Contrast-enhanced cardiac computed tomographic angiography for coronary artery evaluation
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CRD summary
This review concluded that there was insufficient evidence to determine whether computed tomographic angiography improved health outcomes, or whether it was as beneficial as established alternatives such as conventional coronary angiography. The cautious conclusions appear appropriate given the paucity of evidence, but the restricted search and poor reporting of review methods make it difficult to assess the reliability of the results.

Authors' objectives
To evaluate the clinical effectiveness of contrast-enhanced cardiac computed tomographic angiography (CTA) for coronary artery evaluation.

Searching
MEDLINE was searched to April 2005; the search terms were reported. The Cochrane Library and Current Contents were also searched. Only full-length English language articles published in peer-reviewed journals were included.

Study selection
Study designs of evaluations included in the review
Single case reports were excluded, but no other inclusion criteria relating to the study design were specified.

Specific interventions included in the review
Studies of contrast-enhanced CTA, using either electron beam computed tomography (EBCT) with a slice thickness no greater than 1.5 mm, or multidetector-row computed tomography (MDCT) with at least 16 rows, were eligible for inclusion. Most of the included studies used a test threshold of 50% or more to identify stenosis, and most only evaluated vessels of at least 1.5 to 2 mm in diameter.

Reference standard test against which the new test was compared
To be eligible, the studies had to use an appropriate reference standard, such as conventional coronary angiography or clinical reference standard. All included studies except one used conventional coronary angiography as the reference standard; the remaining study used consensus reading of CTA and conventional angiography.

Participants included in the review
The review seemed to include all studies of participants undergoing coronary artery evaluation, including the screening of asymptomatic patients, pre-operative evaluations, and diagnostics due to symptoms or an anomaly, or post-surgical evaluation. Most of the included studies were in patients with non-acute coronary artery disease (CAD). None of the included studies evaluated screening of asymptomatic patients or screening of patients before major noncardiac surgery.

Outcomes assessed in the review
The studies had to report sensitivity and specificity, or sufficient data to construct a 2x2 contingency table. Most of the included studies reported results based on coronary vessel/vessel segments; few studies reported data on a per-patient basis.

How were decisions on the relevance of primary studies made?
The author did not state how the studies were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
Study quality was assessed in relation to study design, description of the study population and potential for spectrum bias, blinding of the interpreters of the index test and reference standard, and the avoidance of verification bias. The author did not state how many reviewers assessed study quality.

**Data extraction**
The author did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

For each study, the sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were presented.

**Methods of synthesis**

*How were the studies combined?*
The studies were combined in a narrative, grouped by the reason why the diagnostic procedure was being undertaken.

*How were differences between studies investigated?*
Study details and results were tabulated, and differences between the studies were discussed in the text. Results from studies that analysed data on a per-patient basis were considered separately from studies that based their analysis on vessels/vessel segments.

**Results of the review**
Twenty-two studies (n=1,016) were included in the review, of which 16 evaluated MDCT and 6 evaluated EBCT.

**Quality.**

Eighteen studies were prospective in design, 3 were retrospective, and in one the study design was unclear. Spectrum bias was avoided in 10 studies, was not avoided in 5 studies, and was unclear in 7 studies. Only 7 studies reported blinding of the investigators when interpreting both tests; one blinded investigators for neither test, and the remaining 14 either only blinded investigators when interpreting one or other test, or blinding was unclear. Eighteen studies avoided verification bias; the remaining studies were unclear. Some studies excluded non evaluable vessels from the analysis; others included these vessels.

**Technical performance.**

For studies using vessel/vessel segment as the unit of analysis, the proportion of evaluable vessels ranged from 79 to 93% for MDCT and from 77 to 95% for EBCT (number of studies not reported).

**Diagnostic accuracy.**

**Acute CAD:** one study (n=22) reported a sensitivity of 94%, specificity of 96%, NPV of 99% and PPV of 77% for MDCT.

**Non-acute CAD on a per-patient basis:** for MDCT when unevaluable segments were not excluded, the sensitivity ranged from 85 to 100%, the specificity from 75 to 86%, the PPV from 81 to 97% and the NPV from 82 to 100% (4 studies).

**Non-acute CAD on a vessel/segment basis:** for MDCT, the sensitivity ranged from 63 to 95%, the specificity from 86 to 98%, the PPV from 64 to 87% and the NPV from 96 to 99% (9 studies); for EBCT, the sensitivity ranged from 70 to 90%, the specificity from 91 to 95%, the PPV from 70 to 84% and the NPV from 95 to 96% (4 studies).

**CAD after coronary artery bypass graft:** one study (n=48) reported a sensitivity of 96%, specificity of 95%, NPV of 99% and PPV of 81% for MDCT.

**CAD after placement of stent:** 14 of 19 patients had evaluable images with MDCT (1 study, n=19); 27 of 341 stents had
evaluable images with EBCT (1 study, n=26).

Delineation of coronary artery anatomy before cardiovascular procedure: one study (n=45) reported an overall 45% procedural failure rate.

Authors' conclusions
There was insufficient evidence to determine whether CTA improved health outcomes or whether it was as beneficial as established alternatives.

CRD commentary
The review question was clear in terms of the intervention, reference standard and outcomes. The author conducted a limited search and only articles in English were included, therefore both language and publication bias may be present. The author did not state whether methods were used to reduce error and bias during the study selection, quality assessment, or data extraction stages of the review. It was not stated if measures of diagnostic accuracy were extracted directly from study reports, or if they were calculated or verified by the reviewers. Study validity was assessed using specified criteria and the results and limitations of the studies were discussed. Details of the studies and their results were tabulated clearly. The use of a narrative synthesis seemed appropriate. Given the limitations of the review and the paucity of data, the conclusions seem suitably cautious.

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

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