The role of spiral volumetric computed tomography in the diagnosis of pulmonary embolism

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Authors' objectives
To evaluate the evidence for the use of spiral volumetric computed tomography (SVCT) in the diagnosis of acute pulmonary embolism (PE).

Searching
MEDLINE (from 1966 to 1998) and Current Contents (from January to July 1998) were searched for English language articles. In addition, all citations from the references retrieved were reviewed.

Study selection
Study designs of evaluations included in the review
No inclusion criteria relating to the study design were specified.

Specific interventions included in the review
Articles evaluating the role of SVCT in the diagnosis of PE were eligible for inclusion.

Reference standard test against which the new test was compared
The included articles were required to use pulmonary arteriogram or another clinical reference standard (e.g. high-probability ventilation-perfusion scan combined with high clinical suspicion) as the reference standard. The criteria for this diagnosis were not always stated in the articles included in the review, but in 8 studies such criteria were either stated or the article cited Remy-Jardin et al. (see Other Publications of Related Interest).

Participants included in the review
No inclusion criteria relating to the characteristics of the participants were specified.

Outcomes assessed in the review
No inclusion criteria relating to the outcome measures were specified. The outcome measure reported in the review was 2x2 contingency data (i.e. numbers of true-positive, false-positive, false-negative and true-negative results), where pulmonary angiography was the reference standard. These were reported separately for, all vascular zones, central vascular zones, and subsegmental vessels.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The validity of the studies selected for inclusion was assessed according to the following 11 criteria.

1. Did the authors provide a clear description of the SVCT technique employed?
2. Were there clear criteria for a positive or negative result?
3. Was the reliability of the result assessed by comparing independent (blinded) readings?
4. Was the reliability of the result assessed by repeat testing?
5. Was the patient selection process described in sufficient detail?
6. Were there sufficient details about the patient population studied?
7. Were there sufficient details about eligible patients who were not included in the study?

8. Was the extent of disease described in sufficient detail to allow stratification of the results by location or severity of disease?

9. Were non-PE diagnoses reported?

10. Were patients tested by SVCT or the reference, regardless of a previous test with either?

11. Were the results of SVCT and reference standard studies interpreted independently?

The authors did not state how the papers were assessed for validity, or how many reviewers performed the validity assessment.

**Data extraction**
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction. The categories of data extracted included year of publication, country, quality data, the number of patients receiving SVCT, the number of patients receiving any reference standard, the number of patients receiving pulmonary angiography, the selection criteria for pulmonary angiography, and outcomes.

**Methods of synthesis**
How were the studies combined?
A narrative synthesis of the studies was undertaken, along with an informal summation of some tabulated data.

How were differences between studies investigated?
The results were described according to the reference standard, primarily pulmonary angiography, then further broken down by vascular zones. The methodological criteria met by each study were listed.

**Results of the review**
Eleven studies (n=764) were included in the review. Nine studies included a direct comparison (in some or all patients) of SVCT results with pulmonary angiography results (n=384); 6 of these did so in all vascular zones (n=268).

None of the studies included in the review met all 11 criteria for basic methodological standards, and none met criteria 4 and 7. Only 5 studies met five or more criteria. The reported sensitivities of SVCT compared with pulmonary angiography varied widely (64 to 93%), as did the specificity (89 to 100%), which can be explained by differences in the study populations. The sensitivity of SVCT appeared low in subsegmental vessels.

**Authors’ conclusions**
SVCT imaging is promising as a rapid, noninvasive test for the diagnosis of PE, but much additional research is needed. Current SVCT may miss a significant PE, while a positive result needs further testing before a definitive diagnosis of PE can be made. SVCT may be relatively sensitive and specific for diagnosing central pulmonary artery PEs, but it is insensitive for diagnosing subsegmental clots. Additional research is required, such as a large multicentre trial and specific investigation of the sensitivity of SVCT in the detection of small subsegmental emboli.

**CRD commentary**
The review addressed an appropriate question with a limited description of the inclusion and exclusion criteria. The search of electronic databases was not particularly wide reaching, although it was backed up with checks of citation lists. This, and the fact that only English language articles were sought, may have resulted in important articles being missed. In addition, no attempt to identify unpublished articles was reported and publication bias was not assessed.

All studies that compared SVCT with a clinical reference standard for the diagnosis of PE were eligible for inclusion.
The methodological quality of these studies was assessed according to a scale detailed in the review article, although it was unclear whether more than one reviewer performed this assessment and the reporting of the review methodology was generally limited. It was therefore difficult to assess the possible impact of potential flaws in the review process on its findings. In only a few studies were patients referred for SVCT or the reference test, regardless of the results of either, or were the test results interpreted independently of each other. However, the quality of the studies was discussed in some detail in the review. The details of the individual studies were limited: only data for comparisons with PA alone were presented, even though other reference standards were included in the review. There was no formal quantitative synthesis of the data, but data for comparisons with PA were summed in tables. This was appropriate given the different methodologies used in the various studies. The authors’ conclusions are supported by the findings of the review, but should be viewed with caution given the limitations described.

Implications of the review for practice and research
Practice: The authors stated 'The clinical utility of testing strategies employing SVCT must be determined and compared with currently employed algorithms, especially with regard to subsegmental emboli'.

Research: The authors stated 'Additional research is required, including a large multi-centre trial and specific investigation of the sensitivity of SVCT in the detection of small subsegmental emboli'.

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.