Die Elektronenstrahltomographie in der kosteneffizienten Diagnostik der koronaren Herzkrankheit [Electron beam CT and cost-efficient diagnosis of coronary artery disease]

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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
Electron beam CT in the diagnosis of coronary artery disease (CAD).

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
Patients with suspected CAD. As the study samples examined in each of the trials reviewed lacked homogeneity it was not possible to provide further details.

Setting
Different hospitals and clinics in various countries depending on the primary study. The economic study was conducted in Rochester, Minnesota, USA.

Dates to which data relate
The clinical data for the primary studies were collected between 1989 and 1995, but emphasis was placed on data from 1994/95.

Source of effectiveness data
The clinical data were derived from a review/synthesis of previously completed studies.

Modelling
A mathematical model was used to determine the costs of each strategy based on the prevalence of CAD in the population considered as well as the sensitivity, specificity and complication rate of each test.

Outcomes assessed in the review
The outcomes assessed in the review were sensitivity, specificity, indeterminate results and complication rate for each test strategy examined.

Study designs and other criteria for inclusion in the review
No specific study designs were included in the inclusion criteria.
Sources searched to identify primary studies
Not stated.

Criteria used to ensure the validity of primary studies
Not stated.

Methods used to judge relevance and validity, and for extracting data
Not stated.

Number of primary studies included
Twenty-two studies were included in the review.

Methods of combining primary studies
A narrative method was chosen by the authors. The authors do not make use of any weighting scheme when combining the studies. The sample sizes vary significantly between 11 and 1,898.

Investigation of differences between primary studies
Not stated.

Results of the review
After diagnosing populations with different prevalence of 100 patients each, angiography proves to be the most effective, with a sensitivity and specificity of 100%, which leaves 0% indeterminate results. Electron beam CT showed a sensitivity and specificity of 84% each, while 2% were undetermined. Stress echocardiography had very similar results: a sensitivity and specificity of 83% and 84% respectively, while 5% were indeterminate results. In comparison, stress thallium had a relatively high sensitivity of 90%, while specificity was only 77%, with 5% undetermined. Finally, treadmill exercise proved to be the least effective with 68% sensitivity and 77% specificity with 15% indeterminate results. Electron beam CT, since it is non-invasive, had a complication rate of 0%, while treadmill exercise, stress thallium and echocardiography had a 0.05% complication rate and angiography was 1.5%.

Measure of benefits used in the economic analysis
The measure of benefits in the economic analysis was the number of correctly diagnosed suspected cases of CAD. The reference test was angiography which was used to determine the diagnostic accuracy of each of the comparators.

Direct costs
The authors gave no details of how direct costs were derived, only stating that total cost per diagnosis was calculated from costs for an initial examination and in the case of a positive result, a coronary angiogram. Discounting was not applicable due to the periodicity of the study.

Statistical analysis of costs
Not stated.

Indirect Costs
Not stated.
Currency
Not applicable.

Sensitivity analysis
Not undertaken.

Estimated benefits used in the economic analysis
The number of true cases detected was expressed in terms of a cost-effectiveness ratio and the benefits, as such, were not reported separately.

Cost results
Costs were not stated in a specific currency, but as a percentage of costs of the main comparator angiography and depended on the prevalence of significant CAD in the study population. At a prevalence of 0.1, the cost of electron beam CT diagnosis was less than 40% of angiography, compared with treadmill exercise at 50%, stress echocardiogram at 60% and stress thallium at 70%. As the prevalence of significant CAD increases, so do the total costs of each diagnostic method compared with angiography, but not proportionally. At a prevalence level of 0.5, electron beam CT and treadmill exercise diagnosis total cost were around 60% of costs for angiography, while stress echocardiogram was at 80% and diagnosis with stress thallium costs the same as diagnosis with angiography. At a prevalence level of 1, stress echocardiogram and stress thallium turn out to be much more expensive at levels of 115% and 130% of angiography. Diagnosis with electron beam CT is only slightly less, whilst the level for treadmill exercise is 80%.

Synthesis of costs and benefits
The cost per true case of CAD detected was reported in relation to the prevalence of significant CAD in the population. At a prevalence level of 0.1, cost efficiency greatly favours electron beam CT with a ratio of slightly less than 5. Treadmill exercise, stress echocardiography and stress thallium, all have ratios of between 7 and 8 and angiography proves to be the least cost efficient at this prevalence level with a ratio of 10. At 0.2 prevalence, cost efficiency seems to converge towards electron beam CT, which has a cost efficiency ratio of 2.5, while treadmill exercise, stress echocardiography and stress thallium have ratios between 3.5 and 4.5 and angiography has a ratio of 5. As prevalence moves towards 1, all ratios converge to a level of around 1.5, with angiography showing a marginal advantage in efficiency.

Authors' conclusions
The authors concluded that EBCT scanning is not a complete substitute for coronary angiography, but it has clear advantages over other, more traditional methods, for diagnosing CAD. In particular it can be performed inexpensively and conveniently in most patients. The analysis presented suggests that it can provide a cost-effective clinical alternative in specific subsets of the population, i.e. those with a low prevalence.

CRD COMMENTARY - Selection of comparators
The reason for the selection of comparators was clear.

Validity of estimate of measure of benefit
The authors gave a good account of the measure of benefits, but did not mention important information regarding the study populations that were included in the primary studies, especially in relation to sample size and the conditions under which measures were derived. As sensitivity analysis was not performed the robustness of the findings may need to be validated by further clinical trials.

Validity of estimate of costs
The authors do not mention how direct costs were derived and expressed them, not in monetary values, but as a percentage, based on the cost of angiography (the main comparator). In this sense the generalisability of the findings may be limited.

**Other issues**
The methods adopted by the authors make it difficult to generalise the results to other settings.

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