Doppler echocardiography was more accurate than B-type natriuretic peptide assay for detecting CHF in acute dyspnea

Logeart D, Saudubray C, Beyne P, et al. **Comparative value of Doppler echocardiography and B-type natriuretic peptide assay in the etiologic diagnosis of acute dyspnea.** J Am Coll Cardiol. 2002;40:1794-800.

QUESTION

In patients with acute dyspnea, how does the accuracy of Doppler echocardiography compare with bedside B-type natriuretic peptide (BNP) assay for diagnosing decompensated congestive left-heart failure (CHF)?

DESIGN

Blinded comparison of BNP levels and Doppler findings with a confirmatory clinical diagnosis.

SETTING

Emergency department (ED) of a hospital in Clichy, France.

PATIENTS

163 consecutive patients (mean age 67 y, 67% men) presenting to the ED with acute, severe dyspnea. Exclusion criteria were acute myocardial infarction, chest injury, recent surgery, receipt of treatments > 2 hours before arrival at the ED, or no available emergency echocardiography.

DESCRIPTION OF TESTS AND DIAGNOSTIC STANDARD

Blood for BNP levels was taken using the Triage BNP test (Biosite Diagnostics, San Diego, CA, USA), a point-of-care method based on fluorescence immunoassay. The BNP measurements were done on frozen plasma approximately 1 to 2 months after blood collection. Doppler echocardiography was done within 60 minutes of enrollment using a Hewlett-Packard Sonos 1500 (Andover, MA, USA) machine with a 2.5-MHz probe and included 2-dimensional and M-mode examination, pulsed Doppler analysis of mitral inflow, and continuous Doppler analysis of tricuspid regurgitation. 2 cardiologists and 1 pneumonologist, blinded to BNP assay and Doppler results, collaborated to determine the final diagnosis of CHF based on the Framingham criteria with corroborative information from other cardiac and pulmonary function tests.

MAIN OUTCOME MEASURES

Sensitivity, specificity, and accuracy of BNP assay and Doppler echocardiography.

MAIN RESULTS

115 of 163 patients (71%) had a final diagnosis of CHF. The highest accuracy (88%) for BNP was obtained with a cutpoint of 300 pg/mL (Table). The best diagnostic performance with Doppler echocardiography was with the "restrictive" mitral pattern (Table), which had an accuracy of 91%. Both BNP and Doppler added significant incremental predictive diagnostic values to the clinical variables, but BNP assay only predicted CHF when levels were > 300 pg/mL.

CONCLUSION

In patients with acute dyspnea, Doppler echocardiography was more accurate than B-type natriuretic peptide assay for diagnosing decompensated congestive left-heart failure.

Diagnostic characteristics of B-type natriuretic peptide (BNP) levels and Doppler echocardiography for diagnosing acute congestive left-heart failure*

Tests	Sensitivity (95% CI)	Specificity (CI)	+LR	−LR
BNP (pg/mL)				
80	97% (93 to 99)	27% (15 to 42)	1.33	0.11
300	88% (81 to 94)	87% (75 to 95)	6.77	0.14
Doppler echocardiography				
"Restrictive" mitral pattern	89% (82 to 95)	93% (82 to 87)	12.71	0.12

*Diagnostic terms defined in Glossary; LRs calculated from data in article, and CIs provided by author.

COMMENTARY

The diagnosis of CHF in an acutely ill patient with comorbid conditions remains a clinical challenge. The study by Logeart and colleagues evaluated the usefulness of Doppler echocardiography and the new assay for BNP in this setting.

BNP values were examined along with Doppler analysis of transmitral flow in patients presenting with severe dyspnea. In sinus rhythm, transmitral flow consists of an early, rapid phase and a second phase caused by atrial systole. Normally, the 2 components of flow are equal. In myocardial restriction, most blood flow into the left ventricle occurs early in diastole with very little supplied by the "atrial kick." At times, a similar pattern, labeled "restrictive," is seen in CHF and is clearly associated with a poor prognosis (1) regardless of the ejection fraction (2). In CHF, this early diastolic predominance of flow is attributed to elevated left atrial pressures.

The high likelihood ratio (LR) of a restrictive flow pattern for the diagnosis of CHF seen in this study is exciting, but should be taken with a grain of salt (or better still, a little furosemide!). Transmitral flow patterns can be greatly affected by volume status and loading conditions. In atrial fibrillation, the "atrial kick" is lost, and with rapid heart rates, the 2 phases of diastole merge into 1, making it difficult if not impossible to judge diastolic filling patterns in those settings. Clinically, restrictive Doppler flow patterns have been shown to predict prognosis but have not been correlated with actual filling pressures; Doppler analysis of tricuspid, pulmonary, and mitral insufficiency velocities are validated for that purpose. It is possible that the high LR for the restrictive pattern in this study was a result of the poor condition of the population being studied, who were admitted to an intensive care unit. These patients may therefore have been particularly ill, and as a group more likely to have restrictive patterns to their transmitral flows because of their poor prognosis.

Diagnosing CHF can be challenging. Good clinical assessment remains our first approach, and evidence supports the use of BNP levels to help clarify the diagnosis in challenging cases (3). Echocardiography is a powerful tool, but the use of Doppler flow patterns to help establish the diagnosis of CHF requires additional study.

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References
1. **Pinamonti B, Di Lenarda A, Sinagra G, Camerini F.** J Am Coll Cardiol. 1993;22:808-15.
2. **Boccalandro F, Loghin C, Darwood S, Seung-Ho K, Barasch E.** Cardiology. 2002;98:148-53.
3. **Maisel AS, Krishnaswamy P, Nowak RM, et al.** N Engl J Med. 2002; 347:161-7.