Comparative evaluation of digital mammography and film mammography: systematic review and meta-analysis

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CRD summary
This review concluded that cancer detection rates were slightly higher using digital mammography than film mammography. Characteristics of tumours detected were similar and there were no significant differences in recall rates between film and digital mammography. These conclusions reflect the data, but should be interpreted cautiously, given limitations in the review process and analysis and small effect sizes.

Authors' objectives
To compare the performance of digital and film mammography for breast cancer screening.

Searching
MEDLINE, Scopus, EMBASE and LILACS were searched to September 2009. The bibliographies of included studies were screened for additional studies. Only studies with an abstract in English, Portuguese or Spanish were included; search terms were reported.

Study selection
Paired studies, cohort studies and clinical trials that compared film mammography and digital mammography, for breast cancer screening in women over 40 years, were eligible for inclusion. Outcomes of interest were: cancer detection rate (the ratio of the number of cancer cases confirmed through biopsy to the number of cases detected by each screening method) in all patients screened; patient recall rate (the proportion of the patients with screening results requiring further investigation); and characteristics of the tumours detected (the ratio of invasive tumours to in situ tumours found using each method). Studies were excluded if they included patients with previously reported cancer.

All studies were conducted in Europe or North America. Where reported, the age of study participants ranged from 40 to 74 years.

Two reviewers independently assessed studies for inclusion and disagreements were resolved by consensus.

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

Data extraction
Data were extracted on total number of cases, number of recall cases, total number of cases with a cancer diagnosis, positive predictive value and total numbers of in situ carcinomas and invasive carcinomas. Risk ratios (RR) with 95% confidence intervals (CIs) were calculated for each outcome (cancer detection, patient recall and invasive cancer detection).

Two reviewers independently extracted data and disagreements were resolved by consensus.

Methods of synthesis
Pooled estimates of risk ratios, with 95% confidence intervals, were calculated for each outcome measure using a random-effects model. Subgroup analyses were also reported for different study designs (RCTs, paired studies and cohort studies) and for different age groups, where data were available.

Between-study heterogeneity was assessed using $X^2$ and $I^2$.

Results of the review
A total of 11 studies were included in the review; one randomised controlled trial (RCT; 6,944 digital mammography images and 16,985 film mammography images), three paired studies (53,179 digital mammography images and film
mammography images) and seven cohort studies (130,199 digital mammography images and 568,184 film mammography images).

Pooled data from all 11 studies indicated a higher rate of cancer detection with digital mammography than with film mammography (RR 1.17, 95% CI 1.06 to 1.29, I²=19%). Results were similar for the seven cohort studies and the single RCT, but the pooled estimate derived from the three paired studies showed no significant difference in cancer detection rates between the two screening methods.

There was high between-study heterogeneity in patient recall rate (I²=96%) and meta-analysis showed no significant difference in recall rate between the two screening methods. The RCT showed a higher recall rate in patients who underwent digital mammography (RR 1.69, 95% CI 1.46 to 1.96).

Invasive carcinoma detection rates and in situ carcinoma detection rates were similar between the two screening methods, for studies that reported this information (one RCT and six cohort studies).

Subgroup analysis, using data from three cohort studies, indicated that digital mammography was better than film mammography for detecting tumours in participants between 50 and 60 years of age (RR 1.23, 95% CI 1.05 to 1.44, I²=0%); no significant differences were found for participants older than 60 years of age. The RCT found that digital mammography was more effective in patients over 50 years, (RR 1.58, 95% CI 1.02 to 2.46), but not in patients between 45 and 49 years of age.

Authors' conclusions
Cancer detection rates were slightly higher using digital mammography than using film mammography. The characteristics of the tumours detected were similar for the two screening methods. There were no significant differences in recall rates between film and digital mammography.

CRD commentary
The review stated a clear objective and reported full inclusion criteria. Several sources were searched for relevant studies, but the restriction to studies with abstracts in English, Portuguese or Spanish raised the possibility of language bias and potential omission of relevant studies. Measures to minimise error and bias were applied throughout the review process.

The authors did not report any assessment of the methodological quality of the included studies, which made it difficult to assess the extent to which weaknesses in the design of primary studies may have affected the findings of the review; it should be noted that the review included only one RCT. Pooling of data across different study designs and/or in the presence of high between-study heterogeneity was of questionable value. The authors' conclusions reflected the data presented, but should be interpreted cautiously, given limitations in the review process and analysis, and the small effect sizes observed.

Implications of the review for practice and research
Practical: The authors stated that the possibility of long-distance transmission, which enabled assessment by specialists away from the examination centre, was an important element of the digital system to consider in developing countries or in places with a reduced number of radiologists experienced in mammography.

Research: The authors did not specify any recommendations for future research.

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