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OPIS PRZYPADKU
CASE REPORT

Acute coronary syndrome as the first symptom of vasospastic angina – case report of a 38-year-old man with myocardial infarction with non-obstructive coronary artery disease

Ostry zespół wieńcowy jako pierwszy objaw dławicy naczynioskurczowej – opis przypadku 38-letniego mężczyzny z zawałem serca bez istotnych zwężeń w tętnicach wieńcowych

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ABSTRACT

A 38-year-old obese man with hypertension and a twenty-year history of nicotinism was admitted for a suspected ST-segment elevation myocardial infarction (STEMI). Coronary angiography did not reveal significant coronary artery stenosis, which, together with symptoms of acute coronary syndrome and increased troponin I levels, led to the diagnosis of myocardial infarction with non-obstructive coronary artery disease (MINOCA) and implied a differential diagnosis. Given the clinical picture, a provocative test with acetylcholine was performed, which indicated the vasoconstrictive origin of MINOCA. In order to reduce the likelihood of another episode, pharmacotherapy was changed and lifestyle changes were recommended.

KEYWORDS

STEMI, coronary artery spasm, acetylcholine, MINOCA, provocation test, VSA, vasospastic angina

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STRESZCZENIE

38-letni otyły mężczyzna chorujący na nadciśnienie tętnicze z dwudziestoletnim wywiadem nikotynizmu został przyjęty z powodu podejrzenia zawału serca z uniesieniem odcinka ST (*ST elevation myocardial infarction* – STEMI). W koronarografii nie wykryto istotnych zwężeń tętnic wieńcowych, co łącznie z objawami ostrego zespołu wieńcowego oraz zwiększonym stężeniem troponiny I pozwoliło na rozpoznanie zawału serca bez zwężeń w tętnicach wieńcowych (*myocardial infarction with non-obstructive coronary artery* – MINOCA) i implikowało przeprowadzenie diagnostyki różnicowej. Ze względu na obraz kliniczny przeprowadzono próbę prowokacyjną z acetylocholiną, która wskazała na naczynioskurczowe pochodzenie MINOCA. W celu zmniejszenia prawdopodobieństwa kolejnego epizodu zmieniono farmakoterapię i zalecono zmianę stylu życia.

SŁOWA KLUCZOWE

STEMI, skurcz tętnicy wieńcowej, acetylocholina, MINOCA, próba prowokacyjna, VSA, dławica naczynioskurczowa

INTRODUCTION

Patients admitted urgently for chest pain present a wide spectrum of its causes and it is not always related to myocardial infarction caused by atherosclerotic coronary artery stenosis [1]. This case describes a diagnostic process in a patient presenting with acute coronary syndrome (ACS) without epicardial significant atherosclerosis.

CASE REPORT

A 38-year-old man was admitted to the Department of Cardiology because of severe retrosternal pain radiating to the mandible and left upper limb. The pain occurred in the early morning hours, was unrelated to exertion and represented the first such episode in his life. On the electrocardiogram (ECG; Figure 1), significant ST-segment elevations in leads II, III, aVF, and V4-V6 were present. With a suspected ST-segment elevation myocardial infarction (STEMI), the patient was transported directly to the cardiac catheterisation lab. During medical transport, the patient received ticagrelor (180 mg), acetylsalicylic acid (ASA, 300 mg) and unfractionated heparin (5000 IU). Coronary angiography did not reveal epicardial artery stenosis, and there was resolution of pain during the examination. During monitoring in the cardiac intensive care unit (CICU), an increase in myocardial damage markers was observed, the troponin I level at first was 193 pg/dl and increased until the following day, peaking at 8594 pg/dl; other laboratory parameters did not show clinically significant deviations. Transthoracic echocardiography did not reveal any abnormalities, apart from slight hypertrophy of all the left ventricle walls.

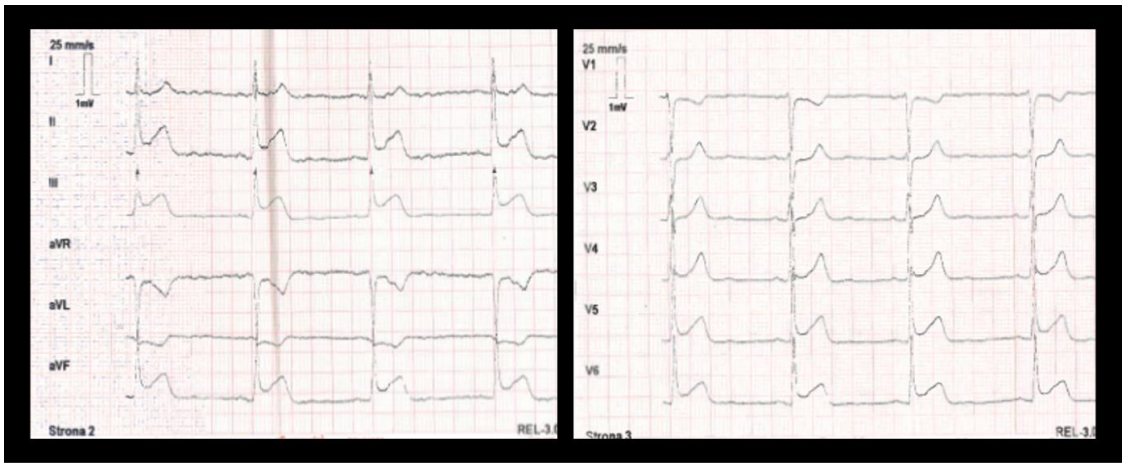

Fig. 1. Sinus rhythm 50 bpm., normal cardiac axis, PQ = 180 ms, QRS = 80 ms, no signs of myocardial hypertrophy, 2 mm ST-segment elevation in leads: II, III, aVF, V4, V5 and V6, 1.5 mm ST-segment deflation in leads: aVR, aVL and 1 mm in V1. QTc = 374 ms.

The patient was obese, with a 20-year history of smoking, and 15-year history of hypertension in addition to anxiety disorder. He had been treated with bisoprolol and opipramol. Two weeks before hospitalisation the patient had an upper respiratory tract infection with fever, and discontinued opipramol without consulting his physician.

The patient was diagnosed with myocardial infarction with non-obstructive coronary artery disease (MINOCA). The differential diagnosis of the causes of MINOCA included myocarditis, coronary microvascular disease (CMD) and vasospastic angina (VSA). The inflammatory parameters remained unelevated, the echocardiography did not reveal any

clinically significant outcome as above, making the diagnosis of myocarditis less likely. In the course of the diagnosis, considering the previous test results, a diagnosis of VSA was the most coherent. An acetylcholine (ACh) spasm provocation test with simultaneous microcirculatory assessment by means of the Coroventis system was performed. Microcirculatory resistance on functional testing was borderline, but not significantly increased. The index of microvascular resistance (IMR) totalled 33 mmHg × s for the right coronary artery (RCA) and 17 mmHg × s for the left anterior descending branch (LAD). The provocative test was performed by administering 50 mcg, 100 mcg and 200 mcg of ACh intracoronary in slow, approximately 20-second boluses. The 100 mcg and 200 mcg doses induced transient ECG changes and angina symptoms, while angiographically significant contraction occurred in both arteries after the 200 mcg doses; it was much more pronounced in the LAD (Figures 2 and 3). Five--minute intervals were used between ACh doses enabling the resolution of symptoms and normalisation of the ECG. The above findings allowed the diagnosis of the vasospastic form of coronary artery disease. At the end of the procedure, the patient had an episode of atrial fibrillation with a ventricular rate of 150/min. A 75 mg amiodaronebolus was administered, followed by infusion for 7 hours until sinus rhythm returned. In the further course of hospitalisation, the angina and arrhythmia did not recur and the ST-segment elevation withdrew (Figure 4). Bisoprolol was changed to diltiazem to reduce the risk of another spasm. The pharmacotherapy further included ASA, ramipril and rosuvastatin. The patient was discharged home and scheduled for outpatient follow-up.

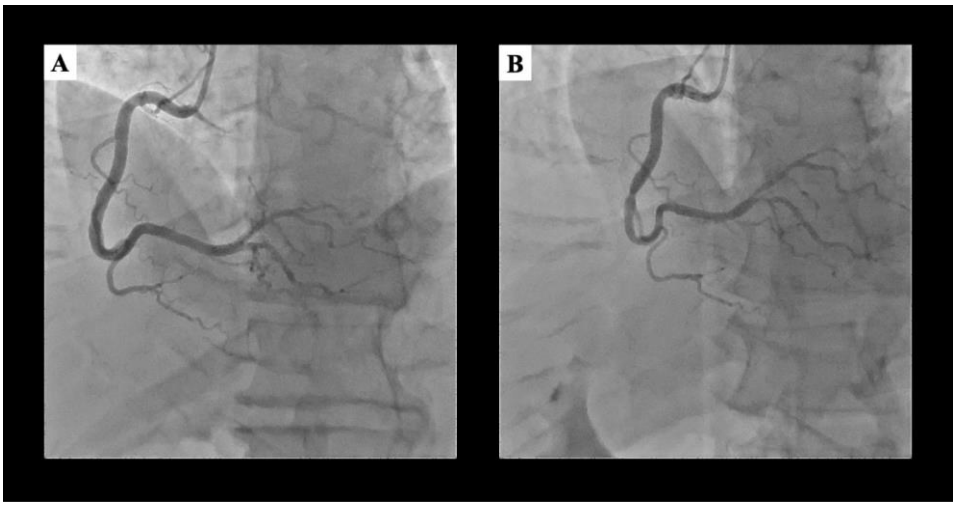

Fig. 2. A – angiogram before acetylcholine administration, no stenosis in right coronary artery; B – angiogram after 200 mcg acetylcholine administration, right coronary artery spasm reducing lumen by about 30% in 1st segment, about 60% in 2nd segment, about 80% in ostium of posterolateral artery and about 90% in ostium of posterior descending artery.

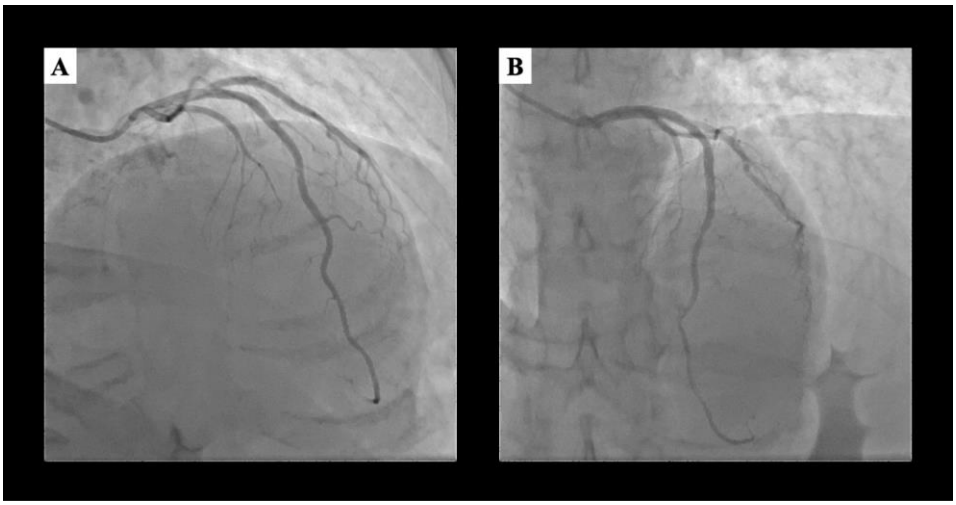

Fig. 3. A – angiogram before acetylcholine administration, no stenosis in left anterior descending branch; B – angiogram after 200 mcg acetylcholine administration, left anterior descending branch spasm reducing lumen on whole course of artery reaching up to 90% in tightest spot.

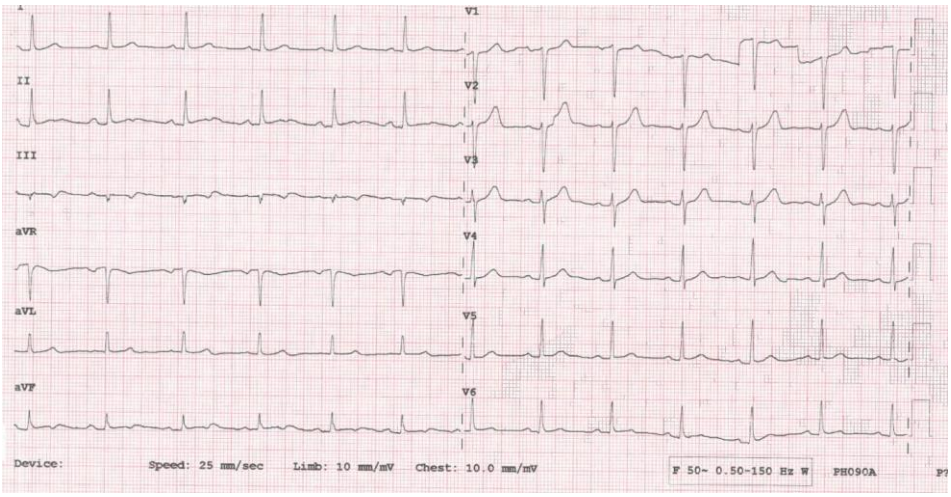

Fig. 4. Sinus rhythm 75 bpm., normal cardiac axis, PQ = 180 ms, QRS = 80 ms, no signs of myocardial hypertrophy, biphasic T wave in III and aVF, no signs of acute ischemia. QTc = 424 ms.

DISCUSSION

The presented case is an example of MINOCA, a clinical situation in which a patient presents with symptoms of ACS and elevated troponin levels, while performed coronary angiography does not show ≥ 50% stenosis in the large epicardial arteries. The prevalence of this phenomenon in the literature ranges from 1–14% of ACS patients undergoing coronary angiography, and the causes are heterogeneous, ranging from coronary vascular disease to non-coronary cardiac disorders, in addition to extra-cardiac causes [1]. In this case, after laboratory tests and echocardiography, the search for the cause of the patient's condition could be narrowed down to the two most likely causes – VSA or CMD myocardial infarction – and an invasive diagnosis of both was made. In addition, VSA was indicated by the onset of symptoms at rest [2].

Vasospastic angina is a disease first described in the 1950s by Prinzmetal et al. [3]. It is characterised by epicardial artery spasm, which can be both spontaneous and induced, and is caused by coronary artery hyperresponsiveness to vasoconstrictive stimuli [4]. The ACh spasm provocation test is a relatively safe method for the diagnosis of VSA. Nevertheless, in most countries, including Poland, ACh is used in this application off-label [5]. On the contrary, in Japan, the leading country in the frequency of such procedures, ACh has been registered in the spasm provocation test since 2017 [6].

According to the 2019 European Society of Cardiology (ESC) guidelines on the diagnosis and treatment of chronic coronary syndromes, a provocative test is considered positive when it results in: symptoms of angina, ischaemic changes on the ECG and significant stenosis caused by a spasm of the epicardial artery [2]. All these criteria were met by the described patient.

Acetylcholine administered intracoronary, although a relatively safe procedure, is not without drawbacks. Side-effects occur mainly as cardiac arrhythmias, the most common among them are bradycardia, ventricular arrhythmias and atrial fibrillation (AF) [5,7]. The arrhythmias occur mainly transiently during the procedure. In the analysed case, AF with rapid ventricular activity was stopped by amiodarone infusion. The arrhythmias did not occur during the subsequent hospitalisation. Therefore, noteworthy is a trial conducted by Shibata et al. [8] on a relatively small sample of 100 patients undergoing an ACh spasm provocation test with a 2-year follow-up. They concluded that the AF episode during the test may be related to impaired left atrial reservoir strain and be a good AF occurrence predictor in the future.

Smoking cessation would be crucial to improve the prognosis of the described patient. An observational study in Japan revealed that up to 91% of patients who developed MINOCA due to VSA had a history of nicotinism. The patient should also eliminate alcohol consumption [6]. In addition, VSA episodes can be induced by commonly used drugs such as beta-blockers and serotonergic as well as cholinergic agents. Consequently, in this patient the discontinuation of beta-blockers is necessary and the possible use of selective serotonin reuptake inhibitor (SSRI) drugs to treat anxiety disorders may be contraindicated [9].

The first-line pharmacotherapy for VSA includes the use of calcium channel blockers and long-acting nitrates [2], with the recommendation that nitrates should be used if there is intolerance or insufficient response to calcium channel blockers [9]. Potential new drugs used in VSA refractory for first-line treatment include fasudil (Rho kinase inhibitor), or denopamine (beta1-receptor agonist) [6]. These drugs are presently unavailable in Europe.

CONCLUSIONS

The diagnosis of MINOCA is a multifaceted process, in which the vasospastic form of ischaemia should also be considered. Some patients experiencing vasospastic MINOCA already have a previous diagnosis of VSA or a positive history of angina complaints suggestive of VSA. However, it should be considered that ACS is often the first manifestation of VSA [6]. It is crucial because adequate follow-up pharmacotherapy may protect the patient from the potentially dangerous consequences of VSA.

Author's contribution

Study design – Ł. Gabryel,
Manuscript preparation – Ł. Gabryel, K. Bugla, T. Pawłowski, A. Gziut-Rudkowska
Literature research – Ł. Gabryel, K. Bugla,
Final approval of the version to be published – Ł. Gabryel, K. Bugla, T. Pawłowski, A. Gziut-Rudkowska

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