Computed tomography and magnetic resonance imaging in staging of uterine cervical carcinoma: a systematic review

CRD summary
This review aimed to assess the diagnostic performance of computed tomography (CT) and magnetic resonance imaging (MRI) in staging cervical carcinoma. The authors concluded that, for overall staging of cervical carcinoma, MRI is more accurate than CT. The review was well conducted and reported, and the conclusion is supported by the results.

Authors' objectives
To review the available evidence on the diagnostic performance of computed tomography (CT) and magnetic resonance imaging (MRI) in staging cervical carcinoma.

Searching
English and German language studies were identified from searches of MEDLINE and EMBASE from January 1985 to May 2002; the search terms were reported. Additional efforts to identify relevant studies included the cross-checking of reference lists. Review articles, letters and comments were not eligible for inclusion.

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
Studies of CT and MRI were eligible for inclusion.

Reference standard test against which the new test was compared
Studies that used histopathology of specimens obtained by surgery, laparotomy, postmortem, biopsy or fine-needle aspiration as the reference standard were eligible for inclusion.

Participants included in the review
Studies that included at least 10 patients were eligible for inclusion. The studies included women with cervical cancer.

Outcomes assessed in the review
The studies had to report sufficient data to construct a 2x2 contingency table comparing the findings of the imaging technique with those of the reference standard to be included. The sensitivity and specificity were calculated for the detection of parametrial invasion, bladder invasion, rectal invasion and lymph node involvement.

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
Studies were assessed for the following methodological criteria: patient selection (consecutive or nonconsecutive); interpretation of the results (blinded or not blinded); method of verification (partial or complete); method of data collection (prospective, retrospective or unknown); description of the study population, diagnostic test(s) and reference test (sufficient or insufficient). Two reviewers independently assessed methodological quality using a standard form. Any discrepancies were resolved independently by a third reviewer.
Data extraction
Two reviewers independently extracted the data using a standard form. Any discrepancies were resolved independently by a third reviewer. For each study, the sensitivity and specificity were calculated from the 2x2 tables.

Methods of synthesis
How were the studies combined?
A bivariate-normal random approach was used to pool data on the sensitivity and specificity (see Other Publications of Related Interest).

How were differences between studies investigated?
To investigate heterogeneity between studies, the following covariates were analysed: sample size (greater than 50 versus less than or equal to 50); publication period (1985 to 1991 versus 1992 to 1997 versus 1998 to 2002). The influence of methodological characteristics on the estimates of test accuracy was also investigated (patient selection, unblended interpretation of test results, verification bias, and retrospective collection of data). These analyses were carried out by adding covariates simultaneously to the bivariate model.

A subgroup analysis comparing different MRI techniques was undertaken for: T2-weighted versus gadolinium-enhanced T1 weighted sequences; body coil versus body and additional coil; low to medium magnetic field strength (less than 1.5 Tesla) versus high magnetic field strength (at least 1.5 Tesla). The z-test was used to test for differences between subgroups.

Results of the review
Fifty-seven studies were included (number of patients not reported).

Many studies suffered from selective patient sampling, suboptimal interpretation of the results, incomplete verification methods, and poor description of the study population and reference test.

Parametrical invasion (MRI, n=52; CT, n=9).
Both the sensitivity and specificity were heterogeneous for MRI, and there were fewer studies for CT. The pooled sensitivity was 74% (95% confidence interval, CI: 68, 79) for MRI and 55% (95% CI: 44, 66) for CT. The difference in sensitivity between MRI and CT was statistically significant (P=0.0027). The specificities of the two techniques were comparable.

Lymph node involvement (MRI, n=25; CT, n=17).
Heterogeneity was mainly observed in the sensitivity for both CT and MRI. The pooled sensitivity was 60% (95% CI: 52, 68) for MRI and 43% (95% CI: 37, 57) for CT. This difference was statistically significant (P=0.047). The specificities of the two techniques were comparable.

Bladder invasion (MRI, n=16; CT, n=3).
The pooled sensitivity was 75% (95% CI: 66, 83) for MRI and 64% (95% CI: 39, 82) for CT. This difference was not statistically significant. The pooled specificity was 91% (95% CI: 83, 95) for MRI and 73% (95% CI: 52, 87) for CT. This difference was statistically significant (P=0.032).

Rectum invasion (MRI, n=9; CT, n=2).
The pooled sensitivity was 71% (95% CI: 53, 83) for MRI and 45% (95% CI: 20, 73) for CT. This difference was not statistically significant. The specificities of the two techniques were comparable.

Investigation of heterogeneity.
The study results were plotted in receiver operating characteristic curve space, which gives a visual assessment of
heterogeneity between studies. There were only sufficient data to carry out covariate adjustment and subgroup analysis for MRI datasets obtained for parametrial invasion and lymph node involvement. Population size, publication period and shortcomings in methodology had no influence on the estimates of sensitivity and specificity. No differences were observed in subgroups comparing MRI techniques.

Authors' conclusions
For overall staging of cervical carcinoma, MRI is more accurate than CT.

CRD commentary
This was a well conducted and reported review. The inclusion criteria were clearly specified, a reasonable literature search was conducted, and details of the review methods were reported. A detailed quality assessment was carried out and included in the synthesis of results, and advanced methods for the meta-analysis of test accuracy studies were used to combine the results. It is possible that publication bias could be a problem in this review, as attempts to identify unpublished studies do not appear to have been made. However, it is unclear whether this is likely to have affected the results of the review. The authors' conclusions are supported by the results presented.

Implications of the review for practice and research
Practice: The authors stated that in clinically early-stage cancer, the prevalence of spread of disease outside the cervix is low and, therefore, the additional value of MRI is limited. In more advanced disease, MRI can play an important role as clinical staging has significant limitations.

Research: The authors stated that more MRI studies, satisfying all methodological criteria, are needed to fully evaluate MRI techniques and protocols and to obtain a uniform MRI strategy.

Bibliographic details

PubMedID
14529663

Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

MeSH
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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.