Diagnostic performance of computer tomography, magnetic resonance imaging, and positron emission tomography or positron emission tomography/computer tomography for detection of metastatic lymph nodes in patients with cervical cancer: meta-analysis

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CRD summary
This review concluded that positron emission tomography (PET) or PET/computed tomography (CT) had overall higher diagnostic performance than those of CT or magnetic resonance imaging (MRI) in detecting metastatic lymph nodes in patients with cervical cancer. Limitations in the review methods and combining of direct and indirect comparative data mean that these conclusions should be interpreted cautiously.

Authors' objectives
To compare diagnostic performances of computed tomography (CT), magnetic resonance imaging (MRI) and positron emission tomography (PET) or PET/CT for detection of metastatic lymph nodes in patients with cervical cancer.

Searching
MEDLINE, EMBASE and The Cochrane Library were searched from January 1981 to December 2007 for CT, January 1988 to December 2007 for MRI and January 2001 to December 2007 for PET or PET/CT; search terms were reported. Bibliographies of relevant articles were screened to identify additional studies. Only English-language studies were included.

Study selection
Studies of at least 20 patients who underwent imaging to assess lymph node metastases from cervical cancer and used histological examination of lymph nodes by surgery or biopsy as the reference standard were eligible for inclusion. Studies had to report clear diagnostic criteria and sufficient data to populate 2x2 contingency tables (numbers of true-positive, false-positive, true-negative and false-negative test results).

Included studies reported both patient-based and region- or node-based data. Studies of CT used either non-helical or single helical scans. Most studies of MRI reported a field strength of 1.5 Tesla.

Studies were independently assessed for inclusion by the three authors. Any disagreements were resolved by discussion.

Assessment of study quality
The authors did not state that they assessed study validity.

Data extraction
Numbers of true-positive, false-positive, true-negative and false-negative test results were extracted for each study and each comparison (such as per patient, per region or per node and CT, MRI, PET or PET/CT) within studies. These data were used to calculate sensitivity, specificity and positive and negative likelihood ratios.

Where there were insufficient or missing data in a study, authors were contacted to request the relevant information.

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

Methods of synthesis
Summary receiver operating characteristic (sROC) curves and sensitivity and specificity with 95% confidence intervals were calculated using a bivariate model. Analyses were conducted separately for each imaging modality and for patient-based and region/node-based data. Area under the sROC curve (AUC) and Q* (the point on the sROC curve which represents maximal joint sensitivity and specificity) were reported.
Two-sample Z-tests were used to assess differences in sensitivity, specificity, AUC and Q* values between imaging modalities (p<0.05 was considered statistically significant).

Between-study heterogeneity was assessed using the I² statistic. I² values greater than 50% were considered to indicate substantial heterogeneity. A subgroup analysis was performed based on the type of CT scanner used (helical versus non-helical).

Results of the review
Forty-one studies were included in the review. Nineteen studies (20 data sets, n=1,099 participants) were included for CT. Twenty-four studies (31 data sets, n=1,342 participants) were included for MRI. Twelve studies (20 data sets, n=737 participants) were included for PET or PET/CT.

Patient-based analyses:

The sensitivities of CT (16 studies), MRI (21 studies) and PET or PET/CT (12 studies) were 50% (95% CI 43% to 57%), 56% (95% CI 51% to 62%) and 82% (95% CI 75% to 87%); there was substantial between-study heterogeneity in all data sets.

The specificities of CT, MRI and PET or PET/CT were 92% (95% CI 90% to 94%), 91% (95% CI 90% to 93%) and 95% (95% CI 93% to 97%); there was substantial between-study heterogeneity in all data sets except CT.

The sensitivity of PET or PET/CT was significantly higher than those of CT or MRI (both p<0.001). The specificity of PET or PET/CT was significantly higher than those of CT (p=0.04) and MRI (p<0.001).

Region/node-based analyses:

The sensitivities of CT (four studies), MRI (nine studies) and PET or PET/CT (eight studies) were 52% (95% CI 42% to 62%), 38% (95% CI 32% to 43%) and 54% (95% CI 46% to 61%); there was substantial between-study heterogeneity in all data sets.

The specificities of CT, MRI and PET or PET/CT were 92% (95% CI 90% to 94%), 97% (95% CI 97% to 98%) and 97% (95% CI 96% to 98%); there was substantial between-study heterogeneity in all data sets.

The sensitivities of CT and PET or PET/CT were significantly higher than that of MRI (p<0.02 and p<0.001). The specificities of MRI and PET or PET/CT were higher than that of CT (both p<0.001).

The results of the subgroup analysis were reported in the discussion.

Authors’ conclusions
PET or PET/CT had an overall higher diagnostic performance than those of CT or MRI in detecting metastatic lymph nodes in patients with cervical cancer.

CRD commentary
The review stated a clear objective and reported inclusion criteria. Sources were searched to identify relevant studies. The restriction to studies in English may have introduced language bias. Assessment of studies for inclusion incorporated measures to reduce error and bias; whether similar measures were used throughout the review process was unclear. No assessment of the methodological quality of included studies was reported and so the reliability of individual study results could not be assessed. Reporting of participant characteristics was limited (for example, disease stage and prior treatment status were not reported), which made it difficult to judge the generalisability of the review findings.

Meta-analytic methods used were broadly appropriate. It appeared that comparisons between imaging modalities appear were based on a mixture of direct and indirect comparisons; it may have been useful to consider separately data from studies that assessed multiple imaging modalities in the same patient group.
The authors’ conclusions reflected the data presented, but should be interpreted cautiously due to methodological limitations.

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

**Practice:** The authors did not state any recommendations for practice.

**Research:** The authors stated that further research was needed to determine the extent of reporting or publication bias in this topic area.

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