Magnetocardiography for the diagnosis of coronary artery disease: a systematic review and meta-analysis

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CRD summary
This review concluded that the performance of magnetocardiography for diagnosing coronary artery disease was similar to that of non-invasive modalities. Seven small studies with suboptimal design were included and none of these studies provided data that compared magnetocardiography to other modalities. There were additional weaknesses in the searches and analysis. The conclusions are unlikely to be reliable.

Authors' objectives
To assess the performance of magnetocardiography for the diagnosis of coronary artery disease.

Searching
MEDLINE and Cochrane Central Register of Controlled Trials (CENTRAL) were searched from inception to August 2011. Search terms were reported. Only studies in English were included.

Study selection
Prospective studies of patients with angiographically confirmed stable coronary artery disease or patients who presented with acute coronary syndrome and were subsequently diagnosed with coronary artery disease based on electrocardiography, cardiac biomarkers, stress testing or angiography were eligible for inclusion. Studies were required to report measures of the diagnostic performance of magnetocardiography for coronary artery disease (such as sensitivity, specificity, likelihood ratios).

All included studies used a diagnostic case-control type design. Participants in the case groups had documented coronary artery disease or presented with acute chest pain and were subsequently diagnosed with coronary artery disease; most had angiographically documented stenosis greater than 50% to 75%. Control groups comprised healthy subjects or participants with test results (angiography, electrocardiography, echocardiography, stress testing or biomarkers) that were not consistent with obstructive coronary artery disease. The diagnostic threshold for coronary artery disease, using magnetocardiography, varied between studies. Approximately 40% of studies were conducted in magnetically shielded rooms and the rest were conducted in unshielded rooms.

Two reviewers independently assessed studies for inclusion. Any disagreements were resolved by discussion or arbitration.

Assessment of study quality
The methodological quality of included studies was assessed using a modified eight-item version of the QUADAS tool. Items for selection criteria, verification biases, reporting of index test and reference standard details and handling of indeterminate test results were omitted. Studies were considered to be of high quality when interpretation of both index test and reference standard were blinded.

The methodological quality of included studies was assessed by one reviewer and checked by a second.

Data extraction
Data were extracted to calculate sensitivity, specificity and positive and negative likelihood ratios (LR), with 95% confidence intervals (CIs).

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Methods of synthesis
Pooled estimates of sensitivity, specificity and positive and negative likelihood ratios, each with 95% CIs, were calculated using a random-effects model.
A summary receiver operating characteristic (SROC) curve was fitted using the Moses and Littenberg model.

Between-study heterogeneity was assessed using the $I^2$ statistic. Sources of heterogeneity were investigated using unweighted univariate regression analysis with the Moses and Littenberg linear model.

**Results of the review**

Seven studies (590 participants) were included in the review. Three studies did not interpret either index test or reference standard blind to other test results and one further study only reported blinded interpretation of the index test. Only two studies provided an explanation for withdrawals.

The pooled estimate of sensitivity was 83% (95% CI 80 to 86; $I^2=83.8\%$) and the pooled estimate of specificity was 77% (95% CI 73 to 81%; $I^2=85.9\%$). The pooled positive likelihood ratio was 3.92 (95% CI 2.30 to 6.66; $I^2=88.6\%$) and the pooled negative likelihood ratio was 0.20 (95% CI 0.12 to 0.35; $I^2=84.2\%$).

Regression analysis suggested that heterogeneity was not associated with clinical presentation (stable coronary artery disease versus acute coronary syndrome), test setting (shielded versus unshielded) or study quality (high versus low).

**Authors’ conclusions**

The performance of magnetocardiography for diagnosing coronary artery disease was similar to that of non-invasive modalities.

**CRD commentary**

The review reported a clear objective and defined appropriate inclusion criteria. Searches were limited to two bibliographic databases and there was a restriction to studies in English so relevant studies may have been missed. Measures to minimise error and bias were applied throughout the review process. Methodological quality of included studies was assessed and results were reported in full; an attempt was made to investigate the possible effects of some aspects of study quality on overall results. Use of a simple random-effects model to produce summary estimates of sensitivity and specificity was of questionable validity given the apparent clinical and statistical heterogeneity and different diagnostic thresholds in the studies (noted by the authors in the discussion); a bivariate or hierarchical SROC model is generally recommended. All included studies were diagnostic case-control type, this design is generally considered to be weaker than the diagnostic cohort; the study population does not represent the population in which the test would be used in practice and may be prone to produce over estimates of test performance.

The authors’ conclusion that the performance of magnetocardiography for diagnosing coronary artery disease was similar to that of non-invasive modalities was not supported by the data presented and the review did not include any studies that compared the performance of magnetocardiography with other modalities.

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

**Practice:** The authors stated that magnetocardiography was a potential complementary or alternative tool for noninvasive detection of coronary artery disease.

**Research:** The authors stated that head-to-head trials to compare magnetocardiography-driven diagnosis and treatment strategies to existing strategies driven by other non-invasive techniques were needed to examine differences in clinical outcomes (such as cardiovascular morbidity and mortality) between strategies. They further stated that the performance of magnetocardiography should be assessed in patient populations where other non-invasive modalities cannot be performed or interpreted.

**Funding**

None.

**Bibliographic details**


**PubMedID**
Indexing Status
Subject indexing assigned by NLM

MeSH
Coronary Artery Disease /diagnosis; Humans; Magnetocardiography /methods; Predictive Value of Tests; Prospective Studies; Sensitivity and Specificity

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.