

MI with non-obstructive coronary arteries (MINOCA)

Compiled by Dr. Andrés R. Pérez Riera

MI with non-obstructive coronary arteries (MINOCA) is a syndrome with different causes, characterized by clinical evidence of MI with normal or near-normal coronary arteries on angiography. (MINOCA) is a term used to describe an enigmatic clinical condition that has been documented for more than 75 years but has been gaining attention in more recent years (**Pasupathy S, Tavella R, Beltrame JF. Myocardial Infarction With Nonobstructive Coronary Arteries (MINOCA): The Past, Present, and Future Management. Circulation. 2017 Apr 18;135(16):1490-1493. doi: 10.1161/CIRCULATIONAHA.117.027666.**).

A patient with MINOCA meets diagnostic criteria for a classic myocardial infarction (MI), including rise and/or fall of troponin associated with one of the following: symptoms of myocardial ischemia, electrocardiographic changes consistent with ischemia (new ST changes or new left bundle branch block), new pathologic Q waves, loss of viable myocardium, or new wall motion abnormality, and identification of intracoronary thrombus by angiogram or autopsy (**Crea F, Libby P. Acute Coronary Syndromes: The Way Forward From Mechanisms to Precision Treatment. Circulation. 2017 Sep 19;136(12):1155-1166. doi: 10.1161/CIRCULATIONAHA.117.029870.**).

MINOCA is differentiated from a typical MI by angiographically proving normal or near normal coronary arteries (**Rocco A Montone , Giampaolo Niccoli, Francesco Fracassi, Michele Russo, Filippo Gurgoglione, Giulia Cammà, Gaetano A Lanza, Filippo Crea. Patients with acute myocardial infarction and non-obstructive coronary arteries: safety and prognostic relevance of invasive**

coronary provocative tests. Eur Heart J. 2018 Jan 7;39(2):91-98. doi: 10.1093/eurheartj/ehx667.).

Its prevalence ranges between 5% and 25% of all myocardial infarction. The prognosis is extremely variable, depending on the cause of MINOCA. The key principle in the management of this syndrome is to clarify the underlying individual mechanisms to achieve patient-specific treatments. Clinical history, electrocardiogram, cardiac enzymes, echocardiography, coronary angiography and left ventricular angiography represent the first level diagnostic investigations to identify the causes of MINOCA.

Regional wall motion abnormalities at left ventricular angiography limited to a single epicardial coronary artery territory identify an “epicardial pattern” whereas regional wall motion abnormalities extended beyond a single epicardial coronary artery territory identify a 'microvascular pattern'.

The most common causes of MINOCA are represented by coronary plaque disease, coronary dissection, coronary artery spasm, coronary microvascular spasm, Takotsubo cardiomyopathy, myocarditis, coronary thromboembolism, other forms of type 2 myocardial infarction and MINOCA of uncertain etiology (**Scalone G, Niccoli G, Crea F. Editor's Choice- Pathophysiology, diagnosis and management of MINOCA: an update. Eur Heart J Acute Cardiovasc Care. 2019 Feb;8(1):54-62. doi: 10.1177/2048872618782414.).**

Diagnosis and Management of MINOCA Patients MINOCA: Myocardial Infarction in the absence of Obstructive Coronary Artery disease (**Jacqueline E Tamis-Holland, Hani Jneid, Harmony R Reynolds, et al, Contemporary Diagnosis and Management of Patients with Myocardial Infarction in the Absence of Obstructive Coronary Artery Disease: A Scientific Statement From the American Heart Association. Circulation. 2019 Apr 30;139(18):e891-e908. doi: 10.1161/CIR.0000000000000670)**

The following are key points to remember from this American Heart Association Scientific Statement on the diagnosis and management of myocardial infarction in the absence of obstructive coronary artery disease (MINOCA):

1. MINOCA occurs in 5-6% of acute myocardial infarction (AMI) cases (range reported between 5-15%).
2. Patients with MINOCA are often younger, more likely to be women, and less likely to have dyslipidemia.
3. Diagnosis of MINOCA should be made according to the Fourth Universal Definition of MI, in the absence of obstructive coronary artery disease (CAD) (no lesion $\geq 50\%$).
4. The diagnosis of MINOCA should exclude: A) other overt causes for elevated troponin (e.g., pulmonary embolism, sepsis, etc.), B) overlooked obstructive coronary disease (e.g., distal stenosis or occluded small branches), and C) nonischemic causes for myocyte injury (e.g., myocarditis).
5. Nonobstructive coronary disease by coronary angiography should be differentiated between patients with normal coronary arteries and minimal luminal irregularities ($<30\%$ stenosis) and mild to moderate coronary atherosclerosis (30% to $<50\%$). Fractional Flow Reserve (FFR) can be useful. Takotsubo syndrome should be considered separately since it is not considered an MI by the Fourth Universal Definition of MI.
6. Plaque disruption is common in MINOCA and encompasses plaque rupture, plaque erosion, and calcific nodules. The authors recommend using optical coherence tomography or intravascular ultrasound imaging in patients with evidence of nonobstructive CAD by angiogram.
7. Coronary vasospasm is another common cause of MINOCA, defined as $>90\%$ vasoconstriction of an epicardial coronary artery resulting in compromised coronary blood flow.
8. The gold standard technique for diagnosing coronary spasm is administration of high-dose intracoronary acetylcholine boluses with the response evaluated by invasive contrast angiography.
9. Coronary microvascular dysfunction may contribute to MINOCA and requires further investigation.
10. Coronary thrombosis or embolism can result in MINOCA, either with or without a hypercoagulable state.
11. Spontaneous coronary artery dissection (SCAD) should be considered as a cause of MINOCA.

12. Management of MINOCA is based on limited evidence and there are no prospective, randomized, controlled trials. Medications (aspirin, statin, beta-blockers, clopidogrel, angiotensin-converting enzyme inhibitors/angiotensin-receptor blockers) should be considered on the basis of the underlying mechanism for MINOCA in each individual. If there is any evidence of atherosclerosis, modifiable CAD risk factors should be treated aggressively.
13. Coronary vasospasm is best treated with calcium channel blockers, and the benefits of long-acting nitrates are less clear.
14. Additional research about MINOCA is needed to determine the efficacy of medications aimed at secondary prevention of AMI.
15. Montone et al demonstrate that in patients presenting with MINOCA and suspected coronary vasomotor abnormalities, a positive provocative test for spasm is safe and identifies a high-risk subset of patients. (**Rocco A Montone, Giampaolo Niccoli, Francesco Fracassi, Michele Russo, Filippo Gurgoglione, Giulia Cammà, Gaetano A Lanza, Filippo Crea. Patients with acute myocardial infarction and non-obstructive coronary arteries: safety and prognostic relevance of invasive coronary provocative tests. Eur Heart J. 2018 Jan 7;39(2):91-98. doi: 10.1093/eurheartj/ehx667.**).