Accuracy of MRI in prediction of pathologic complete remission in breast cancer after preoperative therapy: a meta-analysis

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CRD summary
The review concluded that magnetic resonance imaging had high specificity and relatively low sensitivity in predicting complete pathologic remission after preoperative therapy in patients with breast cancer; pathologic remission rate may influence the performance of MRI in this setting. Limitations in the review methods and analysis mean that these conclusions should be viewed cautiously.

Authors’ objectives
To assess the performance of magnetic resonance imaging (MRI) as a predictor of pathologic complete remission in breast cancer after preoperative therapy.

Searching
MEDLINE and Social Sciences Citation Index were searched from January 1998 to April 2009. Search terms were reported. Bibliographies of relevant articles and reviews were screened for additional studies. Only studies published in full in English were included.

Study selection
Studies that assessed the performance of MRI in predicting remission after preoperative therapy in at least 10 women with breast cancer and used histopathologic findings as the reference standard were eligible for inclusion. Included studies had to report sufficient data to populate 2x2 contingency tables (numbers of true-positive, false-positive, true-negative and false-negative test results) and meet more than nine of the 14 methodological quality criteria of the QUADAS tool. Studies that reported combined data from different diagnostic methods were excluded.

Where reported, all included studies used contrast-enhanced MRI (gadolinium or gadolinium compounds at various doses). MRI field strength ranged from 0.5 to 1.5T. The initial clinical stage and histological subtypes of tumours varied. Various preoperative therapy regimens were used.

The authors did not state how many reviewers screened studies for inclusion.

Assessment of study quality
Meeting more than nine of the 14 methodological quality criteria of the QUADAS tool was used as an inclusion criterion. No further details of methodological quality assessment were reported.

The authors did not state how many reviewers applied the methodological quality inclusion criterion.

Data extraction
Numbers of true-positive, false-positive, true-negative and false-negative test results were extracted for each study; a correction factor of 0.5 was added to any zero value. These data were used to calculate the sensitivity, specificity and diagnostic odds ratio (DOR), with 95% confidence intervals (CIs), of MRI to predict complete pathologic remission.

Two reviewers independently extracted data. Disagreements were resolved by discussion with a third reviewer.

Methods of synthesis
Summary receiver operator characteristic (SROC) curves were estimated using the Moses and Littenberg model. Weighted summary estimates of sensitivity, specificity and diagnostic odds ratio, with 95% CI, were calculated using a random-effects model (weighting unspecified).
Sources of heterogeneity (publication year, mean participant age, pathologic complete remission rate and the ratios of participants positive for oestrogen receptor, progesterone receptor and human epidermal growth factor receptor 2) were explored using meta-regression analysis.

Publication bias was assessed using funnel plots of log odds ratio versus log standard error odds ratio.

**Results of the review**

Twenty-five studies (n=1,213 participants, with 1,225 breast cancers) were included in the review.

The pooled estimate of sensitivity was 0.63 (95% CI 0.56 to 0.70, $I^2=63.5\%$). The pooled estimate of specificity was 0.91 (95% CI 0.89 to 0.92, $I^2=74.1\%$). The pooled estimate of diagnostic odds ratio was 17.05 (95% CI 10.59 to 27.19); there was significant between-study heterogeneity for diagnostic odds ratio.

Regression analyses suggested that the rate of complete pathologic remission was the only factor investigated to significantly effect the diagnostic performance of MRI ($p=0.02$).

Subgroup analyses indicated that the specificity of MRI was lower in studies with a complete pathologic remission rate of at least 20% than in studies with a complete pathologic remission rate less than 20% ($p=0.0003$).

A funnel plot suggested possible publication bias.

**Authors' conclusions**

MRI had high specificity and relatively low sensitivity in predicting complete pathologic remission after preoperative therapy in patients with breast cancer. Pathologic remission rate may have influenced the performance of MRI in this setting.

**CRD commentary**

The review stated a clear research objective and defined appropriate inclusion criteria. A number of sources were searched for relevant studies. The restriction to published English-language studies risked language and publication biases. The data extraction process included measures to minimise error and/or bias; it was unclear whether similar measures were applied throughout the review process. A minimum methodological quality score was used as an inclusion criterion, but no further details of study quality were reported and the reliability of individual study results could not be assessed adequately. Given the presence of significant between-study heterogeneity in all data sets, the value of pooled estimates of diagnostic performance was questionable.

The authors conclusions reflected the data presented, but should be interpreted cautiously in view of the limitations in the review methods and analysis.

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

**Practice:** The authors stated that given its relatively low sensitivity, radiologists should be cautious in reporting complete remission at MRI; greater weight should be given to minimal signs after preoperative therapy.

**Research:** The authors stated that further studies were needed to validate the predictive power of MRI in patients with breast cancer who had received preoperative therapy and investigate the influence of pathologic complete remission rates on test performance.

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**Bibliographic details**

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.