Review: Dobutamine stress myocardial perfusion imaging has high sensitivity for detecting coronary artery disease

Geleijnse ML, Elhendy A, Fioretti PM, Roelandt JR. **Dobutamine stress myocardial perfusion imaging.** J Am Coll Cardiol. 2000 Dec;36:2017-27.

QUESTION

What are the sensitivity and specificity of dobutamine stress myocardial perfusion imaging (DSMPI) for detecting coronary artery disease (CAD)?

DATA SOURCES

Studies were identified by searching MEDLINE (to 1998) with the terms dobutamine and thallium or technetium.

STUDY SELECTION

English-language studies were selected if they included patients with and without angiographically defined CAD and if they reported the number of positive and negative results. Studies were excluded if they involved patients from subgroups of larger published studies; if they described special issues, such as DSMPI in patients with left bundle-branch block or left ventricular hypertrophy; or if all patients had had previous myocardial infarction.

DATA EXTRACTION

Data were extracted on DSMPI protocol, type of radiotracer, imaging technique, patient characteristics, use of β-blockers, threshold for defining clinically significant CAD, type of defect, sensitivity, and specificity. Mean values for sensitivity, specificity, and accuracy were calculated by combining individual patient data from studies.

MAIN RESULTS

20 studies (1014 patients, mean age range 47 to 66 y) met the selection criteria. Sample sizes ranged from 15 to 217 patients (mean 51 patients). The pooled sensitivity, specificity, and likelihood ratios are shown in the Table. The overall weighted mean accuracy was 84% (95% CI 81% to 86%). Mean sensitivity was higher in the 8 studies that used dobutamine, 40 μg/kg/min, with atropine than in the 6 studies that used dobutamine, 40 μg/kg/min, without atropine (90% vs 82%, $P < 0.02$). In 9 studies ($n = 311$) that examined the effect of the number of diseased arteries, the mean sensitivity was 84% for single-vessel disease, 95% for 2-vessel disease, and 100% for 3-vessel disease.

CONCLUSION

Dobutamine stress myocardial perfusion imaging has high sensitivity and moderate specificity for detecting coronary artery disease.

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For correspondence: Dr. M.L. Geleijnse, Thoraxcenter, Ba 302, Dr Molewaterplein 40, 3015 GD Rotterdam, The Netherlands.

Test characteristics of dobutamine stress myocardial perfusion imaging*

Outcome	Weighted mean		+LR	–LR
	Sensitivity (95% CI) (20 studies, 716 pts)	Specificity (CI) (20 studies, 298 pts)		
Coronary artery disease	88% (86 to 90)	74% (71 to 77)	3.4	0.2

*Diagnostic terms defined in Glossary; LRs calculated from data in article.

COMMENTARY

The systematic review by Geleijnse and colleagues attempts to eliminate bias and random error by using a comprehensive search strategy; by using explicit, reproducible criteria to select articles; by critically evaluating study designs; and by synthesizing data and interpreting results. The authors point out the major limitations of attempts to study stress testing, including the heterogeneity of patient populations; differences in how tests are done and interpreted (e.g., different equipment, different definitions of positive results, and different definitions of "clinically significant" CAD on angiography); and "referral bias" (whether angiography is done depends on the results of the stress test), which inflates the sensitivity of tests and decreases specificity.

What is the take-home message? DSMPI has good sensitivity and reasonable specificity for the detection of CAD. However, dobutamine stress echocardiography (DSE) and vasodilator myocardial perfusion imaging have comparable characteristics. Features of each might influence test choice. Bundle-branch blocks, hypertrophy, and obesity increase the rate of false-positive results in myocardial perfusion imaging. Vasodilator tests are contraindicated in patients with high-grade atrioventricular block or reactive airway disease because the dilators may aggravate the disease. Poor acoustic windows have been the major limitation of DSE, although the availability of contrast agents has minimized this problem.

One other important concern exists. Interpreting imaging stress tests requires experience and expertise, and not all institutions can excel in all modalities. Therefore, although it is important for physicians to understand the performance characteristic of stress tests, it is equally important for them to know what imaging expertise their institution offers. That information might reasonably direct the choice of test.

David J. Malenka, MD
Dartmouth–Hitchcock Medical Center
Lebanon, New Hampshire, USA