Time to dot the I's and cross the T's of high-sensitivity cardiac troponin

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Central Message

A good combination toward the gold standard to rule in or rule out AMI in heart valve surgeries is using biomarkers, ECG, and TTE.

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Myocardial damage including acute myocardial infarction (AMI) during the perioperative period is a major concern for surgeons because it has a strong association with the worst short- and long-term patient outcomes.^{1,2}

Biomarkers for AMI are now highly sensitive and specific. The high-sensitivity (hs) cardiac troponin (cTn) assay (for both cTn I and cTnT subunits) is the most advanced test for AMI.³ The hscTnT test was approved by the Food and Drug Administration in January of 2017. However, the hscTn assays come with a price because the hscTn test also detects cTn in plasma of healthy people, as well as a broader spectrum of other morbidities.⁴

How should the hscTn assay be used with acceptable positive predictive value (PPV) and efficacy to rule in or rule out AMI? The assay-specific 99th percentile value reference (99th) of cTn levels at a single time point in healthy people helps define who has an AMI. The reference change value (RCV) depends on the methods and whether it is increasing or decreasing allows the separation between chronic and acute events or diseases. Above a certain 99th cutoff level or RCV, cTn levels a few hours apart can satisfactorily rule in or rule out AMI in patients in the emergency department.⁵⁻⁷

Refinements of the 12-lead electrocardiography (ECG) and transthoracic echocardiography (TTE) with more precise recordings and better imaging quality increased the PPV but decreased efficacy. Learning how ECG and TTE combined with hscTn can yield more precise and faster AMI detection will come with prospective rigorous scientific studies and clinical experience for a stronger “evidence-based medicine.”

It is important to note that if the first screening is performed with a less-sensitive method such as ECG and TTE, the degree of RCV will be greater compared with a more sensitive assay because smaller infarctions will be detectable (eg, hsTnT)⁸ that may have been missed by ECG or TTE.

In this issue of the *Journal*, Cubero-Gallego and colleagues⁹ delineate cutoffs for hscTnT and creatine

kinase-MB (CK-MB) for the ECG or TTE diagnostic of AMI in patients undergoing heart valve surgery on the basis of their surgical service data. They also prospectively show that the screening proposed predicts to a great extent the long-term (30 days and 2 years) outcomes. On the other hand, smaller infarctions may be missed by ECG and TTE, and relatively high levels of cTn will be considered normal. Thus, the cutoff defined by Cubero-Gallego and colleagues⁹ arbitrarily estimated to be greater than 10 times the 99th.¹⁰

However, this worthwhile study missed an important data point: to take advantage of the hscTn assay and an RCV between the levels preoperatively (not available) and admission to the intensive care unit (ICU) within 3 hours. This RCV could be ideal for studies using hscTn assays. Diagnostics could have been made earlier and appropriate treatment instituted. Indeed, the normal-sensitivity cTn assays may have performed similarly (16-24 hours after admission to the ICU) to the regular-sensitivity CK-MB.

More studies using hscTn assays are needed to refine an early and precise algorithm to rule in or rule out perioperative heart valve surgery associated with AMI.

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