iREVIEWS

STATE-OF-THE-ART PAPERS

Comparative Definitions for Moderate-Severe Ischemia in Stress Nuclear, Echocardiography, and Magnetic Resonance Imaging

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The lack of standardized reporting of the magnitude of ischemia on noninvasive imaging contributes to variability in translating the severity of ischemia across stress imaging modalities. We identified the risk of coronary artery disease (CAD) death or myocardial infarction (MI) associated with ≥10% ischemic myocardium on stress nuclear imaging as the risk threshold for stress echocardiography and cardiac magnetic resonance. A narrative review revealed that ≥10% ischemic myocardium on stress nuclear imaging was associated with a median rate of CAD death or MI of 4.9%/year (interquartile range: 3.75% to 5.3%). For stress echocardiography, ≥3 newly dysfunctional segments portend a median rate of CAD death or MI of 4.5%/year (interquartile range: 3.8% to 5.9%). Although imprecisely delineated, moderate-severe ischemia on cardiac magnetic resonance may be indicated by ≥4 of 32 stress perfusion defects or ≥3 dobutamine-induced dysfunctional segments. Risk-based thresholds can define equivalent amounts of ischemia across the stress imaging modalities, which will help to translate a common understanding of patient risk on which to guide subsequent management decisions. (J Am Coll Cardiol Img 2014;7:593–604) © 2014 by the American College of Cardiology Foundation

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Stress imaging is commonly used to evaluate suspected myocardial ischemia in patients with symptoms suggestive of stable ischemic heart disease (SIHD). The evidence to support the use of several stress imaging modalities is substantial and has been synthesized in recent appropriate use criteria and clinical practice guidelines (1–3). The published evidence base for stress nuclear imaging and echocardiography as effective tools for diagnosis of coronary artery disease (CAD) and risk stratification is extensive, and there is growing evidence supporting the role of stress cardiac magnetic resonance (CMR).

However, the optimal evaluation and treatment algorithm following stress imaging has not been clearly defined. Although diagnostic coronary angiography is commonly preceded by stress testing, nearly two-thirds of patients manifest no obstructive CAD at the time of cardiac catheterization (4,5). Before elective percutaneous coronary intervention (PCI), less than one-half of patients have had a stress test in the previous 90 days (6). These data illustrate the lack of accuracy and consistency in clinical practice in the appropriate use of stress imaging to guide the management of patients with SIHD (1,7,8).

One noteworthy gap in the current evidence base is the absence of established comparable categories of the magnitude of ischemia across noninvasive imaging modalities. The lack of standardized grading and inconsistency in reporting of the extent and severity of ischemia in clinical practice may contribute to the wide variability in management decisions and high rates of nonobstructive CAD on diagnostic angiography (5). At a recent Joint Commission/American Medical Association Quality Summit, the variable reporting of the extent and severity of ischemia was identified as contributory to the overuse of elective PCI (9). Recent guidance documents support the requirement of moderate-severe ischemia before elective PCI (10).

For this report, experts in the field of stress cardiac imaging were enlisted to propose a consensus of comparable definitions for moderate-severe ischemia for stress nuclear imaging (myocardial perfusion single-photon emission computed tomography and positron emission tomography), echocardiography, and CMR (wall motion or perfusion). The cut points for moderate-severe ischemia were established using the selected, published evidence for each modality correlating stress imaging results with risk of CAD death or myocardial infarction (MI). The aim of this review was to propose a definition for equivalent amounts of ischemia across the stress imaging modalities for patients with SIHD who have preserved left ventricular function, which will help to translate a common understanding of patient risk on which to guide subsequent management decisions.

Targeting Moderate-Severe Ischemia

Most SIHD revascularization strategy trials have included patients with ischemia on stress testing or typical angina with at least 1 coronary stenosis amenable to revascularization, although only a subset of enrolled patients reported stress test results (11,12). The entry criteria for the COURAGE

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