Imaging in assessing lymph node status in gastric cancer
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CRD summary
This review assessed the role of imaging for detecting lymph node metastases in gastric cancer and concluded that the current data did not support the use of any ultrasound, computed tomography, magnetic resonance imaging, positron emission tomography, or fusion technique to confirm or rule out metastases. Despite some limitations in the review process, these conclusions are likely to be reliable.

Authors' objectives
To assess the role of imaging to determine lymph node status as positive or negative (not the stage of lymph node), in gastric cancer.

Searching
MEDLINE and EMBASE were searched for articles included from database inception to July 2008 and search terms were reported. The bibliographies of included studies were screened to identify additional articles. Studies that were not in English were excluded.

Study selection
Studies were eligible for inclusion if they assessed the performance of abdominal ultrasound scan (AUS), endoscopic ultrasound scan (EUS), multi-detector computed tomography (CT, defined as CT with four or more detectors), magnetic resonance imaging (MRI), 18-fluoro-2-deoxyglucose positron emission tomography (FDG PET), or FDG PET CT fusion in determining the lymph node status of patients with newly diagnosed, histologically proven gastric cancer. Included studies were required to report sufficient data for the construction of two-by-two contingency tables, which means the numbers of true positive, false negative, false positive, and true negative results. Only studies of adenocarcinoma, with more than ten participants, were included.

Studies in which patients were pre-surgically treated with radiotherapy or chemotheraphy and studies which investigated only participants with gastric cancers confined to specific areas of the stomach were excluded. All the included studies used intra-operative or post-surgical histopathology as the reference standard for determining lymph node status.

Two reviewers independently assessed studies for inclusion and disagreements were resolved by consensus.

Assessment of study quality
The methodological quality of the included studies was assessed using a checklist adapted from published criteria (including those of Quality Assessment of Diagnostic Accuracy Studies). The checklist assessed internal validity (prospective or retrospective study design, adequacy of reference standard, avoidance of disease progression bias, avoidance of withdrawal bias, avoidance of study examination bias, and avoidance of review biases) and external validity (avoidance of spectrum bias, reporting of demographic data, avoidance of selection bias, standard execution of index test, and avoidance of observer variability bias). If insufficient information was provided on an item, that item was scored negatively. Studies were assigned a total quality score and subtotal quality scores for internal and external validity; studies with a total quality score of 60% or more of the maximum were considered to be of high quality.

Two reviewers independently assessed study quality.

Data extraction
Data were extracted to calculate the sensitivity and specificity values, with 95% confidence intervals (CIs) for each study. Data were also extracted on the technical details of the index test and the criteria used to determine positive lymph node status.

The authors did not state how the data were extracted for the review, nor how many reviewers performed the data
**Methods of synthesis**

The sensitivity and specificity values, with 95% CIs, from individual studies were summarised in the text, listed in a table, and illustrated in forest plots, stratified by index test type.

For each index test, the mean sensitivity and specificity values were compared, between studies of high and low quality, using a paired t-test.

**Results of the review**

**Inclusion**: Six abdominal ultrasound scan (AUS) studies (n=22 to 198 patients), 30 endoscopic ultrasound scan (EUS) studies (n=21 to 254), ten multi-detector computed tomography (CT) studies (n=27 to 124), three magnetic resonance imaging (MRI) studies (n=21 to 46), four fluorodeoxyglucose positron emission tomography (FDG PET) studies (n=13 to 81) and one FDG PET CT fusion study (n=78) were included.

**Quality**: The median quality score was 58% (range 31 to 69) for AUS studies, 54% (range 38 to 77) for EUS studies, 70% (range 38 to 85) for multi-detector CT studies, 62% (range 46 to 77) for MRI studies, and 58% (range 46 to 62) for FDG PET studies, and the total quality score was 54% for the FDG PET CT fusion study.

**Sensitivity and specificity**: The median sensitivity was 39.9% (range 12.2 to 80) for AUS, 70.8% (range 16.7 to 96.8) for EUS, 80% (range 62.5 to 91.9) for multi-detector CT, 68.8% (range 54.6 to 85.3) for MRI, and 34.3% (range 33.3 to 64.6) for FDG PET. The median specificity was 81.8% (range 56.3 to 100) for AUS, 84.6% (range 48.4 to 100) for EUS, 77.8% (range 50 to 87.9) for multi-detector CT, 75% (range 50 to 100) for MRI, and 93.2% (range 85.7 to 97) for FDG PET. The sensitivity for FDG PET CT fusion was 54.7% and the specificity was 92.2%.

No significant differences in mean sensitivity or mean specificity values were identified between studies of high and low methodological quality.

**Authors’ conclusions**

AUS, EUS, multi-detector CT, conventional MRI and FDG PET could not reliably be used to confirm or rule out the presence of lymph node metastases in gastric cancer. The performance of high resolution FDG PET CT fusion and functional MRI techniques remained to be determined.

**CRD commentary**

This review assessed the role of imaging techniques in determining lymph node metastases in patients with gastric cancer. A number of relevant sources were searched and appropriate inclusion criteria were defined. The restriction to English-language publications means that language bias cannot be ruled out. Measures to avoid error and bias were taken during the inclusion screening and quality assessment, but it is unclear whether these measures were applied to the data extraction. Appropriate criteria were used to assess the quality of the included studies and the results of the quality assessment were reported in full. The use of a summary quality score to compare the findings of high and low quality studies was inappropriate. Given the heterogeneity between studies, the authors judged that pooling estimates of sensitivity and specificity was not appropriate and they presented medians and ranges. The subsequent use of simple mean sensitivity and specificity values to compare high and low quality studies cannot therefore be justified. Summary receiver operating characteristic curves might have been useful for the larger datasets (EUS, multi-detector CT, and AUS).

The authors’ conclusions are a reasonable interpretation of the data presented, but given the small numbers of studies available for conventional MRI and FDG PET, the performance of these techniques might also reasonably remain to be determined.

**Implications of the review for practice and research**
Practice: The authors stated that AUS, EUS, multi-detector CT, conventional MRI and FDG PET could not reliably be used to confirm or rule out the presence of lymph node metastases in gastric cancer.

Research: The authors made no specific recommendations for future research.

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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.