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CLINICAL INQUIRIES FROM THE FAMILY PRACTICE INQUIRIES NETWORK

How accurate is stress radionuclide imaging for diagnosis of CAD?

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EVIDENCE-BASED ANSWER

Stress radionuclide testing is a moderately accurate test compared with coronary angiography for the diagnosis of coronary artery disease (CAD) in intermediate-risk individuals.

Variations in technique of imaging (planar or single-photon emission computed tomography [SPECT]) and stress (exercise or pharmacologic) do not significantly alter the accuracy of this test, although there is some evidence for decreased accuracy in women (strength of recommendation [SOR]: **A**, based on multiple meta-analyses). Abnormal stress radionuclide screening in vascular surgical candidates also predicts an increased rate of perioperative cardiac events (SOR: **A**, based on meta-analysis).

EVIDENCE SUMMARY

Stress radionuclide imaging—specifically its diagnostic accuracy—has been the subject of numerous studies. Detrano et al[1] reported the first pooled data (56 studies); they concluded that estimates of sensitivity (85%) and specificity (85%) are biased by studies that were not blinded, included subjects with prior myocardial infarction (MI), or had a work-up (verification) bias (ie, use of the gold standard test is affected by the result on the test under question).

Another systematic review reported estimates of sensitivity ranging from 68% to 96% and specificity from 65% to 100%.[2] The review was accompanied by a position paper from the American College of Physicians stating that the test may be appropriate for a patient with intermediate risk of coronary artery disease.[3]

Four meta-analyses report diagnostic accuracy of radionuclide cardiac imaging (**Table**). Kwok et al[6] analyzed data on women only and found decreased diagnostic accuracy in this population. Kim et al[7] analyzed pharmacologic stressors used with SPECT and confirmed that accuracy is near that of exercise SPECT. Patient-centered outcomes were reported in a meta-analysis of dipyridamole-thallium imaging in the

preoperative evaluation of vascular surgery patients. The summary odds ratio for any perioperative cardiac event (in patients with abnormal tests) was 3.5 (95% confidence interval [CI], 2.5–4.8); the odds ratio for MI or cardiac death was 3.9 (95% CI, 2.5–5.6), leading the authors to conclude that there is sound evidence to use radionuclide testing in intermedi.ate-risk patients during preoperative screening.[8]

Diagnostic accuracy reported in meta-analyses of cardiac radionuclide SPECT imaging

Authors, year	Studies	Sn % (95% CI)	Sp % (95% CI)	LR+	LR–
Garber and Solomon 1994[4]	8	88 (73–98)	77 (53–96)	3.8	0.16
Fleischmann et al, et al 1998[5]	27	87 (86–88)	64 (60–68)	2.4	0.20
Kwok et al, 1996[6]	3	78 (69–87)	58 (51–66)	1.9	0.38
Kim et al, 2001[7]	44	90 (89–92)*	75 (70–79)*	3.6	0.13
		89 (84–93)†	65 (54–74)†	2.5	0.17
		82(77–87)‡	73 (70–79)‡	3.0	0.25
*Adenosine SPECT					
†Dipyridamole SPECT					
‡Dobutamine SPECT					
SPECT, single-photon emission computed tomography; SN, sensitivity; Sp, specifity; LR+, positive likelihood ratio; LR–, negative likelihood ratio; CI, confidence interval					

RECOMMENDATIONS FROM OTHERS

The American Heart Association/American College Cardiology (AHA/ACC) Task Force on Assessment of Diagnostic and Therapeutic Cardiovascular Procedures and the American Society of Nuclear Cardiology updated guidelines for cardiac radionuclide imaging in 2003. In this consensus statement (a nonsystematic review of literature and expert opinion), they reported test characteristics to detect a 50% angiographic lesion as follows—exercise SPECT: sensitivity 87%, specificity 73%; vasodilator (adenosine or dipyridamole) SPECT:

sensitivity 89%, specificity 75%. They noted that quantitative analysis performs as well as qualitative analysis of radionuclide images. Gated SPECT is slightly more specific and just as sensitive as nongated SPECT.

The Taskforce recommended that radionuclide perfusion scans be performed in patients with baseline electrocardiogram (ECG) abnormalities (such as left bundle branch block, hypertrophy, digitalis effect, etc), patients who cannot perform an exercise stress test, and to assess the functional effect of indeterminate lesions found on angiography. They also note that the repeat use of radionuclide testing 3 to 5 years after an event in asymptomatic high-risk patients and the initial use of radionuclide testing in patients at very high risk are both somewhat controversial, but the weight of limited evidence suggests some benefit to their use.[9]

CLINICAL COMMENTARY

ECG stress still the choice; image those with abnormal ECG or unable to exercise

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Primary care providers frequently face the question of how best to evaluate patients with suspected CAD. Recent studies and expert opinion appear to give conflicting advice regarding the merits of plain exercise ECG vs stress imaging. Information on accuracy doesn't always indicate which test is best for a patient.

Though quoted sensitivities and specificities for exercise ECG typically appear lower than those for stress imaging, costs for stress imaging are significantly higher, and numerous recent studies are demonstrating mortality outcome differences obtainable from physiologic information found in exercise testing (exercise capacity, blood pressure and pulse changes, time to angina).

Currently, the best choice for evaluation appears to be summarized by the 2003 AHA/ACC practice guidelines, which endorse exercise ECG for patients (women included) with intermediate pretest risk, and normal resting ECG for those who are unable to exercise. Stress imaging is cost effective for those patients with abnormal baseline ECG (left bundle branch block, ST abnormalities), or who are unable to exercise.

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