Diagnostic accuracy of myocardial perfusion imaging and stress echocardiography for the
diagnosis of left main and triple vessel coronary artery disease: a comparative meta-analysis


CRD summary
This review compared stress echocardiography and myocardial perfusion imaging for the evaluation of high-risk coronary artery disease and concluded that stress echocardiography appeared to be the preferred screening modality. A lack of any formal quality assessment and the possibility of missing studies made the reliability of these conclusions unclear.

Authors' objectives
To compare the diagnostic performance of stress echocardiography and myocardial perfusion imaging (MPI) for the diagnosis of left main disease and triple vessel disease.

Searching
PubMed, EMBASE and The Cochrane Library were searched from 1980 to 2007 for English-language studies. Search terms were reported. The related articles function in PubMed was used. Reference lists of relevant studies and review articles were screened.

Study selection
Studies that evaluated stress echocardiography or MPI (index tests) compared to conventional angiography (reference standard) for the diagnosis of left main disease or triple vessel disease were eligible for inclusion. Exercise or pharmacologic stress echocardiography and exercise or pharmacologic MPI were eligible. Studies had to report sufficient data to calculate sensitivity and specificity.

Stressors used in the included studies were exercise-9, exercise-5, both exercise and pharmacologic-1, adenosine-1, dipyridamole-1, dobutamine-3 and dobutamine-9. Mean age of participants ranged from 51 to 62 years. The proportion of men ranged from 54% to 88%. Criteria for positivity for MPI consisted of reversible perfusion deficit or hypotension/electrocardiographic changes or abnormal lung-to-heart ratio or left ventricular dilation. Criteria for positivity on stress echocardiography were new or worse reversible regional wall motion abnormality.

The authors did not state how studies were selected for inclusion.

Assessment of study quality
The authors did not assess study quality.

Data extraction
Three reviewers independently extracted data to construct 2x2 tables of test performance. In the event of zero cells, 0.5 was added to each cell of the 2x2 table. Data were extracted for a variety of findings. Estimates of sensitivity, specificity, positive and negative likelihood ratios and diagnostic odds ratios with 95% confidence intervals (CIs) were calculated for each set of data. Disagreements were resolved through consensus.

Methods of synthesis
Summary receiver operating characteristic (SROC) curves were estimated and the area under the curve together with the standard deviation and Q* and 95% CIs were calculated as summary estimates. Summary sensitivity, specificity, diagnostic odds ratios and positive and negative likelihood ratios, together with 95% CIs, were estimated using random-effects models weighted on inverse variance.

Heterogeneity was assessed using X² and I². Heterogeneity was investigated using meta-regression analysis; variables were publication year, age, gender, clinical indication and stressor type. Subgroup analysis was conducted to investigate variations based on imaging techniques and target condition. Publication bias was assessed using the Egger test.
**Results of the review**
Twenty-three studies were included: 15 assessed MPI, 14 assessed stress echocardiography and six assessed both.

**MPI** (15 studies, n=2,310)

The area under the curve was 0.73 (standard error 0.02). Summary sensitivity was reasonable at 75% (95% CI 72% to 78%). Summary specificity was poor at 48% (95% CI 35% to 68%). There was evidence of heterogeneity in sensitivity (p<0.10).

**Stress echocardiography** (14 studies, n=1,403)

The area under the curve was 0.82 (standard error 0.03). Summary sensitivity was high at 94% (95% CI 91% to 97%). Summary specificity was poor at 40% (95% CI 37% to 43%). There was no evidence of heterogeneity in estimates of sensitivity.

**Indirect comparisons**: Based on the area under the curve, stress echocardiography was significantly more accurate than MPI (p=0.01). Sensitivity was significantly higher for stress echocardiography than MPI. There was no significant difference in specificity.

Meta-regression analysis showed a significant association between accuracy estimates for MPI and stress echocardiography and age, gender and year of publication (p<0.05). Full results of subgroup analysis were reported.

There was no evidence of publication bias.

**Authors' conclusions**
Stress echocardiography appeared to be the preferred screening modality for high-risk coronary artery disease.

**CRD commentary**
The review addressed a clear question. Inclusion criteria were defined. The literature search was adequate. It appeared that no specific attempts were made to locate unpublished studies. The review was restricted to English-language studies. Therefore, there was a possibility of language and publication biases. Publication bias was assessed in the review, but methods used were not designed for diagnostic data. Appropriate steps were taken to minimise bias and errors when extracting data; it was unclear whether such steps were taken during study selection. Study quality was not reported and so the reliability of the included studies (and hence the review findings) was unclear. Methods used to pool data were adequate, but were not based on the most robust models for pooling diagnostic data.

A lack of any formal quality assessment and the possibility of missing studies made the reliability of the authors' conclusions unclear.

**Implications of the review for practice and research**
The authors did not state any implications for practice or research.

**Funding**
None stated.

**Bibliographic details**

**PubMedID**
20538671
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.