Practice Guidelines

Myocardial Infarction: Expert Consensus Group Provides Updated Definition

Key Points for Practice

- The term myocardial injury should be used to describe at least one increased cardiac troponin level greater than the 99th percentile upper reference limit.
- The term acute MI should be used to describe an acute myocardial injury (fluctuation in cardiac troponin levels, at least one of which should be greater than the 99th percentile) in the presence of suspected acute myocardial ischemia (based on symptoms, ECG, or imaging).
- Type 1 MI is a result of atherosclerotic plaque rupture and thrombosis, whereas type 2 MI is caused by ischemia from an imbalance of oxygen supply and myocardial demand.

From the *AFP* Editors

An expert consensus group of the European Society of Cardiology, American College of Cardiology Foundation, American Heart Association, and World Heart Federation has provided an updated universal definition of myocardial infarction (MI). The goals of this new definition were to introduce new concepts, such as distinguishing MI from myocardial injury, as well as to update other concepts, such as emphasizing the use of high-sensitivity cardiac troponin measurement. Confirming an MI diagnosis using this definition will entail an evaluation of clinical factors, electrocardiography (ECG) and other imaging, and laboratory findings, as well as findings from pathology testing as needed, over the timeframe of the event.

Recommendations

The term myocardial injury should be used to describe at least one increased cardiac troponin level greater than the 99th percentile upper reference limit, which can be further defined as acute if the values continue to fluctuate. The term acute MI (types 1, 2, and 3) should be used to describe an acute myocardial injury in the presence of suspected acute myocardial ischemia; fluctuation in cardiac troponin levels, at least one of which should be greater than the 99th percentile; and at least one of the following: myocardial ischemia symptoms, new ischemic changes or pathologic Q waves identified on ECG, imaging results suggesting loss of myocardium or wall motion abnormalities that are ischemic in nature, or coronary thrombus identified on angiography. Presence of coronary thrombus is exclusive to the diagnosis of type 1 MI; types 2 and 3 MI can be diagnosed when coronary thrombus is not present.

There are five MI subtypes, which are differentiated based on clinical findings, prognosis, and treatment strategies. Type 1 MI is typically caused by rupture or erosion of an atherosclerotic plaque and thrombosis. ECG changes can be classified as ST elevation or a non–ST elevation MI to further guide treatment. Type 2 MI does not involve any plaque rupture; instead, ischemia is caused by an imbalance of oxygen supply and myocardial demand. Type 3 MI is diagnosed when symptoms are suggestive of ischemia with ECG changes or ventricular fibrillation, but death occurs before biomarkers are elevated or obtained, or MI is detected on autopsy. Types 4 and 5 are related to coronary intervention procedures and surgery, respectively.

Temporary myocardial injury that occurs as a result of revascularization procedures is called procedural myocardial injury. In patients with a

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healthy baseline cardiac troponin level (99th percentile or less), procedural myocardial injury can be diagnosed when there is an increased cardiac troponin level (more than the 99th percentile). In patients with a baseline troponin level greater than the 99th percentile, procedural myocardial injury can be diagnosed when there is an increase in cardiac troponin levels of more than 20% of the patient's baseline, but levels subsequently remain stable or decrease.

MI related to percutaneous coronary intervention (type 4a MI) is defined as a cardiac troponin level more than five times the 99th percentile in patients with a healthy baseline. For patients who have increased levels before the intervention, it can be diagnosed when their levels increase by more than 20% after the procedure while remaining at five times the 99th percentile, with a least one of the following: new ischemic changes or pathologic Q waves identified on ECG, imaging consistent with ischemia, or angiographic results showing a flow-limiting complication (e.g., coronary dissection, occlusion of a major artery).

MI related to coronary artery bypass grafting (type 5 MI) is defined as a cardiac troponin level more than 10 times the 99th percentile in patients with a healthy baseline. In those with an elevated baseline level, MI related to coronary artery bypass grafting can be diagnosed if their levels increase by more than 20% after the procedure while remaining at 10 times the 99th percentile, with at least one of the following: new pathologic Q waves identified on ECG, angiographic results showing new graft or native coronary artery occlusion, or new myocardium loss or a new regional wall motion abnormality suspected to be ischemic identified on imaging. Isolated Q waves can meet the criteria if the troponin level is less than 10 times the 99th percentile, as long as the levels are elevated and rising.

The term MI with nonobstructive coronary arteries (MINOCA) should be used to describe patients with MI but no angiographic findings of obstructive coronary artery disease. Similar to MI, diagnosis of this condition, which has a prevalence of up to 8%, suggests an ischemic cause of the injury.

Increased cardiac troponin levels are a common occurrence in patients in the intensive care unit. Increased cardiac troponin levels in the presence of decreased ejection fraction can occur because of sepsis caused by endotoxin; once appropriately treated, myocardial function will return to normal. After recovery, physicians should use their best judgment regarding further assessment for coronary artery disease or structural heart disease.

Guideline source: European Society of Cardiology, American College of Cardiology Foundation, American Heart Association, World Heart Federation

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Recommendations based on patient-oriented outcomes? No

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Lisa Croke
AFP Senior Associate Editor ■