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50-year-old male with recurrent non-ST segment elevation myocardial infarction with borderline lesions in angiography — the importance of functional diagnostics

50-letni mężczyzna z nawracającymi zawałami bez uniesienia odcinka ST i granicznymi zmianami w koronarografii — znaczenie diagnostyki czynnościowej

Filip Pawliczak[1], Jarosław D. Kasprzak[2], Piotr Lipiec[2], Radosław Kręcki[2]

[1]Students Scientific Circle in the Department of Cardiology, Chair of Cardiology, Medical University of Lodz, Poland
[2]Department of Cardiology, Chair of Cardiology, Medical University of Lodz, Poland

Abstract

Dynamic development of invasive cardiology techniques significantly improved diagnostic and therapeutic abilities for patients with coronary artery disease. Functional assessment of coronary artery stenosis by fractional flow reserve (FFR) measurement or myocardial perfusion studies, such as single photon emission computed tomography (SPECT), allow detailed characterization of angiographically borderline atherosclerotic lesions in coronary arteries and guidance of therapeutic strategy. The authors presented a case of a 50-year old male hospitalized repeatedly due to non-ST segment elevation myocardial infarctions (NSTEMI). Combined functional assessment allowed correct diagnosis and optimal treatment.

Key words: fractional flow reserve, NSTEMI, coronary angiography

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Introduction

Dynamic development of invasive cardiology techniques significantly improved diagnostic and therapeutic abilities for patients with coronary artery disease. Functional assessment of coronary artery stenosis by fractional flow reserve (FFR) measurement or myocardial perfusion studies, such as single photon emission computed tomography (SPECT), allow detailed characterization of angiographically borderline atherosclerotic lesions in coronary arteries and guidance of therapeutic strategy. We present a case of 50-year old male hospitalized repeatedly due to non-ST segment elevation myocardial infarctions (NSTEMI). Combined functional assessment allowed correct diagnosis and optimal treatment.

Case report

A 50-year-old male with a 3-year history of coronary heart disease was admitted to the Department of Cardiology in early December 2013 with non-ST myocardial infarction (NSTEMI). His medical history also included arterial hypertension, hypercholesterolaemia and atherosclerosis of lower limbs arteries treated with left external iliac artery angioplasty with stent implantation. Moreover, he had positive family history (brother — MI in age of 45).

The first manifestation of coronary heart disease was NSTEMI in January 2010. At that time, patient had isolated critical stenosis in right coronary artery (RCA), which was treated with angioplasty and bare metal stent (BMS) implantation. The patient was readmitted three months

Address for correspondence: Filip Pawliczak, Studenckie Koło Naukowe przy Katedrze i Klinice Kardiologii, Uniwersytet Medyczny w Łodzi, ul. Kniaziewicza 1/5,91–347 Łódź, Poland, e-mail: filip.pawliczak@gmail.com

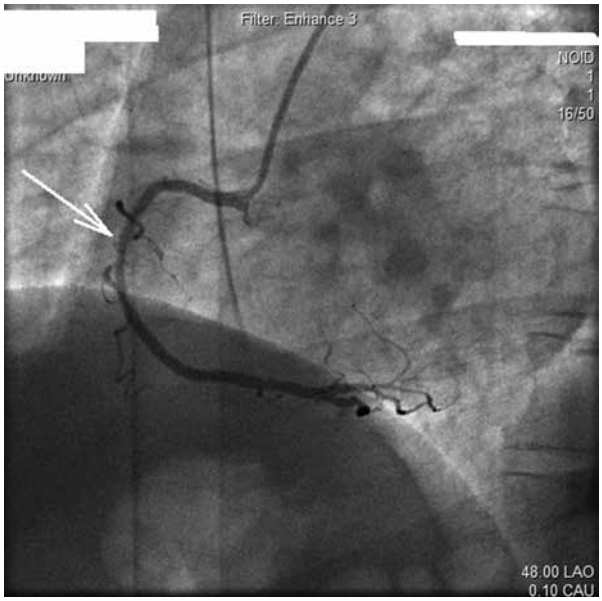

Figure 1. Restenosis in stent implanted in right coronary artery — the arrow points to border line stenosis in previously implanted DES (LAO50)

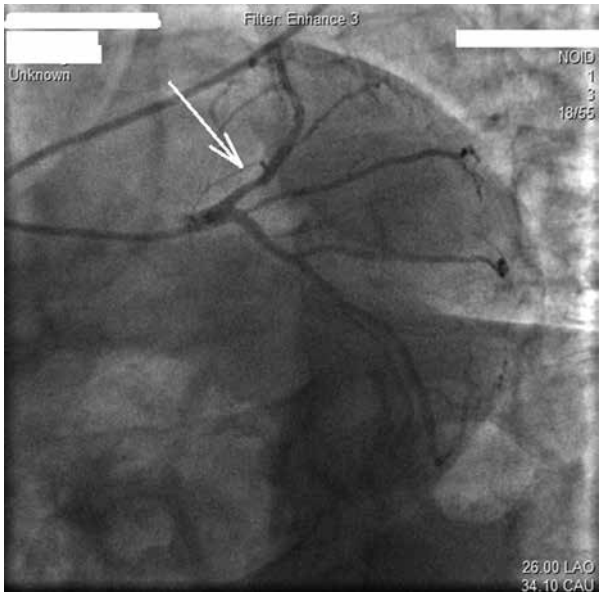

Figure 2. Lesion in 6th segment of left anterior descending artery — the arrow points to border line stenosis (CAU30)

later with another NSTEMI due to restenosis in previously implanted stent in RCA. Everolimus drug-eluting-stent (DES) — Promus Element 2.75 × 24 mm was implanted with optimal angiographic result (Figure 1).

Three years later the patient was admitted once again with NSTEMI. Angiography revealed 50% restenosis in DES in RCA and 50% lesion in 6th segment of left anterior descending (LAD) (Figure 2). No interventional treatment was undertaken and the patient was discharged after optimization of pharmacotherapy.

In December 2013, the patient was admitted with NSTEMI for the fourth time. Regular sinus rhythm, 90 bpm, normal stable ST-T segment was observed in electrocardiography. ECHO examination revealed minor wall motion abnormality with good global systolic function of left ventricle (ejection fraction 57%). Considering typical clinical presentation and many cardiovascular risk factors the decision of invasive strategy was made. Due to estimated low risk of death from cardiovascular causes (GRACE score 77) the patient was qualified to coronary angiography on the following day. In comparison to previous examination (March 2013), no angiographic progression was observed — 50% stenosis in LAD and 50% restenosis in DES in RCA. Due to typical clinical presentation, fractional flow reserve (FFR) measurements in both stenotic vessels were made. Minimal values of fractional flow reserve in RCA and LAD were 0.79 and 0.80, respectively (Figure 3 and 4). Subsequently, angioplasty of RCA with a paclitaxel eluting balloon (PEB) — 3.0 × 25 mm Elutax Sv type under nominal pressure of 15 atm during 30 seconds was performed. Optimal angiographic effect was achieved and confirmed with FFR measurement (0.97). Due to marginal FFR value in LAD the patient was referred for single-photon emission computed tomography (SPECT) in order to determine further strategy regarding the LAD lesion. Negative SPECT resulted in the decision to discharge the patient on pharmacotherapy: bisoprolol 10 mg, ramipril 10 mg, acetylsalicylic acid (ASA) 75 mg, clopidogrel 75 mg (12 months), atorvastatin 40 mg and pantoprazole 20 mg. During 6-month follow-up he remained asymptomatic with satisfactory exercise tolerance.

Discussion

Dynamic development of invasive cardiology techniques improved diagnostic and therapeutic abilities for patients hospitalized due to symptomatic atherosclerosis. Functional assessment of coronary artery stenosis by FFR measurement or myocardial perfusion studies, such as SPECT, allow detailed characterization of angiographically borderline atherosclerotic lesions in coronary arteries and guidance of therapeutic strategy. We present a case of a 50-year old male hospitalized repeatedly due to NSTEMI. Combined functional assessment allowed correct diagnosis and optimal treatment.

Coronary angiography remains the golden standard technique for coronary artery disease diagnosis. However, it has some limitations, such as no information on functional significance of coronary lesions or inability to visualize morphology of atherosclerotic plaques (its vulnerability). In case of absence of evidence of ischaemia, the European

Figure 3. Fractional flow reserve measurements in RCA — value of 0.79 affirming significance of the lesion

Figure 4. Fractional flow reserve measurements in LAD — border line value of 0.80

Society of Cardiology recommends (class IA) simultaneous measurement of fractional flow reserve [1]. FFR is a guide wire-based procedure that can accurately measure blood pressure and flow through a specific part of the coronary artery. Fractional flow reserve measurement involves determining the ratio between the maximum achievable blood flow in a diseased coronary artery and the theoretical maximum flow in a normal coronary artery. An FFR of 1.0 is widely accepted as normal. An FFR lower than 0.80 is generally considered to be associated with myocardial ischaemia. FAME study proved high efficacy of FFR method in diagnostics of hemodynamically significant stenoses in patients with multivessel CAD and revealed 30% reduction of risk of death, MI or urgent revascularization in patients in whom the therapeutic procedure was based on FFR ($p = 0.02$) [2]. FAME 2 study proved that patients with stable CAD with hemodynamically significant stenoses (FFR $\leq$ 0.80 regardless of stenosis morphology) treated with drug eluting stent implantation and optimal medical therapy present lower rate of urgent revascularization and gain higher therapeutic benefit than those treated only with optimal medical therapy [3]. It was also proven that

guidance of therapy with FFR in patients with unstable angina (UA) or NSTEMI is as beneficial as in patients with stable coronary artery disease (CAD) [4]. After taking into consideration the results of presented studies, it is obvious that in the cases of angiographically borderline lesions, FFR and other functional tests play a key role in choice of correct therapeutic management [5]. It is assumable that in such cases routine FFR measurements for physiological lesion assessment and qualification for revascularization allow to recruit for angioplasty a subset of functionally eligible patients who would otherwise be treated pharmacologically on the basis of lumenogram. This could lead to lower risk of rehospitalization and thus to lower costs of treatment [6].

The presented case is a piece of evidence that diagnosing atherosclerosis in coronary vessels and selection of the proper treatment is sometimes difficult. The FFR confirmed the functional significance (that was marginalized in previous angiography) of borderline lesions in RCA and gave no clear answer about lesion in LAD (borderline value of 0.80) this resulted in the decision to performing balloon angioplasty of RCA thus restoring the flow in the vessel (Figure 5) with excellent result (final FFR = 0.97) and expanding non-invasive diagnostics of LAD lesion. As the final effect we obtained improvement of the patient's condition with no angina symptoms during 6-month follow-up.

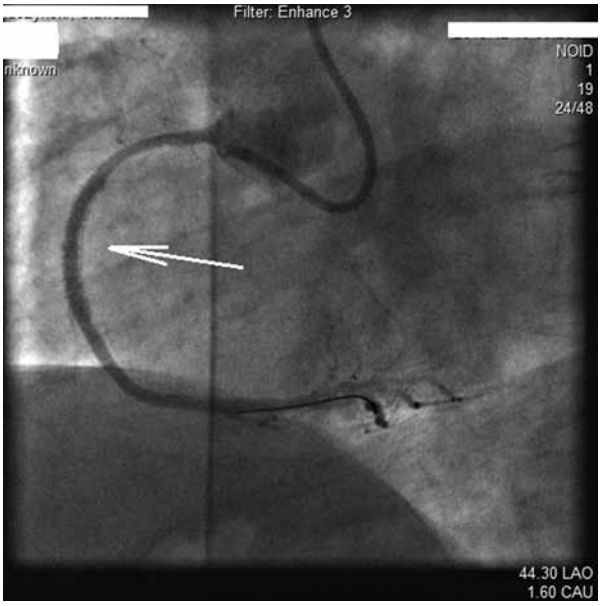

Figure 5. Right coronary artery after balloon angioplasty — the arrow points to expanded stent and optimal flow (LAO50)

Conflict of interest

None declared.

Streszczenie

Dynamiczny rozwój technik kardiologii inwazyjnej znacząco zwiększył możliwości diagnostyczne i terapeutyczne dla pacjentów z chorobą wieńcową. Czynnościowa ocena zwężeń tętnic wieńcowych, od oceny cząstkowej rezerwy przepływu wieńcowego (FFR) do badań perfuzji mięśnia sercowego, takich jak tomografia emisyjna pojedynczego fotonu (SPECT), pozwala na szczegółową weryfikację angiograficznie granicznych zmian miażdżycowych w tętnicach wieńcowych i wybór odpowiedniej strategii terapeutycznej. Autorzy zaprezentowali przypadek 50-letniego mężczyzny wielokrotnie hospitalizowanego z powodu nawracających zawałów bez uniesienia odcinka ST (NSTEMI). Złożona ocena czynnościowa pozwoliła dokonać trafnej diagnozy i dobrać optymalne leczenie.

Słowa kluczowe: cząstkowa rezerwa przepływu wieńcowego, NSTEMI, koronarografia

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