Serial ECGs were more sensitive than an initial ECG for diagnosing chest pain


Question
Is automated serial 12-lead electrocardiogram (SECG) monitoring better than an initial 12-lead electrocardiogram (ECG) for detecting acute injury or ischemia in patients presenting to the emergency department and admitted for chest pain?

Design
Blinded assessment of SECG monitoring and initial ECG monitoring to detect acute injury or ischemia.

Setting
The emergency department of a university teaching hospital in the United States.

Patients
1000 adults (median age 56 y, 61% men, 80% white) presenting with chest pain suspicious for coronary ischemia who were admitted and had ≥ 1 hour of SECG monitoring. Exclusion criteria were recent cocaine use; chest pain in the presence of a tachyarrhythmia or pulmonary edema; or presence of a demand pacemaker.

Main outcome measures
Sensitivity and specificity of initial ECG monitoring and SECG monitoring.

Main results
Discharge diagnoses were acute myocardial infarction (n = 204), recent myocardial infarction (n = 18), unstable angina pectoris, or other acute coronary syndromes.

Diagnosis properties of initial electrocardiogram (ECG) and serial ECG (SECG) monitoring for acute myocardial infarction (MI) and acute coronary syndromes (ACSs)

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Sensitivity, % (95% CI)</th>
<th>Specificity, % (CI)</th>
<th>+LR*</th>
<th>-LR*</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI using ECG</td>
<td>55.4 (48.6 to 62.2)</td>
<td>94.6 (93.0 to 96.2)</td>
<td>10.3</td>
<td>0.47</td>
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<tr>
<td>MI using SECG</td>
<td>68.1 (61.7 to 74.5)</td>
<td>94.8 (93.3 to 96.4)</td>
<td>13.1</td>
<td>0.34</td>
</tr>
<tr>
<td>ACSs using ECG</td>
<td>27.5 (23.6 to 31.3)</td>
<td>97.1 (95.6 to 98.6)</td>
<td>9.5</td>
<td>0.75</td>
</tr>
<tr>
<td>ACSs using SECG</td>
<td>34.2 (30.1 to 36.3)</td>
<td>99.4 (98.7 to 100)</td>
<td>57.0</td>
<td>0.66</td>
</tr>
</tbody>
</table>

*+LR = likelihood ratio for presence of disease if the test is positive; -LR = likelihood ratio if the test is negative. Both calculated from data in article.

Conclusion
12-lead automated serial electrocardiogram monitoring was more sensitive than an initial 12-lead electrocardiogram for detecting acute myocardial infarction and acute coronary syndromes in patients with chest pain admitted through the emergency department.

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For correspondence: Dr. F.M. Fesmire, University of Tennessee College of Medicine, PO Box 4045, Chattanooga, TN 37405, USA. FAX 423-265-4639.


Commentary
The study by Fesmire and colleagues is the first step in the prospective evaluation of the diagnostic performance of automated SECG in the emergency department. The use of a single ECG for the detection of acute cardiac ischemia gives the clinician only a slice-in-time recording of an ongoing dynamic process reflecting varying degrees of coronary occlusion and the interaction between thrombogenic and thrombolytic factors. SECG monitoring, by prolonging the period of data collection, may allow the immediate and ongoing recognition of recrudescence of ST-segment deviation and may thereby improve patient selection for thrombolysis or coronary angioplasty and help assess vessel patency after these interventions.

However, despite the attractiveness of SECG monitoring, its actual effect on care has not yet been shown. The study by Fesmire and colleagues showed modest improvements in sensitivities in the diagnosis of acute myocardial infarction and acute coronary syndromes, which may have been overestimated given the relatively low interobserver reliability for ECG interpretation (89.8%). Standardized computerized waveform measurements in future studies may minimize interobserver variability by supplementing physician ECG interpretation (1).

Despite these and other limitations, such as the exclusion of patients not admitted to the hospital and patients without chest pain, studies such as this one represent an important step in evaluating SECG monitoring. Future large, prospective, randomized studies that include all patients presenting to an emergency department and incorporate bedside clinical information will provide proper validation of this technology for diagnosis and clinical outcome prediction in the emergency department.

Boris E. Coronado, MD
Harry P. Selker, MD
Tufts University School of Medicine
New England Medical Center
Boston, Massachusetts, USA

Reference