Review: Electrocardiography, BNP, and N terminal-pro BNP are more sensitive than specific for chronic left ventricular systolic dysfunction

Davenport C, Cheng EY, Kwok YT, et al. **Assessing the diagnostic test accuracy of natriuretic peptides and ECG in the diagnosis of left ventricular systolic dysfunction: a systematic review and meta-analysis.** Br J Gen Pract. 2006;56:48-56.

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QUESTION

How do electrocardiography (ECG), brain natriuretic peptide (BNP), and N terminal-pro brain natriuretic peptide (NT-pro BNP) perform in diagnosing chronic left ventricular systolic dysfunction (LVSD)?

METHODS

Data sources: MEDLINE, EMBASE/Excerpta Medica (1980 to March 2004), Cochrane Library (Issue 4, 2003), handsearching selected proceedings and cardiology journals, and citations from relevant studies and reviews.

Study selection and assessment: Cohort studies that compared ECG, BNP, NT-pro BNP, or combinations with a reference standard (nuclear cardiology techniques or 2-dimensional echocardiography) in patients with suspected LVSD. Studies with insufficient data to calculate sensitivity and specificity and those that included patients with acute heart failure (HF) or suspected ventricular diastolic dysfunction or patients receiving long-term treatment with angiotensin-converting enzyme (ACE) inhibitors or diuretics for presumed HF were excluded. 29 studies and 3 posters (n = 22 149, mean age range 53 to 79 y in 16 studies) met the selection criteria. Individual study quality was assessed based on risks for selection, verification, measurement, and disease progression biases and treatment paradox.

Outcomes: Sensitivity and specificity.

MAIN RESULTS

9 of 14 ECG studies had sensitivities > 80%, and 11 studies had specificities < 80%; 12 of 16 BNP studies had sensitivities > 80%, and 13 of 16 had specificities < 80%; 6 of 7 NT-pro BNP studies had sensitivities > 80%, and 4 studies had specificities < 80%. Ranges of sensitivity and specificity of the 3 tests are in the Table. 2 of 3 studies that compared ECG with BNP reported higher specificity with BNP (P < 0.05); the tests did not differ for sensitivity. 2 studies that compared the combination of ECG and BNP tests with ECG or BNP alone showed higher specificity with the combination than with ECG alone and than with BNP alone in 1 study; however, there was no improvement in sensitivity. Results were not pooled because of significant clinical and methodological heterogeneity. Test performance was not clearly different based on current findings.

CONCLUSIONS

Electrocardiography, brain natriuretic peptide, and N terminal-pro brain natriuretic peptide are more sensitive than specific for diagnosing chronic left ventricular systolic dysfunction. No clear difference was found among the tests.

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Sensitivity and specificity of electrocardiography (ECG), brain natriuretic peptide (BNP), and N terminal-pro brain natriuretic peptide (NT-pro BNP) for diagnosing chronic left ventricular systolic dysfunction*

Diagnostic tests (number of studies)	Sensitivity range (95% CI)	Specificity range (CI)
ECG (14)	41% (26 to 58) to 98% (94 to 100)	34% (33 to 35) to 100% (99 to 100)
BNP (16)	27% (13 to 46) to 100% (87 to 100)	34% (24 to 45) to 88% (80 to 94)
NT-pro BNP (7)	25% (14 to 38) to 98% (90 to 100)	13% (2 to 40) to 95% (92 to 97)

*Diagnostic terms and CI defined in Glossary.

COMMENTARY

Diagnosis of HF is challenging. In a diagnostic accuracy study in which the "gold standard" was the clinical consensus of 2 cardiologists who had all clinical information except BNP levels, including the echocardiographic results, they disagreed in 21% of patients (1). Given how frequently we misdiagnose HF (2), we need to find methods that improve the accuracy of diagnosis, particularly early in the process such as in primary care settings.

The review by Davenport and colleagues examined the clinically important question of how BNP, NT-pro BNP, and ECG results compare when diagnosing HF. Unfortunately, the target disorder used in most of the primary studies and in this review was LVSD. Natriuretic peptides are raised whenever the ventricles are placed under increased strain and regardless of whether HF is caused by systolic or diastolic dysfunction. Therefore, the lack of specificity seen when measuring natriuretic peptides against LVSD is partly because patients with diastolic HF are classified as "false" positives. The diagnostic accuracy of natriuretic peptides is greater in studies that use broader definitions of HF as the target disorder (3).

Although Davenport and colleagues tried to reduce clinical heterogeneity by excluding studies of acute HF or studies in which most patients received long-term ACE inhibitors and diuretics, considerable heterogeneity existed, making it impossible to compare the 3 tests. Again, this is not surprising given the variety of definitions for normal and abnormal results for BNP, NT-pro BNP, ECGs, and the reference tests used in the studies. A review is currently underway that will examine individual patient data from relevant studies to determine the comparative accuracy of the individual tests and combinations in primary care settings (4).

At present, based on the best evidence available, patients with both a completely normal ECG result and normal BNP level are unlikely to have HF.

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