# The role of ultrasonography as an adjunct to mammography in the detection of breast cancer: a systematic review

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## Authors' objectives

To assess the diagnostic value of ultrasonography as an adjunct to mammography in detecting breast cancer.

## Searching

MEDLINE, EMBASE, and the Cochrane Library were searched for studies published between 1990 and 2000; the search terms were not reported. Studies in English, German, French, Italian, or Dutch were eligible for inclusion. The reference lists of selected papers were screened for additional studies.

## Study selection

### Study designs of evaluations included in the review

The authors did not specify any a priori inclusion criteria relating to the study design. It appears that studies of any design were eligible for inclusion. The authors did not report the exact study designs included.

### Specific interventions included in the review

The authors stated that studies were eligible for inclusion if they performed both mammography and ultrasonography on the same participants. In actuality, the included studies compared either mammography versus ultrasonography, or mammography plus ultrasonography versus mammography alone.

### Reference standard test against which the new test was compared

To be eligible for inclusion in the review, studies had to use the 'gold' standard of pathology (preferably from histological needle biopsy or surgery) or follow-up of patients with negative imaging results, preferably for one year or longer.

### Participants included in the review

Studies of people undergoing screening for breast cancer were eligible for inclusion. The median prevalence of breast cancer in the included studies was 45% (range: 5.5 to 72.2). The mean age of the participants ranged from 37 to 54 years.

### Outcomes assessed in the review

To be eligible for inclusion, studies had to report sensitivity and specificity statistics, or data that allowed the authors to calculate the sensitivity and specificity. The natural logarithm of the diagnostic odds ratio (OR) was used to compare the diagnostic performance of ultrasonography and mammography.

### 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

The authors did not state that they assessed validity.

## Data extraction

The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction. Data were extracted on: publication details; study population selection; characteristics of the participants in whom ultrasonography was performed; definition of a positive imaging result; whether ultrasonography was interpreted with or without knowledge of the mammography results; the average age of the study population; age distribution; the proportion of participants with dense breast parenchyma; the prevalence of benign and malignant lesions; and sensitivity

and specificity.

The authors calculated the diagnostic OR and then calculated the natural logarithm of the diagnostic OR for mammography and ultrasonography in each study. They used the difference in logarithmic statistics to represent the diagnostic performance of mammography relative to ultrasonography.

## Methods of synthesis

**How were the studies combined?**
The authors used summary statistics to describe trends and tabulated the sensitivity, specificity and diagnostic OR of mammography and ultrasonography.

**How were differences between studies investigated?**
The authors did not report a formal method of assessing heterogeneity. They described some differences between the studies and used non-parametric tests to assess the influence of methods of selecting the study population and methods of interpreting ultrasonographic results on diagnostic performance. Three groups of studies were distinguished, based on the way the study population was selected: (1) women referred because of palpable breast lumps or other abnormal findings on clinical examination; (2) women who underwent ultrasonography because of suspicious lesions on clinical examination or mammography; and (3) women who were referred for biopsy or surgery. The authors also examined differences between studies where ultrasonic images were interpreted independently or blinded from the mammography results, and those where the ultrasonography results were interpreted with prior knowledge of the mammography findings.

## Results of the review

The review included 22 studies, the designs of which were not reported. Of these studies, 21 compared the sensitivity and specificity of ultrasonography versus mammography (n=8,477) and 6 compared a diagnosis with mammography alone versus a diagnosis with mammography plus ultrasonography.

The sensitivity of ultrasonography ranged from 49 to 100%, while that of mammography ranged from 57 to 97%.

The specificity of ultrasonography ranged from 29 to 100%, while that of mammography ranged from 36 to 97%.

Comparisons of logarithmic diagnostic ORs found that in more than half of the studies, the diagnostic performance of ultrasonography was better than the diagnostic performance of mammography. All 6 studies comparing mammography plus ultrasonography versus mammography alone found that sensitivity increased when ultrasonography was used as an adjunct to mammography. In 3 of these 6 studies, specificity decreased when ultrasonography was used as an adjunct to mammography.

Ultrasonography performed better than mammography in 4 of the 10 studies in which knowledge of the mammography results was available when interpreting ultrasonography, and in 8 of the 11 studies where ultrasonography was interpreted independently.

The authors reported further results relating to the effect of study population selection on the diagnostic performance of ultrasonography relative to mammography.

## Authors' conclusions

There was little evidence to confirm the value of ultrasonography as an adjunct to mammography in detecting breast cancer. The authors suggested that heterogeneity in diagnostic performance in the primary studies might be explained by differences in patient selection and in methods of interpreting ultrasonography.

## CRD commentary

The research question was clearly specified and the inclusion and exclusion criteria were provided. The search strategy was reasonable, but limited, and the Cancerlit database was not searched. Relevant studies might, therefore, have been

omitted from the review. The authors did not report a formal method of assessing validity, nor did they report how decisions on the relevance of primary studies were made or how the data were extracted. It is therefore unclear whether steps were taken to minimise bias in the review process.

The authors' stated objective was to compare ultrasonography as an adjunct to mammography versus mammography alone. Only 6 studies included in the review focused on this comparison, but the authors included data from 16 other studies comparing the sensitivity and specificity of mammography and ultrasonography. This suggests that some of the data reported may be spurious to the primary research question.

The studies were appropriately combined, although the authors could have presented the pooled results and subgroup analyses more clearly to address their research question. A more comprehensive meta-analysis might also have been appropriate, especially for the 6 studies that compared mammography plus ultrasonography versus mammography alone.

The authors' conclusions appear to be supported by the data presented. However, there was too little information about the review process, or the studies that directly addressed the question, to guarantee that the conclusions are reliable.

## Implications of the review for practice and research
Practice: The authors stated that although adding ultrasonography to mammography is common clinical practice, there is little evidence to confirm that this improves diagnostic accuracy. Although breast ultrasonography does not harm the patient, the authors suggested that the cost and lack of clinical benefit of ultrasonography should limit its widespread use.

Research: The authors suggested that further research is needed in consecutive patients to identify subgroups in which the highest diagnostic yield from ultrasonography would be obtained.

## Bibliographic details
Flobbe K, Nelemans P J, Kessels A G, Beets G L, von Meyenfeldt M F, van Engelshoven J M. The role of ultrasonography as an adjunct to mammography in the detection of breast cancer: a systematic review. European Journal of Cancer 2002; 38(8): 1044-1050

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12008191

## Other publications of related interest
Flobbe K. Bosch AM. Kessels AG. Beets GL. Nelemans PJ. von Meyenfeldt MF. van Engelshoven JM. The additional diagnostic value of ultrasonography in the diagnosis of breast cancer. Archives of Internal Medicine 2003;163(10):1194-9.

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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.