CRD summary
This review assessed functional testing used to assess graft stenosis or the progression of coronary artery disease after coronary artery bypass graft. The authors concluded that stress ventricular imaging was superior to exercise treadmill testing alone. The quality of the included studies was not assessed and relevant studies might have been missed, therefore the reliability of the conclusions was unclear.

Authors' objectives
To assess the diagnostic accuracy of exercise treadmill testing (ETT), stress myocardial perfusion imaging (MPI) and stress echocardiography for detecting graft stenosis or the progression of coronary disease following coronary artery bypass graft (CABG) surgery.

Searching
MEDLINE was searched (the search terms were provided) and the references of relevant articles were checked for English language articles.

Study selection
Study designs of evaluations included in the review
Prospective studies were eligible for inclusion.

Specific interventions included in the review
Studies evaluating ETT, stress MPI and stress echocardiography were eligible for inclusion. Stress transoesophageal echocardiography was excluded. Studies assessing serial functional testing and comparing pre- and post-CABG functional testing were also excluded. The types of stress MPI used in the included studies were dobutamine/atropine single-photon emission computed tomography (SPECT) thallium, exercise planar thallium, exercise SPECT thallium, adenosine thallium, exercise thallium and stress thallium. The types of stress echocardiography used were exercise echocardiography, dobutamine stress echo and dipyridamole echo. The length of time to diagnostic testing following surgery varied between the studies.

Reference standard test against which the new test was compared
The included studies were required to use the 'gold' standard for diagnostic accuracy, which was cardiac catheterisation after CABG, carried out within 3 months of the functional tests of interest.

Participants included in the review
Patients who had undergone a CABG were eligible for inclusion. Patients with inconclusive diagnostic test results were excluded. The patients in the included studies had asymptomatic and symptomatic disease with single- and multiple-vessel involvement.

Outcomes assessed in the review
Studies were included if there were sufficient data to calculate the sensitivity and specificity of the tests to detect graft stenosis or the progression of cardiac disease. The following measures of diagnostic accuracy were calculated for each test and reported in the review: sensitivity, specificity, positive and negative likelihood ratios, and the positive and negative predictive value (PPV and NPV, respectively). Studies that did not define graft or coronary artery stenosis were excluded.

How were decisions on the relevance of primary studies made?
Two reviewers independently examined studies for eligibility. Any disagreements were resolved by consensus or by a third reviewer.
Assessment of study quality
The authors did not state that they assessed validity, although only studies that carried out an interpretation of the diagnostic tests and the gold standard that was blinded to the other test, as well as patient identity and other clinical data, were eligible for inclusion. In addition, studies were only included if the data from cardiac catheterisation had been interpreted by at least two individuals.

Data extraction
Two reviewers independently extracted the data. Any disagreements were resolved by consensus or by a third reviewer. The results of the tests, as well as details of the specific tests and when they took place, were extracted. Indeterminate test results were excluded from calculations of the sensitivity and specificity.

Methods of synthesis
How were the studies combined?
The studies were pooled using a random-effects model for each of the three diagnostic tests. Baye's theorem (see Other Publications of Related Interest) was used to calculate the predictive value of each of the three tests following pooling, with stenosis defined as a reduction in graft or coronary artery diameter of greater than 50%. The values chosen for low, intermediate and high pre-test probability of graft stenosis or disease progression were 10%, 30% and 50%, respectively.

How were differences between studies investigated?
In addition to carrying out a separate pooling for each of the three diagnostic tests, the studies were further divided based on the definition of graft stenosis or disease progression used: greater than 50% reduction in graft or coronary artery diameter, and greater than 70% reduction.

Results of the review
Nineteen studies (n=1,649) were included.

ETT (14 studies; of the 804 tests performed, 112 were excluded due to indeterminate results).
When graft stenosis or disease progression was defined as a diameter reduction of greater than 50%, the sensitivity was 45% (95% confidence interval, CI: 36, 54) and the specificity was 82% (95% CI: 68, 95). Both values increased slightly when the definition was changed to a diameter of greater than 70%. The PPV ranged from 22 to 71% and the NPV from 93 to 60% in patients with a low and high pre-test probability, respectively, of graft stenosis or disease progression.

Stress MPI (11 studies; 464 tests).
When graft stenosis or disease progression was defined as a diameter reduction of greater than 50%, the sensitivity was 68% (95% CI: 51, 86) and the specificity was 84% (95% CI: 78, 91). The sensitivity increased when the definition was changed to a diameter of greater than 70%. The PPV ranged from 32 to 81% and the NPV from 96 to 72% in patients with a low and high pre-test probability, respectively, of graft stenosis or disease progression.

Stress echocardiography (6 studies; of the 503 tests performed, 20 were excluded due to indeterminate results).
When graft stenosis or disease progression was defined as a diameter reduction of greater than 50%, the sensitivity was 86% (95% CI: 78, 94) and the specificity was 90% (95% CI: 84, 95). The PPV ranged from 50 to 90% and the NPV from 98 to 87% in patients with a low and high pre-test probability, respectively, of graft stenosis or disease progression.

Authors’ conclusions
Stress ventricular imaging was superior to ETT alone for the diagnosis of graft stenosis or progression of disease.
CRD commentary
The review addressed a clear research question using defined inclusion criteria. However, relevant studies might have been missed as only one electronic database was searched, and non-English language and unpublished studies were excluded. The review methodology was described and it included measures to avoid the introduction of error and bias. Although only blinded studies were included, other important aspects of study quality were not assessed and the findings were not discussed in the context of study quality. It might not have been appropriate to pool the studies in a meta-analysis. Statistical heterogeneity was not assessed and there was some evidence of clinical heterogeneity. Given these limitations it is unclear whether the findings are reliable.

Implications of the review for practice and research
Practice: For patients at high risk for graft stenosis or disease progression following CABG, evaluation should not be based on ETT alone. For greater diagnostic accuracy, stress ventricular imaging should be performed alone or in addition to ETT.

Research: The authors did not state any implications for research.

Bibliographic details

PubMedID
12813614

Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

MeSH
Cardiac Catheterization; Coronary Artery Bypass /rehabilitation; Coronary Artery Disease /diagnosis /surgery; Coronary Restenosis /diagnosis; Disease Progression; Echocardiography, Stress; Exercise Test; Heart /radionuclide imaging; Heart Function Tests /methods /standards; Humans; Predictive Value of Tests; Prospective Studies; Sensitivity and Specificity; Thallium

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.