

## Testing for Coronary Microvascular Dysfunction

**Coronary microvascular dysfunction refers to abnormal dilation and constriction of the small blood vessels in the heart.**

### What Is Coronary Microvascular Dysfunction?

The small blood vessels in the heart, called the coronary microvasculature, carry most of the blood flow to the heart muscle, delivering oxygen. These blood vessels can become unhealthy when there is damage to their inner lining. There can also be plaque buildup in the larger coronary arteries that does not narrow them but can contribute to abnormal blood flow. Over time, this leads to abnormal widening or narrowing of the small vessels in response to exercise or stress, which can cause problems with the blood supply to the heart, causing chest pain, shortness of breath, heart attack, and heart failure.

Conditions that increase a person's risk of having coronary microvascular dysfunction are high blood pressure (hypertension), diabetes, high cholesterol, smoking, autoimmune disease, and prior breast cancer treatment, as well as other unknown factors.

### Who Should Be Tested for Coronary Microvascular Dysfunction?

Testing for coronary microvascular dysfunction is recommended for people who have chest pain, shortness of breath, an abnormal result of stress testing such as exercise or chemical stress, a heart attack, or clinically indicated angiography with no blockage of the larger coronary arteries. Symptoms that occur when the heart does not get enough blood flow include chest discomfort or shortness of breath triggered by physical exertion or stress and can be of relatively long duration at rest. The goal of testing for coronary microvascular dysfunction is treatment to lower the chance of symptoms worsening, to control symptoms, and to avoid heart attack and heart failure. Medications include those to lower cholesterol and blood pressure, blood thinners such as aspirin, and medications for chest pain relief such as  $\alpha$ - and  $\beta$ -blockers or calcium channel blockers.

### What Kinds of Tests Are Available?

The most commonly used tests to look for coronary microvascular dysfunction include invasive functional coronary angiography, cardiac magnetic resonance imaging, or positron emission tomography (PET). The latter 2 types of imaging studies are noninvasive (they do not require any instruments in the body). The invasive test, which is more commonly used for patients undergoing stenting, can also be used for coronary microvascular dysfunction and involves placing a catheter directly inside the blood vessels of the heart.

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**Sources:** Wei J, Cheng S, Bairey Merz CN. Coronary microvascular dysfunction causing cardiac ischemia in women [published online November 18, 2019]. *JAMA*. doi:10.1001/jama.2019.15736

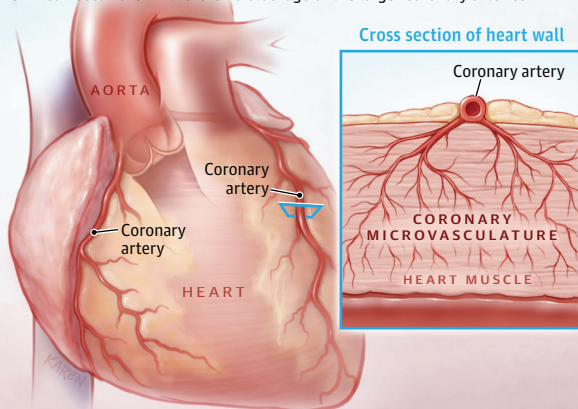
Bairey Merz CN, Pepine CJ, Walsh MN, et al. Ischemia and no obstructive coronary artery disease (INOCA): developing evidence-based therapies and research agenda for the next decade. *Circulation*. 2017;135:1075-1092. doi:10.1161/CIRCULATIONAHA.116.024534

### Coronary microvascular dysfunction (CMD)

The coronary arteries carry blood from the aorta to the heart muscle.

Damage to the small blood vessels that branch off of the main coronary arteries, the coronary microvasculature, can lead to problems with the blood supply to the heart.

CMD can occur even if there is no blockage of the larger coronary arteries.



✚ CMD can cause chest pain, shortness of breath, heart attack, and heart failure.

### Why Does Coronary Microvascular Dysfunction Occur More Frequently in Women?

A majority (60%-75%) of people with coronary microvascular dysfunction are women, yet coronary microvascular dysfunction is increasingly recognized in men. The reason for this may be that women have a greater ability to widen and narrow their arteries, perhaps because of the need to control blood flow during pregnancy and delivery. Additionally, women experience relatively more pain sensations than men, leading to more perceived chest pain (Video).

### FOR MORE INFORMATION

National Heart, Lung, and Blood Institute

<https://www.nhlbi.nih.gov/health-topics/ischemic-heart-disease>

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