Provocative acetylcholine test with resting full-cycle ratio, coronary flow reserve, and index of microcirculatory resistance give definite answers and improve health-related quality of life

Authors: Jacek Bil, Maciej Tyczynski, Pawel Modzelewski, Robert J. Gil

Article type: Clinical vignette

Received: July 12, 2020.

Accepted: September 11, 2020.

Published online: September 24, 2020.

ISSN: 0022-9032

e-ISSN: 1897-4279

This is an Open Access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives 4.0 International License (CC BY-NC-ND 4.0), allowing third parties to download articles and share them with others, provided the original work is properly cited, not changed in any way, distributed under the same license, and used for noncommercial purposes only. For commercial use, please contact the journal office at kardiologiapolska@ptkardio.pl.
Provocative acetylcholine test with resting full-cycle ratio, coronary flow reserve, and index of microcirculatory resistance give definite answers and improve health-related quality of life.

Jacek Bil\textsuperscript{1}, Maciej Tyczński\textsuperscript{2}, Paweł Modzelewski\textsuperscript{2}, Robert J. Gil\textsuperscript{1}

\textsuperscript{1}Department of Invasive Cardiology, Centre of Postgraduate Medical Education, Warsaw, Poland
\textsuperscript{2}Department of Invasive Cardiology, Central Clinical Hospital of the Ministry of Interior and Administration, Warsaw, Poland

Short title: Acetylcholine test with RFR, CFR, and IMR

Conflict of interest: none declared

Address for correspondence:
Jacek Bil, MD, PhD, FESC
Department of Invasive Cardiology
Centre of Postgraduate Medical Education
Woloska Street 137
02-507 Poland
biljacek@gmail.com
+48 608 351 353
ORCID: 0000-0002-8724-5611
Chest pain is a common ailment in clinical practice, but the optimal approach is still challenging, and the subject of debate [1, 2]. A 56-year-old woman with a history of arterial hypertension and dyslipidemia complained of atypical chest pain in the last seven months, mostly after exertion or at night. Electrocardiogram and echocardiography showed no ischemia. Nevertheless, due to a positive treadmill test, coronary angiography was performed. Angiography revealed normal coronary arteries. During the second consultation, the working diagnosis of ischemia and no obstructive coronary artery disease (INOCA) was provided. The following procedures were planned: resting full-cycle ratio (RFR), coronary flow reserve (CFR), index of microcirculatory resistance (IMR) as well as a provocative test with acetylcholine [3]. Parameters were assessed using CoroFlow software (Coroventis, Uppsala, Sweden) and the pressure-temperature sensor guidewire PressureWire X (Abbott Laboratories, Abbott Park, IL).

At the beginning of the whole procedure, we administered intracoronary a bolus of 200 μg nitroglycerin. At first, to exclude flow-limiting coronary artery disease, we assessed RFR, and we obtained the value 1.0 (Figure 1A). CRF and IMR were derived in real-time by coronary thermodilution at rest and during hyperemia. To induce steady-state maximal hyperemia, an intravenous infusion of adenosine (140 μg/kg/min) was administered via a large peripheral vein. To obtain thermodilution we manually injected 3 mL of normal saline (at room temperature) into the coronary artery via the guiding catheter.

The assessment in the left anterior descending artery (LAD) revealed CFR of 4.3 (normal value > 2.0 – 2.5) and IMR of 11 U (normal value ≤ 25 U) (Figure 1B). Then, a provocative test with acetylcholine was performed. It disclosed the pronounced spasm in the distal part of LAD accompanied by chest pain and ST elevation (Figure 1C-E).

The concept to be highlighted from that case is that thorough, simultaneously used invasive tests, we can establish the right diagnosis. Application of the new software and coronary
devices also makes the procedure swift and lasting no much longer than classical coronary angiography. We decided to perform an acetylcholine test at the end of the procedure as in CorMicA trial, although some authors perform this test at the beginning [4, 5].

The right diagnosis entitles pharmacotherapy modification and its intensification, what improves symptoms and quality of life. Our patient has remained asymptomatic up to now (12 months) with improved quality of life based on the 36-item Short Form Health Survey (SF-36) and the Seattle Angina Questionnaire. To our knowledge, this is the first case in Poland showing the simultaneous use of RFR, CFR, IMR, and provocative test with acetylcholine in the cath lab.
References:


Figure 1

(A) Measurement of resting full-cycle ratio (RFR), (B) Measurement of coronary flow reserve (CFR) and index of microcirculatory resistance (IMR) with a wireless PressureWire (Abbott Laboratories, Abbott Park, IL) and CoroFlow software (Coroventis, Uppsala, Sweden), (C) Provocative test with acetylcholine. Baseline view, (D) Provocative test with acetylcholine. At the dose of 50 μg acetylcholine, spasm in distal left descending artery occurred, (E) Provocative test with acetylcholine. The spasm released after nitroglycerin (NTG) administration.