Promise of a Novel Classification System for Acute Myocardial Infarction

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See article by Kumar et al., pages 1-14 of this issue.

Accurate classification of acute myocardial infarction (MI) is instrumental for the appropriate diagnosis and effective management of patients who suffer from this widely prevalent cardiovascular condition. A variety of clinical scores are available to advise clinicians on the best classification schemes for these high-risk patients. Perhaps the most notable of these scores are the Thrombolysis In Myocardial Infarction (TIMI) risk score, the History, ECG, Age, Risk Factors, and Troponin (HEART) score, and the Killip classification. The strength of these scores includes their practicality, because they can be implemented at the bedside to rapidly assist with prognostication. Nonetheless, as technologic advancements have made imaging and tissue identification more accessible, national and international committees are interested in revising traditional classification schemes of acute MI with novel ones that leverage multimodal approaches.

In this issue of the Canadian Journal of Cardiology, Kumar et al. present the Canadian Cardiovascular Society classification of acute myocardial infarction (Fig. 1), a new expert consensus classification of atherothrombotic MI. Using data on acute MI and reperfusion therapy over the past 5 decades, this classification document delineates a novel definition of acute MI with an emphasis on incorporating prognostic myocardial pathology, as opposed to clinical features. Specifically, the 4 stages of progressively worsening myocardial tissue injury described include: (1) aborted MI (no/minimal myocardial necrosis) but without microvascular injury; (2) cardiomyocyte necrosis and microvascular dysfunction leading to microvascular obstruction (ie, “no-reflow”); and (4) cardiomyocyte and microvascular necrosis leading to reperfusion hemorrhage. Injury at each stage builds upon that of the previous stage, escalating in severity and deteriorating prognosis.

There is no doubt that the classification system proposed by the investigators is important and timely because acute MI continues to account for substantial morbidity and mortality worldwide. However, there are promises and challenges that should be noted and weighed before its widespread implementation is possible.

One promise of this novel classification scheme includes its unique incorporation of myocardial pathology in the evaluation of patients with acute MI—a characteristic that is of high prognostic value but has not been used routinely in the past. Several studies have shown that the degree and type of tissue injury in MI are predictive of ventricular remodeling. In fact, progressive loss of myocardium has been associated with worse left ventricular systolic function and with cardiovascular death. Moreover, infarct size has been shown to be an important predictor of adverse cardiovascular outcomes, including hospitalization, heart failure, and death.

As such, the classification scheme would offer an enhanced ability to distinguish high- and low-risk patients who present with acute MI. The incorporation of microvascular obstruction is another strength of this classification system. Advances in imaging have shed light on the prognostic importance of microvascular obstruction. Microvascular obstruction assessed using cardiovascular magnetic resonance (CMR) has been associated with left ventricular remodeling in addition to long-term morbidity after acute MI. Distal coronary artery blood flow obstruction, which often results in the “no-reflow” phenomenon despite successful treatment of the culprit lesion, is a key marker of worse outcomes and increased mortality among patients with acute MI. Previous classification schemes have mostly ignored this aspect of coronary disease, and focused instead on clinical and laboratory features.

In research, the benefits of such a nuanced classification system are evident. The new classification system would allow for the assessment of experimental diagnostic and therapeutic strategies in a more detailed manner. Investigators would be able to understand how tissue changes associated with the various stages of acute MI are affected by new study treatments.

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Potential challenges, however, include the utility and practical nature of the proposed classification system in clinical practice. Unlike the clinical scores that are rapidly available for use at a patient’s bedside, implementation of the proposed pathology-based classification system would be more challenging. The investigators suggest using CMR as the mainstay diagnostic modality to differentiate the 4 distinct stages of acute MI. Although a powerful imaging technique on its own, CMR is at present rarely used in the evaluation of a patient with acute MI. Moreover, there is limited infrastructure for increasing CMR imaging volumes. Many hospitals already have backlogs of patients who need to undergo CMR imaging, and adding this indication for CMR imaging would likely exacerbate the existing backlog. In addition, some patients might not be able to tolerate the study because CMR imaging procedures are often long and might trigger claustrophobia, and the use of gadolinium enhancement-based approaches for the detection of microvascular obstruction might be limited for patients with significant kidney disease. These challenges must be appreciated and addressed before broad implementation of such a classification system.

In summary, Kumar et al. present a novel and intriguing 4-tiered classification scheme for patients with acute MI. This classification scheme allows unique use of prognostic pathologic features to help distinguish high- and low-risk acute MI patients. However, greater access to CMR imaging would be needed to implement this new clinical approach broadly, although for research on emerging diagnostic and therapeutic strategies, it could be implemented immediately.

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