



Title	The Effectiveness and Cost Effectiveness of Computed Tomography Screening for Coronary Artery Disease: Systematic Review
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Aim

To assess the clinical and cost effectiveness of computed tomography (CT) screening for asymptomatic coronary artery disease; to establish whether coronary artery calcification (CAC) predicts coronary events and adds anything to risk factor scores; and whether measuring CAC changes treatment.

Conclusions and results

No randomized control trials (RCTs) assessed the value of CT screening in reducing cardiac events. Seven studies assessed the association between CAC scores on CT and cardiac outcomes in asymptomatic people (n=30 599). Six used electron-beam CT. The relative risk of a cardiac event was 4.4 if CAC was present. As CAC score increased, so did the risk of cardiac events. The correlation between CAC and cardiac risk was consistent across studies. CAC scores varied among people with the same Framingham risk factor scores, and within the same Framingham bands people with higher CAC scores had significantly higher cardiac event rates (mainly when the CAC scores exceeded 300). In one study, CAC score was a better predictor of cardiac events than the Framingham risk scores. No studies showed whether the addition of CAC scores to standard risk factor assessment would improve outcomes. Two observational studies showed that lowering of low-density lipoprotein cholesterol to about 3 mmol l⁻¹ or below with statin treatment modestly reduced CAC scores, but this was not confirmed in 2 RCTs. In 3 studies on whether knowledge of CAC scores would affect compliance with lifestyle measures, perception of risk was affected, but it did not improve smoking cessation rates, and did increase anxiety. A few economic studies of CT screening for heart disease provided useful data on costs of scans, other investigations, and treatment, but did not provide definitive answers. One modeling study estimated that adding CT screening to risk factor scoring, and only giving statins to those with a CAC score over 100, would save money. However, generic statins have reduced prices, and these savings no longer apply.

Recommendations

CT examination of the coronary arteries can detect calcification indicative of arterial disease in asymptomatic people, many of whom would be at low risk when assessed by traditional risk factors. The higher the CAC score, the higher the risk. Treatment with statins can reduce that risk. However, CT screening would miss many of the most dangerous patches of arterial disease, because they are not yet calcified. Hence, there would be false-negative results: normal CT followed by a heart attack. There would also be false-positive results in that many calcified arteries will have normal blood flow and will not be affected by clinically apparent thrombosis: abnormal CT not followed by a heart attack. For CT screening to be cost effective, it must add value over risk factor scoring by producing sufficient information to change treatment and cardiac outcomes, at an affordable cost per quality-adjusted life-year. The evidence did not support this. Most National Screening Committee (NSC) criteria were not met, or met only in part.

Methods

Screening studies and economic evaluations were systematically reviewed. Studies were included in the review if screening for coronary heart disease was the principal theme and if data were provided that allowed comparison of CT screening with current practice, ie, risk factor scoring. Mismatches between CAC scores and risk factor scoring were of particular interest. The case for screening was reviewed using the NSC criteria for assessing screening programs.

Further research/reviews required

It would be useful to have more data on the distributions of risk scores and CAC scores in asymptomatic people, the level of concordance between risk factor and CAC scores, the risk of cardiac events per annum according to CAC score and risk factor scores, information on the acceptability of CT screening, after information about the radiation dose, and an RCT of adding CT screening to current risk factor-based practice.