

‘Ten Commandments’ for the Fourth Universal Definition of Myocardial Infarction 2018

The Fourth Universal Definition of Myocardial Infarction (UDMI) Consensus Document was developed jointly by the European Society of Cardiology, the American College of Cardiology, the American Heart Association, and the World Heart Federation.¹

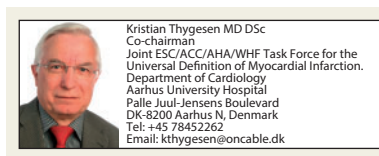
The mainstay of the Fourth UDMI is based on the ESC/ACC 2000 document on the redefinition of myocardial infarction (MI),² The core principle of the redefinition was that myocardial injury detected by abnormal cardiac biomarkers [preferably cardiac troponin (cTn)] in the setting of acute myocardial ischaemia should be labelled as MI. Two revisions followed, the second UDMI in 2007,³ which introduced a novel MI classification with five subcategories and the third UDMI in 2012,⁴ which included amends related to patients undergoing coronary interventions.

A fourth update of the UDMI document became necessary for multiple reasons including the ascendancy of high sensitivity cTn assays. These assays have substantially changed the way in which the evaluation of MI proceeds although the clinical criteria for MI have not been changed. However, the increased sensitivity of cTn assays have unmasked the fact that there are a large number of circumstances where myocardial injury can exist as an entity in itself in the absence of acute ischaemic heart disease. Essence of this concept and other principal points of the Fourth UDMI include:

- (1) Myocardial injury is defined by the presence of cTn values above the 99th percentile of the upper reference limit (URL).
- (2) Myocardial injury may be acute (rise and/or fall of cTn values) as in acute heart failure or chronic ($\leq 20\%$ variation of cTn values) as in chronic kidney disease.
- (3) Myocardial injury may occur in a variety of situations including after coronary procedural intervention and/or with cardiovascular and non-cardiovascular illnesses.
- (4) Occurrence of acute myocardial injury in the setting of acute myocardial ischaemia defines acute MI.
- (5) Myocardial infarction type 1 is acute myocardial injury related to acute atherothrombotic coronary artery disease. It is usually

precipitated by atherosclerotic plaque disruption that reduces blood supply to the myocardium.

- (6) Myocardial infarction type 2 is acute myocardial injury related to an imbalance between myocardial oxygen supply and demand secondary to stressors unrelated to acute coronary atherothrombosis.
- (7) Myocardial infarction type 3 is related to patients who suffer cardiac death, with symptoms suggestive of acute myocardial ischaemia accompanied by new ischaemic ECG changes and die before biomarker values could be obtained.
- (8) Myocardial infarction type 4a denotes PCI-related increases of cTn values >5 times the 99th percentile URL from a normal or if elevated, stable pre-procedural baseline. New myocardial ischaemia evidenced by ECG or imaging, or complications leading to reduced coronary blood flow are required.
- (9) Myocardial infarction type 4b is acute myocardial ischaemic injury related to stent thrombosis and MI type 4c is acute myocardial ischaemic injury associated with restenosis.
- (10) Myocardial infarction type 5 is coronary artery bypass grafting (CABG)-related increases of cTn values >10 times 99th percentile URL from a normal or if elevated, stable pre-procedural baseline. New myocardial ischaemia or new loss of myocardial viability is required.



Conflict of interest: none declared.

References

References are available as [supplementary material](#) at *European Heart Journal* online.