64-slice CT for diagnosis of coronary artery disease: a systematic review
Stein P D, Yaekoub A Y, Matta F, Sostman H D

CRD summary
This review concluded that a negative 64-slice computed tomography reliably excluded significant coronary artery disease but stenoses shown require confirmation. Given a number of concerns relating to the conduct of the review and the included studies, the results of the review should be interpreted with some caution.

Authors' objectives
To assess the accuracy of 64-slice computed tomography (CT) for the diagnosis of coronary artery disease.

Searching
MEDLINE and the Cochrane Library were searched to November 2007 without language restrictions. Search terms were reported. Bibliographies of reviews and trials were also checked. Abstracts were excluded.

Study selection
Prospective studies of 64-slice CT coronary angiography compared to invasive coronary angiography or intravascular ultrasound were eligible for inclusion. Other inclusion criteria were that the study recruited patients with and without disease, specified the degree of stenosis and reported sufficient data to extract or calculate diagnostic outcomes. Case series with 10 patients or fewer were excluded. Most included studies used conventional coronary angiography as the reference standard, used 80 to 100 ml of contrast agent (up to 140 ml was used) and administered β-adrenergic blocking agents. The heart rate at which anxiolytics or other drugs were used varied from over 60 beats per minute to over 70 beats per minute.

The authors did not state how studies were selected for the review, or how many reviewers performed the study selection.

Assessment of study quality
To be included, studies had to report: that interpreters of the 64-slice CT were blinded to the results of the reference standard; the criteria used for patients selection; that the decision to undertake the reference standard was independent of the results of the 64-slice CT; that the study had to include patients with and without the disease. Based on these criteria, studies were categorised according to whether the patients were selected consecutively and whether computer assistance or electronic calipers were used to quantify the results of the conventional coronary angiogram (Tier 1, 2 or 3, fully defined in paper).

The authors did not state how many reviewers performed the quality assessment.

Data extraction
Sensitivity and specificity with 95% confidence intervals (CI) were calculated for each study. Unevaluable and technically inadequate segments were excluded from the calculation. Positive and negative likelihood ratios and positive and negative predictive values were also calculated.

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

Methods of synthesis
Pooled sensitivity, specificity, positive and negative likelihood ratios, positive and negative predictive values with 95% confidence intervals (CI) were calculated for the following: patient basis, segment basis, each separate coronary artery, stents and coronary artery bypass grafts. Studies classified to Tier 1, 2 and 3 were analysed separately. Significant stenosis was defined as 50% or over and high-grade stenosis as 70% or over. χ² test was used to compare proportions. The method used to assess between study heterogeneity was not reported.
Results of the review
Forty-five studies met the inclusion criteria; 29 evaluated coronary arteries, eight stents and eight coronary artery bypass grafts. Seventeen studies reported recruitment of consecutive patients (Tier 1), 23 did not report the recruitment of consecutive patients (Tier 2) and five studies reported recruiting selected populations (Tier 3). The results reported were based on 23 studies reporting significant stenosis of 50% or more (n=2,045, 32,046 segments).

The CT for the diagnosis of significant stenosis on a per patient basis was: sensitivity 98% (95% CI: 96, 98); specificity 88% (95% CI: 85, 89); positive predictive value 93% (95% CI: 90, 93); negative predictive value 96% (95% CI: 94, 97), positive likelihood ratio 8.0 (95% CI: 6.6, 9.6); and negative likelihood ratio 0.03 (95% CI: 0.02, 0.03). On a per segment basis, sensitivity was 90% (95% CI: 88, 90), specificity 96% (95% CI: 95, 96), positive predictive value 73% (95% CI: 71, 74), negative predictive value 99% (95% CI: 98, 99), positive likelihood ratio 20.6 (95% CI: 19.5, 21.7) and negative likelihood ratio 0.11 (95% CI: 0.10, 0.11).

Extensive results were reported for the diagnosis of significant stenosis for each artery separately, stents and coronary artery bypass grafts, overall and for Tiers 1, 2 and 3 separately.

The reporting of high-grade stenosis was sparse and only reported for some named arteries and some Tiers.

Authors' conclusions
Negative 64-slice CT reliably excluded significant coronary artery disease but stenoses shown require confirmation. Combining the results with pre-CT clinical probability assessment strengthens the diagnosis.

CRD commentary
The authors addressed a clear review question, with appropriate inclusion criteria. A limited search was undertaken, therefore publication bias can not be ruled out. Attempts were made to limit language bias. Methods used during the review process were not reported, so it is unclear whether attempts were made to reduce error and bias throughout the review. Quality criteria were used to determine eligibility for inclusion and the classification of studies into tiers (which were then analysed separately). The exclusion of indeterminate segments from the calculations of diagnostic outcomes could have overestimated the accuracy of the test. This could have been investigated using sensitivity analyses including and excluding these data. Few study details were provided but it seems from the text that there was clinical heterogeneity between studies, which could impact on the reliability of the pooled results. Also, many of the studies were small in size and the majority did not report recruiting a representative sample. Given the above concerns, the results of the review should be interpreted with some caution.

Implications of the review for practice and research
Practice: The authors stated that patients should be selected for 64-slice CT carefully due to the potential for radiation-induced cancer, and scan protocols should be optimised to minimise the risk.

Research: The authors did not state implications for research.

Funding
Not stated.

Bibliographic details

PubMedID
18691486

DOI
10.1016/j.amjmed.2008.02.039
Indexing Status
Subject indexing assigned by NLM

MeSH
Coronary Angiography /instrumentation /methods; Coronary Artery Disease /diagnosis; Coronary Stenosis /diagnosis; Humans; Reproducibility of Results; Sensitivity and Specificity; Tomography, X-Ray Computed /instrumentation /methods; Ultrasonography, Interventional

AccessionNumber
12008105908

Date bibliographic record published
31/03/2009

Date abstract record published
20/05/2009

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.