Computed tomographic venography is specific but not sensitive for diagnosis of acute lower-extremity deep venous thrombosis in patients with suspected pulmonary embolus


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
The use of computed tomographic venography (CTV) as an imaging modality to diagnose lower-extremity suprageniculate deep venous thrombosis (LE-DVT). CTV was compared with duplex ultrasound scanning (US).

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients who had undergone CTPA and who had suspected PE. Patients were excluded if hip or knee prosthesis prevented technically adequate CTV. Patients for whom there was a delay of more than one week between the two tests, and in whom the tests indicated chronic rather than acute LE-DVT, were also excluded.

Setting
The setting was secondary care. The economic study was carried out in Michigan, USA.

Dates to which data relate
The effectiveness and resource use data related to 1999 to 2000. The price year was not reported.

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

Link between effectiveness and cost data
It would appear that the cost data were not obtained at a patient level. An average cost for each intervention was estimated on the basis of expected resource use in routine practice.

Study sample
No power calculations were performed. The sample was selected retrospectively by examining health system records to identify patients who underwent US and CTV during May 1999 to September 2000. The review identified 149 patients. Twelve patients were excluded because there was a delay of more than one week between the two tests, while a further patient was excluded because the presence of a hip or knee prosthesis prevented a technically adequate CTV. Thus, the final sample comprised 136 patients. The study sample was 60% female and had a mean age of 59.5 years (range: 16 - 90). PE was diagnosed by CTPA in 40 patients (29%). US preceded CTV by, on average, 3.7 hours (range: 0 - 7).
Study design
The study was a single-centred, retrospective, case series study. There was no follow-up beyond the date of the tests. Due to the retrospective case review design there was no loss to follow-up. The results of the US and CTV tests were sent to physicians (US) and radiologists (CTV), respectively, who were blinded to the result of the CTPA and alternative test.

Analysis of effectiveness
All patients included in the study were accounted for in the analysis. The primary outcomes were the sensitivity, specificity, positive and negative predictive values (PPV and NPV, respectively), and the accuracy rate of the two diagnostic tests.

Effectiveness results
In comparison with US, CTV had a sensitivity of 71%, specificity of 93%, PPV of 53%, NPV of 97%, and an accuracy rate 90%. The study reported only point estimates.

Clinical conclusions
The clinical conclusion was that, although CTV is specific, it has a lower sensitivity rate and PPV than US for acute LE-DVT in patients with suspected PE.

Measure of benefits used in the economic analysis
No summary measure of health benefit was used in the analysis. In effect, a cost-consequences analysis was performed.

Direct costs
The study included only the direct costs of the two diagnostic tests (US and CTV). Clearly every patients had a CTV and US based on the inclusion criteria for the study. The direct costs did not include professional expenses, and it was unclear to whom they related as an independent analyst generated the cost data and no details were given of the analysis. Discounting was not relevant and was not performed. The study reported marginal and total costs and charges. The price year was not reported.

Statistical analysis of costs
No statistical analysis of the costs was undertaken.

Indirect Costs
The indirect costs were not included in the analysis.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analyses were performed.

Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.
**Cost results**
The cost of pelvis and lower extremity CTV was $109.70 and the cost of bilateral LE US was $62.82.

The charge for pelvis and lower extremity CTV was $1,066.00 and the charge for bilateral lower extremity US was $464.00.

Thus, compared with US, the total incremental cost of CTV in the study sample was $6,375.68 and the total incremental charge was $81,872.00.

No statistical analysis was performed.

No costs beyond the costs of the diagnostic tests themselves were included.

**Synthesis of costs and benefits**
Not relevant as the study was, in effect, a cost-consequences analysis.

**Authors' conclusions**
The authors concluded that this preliminary analysis indicated that computed tomographic venography (CTV) was more costly without improving sensitivity and specificity. The use of CTV was not supported as a diagnostic imaging modality for acute lower-extremity suprageniculate deep vein thrombosis (LE-DVT). Thus, ultrasound scanning (US) remains the standard for the diagnosis of acute LE-DVT.

**CRD COMMENTARY - Selection of comparators**
The comparator represented current practice in the study setting. The authors acknowledged that a limitation of the study was the lack of a venography standard for the diagnosis of DVT, against which both US and CTV could be compared. However, the high sensitivity and specificity of US for the diagnosis of DVT have led to the acceptance of US as the standard technique, replacing venography in most practices. You should decide whether US is standard practice for diagnosing acute LE-DVT in your own setting.

**Validity of estimate of measure of effectiveness**
The effectiveness data were taken from a retrospective case series. Thus, there might have been variation in the way the diagnostic tests were performed between patients, which may limit the generalisability of the results. The authors did not comment on the appropriateness of the study sample. In particular, they did not discuss whether those patients having both CTV and US within one week might have differed from patients with suspected PE who underwent only one test. This is important as the study attempted to assess whether CTV should be used in place of US, and not as a concurrent test. The study reported only point estimates for the primary outcomes. Power calculations were not carried out, hence the sample size may have been too small to evaluate the true performance of CTV.

**Validity of estimate of measure of benefit**
The authors did not derive a summary measure of health benefit. The study was, in effect, a cost-consequences analysis.

**Validity of estimate of costs**
The authors did not specify an economic perspective. The study included only the costs of the diagnostic tests being compared. The authors emphasised that this study was not intended to be a cost-effectiveness analysis, simply an initial analysis of the difference in costs between the two tests. It was not necessary to report the costs and the quantities separately. The price year was not reported. An independent analyst estimated the costs, but further details of the analysis were not reported in the paper. This, and the lack of knowledge about the methodology used, is likely to limit the generalisability of the estimates. The costs were reported as point estimates and, whilst this was appropriate for reporting the charge data, it would have been more informative had more statistics been provided around the estimated
cost data. Discounting was, appropriately, not undertaken.

**Other issues**
The authors made appropriate comparisons of their results with the findings from other studies, showing different sensitivity values. They acknowledged that the lack of a venographic standard for DVT diagnosis against which to compare the two diagnostic tests was a potential limitation. The issue of generalisability to other settings was not addressed. Sensitivity analyses were not performed to account for variability in the cost or outcomes data. The authors did not present their results selectively and their conclusions reflected the scope of the analysis.

**Implications of the study**
The authors concluded that their study does not support the use of CTV in place of US for diagnosing LE-DVT. They recommended that the hypothesis be revisited as more technically advance scanners become available.

**Source of funding**
None stated.

**Bibliographic details**

**PubMedID**
11700478

**DOI**
10.1067/mva.2001.118803

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Costs and Cost Analysis; Female; Humans; Leg /blood supply; Male; Middle Aged; Phlebography; Predictive Value of Tests; Pulmonary Embolism; Retrospective Studies; Sensitivity and Specificity; Tomography, X-Ray Computed /economics; Ultrasonography, Doppler, Duplex /economics; Venous Thrombosis /epidemiology /radiography /ultrasonography

**AccessionNumber**
22001002175

**Date bibliographic record published**
31/03/2005

**Date abstract record published**
31/03/2005