Polyvascular extracoronary atherosclerotic disease in patients with coronary artery disease

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Abstract

Background: Cardiovascular diseases are the number one killer in the developed countries, accounting for approximately half of all deaths, with the leading causes being myocardial infarction and ischaemic stroke. In line with the ageing population, the prevalence of coronary artery disease (CAD), lower extremity peripheral arterial disease (PAD), supra-aortic arterial disease (SAD) and renal stenosis (RAS) is increasing. Polyvascular atherosclerosis (PVA) coexisting in several territories has an adverse effect on cardiovascular morbidity and mortality.

Aim: To determine prevalence, coexistence and predictors of significant PAD, SAD and RAS in patients with suspected CAD.

Methods: Based on angiography, the frequency of coexisting CAD, SAD, PAD and RAS (stenosis ≥ 50%) was determined in 687 (487 male) consecutive patients, aged 63.5 ± 9.1 years, referred for coronary angiography.

Results: Significant CAD was found in 545 (79.3%) patients (1-vessel in 164; 2-vessel in 157; 3-vessel in 224). SAD, RAS and PAD were found in 136 (19.8%), 55 (8%), and 103 (15%) patients, respectively. Of the 545 patients with confirmed CAD, 346 (63.5%) had stenoses limited to coronary arteries. 2-, 3- and 4-level PVA was found in 130 (23.8%), 61 (11.2%) and 8 (1.5%) patients, respectively. Of the 142 patients without CAD, 127 (89.4%) had no significant stenoses elsewhere, 12 (8.5%) had 1 extracoronary territory and 3 (2.1%) had 2-territory involvement. Backward stepwise binary logistic regression analysis showed the following independent predictors of at least 2-level PVA: 2- and 3-vessel CAD ($p < 0.001$), hyperlipidaemia ($p = 0.067$), smoking ($p < 0.001$), creatinine level ≥ 1.3 ml/dl ($p < 0.001$), lower extremities claudication ($p < 0.001$) and female gender ($p = 0.003$). The relative risk of having at least 2-territory PVA was 15.7-fold higher in patients with claudication, 2.1-fold in patients with multivessel CAD, 2.8-fold for serum creatinine level > 1.3 mg/dl; and 1.9-fold, 2.4-fold and 2-fold in patients with hyperlipidaemia, smokers and women, respectively.

Conclusions: Significant atherosclerosis in extracoronary arterial territories is present in 36% of patients with documented CAD. With advancing PVA, accumulation of atherosclerosis risk factors, previous atherothrombotic events and more severe CAD is observed.

Key words: coronary artery disease, prevalence of polyvascular extracoronary stenoses, angiography, predictors

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Introduction

Cardiovascular diseases are the number one killer in the developed countries, accounting for approximately half of all deaths, with the leading cause being myocardial infarction (MI) and ischaemic stroke [1-3]. The majority of cardiovascular deaths are caused by atherosclerosis, a chronic inflammatory disease, which is encountered in 10% of men in their forties, and 80% in their sixties [4].

With ageing population, the prevalence of atherosclerotic diseases such as coronary artery disease (CAD), lower extremity peripheral arterial disease (PAD), supra-aortic arterial disease (SAD) and renal artery stenosis (RAS) is increasing [5-7]. In several studies, the prevalence of RAS ≥ 60% is estimated at 3-6%, PAD at 15-20% and internal carotid artery stenosis ≥ 70% at 2-4% in elderly populations [6, 8-11].

A very important issue is that significant stenoses may coexist in several arterial territories (polyvascular atherosclerotic disease; PVA) in a substantial number of subjects [5, 7, 9, 10, 12, 13]. However, due to various diagnostic criteria, the prevalence of PVA varies tremendously [14].

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Lately, the REACH registry has shown that the long-term outcome in patients with PVA is unfavourable, and the cardiovascular risk is independently related to the number of arterial territories with significant atherosclerosis [15].

The study aimed to report the prevalence of significant PAD, SAD and RAS in patients undergoing coronary angiography for suspected CAD. The present study also aimed to identify independent predictors of PVA.

Methods

Study group

The study enrolled 687 consecutive patients (487 male) aged 63.5 ± 9.1 (range 35-87) years, admitted to our Department for coronary angiography between June 2006 and December 2007. The reason for coronary angiography was suspected CAD or various forms of stable angina: exertional angina, atypical chest pain with positive result of treadmill test, a previous MI or recurrent angina in patients previously treated with coronary bypass or percutaneous coronary intervention (PCI). Patients with acute coronary syndrome were not included in this study.

The study was supported by the national grant 2PO5B09330, and the protocol was reviewed and approved by the local ethical committee and all patients signed informed consent.

Imaging techniques of arterial territories

In all 687 patients, 4 major arterial territories were analysed including routine angiographic evaluation of coronary and renal arteries and Doppler ultrasonographic assessment of supra-aortic (carotid, vertebral, subclavian) and iliac/femoral arteries, followed by angiography if Doppler ultrasound examination indicated probability of stenosis ≥ 50%.

High resolution colour and pulse Doppler ultrasonography of supra-aortic and lower extremity arteries were performed with an ultrasound machine: Toshiba Aplio PowerVision (Toshiba Medical Systems Co, Ltd, Tokyo, Japan) equipped with a 4-11 MHz linear array transducer and a 3.5 MHz convex array transducer. The grade of stenosis in the carotid, vertebral and subclavian arteries was assessed through the increase in the peak systolic and the end-diastolic velocities [16]. Similarly, significant lesions exceeding 50% in iliac and femoral arteries were identified with Doppler ultrasound examination with the threshold of the peak systolic velocity within stenosed segment > 2 m/s.

In all patients, coronary and renal artery angiographies were performed during one session, by means of a Coroscop system (Siemens AG, Munich, Germany) equipped with Quantcor version 2.0 quantitative coronary analysis software. Selective angiography of renal arteries was performed with a right 6 French Judkins catheter following coronary angiography. All angiographic examinations were performed by the Seldinger technique through femoral or radial artery access. Coronary and supra-aortic artery angiography was performed in several views that best displayed the lesion and enabled stenosis grade evaluation. The percentage of diameter stenosis was determined with software for quantitative angiography (QA).

Coronary, SAD, RAS and PAD stenosis was defined as significant when lumen reduction was ≥ 50%.

Statistical analysis

Continuous variables are presented as mean ± one standard deviation (SD), and categorical variables are expressed as frequencies and percentages. Frequencies of analysed parameters across groups were verified with the analysis of variance (ANOVA) test. The coexistence and prevalence of significant RAS, SAD and PAD (stenosis ≥ 50%) were determined in patients with suspected and documented CAD.

A backward binary logistic regression analysis (non-linear quasi-Newton estimation method) was performed in order to identify independent predictors of PVA. The following clinical variables were included in the model: age, gender, number of involved coronary arteries (CAD severity), hypertension, body mass index, hyperlipidaemia, diabetes, smoking habit, history of MI and neurological ischaemic event, total LDL and HDL cholesterol, hs-CRP and serum creatinine level (for continuous variables, cut-off values were obtained from ROC curves). For each variable, the odds ratio (OR) and confidence interval (CI) of having PVA were estimated.

Results

The study group comprised patients with typical clinical characteristics for atherosclerosis. The majority of them had multiple risk factors, many of them had a history of atherothrombotic events and about 20% had undergone a previous arterial revascularisation. Detailed patient characteristics are presented in Table I.

Significant CAD was found in 545 (79.3%) patients, including 164 with 1-vessel CAD, 157 with 2-vessel CAD, and 224 with 3-vessel CAD.

Significant SAD was recorded in 136 (19.8%) patients, including multi-vessel SA involvements in 35 patients: stenosis ≥ 50% of internal carotid artery in 74 (10.8%), vertebral – 50 (7.3%), subclavian – 44 (6.4%) and innominate artery – in 3 (0.4%) patients.

The RAS, PAD and abdominal aortic aneurysm (AAA) were found in 55 (8%), 103 (15%) and 18 (2.6%) patients, respectively.

The prevalence of coexisting CAD, lower extremity PAD, SAD and RAS in patients with documented CAD (545 patients) and in those without significant CAD (142 patients) is shown in Table II.

Of the 545 patients with documented CAD, significant SAD, PAD, RAS and abdominal aortic aneurysm accounted for 129 (23.7%), 98 (18%), 49 (9%), and 18 (3.3%) patients, respectively. Artery stenosis in one single territory (coronary) was found in 346 (63.5%) patients, in 2 different arterial territories in 130 (23.8%), in 3 territories in 61 (11.2%) and 4 territories in 8 (1.5%) patients (Table II).

Of the 142 patients with non-significant CAD, significant SAD, PAD and RAS were found in 7 (4.9%), 6 (4.2%), and 5 (3.5%) patients, respectively. No significant arterial stenoses in any extracoronary territories were found in 127 (89.4%) patients (Table II). Stenosis ≥ 50% in one extracoronary territory was found in 12 (8.5%) patients and within 2 territories in 3 (2.1%). None had 3-territory involvement.

With the increasing number of involved territories, we observed accumulation and increasing prevalence of the risk factors hypertension, diabetes, hyperlipidaemia and smoking, and also more frequent history of MI, previous neurological ischaemic events, lower extremity claudication and renal insufficiency (Table III). With advancing PVA, increasing levels of serum creatinine, LDL cholesterol and hs-CRP, but decreasing HDL cholesterol levels were observed. Groups did not differ significantly with regard to age, gender, BMI and triglyceride level. We also observed more severe CAD on angiography, and lower left ventricle ejection fraction ($p < 0.001$) on echocardiography with advancing PVA.

Backward stepwise binary logistic regression analysis showed the following independent predictors of at least 2-level PVA: 2- and 3-vessel CAD, hyperlipidaemia, smoking, creatinine level ≥ 1.3 ml/dl, lower extremity claudication and female gender (Table IV). The relative risk of having at least 2-territory PVA was 15.7-fold higher in patients with claudication, 2.1-fold in patients with multivessel CAD, 2.8-fold for serum creatinine level > 1.3 mg/dl; and 1.9-fold, 2.4-fold and 2-fold in patients with hyperlipidaemia, smokers and women, respectively.

The following independent predictors of 3- and 4-level PVA were identified: 2-3 vessel CAD, arterial hypertension, smoking, creatinine level ≥ 1.3 ml/dl, claudication, LDL cholesterol ≥ 135 mg/dl, and female gender.

Discussion

The primary finding of our study is that PVA is frequent, since more than one third of patients with angiographically

Table I. Clinical characteristics of 687 consecutive patients with suspected CAD referred for coronary angiography

	All study group n = 687
Age [years]	63.5 ± 9.1
Male, n (%)	487 (70.9)
Hypertension, n (%)	570 (83)
Diabetes, n (%)	213 (31)
Hyperlipidaemia, n (%)	594 (86.5)
Smoking, n (%)	453 (65.9)
Myocardial infarction, n (%)	453 (65.9)
Neurological ischaemic event, n (%)	49 (7.1)
Left ventricular ejection fraction, (%)	57 ± 11.4
Previous coronary artery revascularisation, n (%)	103 (15)
Previous supra-aortic artery revascularisation, n (%)	26 (3.4)
Lower extremity claudication, n (%)	58 (8.4)
Previous lower extremity artery revascularisation, n (%)	12 (1.7)
Laboratory results	
Renal insufficiency (serum creatinine > 1.3 mg/dl), n (%)	88 (12.8)
Serum creatinine [μmol/l]	93.9 ± 48.2
LDL cholesterol [mmol/l]	3.02 ± 0.94
HDL cholesterol [mmol/l]	1.22 ± 0.37
Triglycerides [mmol/l]	1.64 ± 1.02
hs-CRP [mg/dl]	5.07 ± 9.6

Table II. Prevalence of SAD, lower extremity PAD, and RAS in 545 patients with significant CAD documented on coronary angiography and in 142 patients with normal coronary arteries or no significant CAD (lumen reduction < 50%)

Patients with documented significant CAD	n = 545
One arterial territory involvement	**346 (63.5%)**
CAD (coronary artery stenosis ≥ 50%)	346 (63.5%)
Polyvascular atherosclerotic stenoses ≥ 50%:	**199 (36.5%)**
2-territory involvement	**130 (23.8%)**
CAD + SAD	73 (13.4%)
CAD + PAD	36 (6.6%)
CAD + RAS	21 (3.8%)
3-territory involvement	**61 (11.2%)**
CAD + SAD + PAD	41 (7.5%)
CAD + PAD + RAS	13 (2.4%)
CAD + SAD + RAS	7 (1.3%)
4-territory involvement	
CAD + SAD + PAD + RAS	8 (1.5%)
Patients with non-significant CAD	**n = 142**
No significant stenoses in any territories	**127 (89.4%)**
One-territory involvement	**12 (8.5%)**
SAD	5 (3.5%)
PAD	2 (1.4%)
RAS	5 (3.5%)
Two-territory involvement	**3 (2.1%)**
SAD + PAD	2 (1.4%)
PAD + RAS	1 (0.7%)

Abbreviations: CAD – coronary artery disease, PAD – lower extremity peripheral arterial disease, RAS – renal artery stenosis, SAD – supra--aortic arterial disease

Table III. Detailed group characteristics by extent of atherosclerotic stenoses ≥ 50%

	No significant stenosis (n = 127)	Stenosis ≥ 50% in 1 territory (n = 358)	Stenosis ≥ 50% in 2 territories (n = 133)	Stenosis ≥ 50% in 3 territories (n = 61)	Stenosis ≥ 50% in 4 territories (n = 8)	p
Age [years ± SD]	62.3 ± 8.3	63.3 ± 9.5	63.6 ± 9.2	65.7 ± 8.1	67.4 ± 7.8	0.125
Male, n (%)	81 (63.8)	267 (70.4)	94 (70.7)	40 (65.6)	5 (62.5)	0.16
Hypertension, n (%)	94 (74)	295 (83.1)	114 (85.7)	59 (96.7)	5 (62.5)	< 0.001
Diabetes, n (%)	26 (20.5)	295 (83.1)	55 (41.3)	24 (39.3)	4 (50)	0.002
Hyperlipidaemia, n (%)	98 (77.2)	306 (83.6)	123 (92.5)	59 (96.7)	8 (100)	< 0.001
Smoking, n (%)	58 (45.7)	215 (60)	115 (86.4)	57 (93.4)	8 (100)	< 0.001
Claudication, n (%)	1 (0.8)	8 (2.2)	19 (14.3)	27 (44.3)	3 (37.5)	< 0.001
Myocardial infarction, n (%)	0 (0)	169 (41.8)	63 (47.4)	35 (57.4)	4 (50)	< 0.001
LV ejection fraction [% ± SD]	61.9 ± 10.6	55.5 ± 11.6	56.2 ± 11	56.8 ± 9.5	50.8 ± 15.2	< 0.001
Stroke, n (%)	9 (7.1)	24 (8.9)	9 (6.8)	4 (6.6)	3 (37.5)	0.023
Body mass index [kg/m^2]	27.9 ± 4.1	27.9 ± 4.8	27.9 ± 4.3	26.5± 3.6	23.9± 2.4	0.12
Laboratory results						
Serum creatinine [µmol/l ± SD]	84.3 ± 18.5	89.1 ± 26.3	95.6 ± 32.8	127.2 ± 122	168.6 ± 121	< 0.001
LDL [mmol/l ± SD]	3.11 ± 0.90	2.91 ± 0.95	3.06 ± 0.84	3.31 ± 1.03	3.48 ± 1.32	0.003
HDL [mmol/l ± SD]	1.39 ± 0.44	1.19 ± 0.35	1.17 ± 0.3	1.17 ± 0.32	0.97 ± 0.38	0.001
Triglycerides [mmol/l ± SD]	1.46 ± 0.89	1.66 ± 1.08	1.73 ± 0.92	1.73 ± 1.19	1.56 ± 0.61	0.23
hs-CRP [mg/dl ± SD]	3.27 ± 3.35	4.28 ± 6.6	7.26 ± 15.5	7.99 ± 13.9	8.6 ± 8.1	0.001
Territories involved						
Coronary artery, n (%)	0 (0)	346 (96.6)	130 (94.2)	61 (100)	8 (100)	< 0.001
Supra-aortic artery, n (%)	0 (0)	5 (1.4)	75 (84.4)	48 (78.7)	8 (100)	< 0.001
Renal artery, n (%)	0 (0)	5 (1.4)	22 (24.8)	20 (32.8)	8 (100)	< 0.001
Lower extremity artery, n (%)	0 (0)	2 (0.6)	39 (26.6)	54 (88.5)	8 (100)	< 0.001

documented significant CAD have extracoronary stenoses exceeding 50% in at least one other vital arterial territory. Furthermore, 3-level and 4-level PVA is present in 11% and 1.5% of patients with confirmed CAD.

Using similar criteria, Lanzer et al. observed co-existence of angiographically documented CAD with stenoses in other arterial territories in 31.8% of patients, including 3-level and 4-level PVA in 6.5% and 1.2% of patients, respectively [17].

Although it has been well known for many years that atherosclerosis is a systemic disease, the estimated frequency of CAD, SAD, PAD and RAS coexistence is controversial, as in many studies different definitions of atherosclerotic territory involvement and stenosis threshold criteria were adopted [13, 18]. In some studies, the clinical symptoms specific for a given territory were assumed as territorial involvement, e.g. a previous ischaemic stroke might have been assumed as cerebrovascular disease, often leading to underestimation of true SAD prevalence [9-11, 13, 15]. As demonstrated in several studies, including the present one, a history of previous neurological ischaemic event was present in only about one third of patients with confirmed SAD on ultrasound and angiography [5, 12, 14, 17, 18]. Similarly, a previous MI has been reported in 20-50%

Table IV. Independent predictors of 2-level and 3-, 4-level polyvascular atherosclerotic stenoses ≥ 50% in patients with CAD

	p	RR	95% CI
Predictors of at least 2-level PVA			
2-3 vessel CAD	< 0.001	2.13	1.74-2.61
Hyperlipidaemia	0.067	1.96	0.95-4.03
Smoking	< 0.001	2.45	1.55-3.89
Lower extremity claudication	< 0.001	15.67	6.92-35.5
Creatinine level ≥ 1.3 ml/dl	< 0.001	2.83	1.64-4.9
Female gender	0.003	1.99	1.27-3.11
Predictors of 3- and 4-level PVA			
2-3 vessel CAD	< 0.001	2.52	1.61-3.21
Hypertension	0.017	6.59	1.41-30.7
Smoking	0.097	1.89	0.89-4.03
Lower extremity claudication	< 0.001	11.75	5.81-23.78
Creatinine level ≥ 1.3 ml/dl	0.007	2.63	1.3-5.33
Female gender	0.018	2.27	1.15-4.49
LDL cholesterol level	0.009	2.52	1.26-5.05

Abbreviations: CAD – coronary artery disease, PVA – polyvascular atherosclerotic stenoses ≥ 50%

of CAD patients seen in cath labs, and coronary angiography is needed to verify coronary artery atherosclerotic status in patients with typical/atypical angina or treadmill test, which is especially important in women [5, 9, 12, 13, 17-21]. Thus, in studies based on patients' medical history and clinical findings, the estimated prevalence of PVA is lower, in the range between 8.6 and 22% [9-11, 13, 15, 16, 22-25].

The PVA has a tremendous impact on clinical outcome of patients with CAD. Several large studies, e.g. by Mukherjee et al., BARI Investigators and OPUS-TIMI Study, demonstrated that concomitant extracardiac vascular disease is associated with an increased risk of in-hospital mortality and higher complication rate after coronary interventions, independent from other co-morbidities and baseline atherosclerotic risk factors [22-24]. Also, the long--term outcome in patients with PVA is worse, as compared to patients with less advanced atherosclerosis [15, 25, 26]. During one year of follow-up, in the Reduction of Atherothrombosis for Continued Health Registry (REACH Registry), the cardiovascular event rate was 12.6% in patients with 1-level atherosclerosis, 21.1% in those with 2-level PVA, and 26.3% in those with co-existing CAD, SAD and PAD [15, 16].

Multi-territorial atherosclerotic involvement indicates generalised systemic atherosclerosis and it is probably an indicator of more inflamed, aggressive, and high-risk vascular disease [23, 27]. As we demonstrated in this study, 2-3 vessel CAD, lower extremity claudication, hyperlipidaemia (and/or LDL cholesterol level), arterial hypertension, smoking, as well as creatinine level ≥ 1.3 ml/dl, independently increased the probability of having PVA, and through the presence and accumulation of these risk factors PVA could be suspected. In contrast, according to Lanzer et al., diabetes type 2 was the only independent variable, increasing 1.5-fold the risk of PVA [17]. Rigatelli et al. found that 3-vessel CAD, accumulation of at least 3 traditional atherosclerosis risk factors and age > 60 years were independently related to higher risk of at least 2-level PVA [18]. In the BlueCross & BlueShield of Michigan Cardiovascular Consortium, patients with CAD and extracoronary stenoses were significantly older, had more often diagnosed heart failure and lower ejection fraction, hypertension, diabetes, and renal insufficiency, as compared to patients with CAD alone [25]. In the PRISMA Study, greater frequency of diabetes, higher LDL and lower HDL cholesterol levels were observed in patients with PVA [28]. Thus, patients with several PVA risk factors of having at least 2-level PVA, or signs and symptoms of ischaemia in other vascular beds, should be screened for coexistent atherosclerotic vascular disease [5, 12, 17, 18].

In conclusion, significant atherosclerosis in extra-coronary arterial territories is present in 36% of patients with documented CAD. With advancing PVA, accumulation of atherosclerosis risk factors, previous atherothrombotic events and more severe CAD are observed.

Identification of patients with PVA among patients referred for coronary angiography might indicate those in whom also extracoronary artery revascularisation should be considered, besides very intensive risk factor modification with pharmacotherapy and lifestyle changes.

Multi-territory vascular disease points out a new potentially important clinical aspect of the management of patients with CAD, suggesting the need for at least non-invasive screening in the search for atherosclerosis in extracoronary arterial territories, as a tool to assess the short- and long-term cardiovascular risk [15, 19, 21-30].

Study limitations

As angiographic examinations of lower extremities and supra-aortic arteries were performed only when on Doppler ultrasonography probability of lesion stenosis ≥ 50% was found, there is some possibility of underestimating the true incidence of PVA. However, the majority of studies have shown that screening of supra-aortic and lower extremity arteries by means of Doppler ultrasonography examination has a high sensitivity and specificity in stenosis recognition ≥ 50%, and the concordance between angiography and ultrasonography in our centre exceeds 95%. Thus, we decided not to perform lower extremity and supra-aortic artery angiography routinely, in view of the increased risk of contrast-induced nephropathy. On the other hand, since non-invasive diagnosis with Doppler ultrasonography of renal stenosis is less accurate, all patients underwent renal angiography, which requires only a small amount of contrast agent. Other non-invasive imaging techniques such as computed angiography and magnetic resonance, were not involved in this study since they also require contrast agent injection for artery visualisation.

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Częstość występowania i czynniki predykcyjne miażdżycy w wielu obszarach tętniczych u pacjentów z chorobą wieńcową

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Streszczenie

Wstęp: W dobie starzejących się społeczeństw częstość choroby wieńcowej (CAD), miażdżycy zarostowej tętnic kończyn dolnych (PAD), występowania zwężeń tętnic odchodzących od łuku aorty, tj. tętnic szyjnych, kręgowych i podobojczykowych (SAD), jak również zwężeń tętnic nerkowych (RAS) znacznie wzrasta. Wielopoziomowa miażdżyca (PVA), tj. obecność zwężeń miażdżycowych ≥ 50% w 2 lub więcej obszarach tętniczych, związana jest z częstszym występowaniem zdarzeń sercowo-naczyniowych, w tym zgonów.

Cel: Ocena częstości występowania SAD, PAD i RAS u chorych z CAD oraz wyodrębnienie czynników predykcyjnych PVA.

Metody: Badaniem objęto 687 (487 mężczyzn) kolejnych chorych, w średnim wieku 63,5 ± 9,1 roku, u których wykazano angiograficznie obecność przynajmniej jednego zwężenia ≥ 50% zlokalizowanego w tętnicach wieńcowych, dogłowowych, nerkowych lub kończyn dolnych.

Wyniki: Zwężenia ≥ 50% w tętnicach wieńcowych stwierdzono u 545 (79,3%) chorych (1-naczyniowa CAD u 164, 2-naczyniowa CAD u 157, 3-naczyniowa CAD u 224 chorych). Obecność SAD, RAS i PAD ≥ 50% stwierdzono u odpowiednio 136 (19,8%), 55 (8%) oraz 103 (15%) chorych. Spośród 545 chorych z potwierdzoną CAD, u 346 (63,5%) zwężenia występowały tylko w tętnicach wieńcowych, natomiast 2-, 3-, 4-obszarową PVA wykazano u odpowiednio 130 (23,8%), 61 (11,2%) oraz 8 (1,5%) chorych. Spośród 142 chorych bez istotnych zwężeń w tętnicach wieńcowych, u 127 (89,4%) nie wykazano zwężeń ≥ 50% w żadnym z pozostałych obszarów tętniczych, natomiast u 12 (8,5%) chorych stwierdzono zwężenia w jednym obszarze pozawieńcowym, a u 3 (2,1%) w dwóch obszarach. Zidentyfikowano następujące niezależne czynniki predykcyjne ≥ 2-poziomowej PVA: chromanie przestankowe (ryzyko względne – RW = 15,7; p < 0,001), wielonaczyniowa CAD (RW = 2,1; p = 0,001), stężenie kreatyniny ≥ 1,3 mg/dl (RW = 2,8; p = 0,007), hiperlipidemia (RW = 1,9; p = 0,067), palenie tytoniu (RW = 2,4; p < 0,001) oraz płeć żeńska (RW = 2; p = 0,003).

Wnioski: Istotne zwężenia w tętniczych obszarach pozawieńcowych występują u 36% chorych z udokumentowaną, istotną chorobą wieńcową. Wraz z rosnącym zaawansowaniem miażdżycy obserwuje się większą częstość i kumulację licznych czynników ryzyka miażdżycy, a także wielonaczyniową chorobę wieńcową.

Słowa kluczowe: choroba wieńcowa, zwężenia tętnic pozawieńcowych, angiografia, czynniki predykcyjne

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