

Initial Diagnostic Evaluation of Stable Coronary Artery Disease: The Need for a Patient-Centered Strategy

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The diagnosis and subsequent management of coronary artery disease (CAD) represents a major challenge to our healthcare systems, affecting millions of patients each year. Despite many years and literally thousands of publications, the optimal approach for the evaluation of stable ischemic heart disease remains unclear. Functional or stress testing to detect inducible ischemia has been the “gold standard” and remains the most common noninvasive test used to diagnose stable CAD. However, the advent of coronary computed tomography angiography (CCTA) has created a genuine debate regarding the best initial modality for the workup of stable CAD. Furthermore, simple and low-cost diagnostic options, such as ECG stress testing (GXT), should be considered, given extensive clinical experience and current pressures on healthcare resources.

In this issue of *JAHA*, Roifman and colleagues evaluated initial testing strategies for stable CAD with anatomical versus functional stressing modality in a nonselected general population.¹ The cohort consisted of 15 467 patients who had undergone a noninvasive test, with the end point being obstructive coronary artery disease on invasive coronary angiography. The authors demonstrated that neither stress imaging nor CCTA resulted in a higher diagnostic yield for obstructive CAD than GXT, a rather surprising result. Outcome data were also provided and did not demonstrate superior risk discrimination with cardiac imaging, as compared with GXT.

The design of the current study has inherent selection biases that limit the conclusions and utility of these data.

Patients had to have undergone both a noninvasive test and then invasive coronary angiography within 6 months of the index test to be included. Additionally, patients who had a noninvasive study during the preceding year were excluded. Depending on the testing modality, only 3.8% to 6.5% of patients having noninvasive testing underwent invasive angiography for the definitive diagnosis of CAD. In aggregate, only 3.3% of the initial cohort undergoing stress testing or CCTA were included in this retrospective trial.

A major concern regarding this article was the use of the Framingham Risk Score rather than a determination of the pretest probability for coronary artery disease; this is critically important as Framingham Risk Score does not include an assessment of symptoms and should be used for evaluation of the 10-year risk for developing coronary heart disease.² The use of the Framingham Risk Score for something other than prognosis is therefore an incorrect application of this measure.

The authors do quote existing guidelines but do not stress that these guidelines offer specific scenarios for some of the recommendations; they also seem to overstate the impact of their findings. It is clear that not all patients with suspected CAD are the same and risk factors, pre-existing diagnoses, ability to exercise, the interpretability of an ECG, and the purpose of the evaluation should be considered in the selection of noninvasive testing. The European Society of Cardiology Guidelines clearly base noninvasive test selection for the initial diagnosis of CAD on the pretest likelihood of CAD and actually make a Class I recommendation for GXT in patients with an intermediate likelihood of CAD who have an interpretable ECG and can exercise.³ A virtually identical recommendation is made by the 2012 American College of Cardiology/American Heart Association guidelines, as supported by the appropriate use criteria.^{4,5} Thus, it appears that no guidelines recommend cardiac imaging procedures as the initial test in this population, although the European Society of Cardiology document does indicate that stress imaging is an initial testing option depending on local expertise. Both guidelines suggest stress imaging when the pretest likelihood is higher than intermediate or when the resting ECG is uninterpretable. It also is obvious that GXT cannot be considered the initial testing option when patients are unable

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to exercise and pharmacologic stress imaging or CCTA would clearly be rational and appropriate.^{3,4} Thus, while GXT may well serve as the first-line test in some patients, all guidelines indicate that cardiac imaging (stress echocardiography, stress cardiac magnetic resonance, stress radionuclide myocardial perfusion imaging, and CCTA) may be selected and in fact preferable in many patients.

Some of the findings in this trial merit additional comments. The selection of detection of obstructive CAD may be a reasonable end point but should not be considered an “outcome” measure. Fortunately, the authors also included some data on cardiac events, although the follow-up period was limited to 2 years and not all events were included. It is a surprising finding that among the patients who had CCTA, only 54% were found to have obstructive CAD during invasive coronary angiography. This is certainly disparate to the findings of many who have shown the very high diagnostic accuracy of CCTA^{6,7} for the detection of obstructive CAD and begs the question of who got invasive coronary angiography and who did not and the reasons for these evaluations. It is also surprising that stress echocardiography and stress single-photon emission computed tomography myocardial perfusion imaging did not demonstrate higher diagnostic accuracy than GXT, which is very much in conflict with the existing literature.^{8–10} Additionally, the concern raised by the author about the apparent discordance between stress imaging procedures and invasive coronary angiography is not new, as there is an abundance of evidence highlighting the difference between the anatomic assessment of CAD and the results of functional testing, which are based on coronary physiology.^{11,12} Increasing emphasis is now placed on the hemodynamic assessment of coronary stenosis, which is clearly valuable from a prognostic standpoint and is critical to direct therapeutic interventions.¹² Of note, the ability to noninvasively obtain both data related to obstructive coronary disease and the physiologic significance of a coronary stenosis has great promise.¹³ Related to the current article, the known disparity between functional testing and coronary anatomy raises concern about the selection of the presence of obstructive CAD as the primary end point for this trial.

We agree with the authors that there are few data on the comparative effectiveness of different noninvasive testing strategies, literature that would be most welcome.¹⁴ These should, however, focus on prognosis, not the mere detection of disease. The PROMISE (Prospective Multicenter Imaging Study for Evaluation of Chest Pain) trial suggests clinical equipoise regarding outcome between functional (stress single-photon emission computed tomography, stress echo, and GXT) and anatomic (CCTA) but did not examine differences among the stress modalities, and initial testing with GXT was performed in only 10.2% of the study cohort.¹⁵ Although cardiac events were similar between functional and

anatomic approaches, there were more coronary revascularization procedures performed with CCTA. However, the SCOT-HEART trial demonstrated that a CCTA-based approach to the detection of CAD results in a decline in subsequent myocardial infarction, albeit not a statistically significant reduction.¹⁶ In one of the few comparative effectiveness trials performed, we previously demonstrated that the addition of single-photon emission computed tomography myocardial perfusion imaging did not add prognostic value beyond that obtained with GXT in a population of women, although this was a low-risk cohort.¹⁷ Overall, most trials support the notion that commonly performed diagnostic modalities are often similarly effective, emphasizing the need for continued studies of clinical and cost effectiveness.

In conclusion, while the authors are to be commended for their efforts to assess the diagnostic efficacy of various noninvasive tests, issues related to referral/selection bias, known discordance of anatomic and physiologic factors, and absence of patient-specific approaches based on risk ECG and exercise abilities limit the conclusions offered in this article. While it is true that these results “do not support the routine initial use of stress imaging or CCTA,” this conclusion is based on an inhomogeneous cohort of patients and must be tempered with the application of patient-centered imaging strategies.

Disclosures

None.

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