

# Myocardial infarction complicated by acute heart failure treated with percutaneous coronary intervention by transradial approach

Zawał serca powikłany ostrą niewydolnością krążenia leczony metodą przezskórnej interwencji wieńcowej z dostępu promieniowego

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## Abstract

The early period of myocardial infarction may be a dramatic step in coronary heart disease due to the risk of sudden death or acute heart failure less often. It is known that a quick opening coronary artery responsible for the creation of a myocardial infarction, is the best method of treatment in the prevention of these complications. We describe a case of a 75-year-old patient with myocardial infarction complicated by pulmonary edema and cardiogenic shock, treated with primary coronary angioplasty with the left transradial approach.

**Key words:** myocardial infarction, cardiogenic shock, transradial approach

## Streszczenie

Wczesny okres ostrego zawału serca może być dramatycznym etapem choroby wieńcowej ze względu na ryzyko nagłego zgonu lub rzadziej – ostrej niewydolności krążenia. Wiadomo, że szybkie udrożnienie zamkniętej tętnicy wieńcowej odpowiedzialnej za powstanie zawału serca jest najlepszą metodą leczniczą w profilaktyce wspomnianych powikłań. Opisujemy przypadek 75-letniego pacjenta z zawałem serca powikłanym obrzękiem płuc i wstrząsem kardiogenym, leczonego metodą pierwotnej angioplastyki wieńcowej z wklucia promieniowego lewego.

**Słowa kluczowe:** zawał serca, wstrząs kardiogeny, wklucie promieniowe

## Introduction

The early phase of an acute coronary syndrome may be a dramatic stage of coronary artery disease due to the risk of sudden death or acute heart failure [1]. It is known that prompt opening of the occluded infarct-related artery is the best method of treatment in prophylaxis of these complications [2, 3]. There are no controversies over the treatment of typical forms of myocardial infarction, but atypical infarctions may pose management challenges even for an experienced physician [1]. We describe a case of a patient with myocardial infarction complicated by pulmonary oedema and cardiogenic shock treated with

primary percutaneous coronary intervention (PCI) with a transradial approach (TR).

## Case report

A 74-year-old man was admitted to the Department of Cardiology on 19 March 2010 at 1:55 PM after several hours of resting dyspnoea which occurred without apparent reason. He reported limitation of exercise capacity (NYHA III) since 3-4 days previously. He had a history of left internal and external iliac artery angioplasty with bare metal stent implantation in 2008.

On admission to the ward the patient presented with pulmonary oedema, forced half-sitting position,

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BP 130/80 mmHg, HR 100-110 bpm and silent heart tones. Laboratory tests revealed the following abnormalities: Na – 135.4 mmol/l (136.0-145.0), D-dimers – 2.33 µg FEU/ml (< 0.5), fibrinogen – 446 mg/dl (150-400), proBNP – 20230 pg/ml (< 300 pg/ml), troponin I – 0.91 ng/ml (cut-off point for myocardial infarction 0.9).

Blood morphology, potassium, creatinine, glucose plasma levels and INR were normal. ECG showed sinus rhythm 106 bpm, right bundle branch block and left posterior hemiblock, ST-segment elevation in leads V<sub>1</sub>-V<sub>3</sub>, ST-segment depression in leads V<sub>5</sub>-V<sub>6</sub>, Q wave in leads V<sub>2</sub>-V<sub>3</sub> (fig. 1).

Echocardiography disclosed extensive left ventricular contraction abnormalities including akinesis of the periapical anterior and septal segments. Left ventricular ejection fraction (EF) was 20%.

The patient received aspirin – 75 mg *p.o.*, clopidogrel – 300 mg *p.o.*, enoxaparin – 0.6 ml *s.c.*, nitroglycerine infusion with BP monitoring, 1 vial of furosemide *i.v.*, 2.5 mg of morphine *i.v.* and oxygen.

Despite treatment the patient's condition did not improve. Troponin I level assessed at 7 PM was 2.3 ng/ml.

Because of the dynamic rise of troponin I a decision to perform coronary angiography was made. The study was done at 10:30 PM of the same day using a left transradial approach and 6F catheters because of the patient's inability

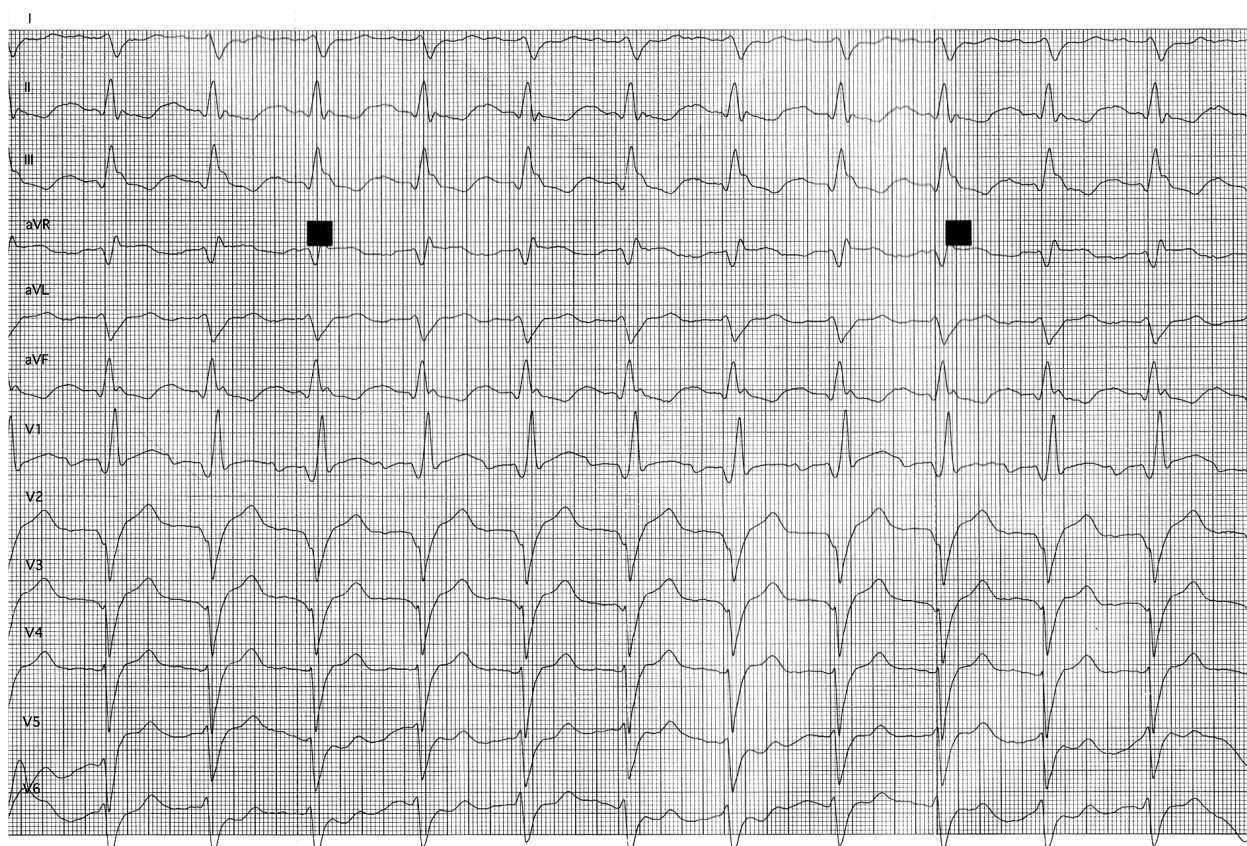
to remain for long in the horizontal position (due to dyspnoea and half-sitting position).

Coronary angiography (fig. 2) showed significant stenosis close to the ostium of the right coronary artery (RCA), significant stenosis (70%) of the ostium of the left anterior descending artery (LAD) and critical stenosis in the proximal one third of the same vessel (secondary recanalization?) accompanied by critical stenosis in the proximal segment of the circumflex artery (Cx). Integrilin (Eptifibatide?) infusion was started according to the treatment scheme with the intention to perform PCI [4].

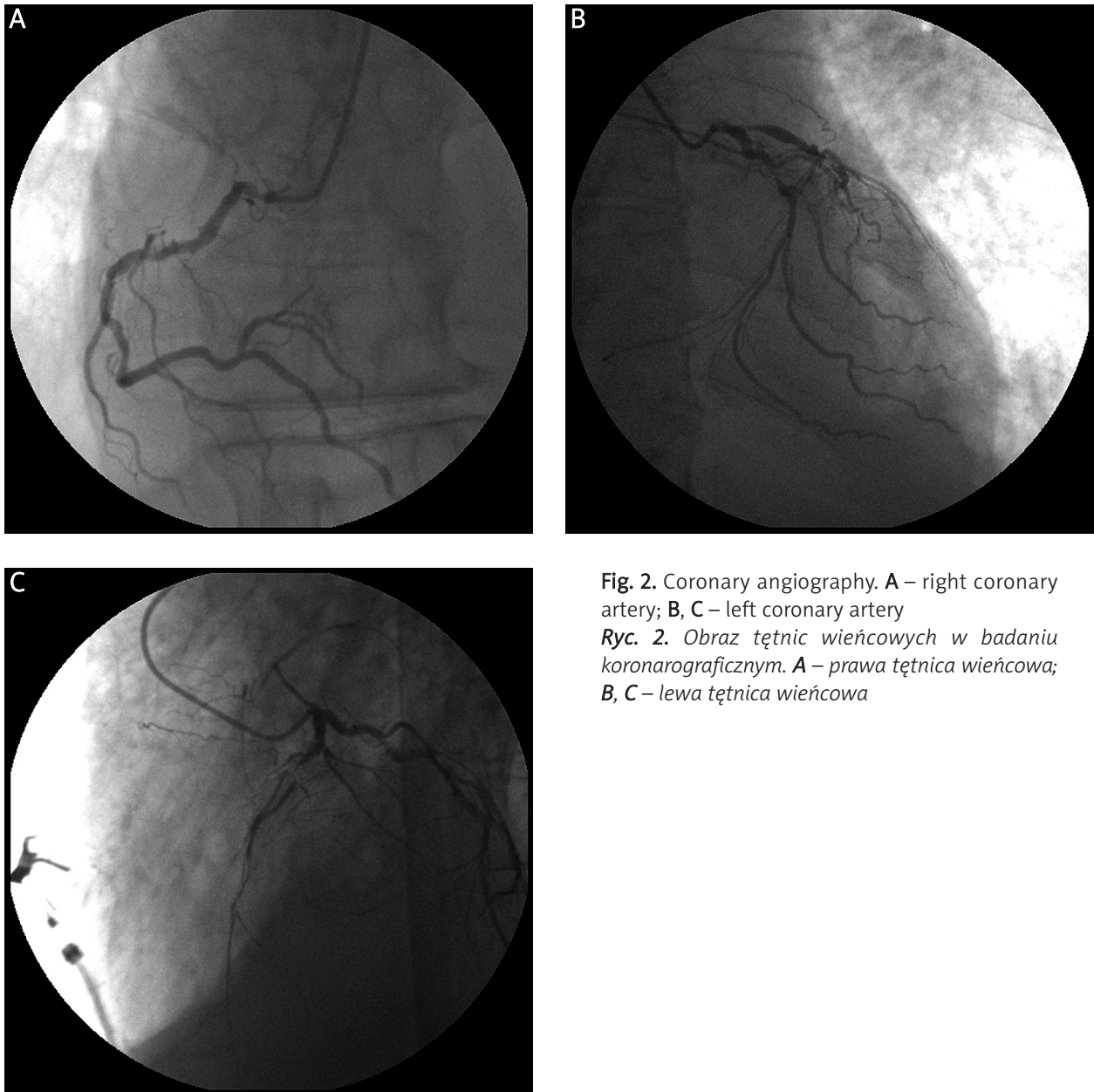
During coronary angiography the patient's condition deteriorated: dyspnoea worsened, there was a blood pressure drop to 70/50 mmHg and tachycardia (130-140 bpm). An intra-aortic balloon pump (IABP) was installed through the transfemoral approach (TF) which resulted in BP and HR stabilization at 100/70 mmHg and 100-110 bpm after several minutes and significant reduction of dyspnoea.

Because of the fairly easy intubation of all coronary artery ostia with the use of catheters introduced through transradial access we decided to perform PCI of all lesions with this approach.

The circumflex artery was predilated using the Sequent balloon, 2.0 × 20 mm (16 atm), before implantation of the Coroflex Blue stent, 3.0 × 8 mm (18 atm). The distal lesion in the LAD was predilated using Sequent balloons,



**Fig.1.** Electrocardiograms on admission  
**Ryc. 1.** Elektrokardiogram przy przyjęciu



**Fig. 2.** Coronary angiography. **A** – right coronary artery; **B, C** – left coronary artery

**Ryc. 2.** Obraz tętnic wieńcowych w badaniu koronarograficznym. **A** – prawa tętnica wieńcowa; **B, C** – lewa tętnica wieńcowa

1.5 × 20 mm (20 atm) and 2.0 × 20 mm (18 atm), before implantation of the Coroflex Blue stent, 2.5 × 16 mm (20 atm), and subsequent overlapping implantation of the Liberte stent, 3.0 × 8 mm (18 atm), proximally. The next step consisted of direct Liberte stent implantation (3.0 × 12 mm, 20 atm) into the RCA. The lesion in the ostium of the LAD was left without intervention (fig. 3).

A total of 300 ml of contrast agent (Iomeron 350) was used during the procedure. Total time of fluoroscopy was 33 min and 24 sec.

Peak concentration of troponin I was observed on the second day after PCI (52.80 ng/ml). The intra-aortic balloon pump was removed on day 3 after the procedure.

Chest X-ray performed on day 4 of the hospitalization showed a hyperintense pulmonary stromal picture with

overlapping post-inflammatory interstitial densities in the subclavian and apical area of the right lung. Heart silhouette was normal.

Echocardiography performed on day 6 after the PCI procedure revealed improvement of the global left ventricular contractility and ejection fraction of 25-30%.

The patient was discharged home after 7 days of treatment with diagnosis of NSTEMI complicated by heart failure in the acute phase of myocardial infarction. On the day of discharge he was in NYHA heart failure class II and was instructed to return for another hospitalization after 3 months to qualify for eventual coronary artery bypass grafting of the lesion located in the LAD ostium.

Ambulatory therapy included: aspirin 75 mg/d, clopidogrel 75 mg/d, ramipril 2.5 mg/d, atorvastatin





**Fig. 3.** Angiogram presenting final result after stent implantation. **A** – right coronary artery; **B, C** – left coronary artery

**Ryc. 3.** Angiogram prezentujący końcowy wynik angioplastyki. **A** – prawa tętnica wieńcowa; **B, C** – lewa tętnica wieńcowa

40 mg/d and furosemide 20 mg/d. Because of the tendency for bradycardia (50-60 bpm) and low blood pressure (BP 100-90/70-50 mmHg) no beta-blocker was introduced.

After 3 months the pharmacotherapy was modified by addition of carvedilol  $2 \times 3.125$  mg/d with the intention to increase the dose after 2-3 weeks. The patient remains under ambulatory monitoring and has exercise tolerance in NYHA class II. There was no change in the echocardiographic picture. He reports no complaints and has no desire for further invasive procedures (CABG, PCI).

## Discussion

This case report deserves attention for several reasons. First, it is an example of a patient who presented with

clinical symptoms of marked heart failure for several days without typical angina. The initial level of troponin I which was within the normal range also suggested aggravation of chronic heart failure (high values of pro-BNP).

Presence of Q wave and ST-segment elevation in the precordial ECG leads [5, 6] together with a low level of troponin and long lasting history of dyspnoea was suggestive of previous myocardial infarction. This concept was supported by the fact that ECG did not change significantly during subsequent days of hospitalization. Angiography of the LAD and difficulties in crossing the critical lesion with balloons were suggestive of secondary recanalization of the LAD after previous myocardial infarction. Based on the coronary angiography picture it was concluded that the present deterioration of circulatory

capacity was caused by a critical lesion in the circumflex artery.

Secondly, the decision to perform coronary angiography in a patient with borderline values of troponin and developing pulmonary oedema was extremely difficult as administration of the contrast agent may additionally worsen the patient's condition. At the same time it is known that isolated pulmonary oedema may be a reason for increase of markers of myocardial necrosis [7, 8].

Third, PCI using the transradial approach although more risky due to technical difficulties should be considered in patients with acute coronary syndromes, as reported by many researchers [9-12]. Hetherington SL *et al.*, who analysed a group of more than one thousand patients with ST-segment elevation myocardial infarction (STEMI) without haemodynamic instability treated with PCI through a TR or TF approach, concluded that both methods are safe, but the transradial approach is related to lower risk of vascular complications [13].

If in our case the coronary angiography picture had not given a possibility to perform PCI (insignificant stenoses of the coronary arteries vs. atherosclerosis with no option for PCI) then the transfemoral approach and forced horizontal position after the procedure would have caused a major problem for the anaesthesiologists. The transradial approach does not limit the patient's mobility or his body position, which can facilitate pharmacological treatment of pulmonary oedema by putting the patient in a sitting or half-sitting position.

It seems that coronary angiography and PCI through the transradial approach are not well promoted in our country despite the fact that for many reasons this method is superior to the traditional transfemoral approach [14-17] and is becoming a strongly propagated technique of coronary angiography in many centres despite longer radiation times in some cases [18]. Even PCI procedures presented at haemodynamic congresses and conferences are almost always performed via the transfemoral approach. Is this because of old habits?

In the literature there are no reports on PCI procedures performed through the transradial approach in haemodynamically compromised patients with ACS, although at the same time many authors think that this method is equally safe and effective in the treatment of uncomplicated myocardial infarction as the transfemoral approach with lower risk of local complications after arterial puncture. The transfemoral approach seems more appropriate when a second arterial approach is needed [10].

An important problem in the transradial approach is a low diameter of the radial artery and not infrequent artery spasm at the puncture site which occurs more often in women [15, 19].

The transradial approach can be achieved through right or left radial artery puncture. We prefer left radial artery access, because this way of introducing catheters to the

ostia of coronary arteries resembles the curvature of catheter introduction through the femoral artery, which enables the use of typical diagnostic and guiding catheters.

Another problem is related to the dose and order of introduction into therapy of beta-blockers and angiotensin-converting enzyme inhibitors (ACEI), especially in patients with haemodynamically unstable heart failure, as observed in this case. We decided to use the highest possible dose of ACEI in the hospital phase with a plan to introduce beta-blockers in the period of the next several weeks.

According to the current guidelines for the management of coronary artery disease the presented picture of changes in coronary arteries and a relatively stable phase of the disease together with direct access to cardiac surgery would be an indication for coronary artery bypass grafting [5], which was not fulfilled in our case (the Department of Cardiac Surgery is located 80 km away from our centre). Therefore we decided to perform a maximally extensive PCI procedure to increase the patient's chances of survival.

At the end of the discussion it is important to underline the value of periodic repeated sampling of blood for troponin in patients with suspected ACS, especially in those with atypical clinical presentation. Our experience shows that the diagnosis and treatment is not certain until repeated marker levels are known.

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