Diagnostic precision of CT in local staging of colon cancers: a meta-analysis

CRD summary
This review concluded that preoperative computed tomography accurately detected colonic tumours that extended beyond the muscularis propria, but was poorer at determining nodal status. These conclusions appear too strong for the data presented and should be viewed cautiously due to limitations in the review methods.

Authors' objectives
To determine the accuracy of computed tomography (CT) in staging colon cancers (detecting disease with invasion beyond the muscularis propria and malignant lymph nodes).

Searching
MEDLINE, EMBASE and The Cochrane Library were searched to March 2009. Search terms were reported. Google Scholar and Vivisimo search engines were used. Bibliographies of included articles were screened for additional studies.

Study selection
Studies in which CT was used to stage colonic tumours preoperatively and that reported information on tumour invasion beyond the muscularis propria (stage T3/T4) and the presence of metastatic malignant lymph nodes (N Stage) were eligible for inclusion. Included studies were required to use histopathology following surgery as the reference standard. Studies needed to report sufficient data to populate 2x2 contingency tables on a per patient basis (numbers of true positive, true negative, false positive and false negative test results).

Participant age in the included studies ranged from 22 to 92 years. Most participants were male. Most participants had colon cancer; some had rectal cancer. Studies were conducted between 1986 and 2008 and included CT, spiral CT and multi-detector CT (MDCT). Section thickness ranged from 1mm to 10mm. Some studies used rectal insufflation with air and other studies used water.

One reviewer screened all studies for inclusion. The selected articles were discussed with second reviewer. Inclusion was decided by consensus.

Assessment of study quality
Methodological quality of the included studies was independently assessed by two reviewers using the 14-item QUADAS tool. Results were reported separately. An overall quality score was calculated by assigning one point for each criterion fulfilled, zero points for unclear criteria and deducting one point for each criterion not fulfilled.

Data extraction
Data were extracted on numbers of true positive, true negative, false positive and false negative test results on a per patient basis for tumour invasion beyond the muscularis propria and for lymph node involvement. These data were used to calculate sensitivity, specificity, and diagnostic odds ratio (DOR) with 95% confidence interval (CI).

The authors did not state how many reviewers performed data extraction.

Methods of synthesis
A bivariate model was used to generate summary receiver operating characteristic (sROC) curves and overall estimates of sensitivity, specificity and diagnostic odds ratios with 95% CIs separately for tumour invasion beyond the muscularis propria and for lymph node involvement.

Various subgroup analyses were conducted. These were based on QUADAS score, section thickness, insufflation, contrast medias, type of CT, publication date and disease staging.
Publication bias was investigated by correlating the inverse variance weighted trial size with the log diagnostic odds ratio across the trials. P-values were two-sided, a p-value of 0.01 was used to determine significance to allow for multiple testing.

Results of the review
Nineteen studies (n=907 participants, range 10 to 124) were included in the review. QUADAS scores ranged from 9 to 14. Twelve studies were prospective and seven were retrospective.

For detection of tumour invasion beyond the muscularis propria (17 studies, 784 participants), pooled sensitivity was 86% (95% CI 78% to 92%), specificity was 78% (95% CI 71% to 84%) and diagnostic odds ratio was 22.4 (95% CI 11.9 to 42.4).

For detection of lymph node involvement (15 studies, 674 participants), pooled sensitivity was 70% (95% CI 63% to 73%), specificity was 78% (95% CI 73% to 82%) and diagnostic odds ratio was 8.1 (95% CI 4.7 to 14.1).

Subgroup analyses indicated that the best results were obtained in studies that used spiral CT or MDCT, used section thickness of 5mm or less and used rectal insufflation with air or water.

There was evidence of publication bias for tumour invasion and lymph node involvement.

Authors' conclusions
Preoperative staging CT accurately distinguished between tumours confined to the bowel wall and those that were invading beyond the muscularis propria; it was significantly poorer at identifying nodal status. MDCT provided the best results.

CRD commentary
A clear research question was stated and appropriate inclusion criteria were defined. A number of sources were searched for relevant studies. No search restrictions were reported. There was some evidence of publication bias. It was unclear whether measures were taken to minimise error and bias during data extraction. Inclusion screening was conducted by a single reviewer and only studies selected for inclusion were checked by a second reviewer. Methodological quality of included studies was assessed, but only an overall score was reported (use of overall scores is not recommended for QUADAS). Methods of synthesis were appropriate and reported clearly.

Overall, the authors' conclusions appear too strong for the data presented (specificity was poor for both tumour invasion and lymph node involvement) and should be interpreted cautiously given limitations in the data and weaknesses in the review methodology.

Implications of the review for practice and research
Practice: The authors stated that the preoperative prognostication of colon cancers should rely principally on the level of local tumour invasion. They also provided a suggested optimum protocol for CT examinations.

Research: The authors stated that future studies should apply the TNM staging system universally and consider peritoneal anatomy to determine accuracy in identifying T4 tumours that infiltrate the peritoneum.

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Bibliographic details

PubMedID
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.