

Combining electrocardiography and necrosis biomarkers improved detection of acute myocardial infarction in patients with LBBB

Kontos MC, McQueen RH, Jesse RL, Tatum JL, Ornato JP. Can myocardial infarction be rapidly identified in emergency department patients who have left bundle-branch block? *Ann Emerg Med.* 2001 May;37:431-8.

QUESTION

In patients with left bundle-branch block (LBBB) on initial electrocardiography (ECG), what are the diagnostic properties of clinical evaluation, ECG, and biochemical markers of necrosis for detection of acute myocardial infarction (AMI)?

DESIGN

Blinded comparison of clinical evaluation, ECG criteria for acute myocardial infarction, and biochemical markers of necrosis with creatine kinase-MB (CK-MB) as the diagnostic standard.

SETTING

Emergency department of the Medical College of Virginia Hospital, USA.

PATIENTS

182 patients (mean age 66 y, 70% women) from an unselected population who presented with LBBB on initial ECG and who were evaluated for possible myocardial ischemia.

DESCRIPTION OF TESTS AND DIAGNOSTIC STANDARD

On presentation, patients received clinical and initial ECG evaluation. After admission to the coronary care unit, patients had serial sampling of total CK and CK-MB. A CK relative index was calculated using a formula (CK-MB \times 100/total CK). All ECGs were read by 2 cardiologists unaware of the clinical

variables and patient outcome. Diagnosis of AMI was confirmed by an elevation of CK-MB to 8.0 ng/mL with a relative index of 4.0 in association with a characteristic increase and decrease in markers.

MAIN OUTCOME MEASURES

Sensitivity, specificity, and positive and negative likelihood ratios (calculated from data in the article) of the 3 tests.

MAIN RESULTS

13% of the patients with LBBB had AMI. Diagnostic properties of the 3 tests alone and in combination are shown in the Table.

CONCLUSION

Combining electrocardiography and biomarkers of necrosis increased both the sensitivity and specificity of testing for acute myocardial infarction in patients with left bundle-branch block.

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Diagnostic properties of clinical evaluation, electrocardiography, and biomarkers for identifying acute myocardial infarction in patients with left bundle-branch block (LBBB)*

Criteria	Sensitivity (95% CI)	Specificity (CI)	+LR	-LR
Electrocardiographic (ECG) changes	46% (28 to 65)	93% (88 to 96)	6.57	0.58
New LBBB	42% (24 to 62)	65% (57 to 72)	1.20	0.89
New or indeterminate-age LBBB	83% (64 to 93)	41% (34 to 49)	1.41	0.41
Clinical impression (high risk)	25% (12 to 45)	98% (94 to 99)	12.50	0.77
Initial CK-MB/RI elevation	42% (24 to 62)	99% (95 to 100)	42.00	0.59
Initial myoglobin elevation	67% (43 to 84)	85% (77 to 90)	4.47	0.37
Initial CK-MB/RI elevation or ECG finding of concordant ST-segment elevation or depression	63% (42 to 79)	99% (95 to 100)	63.00	0.37
IMCECG	83% (60 to 94)	85% (77 to 90)	5.53	0.20

*CK-MB/RI = creatine kinase-MB/relative index; IMCECG = elevation of initial myoglobin or CK-MB/RI or ECG finding of concordant ST-segment elevation or depression. Diagnostic terms defined in Glossary; LRs calculated from data in article.

COMMENTARY

Patients with LBBB and AMI are at high risk with much to gain from thrombolysis (1). However, these patients remain undertreated. With the common goal of distinguishing truly lytic-eligible patients from potential iatrogenic disasters, researchers have developed ECG-based algorithms. Kontos and colleagues have presented further evidence that the most enduring of these algorithms, the Sgarbossa criteria, has inadequate sensitivity. Although a test with high specificity will help to prevent overtreatment and its resulting complications, it will fight only half the battle. Prevention of undertreatment, which indeed is a reality today and in our view the far greater error in terms of harms and benefits, calls for a test with high sensitivity and adequate specificity.

Although ECG is an essential tool in the diagnosis of AMI, it is proving to be insufficient in preventing undertreatment. This is not, however, a major setback for clinicians because they are never faced with ECG results in isolation. ISIS-2 (Second International Study of Infarct Survival) showed that in the setting of bundle-branch block,

of which many would have been LBBB, the clinical impression of AMI (< 12 h after onset of symptoms of suspected AMI) warranted thrombolysis in the absence of contraindications (1).

When faced with a patient who has signs and symptoms of AMI and an ECG showing LBBB, any time spent studying the subtleties of the ECG is wasted time. If the clinical evidence is inconclusive, the decision is subject to greater uncertainty. But we suggest that precious time be used to further assess the patient, not the ECG.

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Reference

- ISIS-2 (Second International Study of Infarct Survival) Collaborative Group. Randomised trial of intravenous streptokinase, oral aspirin, both, or neither among 17,187 cases of suspected acute myocardial infarction: ISIS-2. *Lancet.* 1988;2:349-60.