Detection of acute myocardial ischemia using high-frequency QRS analysis

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Background: Myocardial ischemia causes changes in the depolarization phase of the ECG, which can be quantified by analyzing the high-frequency mid-QRS components (HFQRS). Our aim was to test this technique in detecting supply ischemia caused by prolonged intracoronary balloon occlusion and assess the feasibility of HFQRS detection of acute ischemia using a single, unreferenced measurement.

Methods: High-resolution 12-lead electrocardiogram was recorded before and during prolonged intracoronary balloon occlusion in 104 patients (60 ± 11 years old, 65 men) undergoing elective PTCA (STAFF3 database). The HyperQ™ System (BSP Ltd, Israel) was used to derive HFQRS data and ST-segment levels. Indices of HFQRS based on (i) relative intensity reduction and (ii) ischemia-specific signal morphology without a reference measurement were examined. The area under the receiver operating characteristic curve (AUROC) was used to assess the diagnostic value of each index and to derive optimal cutoff values. ST changes were examined according to ESC/ACCF/AHA guidelines.

Results: Balloon occlusions lasted 4.4 ± 1.3 minutes. HFQRS intensity index was available in 87 patients, morphologic index in 64 patients, and ST analysis in 99 patients. Both HFQRS indices were more sensitive than ST analysis (see table below), with similar specificity for the HFQRS intensity index and ST analysis.

<table>
<thead>
<tr>
<th>Index</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Accuracy</th>
<th>AUROC</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFQRS intensity</td>
<td>95%*</td>
<td>96%</td>
<td>96%*</td>
<td>0.99</td>
</tr>
<tr>
<td>HFQRS morphology</td>
<td>84%*</td>
<td>80%</td>
<td>82%*</td>
<td>0.88</td>
</tr>
<tr>
<td>ST segment analysis</td>
<td>55%</td>
<td>95%</td>
<td>75%</td>
<td>NA</td>
</tr>
</tbody>
</table>

* P < .001 vs ST analysis.

Conclusion: HFQRS analysis provided high diagnostic performance in detecting acute supply ischemia. In particular, HFQRS morphology index achieved high accuracy without using a baseline measurement. Thus, HFQRS analysis may aid in detecting both transient ischemic episodes and conditions of acute myocardial ischemia/infarction.

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Poster Session 1

Acoustic Cardiographic Electromechanical Activation Time Correlates with Echocardiographic Parameters of Left Ventricular Contractility in Patients with Myocardial Ischemia

Faraj Faour, Beth Israel Medical Center, New York, NY, USA

Prevalence and Clinical Significance of Brugada-Type ECG in Young Patients with Atrial Fibrillation

Dewar Finlay, University of Ulster, Belfast, NORTHERN IRELAND

Automated Classification of Right and Posterior Myocardial Infarcts Improves with Increasing Numbers of Right Sided and Posterior Leads

Shen Luo, Cardiac Science Corporation, Deerfield, WI, USA

Changing of Cardiac Repolarization Pattern in Response to Thoracic Electrical Shock Application

Alexander Schirdewan, Charité, University of Berlin, Berlin, GERMANY

Monitor atrial fibrillation burden using a miniaturized electrocardiographic recorder


Background: Improved therapeutic decisions based on accurate monitoring of daily atrial fibrillation (AF) burden may reduce hospitalization, symptoms, and strokes. Continuous long-term monitoring of patients at risk of AF could benefit from a noninvasive miniaturized device. This study evaluates the potential for using such a device along with a novel algorithm to monitor AF burden.

Methods: Electrocardiograms (ECGs) were recorded from 48 patients with cardiac-related symptoms at emergency department, General Hospital of Vienna, using a prototype investigational device provided by Philips Healthcare. This device is a 3-channel ECG recorder integrated with a unified electrode with the largest dimension less than 10 cm. Recordings (length = 292 ± 238 minutes, 50-1110 minutes) were analyzed by experts to mark AF episodes. From 48 recordings, 10 were AF (10 episodes, 2693