

Minoca due to Recurrent Coronary Vasospasm: A Case Report

Case Report

Barbosa RR^{1,2*}, Padilha Jr.JE², Picallo GP², Campanati SSE², RolimVMB¹, Lima PD¹, de Barros LC¹, Serpa RG^{1,2}, Calil OA^{1,2}, and Barbosa LMF^{1,2}

¹Department of Cardiology, Santa Casa de Misericórdia de Vitória Hospital, Brazil

²School of Medicine of Santa Casa de Misericórdia, Brazil

Received: May 18, 2020; **Accepted:** June 09, 2020; **Published:** June 12, 2020

***Corresponding author:** Roberto Ramos Barbosa, Department of Cardiology, Santa Casa de Misericórdia de Vitória Hospital, Address: Rua Dr. João dos Santos Neves, 143, Vila Rubim, 29025-023, Vitória, ES, Brazil

Copyright: © 2020 Roberto Ramos Barbosa. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

Coronary vasospasm is defined as an exaggerated contractile response of the smooth muscle from the epicardial coronary artery. Its presentation is variable and may differ from asymptomatic to acute myocardial infarction (MI) or sudden death. This report is about a male patient, 56 years of age, who presented repeated events of acute coronary syndrome without ST-segment elevation. In November 2018, during his second event, the electrocardiogram showed intense ST-segment depression and T-wave inversion at precordial leads. Coronary angiography demonstrated nonobstructive coronary arteries and a Takotsubo-like apical ballooning as seen on left ventriculography. One month later, he was readmitted at the Emergency Department presenting acute chest pain characterizing a new episode of MI without ST-segment elevation. After heart team discussion about propaedeutics and diagnostic possibilities in the context of myocardial infarction with nonobstructive coronary arteries (MINOCA), a new coronary angiography was performed, which revealed severe vasospasm in the mid-segment of the left anterior descending artery, reverted after intracoronary nitroglycerin administration. Pharmacological therapy with calcium antagonist and nitrates was implemented, resulting in adequate clinical control. The patient presented no new episodes of angina or MI on follow-up. Challenging situations can be found in MINOCA, and a precise diagnosis can provide targeted treatment and reduce the risk of adverse outcomes.

Keywords

Myocardial infarction; Coronary angiography; Coronary vasospasm

Introduction

Myocardial Infarction with Nonobstructive Coronary Arteries (MINOCA) can be described as an acute myocardial infarction (MI) without obstructive lesions in coronary arteries as seen in coronary angiography. The prevalence ranges from 3.5 to 15% of all cases of MI, and it occurs predominantly in women and young adults [1]. It has a poor prognosis and presents higher mortality when

compared to classical MI due to obstructive coronary artery disease [2].

Diagnosis and propaedeutics of patients with MINOCA are medical challenges given the large number of clinical phenotypes and different causes. Potential mechanisms include coronary causes other than atherosclerotic obstruction (coronary spasm, coronary microvascular

dysfunction, plaque rupture, thrombosis/spontaneous coronary embolism and coronary dissection), myocardial disorders (myocarditis, Takotsubo syndrome and other cardiomyopathies); and non-cardiac causes (pulmonary embolism, type 2 MI) [2]. Therefore, given its heterogeneity, the correct diagnosis of MINOCA is necessary to offer specific treatment and avoid iatrogenic injuries or unnecessary procedures.

We describe a case of an inpatient repeatedly diagnosed with non-ST-segment elevation MI (NSTEMI), with coronary stenosis seen in invasive stratification, in which diagnostic work-up was crucial for effective long-term medical treatment.

Case report

A 56 years old, caucasian, male patient, smoker (80 years/pack), was admitted to the emergency room on november 3rd 2018 presenting typical chest pain for the last two hours. He mentioned a similar episode one month before, in which he also sought emergency services, however he evaded before proper medical investigation. He had no history of chronic diseases, continuous prescription drugs or substance abuse. Electrocardiogram (ECG) at admission showed a 1.5mm ST-segment depression in leads D2, D3, aVF, V4 and V5. Serial measurement of serum troponin I and CKMB detected high levels in second dosage. Serial ECG showed a slight improvement of ST-segment depression after three hours.

He received aspirin 300mg and clopidogrel 300mg according to the acute coronary syndrome institutional protocol, and an urgent coronary angiography was performed, which revealed 30% luminal eccentric stenosis in proximal segment of left anterior descending artery (LAD), No coronary vasospasm was detected. Left ventriculography showed anterior and apical hypokinesia (Figure 1). After hospitalization for two days and optimal medical treatment with dual antiplatelet therapy, metoprolol 50mg daily, simvastatin 40mg daily and losartan 50mg daily, the patient was discharged with no chest pain and was advised to continue ambulatory follow-up. The proposed diagnosis was Takotsubo syndrome, despite a doubtful history of emotional distress as a trigger for the event.

On December 8th 2018 the patient was readmitted to the emergency room with similar symptoms, this time with chest pain lasting four hours, with serial ECG showing a 3.0mm ST-segment depression and negative deep

T-waves in leads V3-V6 suggesting acute subendocardial ischemia of the anterior wall (Figure 2). Serial laboratory measurements showed elevation of cardiac biomarkers (CKMB 55ng/ml [reference value < 1755ng/ml], positive qualitative troponin I).

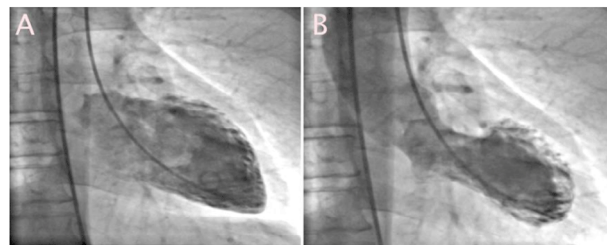


Figure 1: Left ventriculography showing severe hypokinesia in the anterior and apical segments of myocardial wall. A: Diastole B: Systole.

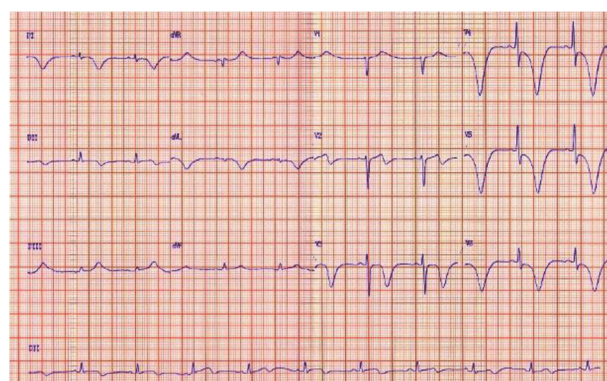


Figure 2: Electrocardiogram showing ST-segment depression and negative deep T-waves in the anterior myocardial wall

After discussion by Cardiology staff about the propaedeutics to be taken considering that a coronary angiography was performed 35 days earlier, hospitalization was indicated in order to optimize medical treatment initially. During two days of observation, dynamic changes of the ST-segment and T-wave occurred, with typical ST-T ischemic patterns in moments of recurrence of chest pain. Another coronary angiography was performed on day three and revealed severe vasospasm in mid-segment of LAD and diffuse moderate spasm of the left main coronary artery (LMCA), which reduced after intracoronary administration of nitroglycerin 1.0mcg (figure 3). The patient reported relief of chest pain and ECG showed attenuation of ST-segment and T-wave changes after coronary angiography (figure 4). Medical treatment was transitioned to oral diltiazem 60mg twice a day and isosorbid mononitrate

20mg three times a day, and the patient was strongly advised to quit smoking. The patient was discharged asymptomatic on December 16th 2018. No more acute cardiac events occurred on late clinical follow-up.

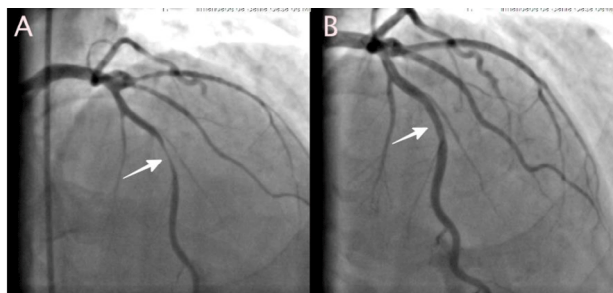


Figure 3: Coronary angiography performed on December 11th 2018. A: Spasm in the mid-segment of the left anterior descending coronary artery (white arrow). B: Reduction of coronary spasm in the left anterior descending coronary artery (white arrow) after intracoronary administration of 1.0mcg of nitroglycerin.

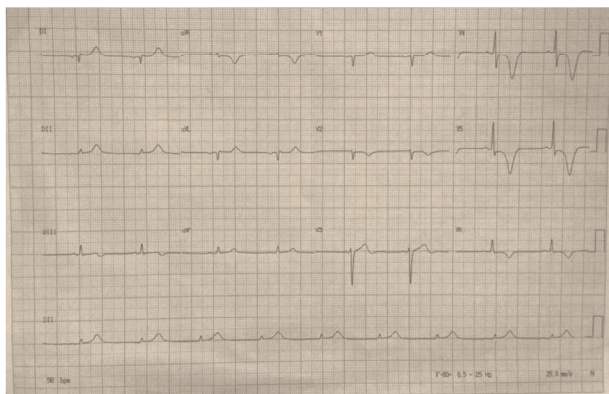


Figure 4: Electrocardiogram showing attenuation of ST-segment and T-wave changes immediately after coronary angiography and intracoronary administration of nitroglycerin.

Discussion

According to the guidelines of the European Society of Cardiology (ESC), the diagnosis of MINOCA is made through three components: 1) universal MI criteria; 2) nonobstructive coronary arteries as seen in coronary angiography (defined as coronary stenosis <50%); 3) absence of another clinically evident specific cause for acute presentation of symptoms [3]. Once atherosclerotic coronary obstruction is ruled out, etiological investigation is necessary for a better approach, follow-up and, whenever possible, prevention of new events.

The main methods of investigation, in addition to a detailed clinical history, include routinely used tests such as ECG, cardiac biomarkers, echocardiogram and cardiac catheterization. From clinical suspicions raised by initial examinations, more specific tests can be added, such as cardiac magnetic resonance imaging, which has been an important diagnostic tool to differentiate between microvascular causes, Takotsubo syndrome and myocarditis [2,4]. Usually, a normal or inconclusive coronary angiography must open the diagnostic possibilities inside the context of MINOCA [1].

According to clinical suspicion and availability, other specific methods can be used to differentiate possible causes of MINOCA. Intravascular imaging methods, such as intracoronary ultrasound and optical coherence tomography can help identifying coronary dissection, thrombi and plaque rupture [5-7]. These can be used rationally in the catheterization laboratory to add relevant information in cases of MINOCA. Even coronary vasospasm may have specific imaging features as seen in optical coherence tomography [7]. Although endomyocardial biopsy remains as the gold standard method for the diagnosis of myocarditis, it is reserved for cases where the diagnosis remains uncertain after cardiac magnetic resonance [2]. Provocative invasive testing with acetylcholine or ergonovine during coronary angiography is also possible for the diagnosis of coronary spasm and may identify patients with worse prognosis [1]. However, the last is unfrequently used, given its potential to cause harm and false-positive diagnosis.

Coronary vasospasm is the most frequent cause of MINOCA, and it may occur both in normal arteries and in combination with atherosclerotic plaques causing fixed coronary stenosis in different degrees. There is a great variability of symptoms, which oscillate in duration, degree and extent of coronary involvement. Thus, coronary vasospasm may present from the asymptomatic form, with silent myocardial ischemia, through unstable angina, MI, life-threatening arrhythmias and even sudden death [3,4]. Regardless of etiology, data point to a reduction in cardiovascular events with the use of statins and angiotensin-converting enzyme inhibitors/angiotensin receptor blockers [1,8]. Once coronary vasospasm is confirmed, calcium antagonists and nitrates are listed as drugs of choice. On the other hand, beta-blockers should be avoided and smoking immediately suspended, as they favor worsening of the spasms [8]. In addition, the option

for implantable cardioverter defibrillator may be considered in some patients at high risk of sudden death from vasospasm, especially if advanced heart failure is present [1].

The patient we reported had several admissions on the Emergency Department before having a correct diagnosis. Cases of MINOCA are commonly misdiagnosed, which leads to often unnecessary or harmful treatments. Since there are a great variety of conditions included in the large MINOCA group, there are several possible approaches and variants, depending on their etiology. Searching for diagnostic definition, although often challenging, is necessary to provide specific treatment, as well as to avoid iatrogenic events or unnecessary treatments. In the case of coronary vasospasm, medical treatment should target pharmacological and life-style interventions. It should also be emphasized that adherence to these recommendations is the key to success in the management of the syndrome and avoid serious outcomes, such as MI and sudden death, as well as frustrated and unfounded interventions.

References

1. Tamis-Holland JE, Jneid H. Myocardial Infarction with Nonobstructive Coronary Arteries (MINOCA): it's time to face reality! *J Am Heart Assoc.* 2018; 7: e009635.
2. Pasupathy S, Air T, Dreyer RP, Tavella R, Beltrame JF. Systematic review of patients presenting with suspected myocardial infarction and nonobstructive coronary arteries. *Circulation.* 2015; 13: 861-870.
3. Scalone G, Niccoli G, Crea F. Editor's Choice - Pathophysiology, diagnosis and management of MINOCA: an update. *Eur Heart J Acute Cardiovasc Care.* 2019; 8: 54-62.
4. Pathik B, Raman B, Mohd Amin NH, Mahadavan D, Rajendran S, McGavigan AD, et al. Troponin-positive chest pain with unobstructed coronary arteries: incremental diagnostic value of cardiovascular magnetic resonance imaging. *Eur Heart J Cardiovasc Imaging.* 2016; 17: 1146-1152.
5. Nordenskjöld AM, Lagerqvist B, Baron T, Jernberg T, Hadziiosmanovic N, Reynolds HR, et al. Reinfarction in patients with myocardial infarction with nonobstructive coronary arteries (MINOCA): coronary findings and prognosis. *Am J Med.* 2019; 132: 335-346.
6. Ibáñez B, James S, Agewall S, Antunes MJ, Bucciarelli-Ducci C, Bueno H, et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. *Rev EspCardiol (Engl Ed).* 2017; 70: 1082-1095.
7. Tanaka A, Shimada K, Tearney GJ, Kitabata H, Taguchi H, Fukuda S, et al. Conformational change in coronary artery structure assessed by optical coherence tomography in patients with vasospastic angina. *J Am Coll Cardiol.* 2011; 58: 1608-1613.
8. Hung MJ, Hu P, Hung MY. Coronary artery spasm: review and update. *Int J Med Sci.* 2014; 11: 1161-1167.