Meta-analysis of the diagnostic accuracy of transesophageal echocardiography for assessment of atherosclerosis in the ascending aorta in patients undergoing cardiac surgery


CRD summary
This generally well-conducted review concluded that the low sensitivity of transesophageal echocardiography meant a negative test during ascending aorta atherosclerosis assessment required verification by epiaortic scanning, whereas a positive result should be considered as confirmation of atherosclerosis presence. The reliability of the conclusion is limited by the potential presence of publication bias and the paucity of good quality data.

Authors' objectives
To estimate the diagnostic accuracy of transesophageal echocardiography for the assessment of atherosclerosis in the ascending aorta.

Searching
MEDLINE, EMBASE, the Cochrane Library, DARE and Medion were searched for published studies in any language from 1966 to January 2006; search terms were reported. Reference lists of retrieved studies and related articles were scanned. Investigators were contacted to identify further published and unpublished studies.

Study selection
Diagnostic accuracy studies of transesophageal echocardiography, magnetic resonance imaging or computer-aided tomography scanning for the assessment of atherosclerosis in the ascending aorta in cardiac surgery patients, compared to epiaortic ultrasound scanning, were eligible for inclusion. Insufficient evidence for magnetic resonance imaging and computer-aided tomography were found to include these modalities in the analysis, therefore only transesophageal echocardiography was assessed. Studies had to report sufficient data to produce a 2x2 table.

In the included studies, the mean age of participants ranged from 64 to 69 years, the proportion of males ranged from 70 to 76% and the prevalence of atherosclerotic disease from 17 to 43%.

The authors did not state how many reviewers performed the study selection.

Assessment of study quality
Study quality was assessed independently by two reviewers in terms of study design, patient spectrum, reference standard used, descriptions of test methods, blinding, availability of clinical data, and the reporting of uninterpretable results and withdrawals, using QUADAS (Quality Assessment of Diagnostic Accuracy Studies Assessment). A methodologist was consulted to resolve disagreements.

Data extraction
Data were extracted from each study to produce a 2x2 table, from which sensitivity and specificity and their 95% confidence intervals (using the binomial method) were calculated. Analysis was done on a per patient basis where these data were available. If only per segment results were provided, authors were contacted in an attempt to retrieve per patient results. Where only per segment data were available, 95% confidence intervals were adjusted by dividing standard errors by the number of segments used.

Two reviewers independently extracted data; disagreements were resolved by consensus, or by recourse to a third reviewer.

Methods of synthesis
Summary estimates of sensitivity and specificity and 95% confidence intervals were calculated using a random effects bivariate meta-regression model. Heterogeneity was assessed using the I^2 statistic. Heterogeneity was explored in terms
of sample size, year of publication, age, prevalence of atherosclerotic disease, the use of segmental analysis, and quality criteria. Publication bias was assessed using a funnel plot and the effective sample size regression test.

Results of the review
Six prospective cohort studies met the inclusion criteria (n=346 patients; range 22 to 100; 419 aortic segments analysed). All studies recruited a representative patient sample, although only two reported using consecutive patients. Blinding was reported of both index test results and reference standard in three studies. Verification bias was avoided in most studies. The availability of clinical data, uninterpretable/intermediate results and the explanation of withdrawals were poorly reported.

The pooled estimate of transoesophageal echocardiography sensitivity was 21% (95% CI: 13%, 32%) and specificity was 99% (95% CI: 96%, 99%). Both analyses showed low levels of heterogeneity (sensitivity I^2 was 31% and specificity I^2 was 0%).

The funnel plot was asymmetrical, and the effective sample size regression test significant, indicating the presence of publication bias.

Authors' conclusions
Low sensitivity of transoesophageal echocardiography for the detection of atherosclerosis in the ascending aorta meant a negative test required verification using epiaortic scanning. A positive transoesophageal echocardiography result should be considered as confirmation of the presence of atherosclerosis.

CRD commentary
The authors addressed a clear review question, supported by appropriate inclusion criteria. A search was undertaken to locate both published and unpublished studies, and translation of foreign language papers sought, in attempts to reduce publication and language bias. Despite these attempts, publication bias was detected. Data extraction and the assessment of study quality were conducted in duplicate, reducing the potential for error and bias. It was unclear whether similar methods to reduce bias were used during study selection. Appropriate quality criteria were used to assess included studies, and the results for each criterion reported. Appropriate methods of synthesis were used. Few studies were identified, and those included tended to have small numbers of patients that were not consecutively recruited. This was generally a well-conducted review, but the reliability of the conclusions is limited by the paucity of available data.

Implications of the review for practice and research
Practice: The authors did not state implications for practice.

Research: The authors stated that future diagnostic studies should adhere to the Standards for Reporting of Diagnostic Accuracy (STARD) guidelines.

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