

50-year-old male with recurrent non-ST segment elevation myocardial infarction with borderline lesions in angiography

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

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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. We present 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 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, hypercholesterolemia and atherosclerosis of lower limb arteries treated with stent implantation to left external iliac artery angioplasty with stent implantation. Moreover, he had positive family history (brother – MI at the age of 45).

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

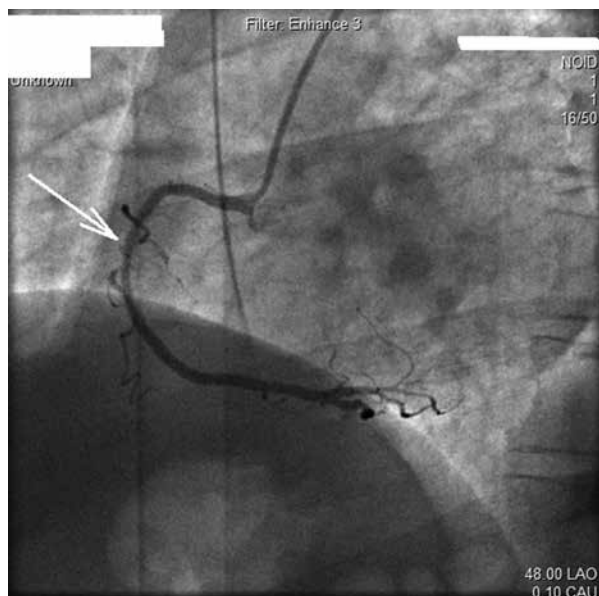


Figure 1. Restenosis in stent implanted in right coronary artery – the arrow points to border line stenosis in previously implanted DES (LA050)

implantation. The patient was readmitted three months later with another NSTEMI due to restenosis in previously implanted stent in RCA. Everolimus eluting-stent (DES) – Promus Element 2.75 × 24 mm was implanted with an optimal angiographic result (Fig. 1).

Three years later 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) (Fig. 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, and normal stable ST-T segment were 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 a decision to apply an invasive strategy was made. Due to an 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 performed. Minimal values of fractional flow reserve in RCA and LAD were 0.79 and 0.80, respectively (Fig. 3, 4). Subsequently, angioplasty of RCA with a paclitaxel eluting balloon (PEB) – 3.0 × 25 mm

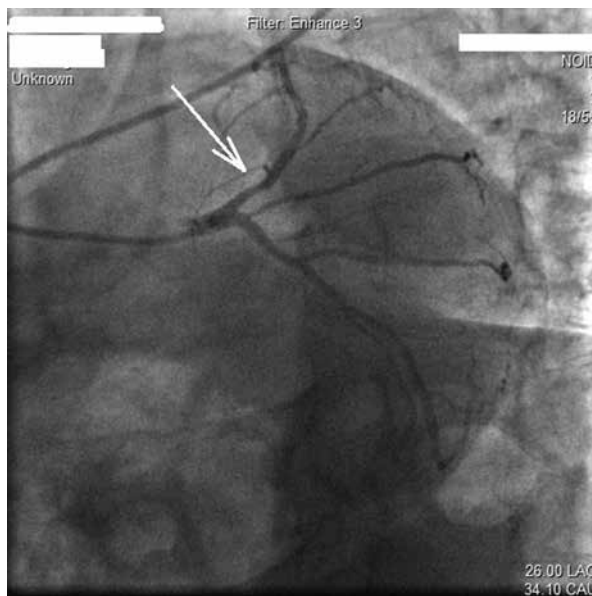


Figure 2. Lesion in 6th segment of left anterior descending artery – the arrow points to border line stenosis (CAU30)

Elutax Sv type under nominal pressure of 15 atm during 30 seconds was performed (Fig. 5). 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, ASA 75 mg, clopidogrel 75 mg (12 months), atorvastatin 40 mg and pantoprazole 20 mg. During the 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



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

visualize morphology of atherosclerotic plaques (its vulnerability). In case of absence of evidence of ischemia, European 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 ischemia. A 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]. A 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

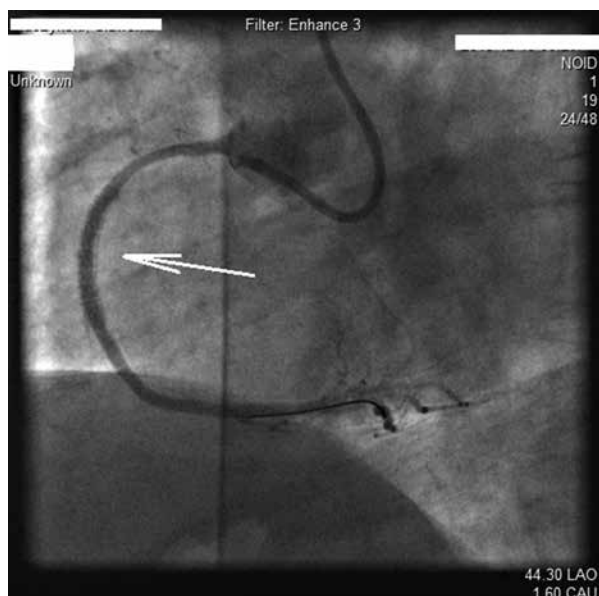


Figure 5. Right coronary artery after balloon angioplasty – the arrow points to expanded stent and optimal flow (LA050)

beneficial as in patients with stable CAD [4]. After taking into consideration the results of presented studies, it is obvious that in the case of angiographically borderline lesions, FFR and other functional tests play a key role in

the 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 recruiting for angioplasty a subset of functionally eligible patients who would otherwise be treated pharmacologically on the basis of a luminogram. This could lead to lower risk of rehospitalization and thus to lower costs of treatment [6].

Summary

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) which resulted in the decision to perform balloon angioplasty of RCA restoring the flow in the vessel (final FFR = 0.97) and to expand non-invasive diagnostics of LAD lesion. As the final effect, we obtained improvement of patient's condition with no angina symptoms during a 6-month follow-up.

Conflict of interest(s)

There was no conflict of interest found in the presented study.

Streszczenie

Dynamiczny rozwój technik kardiologii inwazyjnej znacząco zwiększył możliwości diagnostyczne i terapeutyczne dla pacjentów z chorobą wieńcową. Czynnościowa ocena zwężeń tętnic wieńcowych, począwszy od oceny cząstkowej rezerwy przepływu wieńcowego (FFR), a skończywszy na badaniach 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. W pracy zaprezentowano przypadek 50-letniego mężczyzny wielokrotnie hospitalizowanego z powodu nawracających zawałów bez uniesienia odcinka ST (NSTEMI). Złożona ocena czynnościowa pozwoliła postawić trafną diagnozę i dobrać optymalne leczenie.

Słowa kluczowe: cząstkowa rezerwa przepływu wieńcowego, NSTEMI, koronarografia

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References

1. The Task Force on the management of stable coronary artery disease of the European Society of Cardiology, 2013 ESC guidelines on the management of stable coronary artery disease. *Eur. Heart J.* 2013; 34: 2949–3003.
2. Tonino P.A., De Bruyne B., Pijls N.H. et al. Fractional Flow Reserve versus Angiography for Guiding Percutaneous Coronary Intervention. *N. Engl. J. Med.* 2009; 360: 213–224.
3. De Bruyne B., Pijls N.H., Kalesan B. et al. Fractional Flow Reserve-Guided PCI versus Medical Therapy in Stable Coronary Disease. *N. Engl. J. Med.* 2012; 367: 991–1001.
4. Sels J.W., Tonino P.A., Siebert U. et al. Fractional flow reserve in unstable angina and non-ST-segment elevation myocardial infarction experience from the FAME study. *JACC Cardiovasc. Interv.* 2011; 4: 1183–1189.
5. Van Belle E., Rioufol G., Pouillot C. et al. Outcome Impact of Coronary Revascularization Strategy Reclassification With Fractional Flow Reserve at Time of Diagnostic Angiography: Insights From a Large French Multicenter Fractional Flow Reserve Registry. *Circulation* 2014; 129: 173–185.
6. Fearon W.F., Bornschein B., Tonino P.A. et al. Economic evaluation of fractional flow reserve-guided percutaneous coronary intervention in patients with multivessel disease. *Circulation* 2010; 122:2545–2550.