FPIN's Clinical Inquiries

Brain Natriuretic Peptide Levels for Ruling Out Heart Failure

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Clinical Question

Can brain natriuretic peptide (BNP) levels be used to rule out heart failure?

Evidence-Based Answer

A BNP level less than 100 pg per mL (100 ng per L) can rule out heart failure. (Strength of Recommendation [SOR]: A, based on meta-analyses.) BNP levels should be used when the pretest probability of heart failure based on overall clinical assessment is of an intermediate likelihood. (SOR: A, based on meta-analyses.)

Evidence Summary

Heart failure is a clinical syndrome of impaired ventricular filling and ability to eject blood that results from structural or functional cardiac disorders.[1] Symptoms of heart failure include dyspnea and fatigue. Patients with heart failure have fluid retention, which may lead to pulmonary congestion and peripheral edema. Because pulmonary congestion is not a universal feature, the term "heart failure" is preferred over "congestive heart failure."

A meta-analysis reviewed 22 studies of clinical and laboratory findings for diagnosing heart failure in adults presenting to the emergency department with dyspnea.[2] A BNP level less than 100 pg per mL decreased the posttest likelihood of heart failure (negative likelihood ratio [LR–] = 0.11; 95% confidence interval [CI], 0.07 to 0.16). The Breathing Not Properly trial, a prospective study of 1,586 patients, demonstrated that a BNP level less than 100 pg per mL can eliminate the diagnosis of heart failure in patients presenting to the emergency department with dyspnea, regardless of age, sex, or ethnicity.[3]

A meta-analysis of 30 studies assessed the diagnostic utility of BNP levels versus a reference standard of echocardiography and/or clinical findings in patients with symptoms of heart failure.[4] Patients were evaluated in multiple clinical settings (i.e., emergency department, specialized clinics, and primary care clinics). Two studies included primary care patients and used a BNP cutoff of 10 or 115 pg per mL (10 or 115 ng per L). At these BNP levels, the LR– ranged from 0.02 to 0.75, whereas the positive likelihood ratio (LR+) ranged from 1.12 to 6.71, indicating that BNP levels were more useful for ruling out heart failure. Regardless of the setting, BNP had a low LR+, which limited its ability to rule in heart failure.[4]

The Natriuretic Peptides in the Community Study was a prospective, randomized controlled trial that measured the effect of BNP levels on the accuracy of physicians' initial diagnosis of heart failure.[5] A total of 305 patients in New Zealand presented to their general practitioners with symptoms of dyspnea, peripheral edema, or both. Physicians were asked if heart failure was suspected based on the patient's history and clinical examination. Patients then underwent cardiologist evaluation, electrocardiography, chest radiography, echocardiography, and serum BNP testing. Patients were randomly assigned to two groups. One group had BNP measurement included with testing data and the other group did not. Use of BNP measurements improved the diagnostic accuracy over customary clinical review by 21 percent (the percent of correct diagnoses increased

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from 49 to 70 percent). The improved diagnostic accuracy was attributed to physicians correctly ruling out heart failure. Obtaining BNP levels in seven patients with a provisional diagnosis of heart failure was needed to correctly recharacterize one patient as not having heart failure.

The diagnostic power of a clinical risk score may be equal to that of BNP levels in primary care settings.[6] In a prospective study of 542 patients with at least one cardiovascular risk factor, both a low clinical risk score (i.e., absence of dyspnea at exertion, ankle swelling, coronary artery disease, and diuretic treatment) and a low BNP level showed excellent ability to rule out left ventricular systolic dysfunction diagnosed by echocardiography. BNP levels (in this study, an N-terminal pro-BNP less than 98.5 pg per mL [98.5 ng per L]) demonstrated an LR– of 0.19 (95% CI, 0.05 to 0.71), whereas the clinical risk score had an LR– of 0.14 (95% CI, 0.04 to 0.51). Clinical risk scoring (LR+ = 2.53; 95% CI, 2.12 to 3.01) is better than BNP testing (LR+ = 1.69; 95% CI, 1.51 to 1.88) for confirming heart failure.

Recommendations from Others

American Heart Association/American College of Cardiology guidelines suggest that measurement of BNP levels can be useful in risk stratification if the clinical diagnosis of heart failure is uncertain, especially in the urgent care setting.[1] The Heart Failure Society of America recommends evaluation for symptoms, signs, and cardiac abnormalities suggestive of heart failure. When the diagnosis of heart failure is uncertain, the Heart Failure Society of America recommends measuring BNP levels.[7] The European Society of Cardiology guidelines suggest that a normal BNP level (BNP level less than 100 pg per mL or N-terminal pro-BNP level less than 400 pg per mL [400 ng per L]) in an untreated patient has a high negative predictive value and makes heart failure an unlikely cause of symptoms.[8]

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