Usefulness of CT angiography in diagnosing acute gastrointestinal bleeding: a meta-analysis

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CRD summary
This review concluded that computed tomography angiography was an accurate, cost-effective tool in the diagnosis of acute gastrointestinal bleeding and could show the precise location of bleeding, directing further management. Given the limitations of the included studies and the review, and the lack of any evaluation of cost-effectiveness, the conclusions and implications for practice seem overly strong.

Authors' objectives
To analyse the accuracy of computed tomography (CT) angiography in the diagnosis of acute gastrointestinal bleeding.

Searching
MEDLINE, EMBASE and the Cochrane Library were searched for studies published in English from 1995 to December 2009; search terms were reported. ScienceDirect, SpringerLink, Scopus and the references of retrieved articles were also searched.

Study selection
Diagnostic accuracy studies with CT as the index test compared with a reference standard of angiography, endoscopy, colonoscopy, or surgery alone or in combination for the diagnosis of gastrointestinal bleeding were eligible for inclusion. Studies had to report sufficient data to construct 2x2 tables of test performance on a per-patient basis for at least five patients. Studies were excluded if CT was used but did not provide information on CT alone, or if the diagnosis of gastrointestinal bleeding could not be differentiated from other existing diseases, or if they specialised in the aetiology of bleeding.

Included studies used single detector or multi-detector CT (ranging from dual-slice to 64-slice). The definition of a positive CT was generally extravasation of contrast into the bowel lumen. Reference standards used were digital subtraction angiography, conventional angiography, upper gastrointestinal endoscopy, colonoscopy and surgery, alone or in combination. The severity of gastrointestinal bleeding varied across studies from patients not requiring a blood transfusion to patients with massive gastrointestinal bleeding and/or requiring multiple transfusions.

Two reviewers independently selected studies for the review; disagreements were resolved by consensus.

Assessment of study quality
Study quality was assessed using the 14-point QUADAS (Quality Assessment of Diagnostic Accuracy Studies) tool. Studies had to meet at least nine of the criteria to be included in the review. The results were presented as the number of items fulfilled.

The number of reviewers performing the quality assessment was not reported.

Data extraction
Data were extracted to produce 2x2 tables of test performance on a per-patient basis from which sensitivity and specificity were calculated. A value of 0.5 was added to all cells of studies that contained zero cells. Authors were contacted to request additional information when necessary.

The number of reviewers extracting data was not reported.

Methods of synthesis
Pooled estimates of sensitivity and specificity with 95% confidence intervals (CI) were calculated using the random-effects DerSimonian and Laird model. Heterogeneity was assessed using $X^2$ and $I^2$. A summary receiver operating...
characteristic (SROC) curve was fitted using the Moses and Littenberg model, from which a weighted area under the curve (AUC) was calculated.

**Results of the review**

Nine studies met the inclusion criteria (n=188; range 7 to 41); six were prospective and three were retrospective. The QUADAS scores ranged from 6 to 12. Five of the studies recruited unselected populations.

The pooled sensitivity for CT angiography diagnosis of gastrointestinal bleeding was 89% (95% CI 82 to 94; range 78% to 100%; \(I^2=36\%\)), the pooled specificity was 85% (95% CI 74 to 92; range 17% to 100%; \(I^2=65.1\%\)), and the area under the curve (AUC) was 0.9297.

**Authors' conclusions**

CT angiography was an accurate, cost-effective tool in the diagnosis of acute gastrointestinal bleeding and could show the precise location of bleeding, thereby directing further management.

**CRD commentary**

The review addressed a clear review question supported by appropriate inclusion criteria. Several relevant sources were searched, but only published studies in English were included, so publication and language bias could not be ruled out.

Diagnostic filters were used during the searches, so some studies may have been missed. Inclusion was restricted to studies meeting nine of the 14 QUADAS criteria; some biases may be more relevant than others and it seemed that there was no specification as to which of the criteria needed to be met. The results of the quality assessment were reported only as summary scores, and one of the included studies seems to have met only six of the QUADAS criteria.

Study selection was conducted in duplicate, but it was not clear whether similar methods to reduce error and bias were employed during data extraction and the quality assessment.

Sensitivity and specificity were pooled separately. Although a summary receiver operating characteristic (SROC) analysis was conducted, the model used had limitations, and was not one of the more robust models available. The number of studies and participants included in the analyses was extremely low, with none of the studies having over 50 patients. One study had a much lower specificity than all the other studies; the reasons for this were not investigated.

The review did not assess any cost-effectiveness data.

Given the limitations of the included studies and the review, and the lack of any evaluation of cost-effectiveness, the conclusions and implications for practice seem overly strong.

**Implications of the review for practice and research**

**Practice:** The authors recommended the routine use of CT angiography in the initial radiological investigation of patients who meet the criteria for acute gastrointestinal haemorrhage.

**Research:** The authors stated that large prospective studies are needed to define the role of CT in acute gastrointestinal bleeding when other investigations are unable to provide a diagnosis.

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**Bibliographic details**


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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.