Multi-detector row CT angiography in the assessment of coronary in-stent restenosis: a systematic review
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CRD summary
This review assessed diagnostic performance of multi-detector row computed tomography angiography (MDCT) for coronary in-stent restenosis and concluded that invasive catheter angiography remained the gold standard although the high specificity of MDCT made it useful in ruling-out restenosis. Weaknesses in the review process and analysis and inaccurate interpretation of the results mean that the findings of this review are unreliable.

Authors' objectives
To assess the diagnostic accuracy of multi-detector row computed tomography angiography (MDCT) for detection of coronary in-stent restenosis in patients treated with coronary stenting.

Searching
PubMed and MEDLINE were searched (1998 to September 2007) for English-language studies. Bibliographies of retrieved articles were screened for additional studies. Only peer-reviewed published articles were included.

Study selection
Prospective and retrospective studies of at least 10 patients who underwent MDCT angiography with a 16-or more detector row scanner for assessment of coronary in-stent restenosis and occlusion were eligible for inclusion. A decrease of more than 50% in vessel diameter was classified as restenosis. Included studies had to use invasive catheter angiography as the reference standard and report sensitivity and specificity for MDCT.

Mean age of study participants ranged from 57 to 68 years. The proportion of male participants ranged from 64% to 92%. Stent materials and diameters varied across studies. Most of the included studies used 16 or 64 detector row CT; one study used 40 detectors.

The authors did not state how many reviewers assessed studies for inclusion in the review.

Assessment of study quality
The authors did not state that they assessed methodological quality.

Data extraction
Data were extracted on the type of CT unit and scanning protocol used and sensitivity and specificity, with 95% confidence intervals (CIs) of MDCT for the detection of in-stent restenosis and occlusion. Data were extracted on the post-processing methods used in each study and numbers of assessable stents.

The authors stated that data were extracted by two reviewers (no further details provided).

Methods of synthesis
Pooled estimates of sensitivity and specificity were calculated using a fixed-effect model. Between-study heterogeneity was assessed using the X² test.

Results of the review
Fifteen studies were included in the meta-analysis (a total of 1,333 stents, range 20 to 232). Eight studies were performed with 16-detector row CT scanners, five studies with 64-detector row scanners and one study with a 40-detector scanner; the remaining study was performed with a mixture of 16-and 64-detector row scanners.

The proportion of the stents that were assessable varied across studies (mean 88%, 95% CI 80% to 95%). There was no...
significant difference between 16- and 64-detector row CT in the proportion of assessable stents (p>0.05).

Mean prevalence of coronary in-stent restenosis was 18% (95% CI 13% to 24%).

The overall pooled estimates of sensitivity and specificity of MDCT angiography for the detection of coronary in-stent restenosis were 85% (95% CI 78% to 90%) for sensitivity and 97% (95% CI 95% to 98%) for specificity. There was no significant difference between 16- and 64-detector row CT in either sensitivity or specificity, (p>0.05). Significant between-study heterogeneity was present in all analyses (p<0.001).

Factors that affected the visualisation of coronary in-stent restenosis included motion artefacts, blooming artefacts, stent diameter and severe calcification.

**Authors' conclusions**
MDCT angiography (with 16 or more detector rows) had moderate sensitivity and high specificity for the detection of coronary in-stent restenosis. The main factors that affected visualisation were stent diameters and stent materials.

**CRD commentary**
The review stated a clear objective and defined appropriate inclusion criteria. The search strategy was very limited. Only one bibliographic database was searched and the search was restricted to English-language publications, so it was likely that relevant studies were missed. Reporting of the review process was limited. No attempt to assess the methodological quality of included studies was reported. It was not possible to assess the potential for error and/or bias in the review process and the extent to which the quality of the primary studies may have affected the review's findings. Given the presence of significant between-study heterogeneity, separate pooling of sensitivity and specificity using a fixed-effect model was not appropriate and the pooled estimates generated were of limited value. Based upon these estimates, the authors concluded that the high specificity observed for MDCT made it a useful test for ruling-out restenosis (in fact, high specificity is associated with a utility in ruling-in disease). Weaknesses in the review process and analysis and poor interpretation of the results mean that the findings of this review are unreliable.

**Implications of the review for practice and research**
**Practice:** The authors stated that the evidence indicated that invasive catheter angiography remained the gold standard technique for follow-up of coronary in-stent restenosis. The high specificity of MDCT angiography meant that it could be used to rule out the presence of in-stent restenosis.

**Research:** The authors stated that future studies performed with 64-detector row or dual source CT should focus on using improved imaging techniques to reduce artefacts resulting from the implanted stents.

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**Record Status**
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