were analyzed: hypertension, hypercholesterolemia, diabetes, smoking, overweight and obesity, and a family history of CAD. We used the following definitions of the risk factors for the purpose of this study: hypertension – arterial blood pressure of ≥140/90 mmHg and/or use of antihypertensive therapy; hypercholesterolemia – plasma cholesterol concentration of >200 mg/dl (5.2 mmol/l) at the time of the study or before; diabetes – diagnosis of diabetes during index hospitalization or the use of antidiabetic agents and/or diet; obesity – body mass index (BMI) of >30 kg/m^2; smoker – smoking at least 1 cigarette/day for at least 6 months; positive family history – myocardial infarction in parents or siblings aged ≤55 years.

The study was approved by the Bioethics Committee of the Medical University of Silesia and all patients gave written informed consent.

Study protocol All the cardiovascular medications that were used in the study, such as nitrates, calcium blockers, β-adrenolytics, angiotensin-converting enzyme inhibitors, and statins, were administered routinely, also before ultrasound examination and coronary angiography. All smokers complied with a recommendation not to smoke at least 12 to 24 h or more before an ultrasound examination.

The ultrasound examination of the intima-media thickness (IMT) and flow-mediated dilatation (FMD) was performed after overnight fast in the morning hours, after a 15-minute rest in a horizontal position, using the SONOS 5000 ultrasound scanner (Hewlett Packard, United States) with the 11 MHz linear probe.

The IMT was measured in the right and left common carotid arteries, 2 cm below the bulb on the posterior arterial wall. The mean of 3 measurements was calculated and further analyzed.[22,23]

The diameter of the right brachial artery was measured at baseline, 3 to 5 cm above antecubital space in the M-mode. The measurement was performed in the end-diastolic phase, marking the diameter between the anterior and posterior arterial wall in the zone between media and adventitia ("m-line"). The mean of 3 measurements was calculated and further analyzed to calculate FMD. Subsequently, a pneumatic tourniquet was placed in the upper part of the right forearm and inflated for 4 minutes to the pressure of 200 mmHg or 50 mmHg above systemic arterial blood pressure. Sixty seconds after the cuff release, the diameter of the right brachial artery was measured 3 times. FMD was calculated as an increase of the vascular diameter (in percentage) from the difference between the maximum and baseline brachial artery diameter.

After a 15-minute break, a nitroglycerin-mediated dilatation (NTG-MD) test was performed using 0.4 mg of sublingual nitroglycerin (Nitromint 0.4 mg/dose, Egis Pharmaceuticals, Hungary). Before nitroglycerin administration, the brachial artery diameter was measured 3 times at baseline. Five minutes after nitroglycerin administration, the brachial artery diameter was measured again 3 times. NTG-MD was calculated as an increase of the vascular diameter (in percentage) from the difference between the maximum and baseline brachial artery diameter.[24,25]

Coronary angiography was performed using the Judkins method from the right femoral artery access. After the 6F sheath insertion, angiography of both coronary arteries was performed using the Visipaque 320 contrast agent (Amersham Health, United States), showing

TABLE 1 Characteristics of the patients

Variable[a]	All patients (n = 65)	Study group (n = 32)	Controls (n = 33)	*P*
age (years)	50.3 ±3.2	50.3 ±3.5	50.2 ±3.0	NS
BMI (kg/m²)	27.4 ±4.0	27.2 ±4.0	27.6 ±4.1	NS
risk profile, n (%)				
obesity	13 (20%)	7 (22%)	6 (18%)	NS
hypertension	41 (63%)	21 (66%)	20 (61%)	NS
family history of CAD	16 (25%)	8 (25%)	8 (24%)	NS
hypercholesterolemia	28 (43%)	20 (62%)	8 (24%)	<0.001
diabetes mellitus	19 (29%)	14 (44%)	5 (15%)	<0.01
current smoking	37 (57%)	24 (75%)	13 (39%)	<0.003
systolic BP (mmHg)	121 (12)	122 (12)	120 (12)	NS
diastolic BP (mmHg)	74 (10)	75 (9)	72 (10)	NS
glucose (mmol/l)	4.60 (0.55)	4.55 (0.50)	4.66 (0.55)	NS
total cholesterol (mmol/l)	5.49 (0.95)	5.59 (1.04)	5.36 (0.83)	NS
HDL cholesterol (mmol/l)	1.55 (0.67)	1.53 (0.41)	1.63 (0.36)	NS
LDL cholesterol (mmol/l)	3.37 (0.80)	3.42 (0.75)	3.34 (0.88)	NS
triglycerides (mmol/l)	1.03 (0.37)	1.00 (0.27)	1.06 (0.39)	NS
medication, n (%)				
ß-blockers	59 (91%)	28 (87%)	31 (94%)	NS
statins	27 (41%)	18 (56%)	8 (24%)	<0.017
ACE inhibitors	36 (55%)	19 (59%)	17 (52%)	NS
nitrates	12 (18%)	7 (22%)	5 (15%)	NS
calcium channel blockers	9 (14%)	3 (9%)	6 (18%)	NS

a mean ± standard deviation or absolute value and percentage

Abbreviations: ACE – angiotensin-converting enzyme, BMI – body mass index, BP – blood pressure, CAD – coronary artery disease, HDL – high-density lipoprotein, LDL – low-density lipoprotein, NS – nonsignificant

the right coronary artery in at least 2 opposite projections and the left coronary artery in at least 4 different projections. Coronary artery narrowings were calculated digitally.

Statistical analysis Statistical analysis was performed using STATISTICA 7.1 (Statsoft, Tulsa, Oklahoma, United States). Qualitative variables were shown as absolute values and percentage and quantitative variables as mean and standard deviation (for variables with normal distribution) and as median and interquartile range (for variables different from normal). The type of distribution was assessed using the Shapiro-Wilk test. The differences between the groups were analyzed using the Student's t-test (for normal distribution) and Mann-Whitney U test (for variables different from normal), and for qualitative data on the basis of the χ^2 test or the exact Fisher test. Additionally, the results of the above-mentioned tests were verified using stratification analysis in the subgroups with different intensity of CAD risk factors: obesity, hypertension, positive family history, hypercholesterolemia, diabetes, and smoking status. To assess whether IMT and FMD can help to diagnose CAD, we analyzed the receiver operating characteristic (ROC)curves with coronary angiography as a reference test. For the ROC curve analysis, sensitivity and specificity values, likelihood ratios (LR) for negative and positive test results, as well as the Youden index (YI) (sensitivity + specificity – 1) for selected optimal cut-off points were provided. Diagnostic accuracy of IMT and FMD was assessed according to the area under the ROC curve (AUROC) with 95% confidence interval (CI). P <0.05 was considered statistically significant.

RESULTS The characteristics of the groups are presented in TABLE 1. There was a statistically higher prevalence of hypercholesterolemia (62% vs. 24%), diabetes (44% vs. 15%), and smoking (75% vs. 39%) in the study group compared with controls. There were no significant differences between the groups in terms of BMI, obesity, hypertension, and a family history of CAD. There were no significant differences in pharmacotherapy, except for statins, which were used in the study group due to a larger number of patients with hypecholesterolemia.

The results of ultrasound examination are presented in TABLE 2. The end-diastolic baseline diameter of the artery did not differ between the groups. The IMT value was significantly higher and FMD significantly lower in the study group. NTG-MD values did not differ between the groups.

TABLE 2 IMT and FMD in the study group and in controls

Variable[a]	Study group	Controls	*P*
IMT (mm)	0.059 (0.01)	0.049 (0.01)	<0.001
end-diastolic baseline diameter (mm)	3.06 (0.44)	3.09 (0.43)	NS
FMD (% increase with hyperemia)	6.53 (0.98)	7.89 (0.85)	<0.001
NTG-MD (% increase with NTG)	11.28 (1.66)	11.42 (1.72)	NS

a mean ± standard deviation

Abbreviations: FMD – flow-mediated dilatation, IMT – intima-media thickness, NS – nonsignificant, NTG-MD – nitroglycerin-mediated dilatation, others – see TABLE 1

The results of a stratification analysis are shown in TABLES 3 and 4.

We observed a confounding influence of obesity ($P = 0.008$), diabetes ($P < 0.001$), and smoking ($P = 0.05$) on the differences in IMT values between the groups. However, after adjustment for obesity these differences remained significant both in obese ($P = 0.01$) and in nonobese women ($P < 0.001$). As far as the other variables are concerned, significant differences in IMT values between the groups were observed in nondiabetic ($P < 0.001$) and smoking women ($P < 0.001$). We observed a confounding influence of hypercholesterolemia ($P < 0.001$), diabetes ($P = 0.001$), and smoking ($P = 0.01$) on FMD values. After adjustment for diabetes and smoking, the differences between the study group and controls still remained significant; after adjustment for hypercholesterolemia, a significant difference in FMD was observed only in women without hypercholesterolemia ($P < 0.001$).

In order to evaluate whether IMT and FMD are useful in CAD risk assessment in women, we performed an analysis of the ROC curves, which revealed that both these parameters (especially FMD) were able to identify women with CAD – the AUROC for IMT was 0.73 (95% CI 0.6–0.85; $P < 0.001$; FIGURE 1), and the AUROC for FMD was 0.85 (95% CI 0.76–0.94; $P < 0.001$; FIGURE 2).

Values of the accuracy parameters of CAD diagnosis for optimal cut-off points on the ROC curves both for IMT and FMD are shown in TABLE 5. These results confirm that FMD was a more accurate parameter to diagnose CAD in our patients. As for the IMT, the highest YI (YI = 0.36) was observed for the cut-off point of IMT = 0.0495 mm, a positive LR was the highest for the IMT = 0.058 mm (+LR = 3.87), and a negative LR was the lowest for the IMT = 0.045 mm (–LR = 0.1). As for the FMD, the highest YI (YI = 0.56) was observed for the cut-off points of FMD = 6.29% and 7.26%, a positive LR was the highest for FMD = 6.63% (+LR = 3.87), and a negative LR was the lowest for FMD = 7.86% (–LR = 0.12).

DISCUSSION The measurement of the IMT complex and the assessment of brachial artery dilatation dependent on endothelial function are widely recognized research methods. The ultrasound evaluation of the carotid arteries is a noninvasive method that allows to estimate the extent of systemic atherosclerosis.[25] Clinical signs and symptoms of atherosclerosis are preceded by preclinical phase marked by arterial lesions, such as intima and media thickening in the carotid artery,

TABLE 3 IMT values (mm) in the study group and in controls and the effect of potential confounding variables

Confounding variables		All patients	Study group	Controls	*P*[a]
obesity	yes	0.061 ±0.01	0.065 ±0.01	0.055 ±0.01	0.01
	no	0.53 ±0.01	0.058 ±0.01	0.048 ±0.01	<0.001
	P[b]	0.008	–	–	
arterial hypertension	yes	0.056±0.01	0.061 ±0.01	0.05 ±0.01	<0.001
	no	0.052 ±0.01	0.056 ±0.01	0.048 ±0.01	0.03
	P[b]	0.1	–	–	
family history of CAD	yes	0.056 ±0.01	0.06 ±0.01	0.051 ±0.01	0.07
	no	0.054 ±0.01	0.06 ±0.01	0.049 ±0.1	<0.001
	P[b]	0.6	–	–	
hypercholesterolemia	yes	0.056 ±0.01	0.058 ±0.01	0.051 ±0.01	0.05
	no	0.053 ±0.01	0.062 ±0.01	0.049 ±0.01	0.001
	P[b]	0.2	–	–	
diabetes	yes	0.06 ±0.01	0.061 ±0.01	0.059 ±0.01	0.5
	no	0.052 ±0.01	0.058 ±0.01	0.048 ±0.01	<0.001
	P[b]	<0.001	–	–	
smoking	yes	0.056 ±0.01	0.06 ±0.01	0.048 ±0.01	<0.001
	no	0.052 ±0.01	0.057 ±0.01	0.05 ±0.01	0.7
	P[b]	0.05	–	–	

a study group vs. controls

b risk factors YES vs. risk factors NO

Abbreviations: see TABLES 1 and 2

TABLE 4 FMD values (%) in the study group and in controls and the effect of potential confounding variables

Confounding variables		All patients	Study group	Controls	P^a
obesity	yes	6.77 ±1.05	6.46 ±1.19	7.13 ±0.82	0.5
	no	7.35 ±1.13	6.55 ±0.93	8.06 ±0.78	<0.001
	P^b	0.1	–	–	
arterial hypertension	yes	7.31 ±1.12	6.59 ±0.86	8.03 ±0.87	<0.001
	no	7.1 ±1.17	6.41 ±1.19	7.68 ±0.8	0.005
	P^b	0.8	–	–	
family history of CAD	yes	7.05 ±1.27	6.23 ±1.05	7.87 ±0.9	0.004
	no	7.29 ±1.1	6.64 ±0.95	7.9 ±0.86	<0.001
	P^b	0.5	–	–	
hypercholesterolemia	yes	6.61 ±1.01	6.38 ±1.03	7.13 ±0.78	0.08
	no	7.69 ±1.0	6.75 ±0.85	8.13 ±0.73	<0.001
	P^b	<0.001	–	–	
diabetes	yes	6.48 ±1.23	6.04 ±1.02	7.69 ±0.95	0.01
	no	7.55 ±0.93	6.94 ±0.73	7.93 ±0.84	<0.001
	P^b	0.001	–	–	
smoking	yes	6.94 ±0.98	6.6 ±0.85	7.53 ±0.93	0.007
	no	7.62 ±1.23	6.34 ±1.33	8.13 ±0.73	0.002
	P^b	0.01	–	–	

a study group vs. controls

b risk factors YES vs. risk factors NO

Abbreviations: see **TABLES 1** and **2**

visible on ultrasound. Noninvasiveness and repetitiveness are the advantages of ultrasound examination. Held et al.[26] proved that not only the presence of atherosclerotic plaques but also carotid IMT measurement allow to assess the risk of CAD. IMT measurement is also used to assess severity of atherosclerosis in patients receiving hypolipemic and antihypertensive agents.[27-33] FMD, which is used to measure brachial artery dilatation dependent on endogenous nitric oxide (NO) release caused by short-lasting forearm ischemia, is a reference method in the diagnosis of endothelial dysfunction. An increased flow stimulates endothelial cells to NO secretion, which has vasodilator properties and acts directly on the vessels. Endothelial dysfunction is associated with lower NO bioavailability, which results in impaired or absent vasodilatory effect after the stimulus that increases the blood flow.[34,35] Numerous studies confirmed the relationship between the extent of endothelial dysfunction and the risk of adverse atherosclerotic cardiovascular events.[15-18,36-40]

The aim of our study was to show whether simple, noninvasive methods of arterial ultrasound can be helpful in CAD risk assessment in perimenopausal women, because electrocardiographic stress test has lower sensitivity and specificity in women, and therefore its role in CAD diagnosis in this patient group is limited.[41,42] There is evidence that oral contraceptives and hormone replacement therapy influence the endothelial function, therefore patients using these agents were excluded from the study.[43-46]

Kuvin et al.[47] demonstrated that using the ultrasound for the assessment of endothelial dysfunction could be a valuable method in the diagnosis of CAD by proving that FMD examination helped to exclude CAD in low-risk subjects. A similar study was performed by Jambrik et al.[48] on 198 patients including 78 women (mean age 59 years). They confirmed that FMD is significantly lower in subjects with CAD (4.64% vs. 7.39%; P <0.01), and showed that FMD is an independent prognostic factor in men and in smokers. Additionally, they reported a positive correlation between FMD and CAD progression. FMD is not only useful in evaluating the risk of CAD, but also seems to be a predictor of cardiovascular events.[49,50] Other studies confirm the usefulness

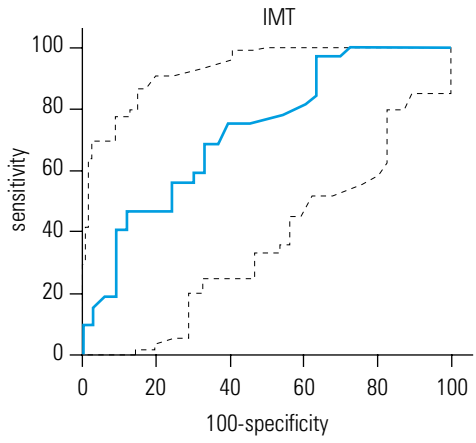

FIGURE 1 ROC curve with IMT for the diagnosis of coronary artery disease
Abbreviations: ROC – receiver operating characteristic, others – see **TABLE 2**

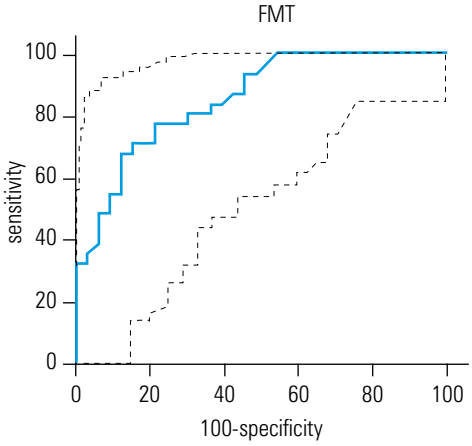

FIGURE 2 ROC curve with FMD for the diagnosis of coronary artery disease
Abbreviations: see **FIGURE 1** and **TABLE 2**

of carotid IMT measurement for the diagnosis of CAD.[36-38,51]

Although many authors sought to choose an optimal noninvasive diagnostic method to assess the risk of CAD,[36-38] there is a paucity of data on perimenopausal women. The results of our study confirm the hypothesis that in perimenopausal women with CAD, the IMT complex is significantly thicker and an increase of the brachial artery diameter in FMD examination is significantly lower. This is consistent with the results published by other authors.[39] Moreover, there is evidence that impaired FMD is associated with an increased risk of cardiovascular events,[50] even in a population without significant CAD.[40]

It is known that IMT and FMD are influenced by the presence of hypercholesterolemia and all components of the metabolic syndrome as well as by pharmacotherapy of these risk factors.[30-32,52] In our study, the assessment of IMT and FMD in the subgroups defined on the basis of the established CAD risk factors showed that obesity, diabetes, and smoking (for IMT) and hypercholesterolemia, diabetes, and smoking (for FMD) may confound the relationship between IMT or FMD and atherosclerosis. The influence of obesity on IMT, and diabetes and smoking on FMD, however, only modified the magnitude of the difference between the groups, but it did not reach statistical significance (P = 0.05), so the final result remained unchanged. As far as other confounding factors are concerned, significant difference in the IMT value was observed in nondiabetic and in smoking women, and the difference in FMD value was significant only for women without hypercholesterolemia.

In order to answer the question whether the measurement of IMT and FMD is useful in CAD risk assessment in women, we performed the ROC curve analysis. Both parameters were useful for detecting CAD; however, regarding the AUROC, FMD had a better diagnostic capability than IMT.

This observation was supported by the analysis of validity parameters.

The assessment of the same parameters with a multivariable analysis would probably provide new information. Therefore, it seems justified to perform additional studies evaluating the influence of CAD risk factors on the analyzed parameters, especially in the context of their usefulness for noninvasive confirmation or exclusion of CAD. Then, a valuable supplement to this analysis would be the assessment of CAD risk factors and their influence on the probability of CAD at any selected cut-off point; however, it was not a primary aim of this study.

One of the main limitations of the study was the small size of a patient group; therefore, further studies on larger populations are necessary to validate our results.

In conclusion, the ultrasound evaluation of IMT and FMD and for the assessment of endothelial dysfunction and early atherosclerotic artery remodeling in perimenopausal women can be a useful noninvasive diagnostic test to assess the risk for CAD.

TABLE 5 Values of validity parameters for selected cut-off points of IMT and FMD

Variable	Cut-off point	Sensitivity (%)	Specificity (%)	YI	+LR	–LR
IMT (mm)	0.045	96.87	30.3	0.27	1.39	0.1
	0.0495	75.0	60.61	0.36	1.9	0.41
	0.051	65.62	66.67	0.32	1.97	0.52
	0.053	56.25	69.7	0.26	1.86	0.63
	0.058	46.88	87.88	0.35	3.87	0.6
	0.062	21.87	90.91	0.13	2.41	0.69
FMD (%)	6.63	48.39	93.94	0.42	7.89	0.55
	6.91	64.52	87.88	0.52	5.32	0.4
	6.92	67.74	87.88	0.56	5.59	0.37
	7.01	70.97	81.82	0.53	4.68	0.34
	7.26	77.42	78.79	0.56	3.5	0.33
	7.86	93.55	54.55	0.48	2.06	0.12

Abbreviations: YI –Youden index (sensitivity + specificity – 1), +LR – positive likelihood ratio, –LR – negative likelihood ratio, others – see **TABLE 2**

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Rola pomiarów grubości błony wewnętrznej i środkowej oraz funkcji śródbłonka naczyniowego w diagnostyce choroby wieńcowej u kobiet w wieku okołomenopauzalnym

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SŁOWA KLUCZOWE

choroba wieńcowa, dylatacja zależna od przepływu, funkcja śródbłonka, płeć żeńska

STRESZCZENIE

WPROWADZENIE Nieinwazyjna diagnostyka choroby wieńcowej u kobiet w wieku okołomenopauzalnym stanowi wielkie wyzwanie w praktyce klinicznej.

CELE Celem pracy było zbadanie, czy ultrasonograficzna ocena funkcji śródbłonka oraz wczesnej przebudowy tętnicy może być przydatna w szacowaniu ryzyka choroby wieńcowej u kobiet w wieku okołomenopauzalnym.

PACJENCI I METODY Badaniem objęto 65 kobiet z bólami w klatce piersiowej oraz pozytywnym wynikiem testu wysiłkowego. Na podstawie wyników koronarografii wyłoniono 2 grupy: grupę badaną (n = 32) ze zmianami w naczyniach wieńcowych i grupę kontrolną (n = 33) bez zmian w naczyniach wieńcowych. Średni wiek wynosił 50,3 ±3,2 lata (grupa badana: 50,3 ±3,5 lat; grupa kontrolna: 50,2 ±3,0 lat; *P* = 0,9). U wszystkich badanych przeanalizowano czynniki ryzyka miażdżycy. Badaniem ultrasonograficznym szacowano wczesną przebudowę tętnicy (poprzez pomiar kompleksu intima-media [*intima-media thickness* – IMT]) oraz funkcję śródbłonka (poprzez ocenę dylatacji naczynia zależnej od przepływu [*flow-mediated dilatation* – FMD]).

WYNIKI IMT było znamiennie większe w grupie badanej w porównaniu z grupą kontrolną (0,059 ±0,01 mm *vs* 0,049 ±0,01 mm; *P* <0,001); FMD było znamiennie mniejsze w grupie badanej w porównaniu z grupą kontrolną (6,53 ±0,98 *vs* 7,89 ±0,85; *P* <0.001). Dla IMT pole pod krzywą charakterystyki odbiornika (*area under the receiver operating characteristic curve* – AUROC) wynosiło 0,73 (95% CI 0,6–0,85; *P* <0,001), dlatego nie stwierdzono przydatności tego parametru dla diagnostyki choroby wieńcowej. Dla FMD z wartością AUROC 0,85 (95% CI 0,76–0,94; *P* <0,001) wykazano dobrą wartość predykcyjną w odniesieniu do obecności choroby wieńcowej.

WNIOSKI Ocena IMT i FMD u kobiet w wieku okołomenopauzalnym może być przydatnym nieinwazyjnym narzędziem diagnostycznym do oszacowania ryzyka choroby wieńcowej.

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