Ultrasonographic differentiation of malignant from benign breast lesions: a meta-analytic comparison of elasticity and BIRADS scoring
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CRD summary
This generally well-conducted review concluded that ultrasound elastography was not superior to B-mode ultrasound but ultrasound elastography after a positive B-mode ultrasound in low risk patients could avoid unnecessary biopsies. The conclusions regarding the comparative accuracy of the tests are likely to be reliable. However, the potential risk of bias means the accuracy estimates could have been overestimated.

Authors' objectives
To compare the effectiveness of conventional B-mode ultrasound versus breast ultrasound elastography or their combination in differentiating breast lesions.

Searching
PubMed, EMBASE, Web of Knowledge and The Cochrane Library were searched from inception to August 2011 for studies published in full. There were no language restrictions. Search terms were reported. Reference lists from identified studies were scanned.

Study selection
Studies of patients of any age with breast symptoms or an abnormal clinical breast examination, breast ultrasound or mammography that directly compared the B-mode and 5-point breast elastography scale ultrasound for differentiation of focal breast lesions as benign or malignant were eligible for inclusion. Where mammography was used, this had to be reported according to the American College of Radiology breast imaging reporting and data system (BIRADS). Eligible reference standards were histopathology (core biopsy or surgical biopsy) or cytology (fine needle aspiration).

Mean ages of participants in the included studies ranged from 39 to 55 years. All studies except one were restricted to female participants. The proportion of breast lesions that were malignant was 37.5%. Most of the studies that evaluated elasticity ultrasound used freehand compression elastography probes. All the studies used histopathology as the reference standard; approximately half also used cytology.

Two reviewers selected studies for the review; disagreements were resolved by discussion.

Assessment of study quality
Two reviewers independently assessed study quality using the adapted 11-point QUADAS tool; disagreements were resolved by discussion.

Data extraction
Data were extracted by two independent reviewers to produce 2x2 tables of test performance from which sensitivity and specificity were calculated. Elasticity scores of 4 and 5 and BIRADS categories 4 and 5 were considered malignant; other categories were considered benign lesions. Disagreements were resolved by discussion. Study authors were contacted for missing data.

Methods of synthesis
Summary estimates of sensitivity and specificity each with a 95% credible interval (CrI) were calculated using a bivariate random-effects generalised linear model. Markov Chain Monte Carlo simulation with uninformative priors was used. The summary estimates of sensitivity and specificity were used to calculate summary positive and negative likelihood ratios (LR+/-). A LR+ of more than 10 or LR- less than 0.1 were considered to have high informational value and therefore a high probability of altering clinical management. Summary receiver operating characteristic (SROC) curves were presented and the area under the curve was calculated. The diagnostic accuracy of the combination of B-mode and elastography ultrasound was determined based on concordance of the two tests. Heterogeneity was assessed using the I² statistic; values greater than 50% were considered to indicate substantial heterogeneity.
bias was assessed using funnel plots.

Results of the review
Twenty-nine studies met the inclusion criteria (5,153, range 50 to 779 patients; 5,511, range 50 to 779 lesions). Of the 29 studies, all used an appropriate reference standard and avoided incorporation bias. More than 95% of studies accounted for intermediate results and explained withdrawals. Approximately 40% to 45% of studies avoided differential verification bias, recruited a representative patient spectrum and/or blinded interpreters of the index test. Approximately 10% to 15% of studies avoided clinical review bias and progression bias. None of the studies blinded interpreters of the reference standard.

For ultrasound elastography alone, the summary estimate of sensitivity was 79% (95% CrI 74% to 83%), specificity was 88% (95% CrI 83% to 92%), LR+ was 6.71 (95% CrI 4.60 to 10.20) and LR- was 0.24 (95% CrI 0.19 to 0.30). For B-mode ultrasound alone, the summary estimate of sensitivity was 96% (95% CrI 93% to 98%), specificity was 70% (95% CrI 55% to 83%), LR+ was 3.10 (95% CrI 2.12 to 5.14) and LR- was 0.06 (95% CrI 0.04 to 0.10).

When B-mode and ultrasound elastography were combined, the summary estimate of sensitivity was 73% (95% CrI 67% to 79%), specificity was 97% (95% CrI 95% to 98%), LR+ was 26.20 (95% CrI 16.00 to 48.68) and LR- was 0.28 (95% CrI 0.22 to 0.34). When the combination of the two tests used the disjunctive positivity criterion, the summary estimate of sensitivity was 99% (95% CrI 98% to 99%), specificity was 59% (95% CrI 44% to 68%), LR+ was 2.41 (95% CrI 1.79 to 3.05) and LR- was 0.02 (95% CrI 0.01 to 0.2).

There was no evidence of publication bias.

Authors' conclusions
The application of ultrasound elastography as a single test was not superior to B-mode ultrasound alone. However, in low risk patients it is recommended to perform ultrasound elastography following a positive B-mode ultrasound result to decrease the rate of unnecessary biopsies.

CRD commentary
The review addressed a clear question with reproducible inclusion criteria. Several relevant sources were searched without language restrictions. Only articles published in full were eligible for inclusion so there were no attempts to mitigate potential publication bias. Each stage of the review process was conducted in duplicate, which reduced potential for error and bias. Relevant criteria were used to assess study quality. The results of the assessment were not published in full but from the information available it appeared that all of the included studies had the potential to be at a risk of bias. Appropriate methods of synthesis were used.

This was a well-conducted review and the conclusions regarding the comparative accuracy of the tests are likely to be reliable. However, the unknown risk of bias of the included studies means that the reliability of the actual estimates of accuracy (and therefore the authors' conclusion and implications for practice) are uncertain.

Implications of the review for practice and research
Practice: The authors stated that if both B-mode and ultrasound elastography were positive, the patient should be referred for biopsy but if B-mode ultrasound was positive and ultrasound elastography was negative patients could be evaluated using imaging which decreased the rate of benign biopsies. For high risk patients, the authors recommended that B-mode ultrasound alone be used to evaluate breast masses and where this was positive evaluate further with biopsy.

Research: The authors did not state any implications for research.

Funding
None stated.

Bibliographic details
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.