Accuracy of magnetic resonance imaging in ovarian tumor: a systematic quantitative review

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CRD summary
This review concluded that magnetic resonance imaging appeared to be a useful pre-operative test for differentiating malignant from benign pelvic masses. This conclusion reflects the data presented and is appropriately cautious, given some limitations in the analytic methods and reporting of the review.

Authors’ objectives
To assess the accuracy of magnetic resonance imaging (MRI) for the diagnosis of ovarian cancer.

Searching
MEDLINE, CANCERLIT, LILACS, EMBASE and The Cochrane Library were searched from January 1990 to February 2010. There were no language restrictions. Search terms were reported. Bibliographies of included studies were screened for additional articles.

Study selection
Observational studies that assessed MRI for diagnosis of ovarian cancer in patients with clinically suspicious adnexal masses were eligible for inclusion. MRI had to be performed on a 1.5T scanner using a pelvic coil and T1-weighting for the transverse plane and T2-weighting for the transverse and sagittal planes. Included studies were required to use histological analysis of surgical samples as the reference standard and report sufficient data for construction of 2x2 contingency tables (numbers of true positive, false negative, false positive and true negative test results).

Where reported, mean age of participants across the included studies was 49 years (range 13 to 87 years) and study dates ranged from 1989 to 2007.

Studies were assessed independently by eight reviewers. Final inclusion decisions were made using a checklist. Disagreements were resolved by discussion or, where this was not possible, by the decision of one reviewer.

Assessment of study quality
The methodological quality of included studies was assessed based on methods of data collection, relevant features of population/selection, description of the index test and reference standard and presence of verification biases.

The authors did not specify how many reviewers performed the quality assessment, but the data analysis included percentage agreement which implied that more than one reviewer was involved.

Data extraction
Data were extracted to populate 2x2 contingency tables for borderline or malignant ovarian tumours versus benign ovarian lesions. These data were used to calculate sensitivity and specificity and positive and negative likelihood ratios, with 95% confidence intervals (CIs).

Articles in English were extracted by six reviewers and non-English articles were extracted independently by two reviewers. Any disagreements were resolved by consensus.

Methods of synthesis
Pooled estimates of sensitivity and specificity, with 95% CIs, were calculated using a random-effects model. Pooled positive and negative likelihood ratios were calculated from the pooled estimates of sensitivity and specificity. Where 2x2 tables contained zero values, 0.5 was added to each cell.

Between-study heterogeneity was assessed using the Cochran and $\chi^2$ tests. The association between sensitivity and
specificity was assessed using Spearman's correlation coefficient. A summary receiver operating characteristic (SROC) curve was constructed to assess the trade-off between sensitivity and specificity. A sensitivity analysis included only the 11 studies classified as level 2B on the Oxford Centre for Evidence-based Medicine Levels of Evidence classification.

Results of the review
Eighteen studies (n=1,481 participants, 1,442 masses analysed). Sample sizes ranged from 37 to 136 patients. Two of the included studies were blinded and 11 were prospective studies with consecutive recruitment. All studies had complete verification using the reference standard and all reported adequate details of both the index test and reference standard.

The pooled estimate of the sensitivity of MRI for differentiating borderline or malignant ovarian tumours from benign lesions was 92% (95% CI 89 to 94) and the pooled estimate of specificity was 85% (95% CI 82 to 87). The pooled estimates of positive and negative likelihood ratios were 6.7 (95% CI 4.3 to 10.5) and 0.1 (95% CI 0.08 to 0.15). There was significant between-study heterogeneity for all estimates.

The sensitivity analysis did not change estimates of test accuracy.

Data on positive and negative predictive values and area under the SROC curve were reported.

Authors' conclusions
Magnetic resonance imaging appeared to be a useful pre-operative test for differentiating malignant from benign pelvic masses.

CRD commentary
The review stated a clear objective and defined appropriate inclusion criteria. Several sources were searched for relevant studies. The search strategy included methodological terms for test accuracy studies; these terms have been shown to reduce the sensitivity of searches and may have resulted in the omission of relevant studies. The methodological quality of included studies was assessed and details were reported. Study selection and data extraction processes included measures to reduce error and/or bias. There was a small discrepancy between the positive likelihood ratio reported in the abstract and that given in the body of the paper. Given the apparent between-study heterogeneity and the inclusion of an SROC curve, use of a bivariate model (or similar) to generate overall estimates of sensitivity and specificity may have been more appropriate.

The authors’ conclusions reflect the data presented and are appropriately cautious given the limitations in the analytic methods and reporting of the review.

Implications of the review for practice and research
The authors did not specify any recommendations for clinical practice and research.

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