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The Fourth ESC/ACC/AHA/WHF Universal Definition of Myocardial Infarction

<https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Fourth-Universal-Definition-of-Myocardial-Infarction>

Introduction

The ESC/ACC/AHA/WHF published their fourth iteration of the Universal Definition of Myocardial Infarction (MI) in August 2018.¹ This document supersedes the last guideline published in 2012 and it describes the classification of myocardial injury and infarction, other associated syndromes, biochemical and imaging modalities employed in diagnosing MI as well as other operational and regulatory perspectives on diagnosing MIs. In keeping with other guideline documents released by the ESC this year, this guideline also starts with a helpful list of all the new and updated concepts introduced; this review will focus on some key concepts.

Myocardial injury vs myocardial infarction

This iteration of the Universal Definition of MI clearly recognizes myocardial injury as a discrete entity. It is defined by elevated cardiac troponin (cTn), with at least one value above the 99th percentile upper reference limit (URL). Criteria for an MI remains unchanged: Biomarker elevation (myocardial injury) with any one other supportive features of acute myocardial ischaemia (symptoms, new ECG changes, pathological Q waves, imaging evidence of new loss of viability or regional motion abnormality, angiographic or autopsy evidence of coronary thrombus).

This recognition of myocardial injury also allows for the differentiation of periprocedural myocardial injury from infarction when the rise in cTn is above the 99th percentile of URL but below the diagnostic cut-offs for Type 4a and Type 5 MI.

Classification of myocardial infarction

Other than some minor clarification of concepts (aided with the introduction of a few new figures), the 5-category model remains largely unchanged. Most notably, Type 4c MI (in-stent restenosis) which was discussed in less detail in the 3rd Universal Definition (with a 'might-be-designated-as' label) has been featured in the main discussion this time around; making it clear that there are now 3 subcategories within Type 4 MI.

The authors decided to maintain the arbitrary cTn cut-offs of >5x and > 10x URL for defining Type 4a and Type 5 (periprocedural) MIs respectively. (Note in patients with already elevated pre-procedure cTn there must be a >20% increase plus an absolute value >5x/10x URL) They argue that there is lack of any evidence supporting a different cut-off and offer a recently

published study observing peri-angioplasty troponin elevations that are broadly in line with current recommendations.²

MI with Non-Obstructive Coronary Arteries (MINOCA) and Takotsubo Syndrome (TTS)

Amongst the new sections introduced in the 4th Universal Definition of MI are those of MINOCA and TTS. The ESC has a separate position paper that describes MINOCA³ which essentially is an umbrella term for patients who fulfil criteria for acute MI as defined above but with no obstructive coronary artery disease (defined as $\geq 50\%$ stenosis) AND no clinically apparent cause for the acute presentation necessitating further investigation (this may eventually be any of the differential diagnoses within Type 1 or Type 2 MIs) In other words, MINOCA could be considered as a working diagnosis, such as heart failure, where further investigation is required before the underlying aetiology can be determined.

The authors describe the diagnostic criteria for TTS and discuss the subtleties (and challenges) of differentiating TTS from acute MI in the 15% of patients where both pathologies are present concurrently. They suggest a QTc prolongation $> 500\text{ms}$ in the acute phase and recovery of LV function within 2-4 weeks as features supporting a diagnosis of TTS. On the other hand, in the 10 - 15% of patients with a diagnosis of TTS but persistent RWMA, late-gadolinium enhancement cardiac MRI (CMR) will be able to exclude MI with spontaneous recanalization.

Cardiac troponin

The authors recommend the use of high sensitivity cTn (hs-cTn) assays. They also endorse a single sample rule-out strategy for low risk patients presenting at least 2 hrs from symptom onset and a serial rapid rule-out strategy over 1-2 hours. This is broadly similar to current UK guidance.

The guideline also discusses issues around using change ('delta') in cTn to detect or exclude MI. A new figure depicting cTn kinetics has been added to demonstrate how the timing of sampling can affect the 'delta' and result in diagnostic errors.

Role of imaging

The authors recognised the increasing importance of cardiac imaging in diagnosing acute and chronic coronary artery disease as well as identifying other pathology that may mimic ischaemic myocardial damage. Of particular interest is the role of CT coronary angiography in diagnosing acute MI and that of CMR in differentiating the aetiologies of RWMA and varying patterns of myocardial scarring.

Conclusion

This guideline further strengthens and crystallises the classification criteria for MI. It describes other syndromes that frequently present with or complicate MIs. It also updates the guidelines with recent advances in the diagnosis of MI particularly around biochemical and imaging modalities.

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References

1. Thygesen K, Alpert JS, Jaffe AS, et al. Fourth universal definition of myocardial infarction (2018). *Eur Heart J* 2018 doi: 10.1093/eurheartj/ehy462 [published Online First: 2018/08/31]
2. Zeitouni M, Silvain J, Guedeney P, et al. Periprocedural myocardial infarction and injury in elective coronary stenting. *Eur Heart J* 2018;39(13):1100-09. doi: 10.1093/eurheartj/ehx799 [published Online First: 2018/01/25]
3. Agewall S, Beltrame JF, Reynolds HR, et al. ESC working group position paper on myocardial infarction with non-obstructive coronary arteries. *Eur Heart J* 2017;38(3):143-53. doi: 10.1093/eurheartj/ehw149 [published Online First: 2017/02/06]

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