Making the transition: the role of helical CT in the evaluation of potentially acute thoracic aortic injuries


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
Helical computed tomography (HCT) to diagnose acute thoracic aortic injuries.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population was patients who had a radiographically "unclearable" mediastinum. This was defined as a number of irregularities detected in the mediastinum including widening, and deviation of nasogastric or endotracheal tubes.

Patients with an isolated haemothorax or bony thoracic trauma were excluded, as were patients aged below 18 or over 75, those who refused consent, were pregnant or were haemodynamically unstable. Patients with suspected acute thoracic aortic injuries were included at the trauma surgeon's discretion.

Setting
Secondary care (trauma centre). The economic study was carried out in the USA.

Dates to which data relate
Effectiveness data were collected between August 1997 and August 1998. Resource use and prices were also taken from this period.

Source of effectiveness data
Effectiveness data were derived from a single study.

Link between effectiveness and cost data
It is unclear whether costing was undertaken on the same patient sample as that used in the effectiveness study, although the cost analysis appears to have been performed retrospectively.

Study sample
No power calculations were performed to determine a necessary sample size. All patients who fulfilled the entry criteria and provided consent were entered into the trial. The study sample appears to be appropriate for the study question. During the study period, 3870 patients presented at the trauma centre with blunt trauma. Of these, 265 had
'radiographically unclearable mediastinums', and were eligible for entry into the study. Of these, one died, 95 were subjected to aortography alone, and 27 patients refused consent for aortography and were analysed by HCT alone. Thus 142 patients were analysed by both aortography and HCT.

Study design
This was a single-centre, prospective cohort study. There was no follow-up of patients beyond the results of the HCT and aortogram. Radiologists and other staff members assessing CTs and aortograms were blind to each other's interpretations of the results.

Analysis of effectiveness
The analysis of the accuracy of HCT against aortograms was based on the 142 patients for whom there were complete data. The outcomes reported were the sensitivity and negative-predictive values of HCT and aortography.

Effectiveness results
The sensitivity and negative predictive values of HCT were both 100% for the detection of possible acute aortic injuries. The specificity of HCT was 89%. The kappa value measuring intra-observer variability was 0.714, indicative of 'substantial agreement' between observers.

The sensitivity and negative predictive values of aortography were both 100%. The authors do not report the specificity of aortography.

Clinical conclusions
Both diagnostic methods were equally accurate at detecting acute thoracic aortic injuries.

Measure of benefits used in the economic analysis
No summary measure of health benefit was appropriate for this analysis; therefore, a cost-consequences analysis was performed.

Direct costs
Resource quantities and costs were not reported separately. From the information supplied in the article, it was not possible to say for certain to whom the costs included pertain, but it is most likely to be hospital costs. The authors did not state which costs were included in the analysis. The authors only stated the source of the combined technical and professional charges for the two examinations: their own centre. As all the costs included in the analysis were incurred over a short space of time (less than one year), discounting is not relevant. The study reported total costs for the cohort of patients, including those excluded from the effectiveness analysis.

Indirect Costs
Not applicable.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was performed.
Estimated benefits used in the economic analysis
Please refer to the effectiveness results reported earlier.

Cost results
The total cost of HCT in 169 patients (including the 142 included in the study plus the 27 patients who did not have aortography) was $202,800. The total cost of aortograms in 237 patients (including the 142 included in the study plus the 95 that did not have HCT) was $402,900. The difference in the combined technical and professional charges per procedure was reported as approximately $500. The use of CT could have reduced the required number of aortograms to 21, at a cost of $36,000.

Synthesis of costs and benefits
Not applicable.

Authors' conclusions
Helical CT is as effective and less costly than aortography in detecting acute thoracic aortic injuries.

CRD COMMENTARY - Selection of comparators
A justification was given for the comparator used, namely that the authors' centre exclusively used conventional transcatheter aortography. The study was required to prove the effectiveness of helical CT before adoption of the technology. You, the user of the database, should decide if this is a widely used technology in your own setting.

Validity of estimate of measure of effectiveness
The analysis was based on a prospective cohort study with controls drawn from the same cohort as those receiving the study procedure. This study design is well suited to answer the study question. The study sample appeared to be representative of the study population. As all patients included in the study received both diagnostic tests they were, by definition, comparable. Appropriate statistical analysis of the data was undertaken.

Validity of estimate of measure of benefit
The analysis of benefits was based upon the therapeutic equivalence of treatment alternatives. The economic analysis therefore included only costs.

Validity of estimate of costs
Due to the limited presentation of cost data, it is not possible to assess whether all relevant costs were taken into account in this study. Furthermore, the results listed are the total costs of the 142 patients in the study plus those who were excluded from the effectiveness analysis (due to only receiving one of the diagnostic tests). A presentation of individual cost components, and the mean cost per patient with statistical analysis would have been more useful in this instance. The lack of statistical analysis and presentation of per patient costs means the conclusions of this study should be treated with caution.

The sources of resource use and price data were not stated. They may have been real data as incurred by patients or standard estimates for the authors' centre. No statistical analysis of quantities or prices was performed. The price year was not stated.

Other issues
The authors compared their results with other studies on the effectiveness of helical CT, but not for their cost findings. The issue of generalisability to other settings was not addressed. The authors did not present all the results of their analysis: the specificity of aortography was not stated in the article. As presented in the study, it is not possible to
confirm the validity of the cost data used. Therefore, the cost conclusions must be treated with caution.

The authors acknowledged a number of limitations to their study: the technique for CT they employed was ‘very stringent’ and there were some 'peculiarities' in their method of aortography. These techniques could impact the sensitivity and specificity of the tests if different from standard practice. The authors also noted that they excluded older trauma patients from undergoing both tests. They stated that this was done to expedite the clinical work-up in this sub-group, and to minimise the possibility of false positives through atheromatous disease mimicking an acute aortic injury.

**Implications of the study**
The authors stated that the year following the study, 298 unnecessary aortograms were avoided, saving the centre $149,000. Reducing unnecessary aortographic examinations expedites patient care and saves money.

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