High Frequency QRS-Analysis: A Novel Technology Enhances Accuracy of Exercise ECG Testing in Patients Referred for Angiography

N. Reinsch†, TH. Phung†, TFM. Konorza†, R. Erbel† - (1) West German Heart Center Essen, Clinic for Cardiology, Essen, Germany

METHODS

- Exercise ECG testing (EET) in patients with suspected coronary artery disease (CAD) has limited diagnostic accuracy.
- Analysis of high-frequency QRS (HFQRS) components was recently shown to be more accurate than ST changes in identifying stress-induced ischemia.
- We aimed to evaluate the diagnostic value of HFQRS in patients referred for angiography.

BACKGROUND

- Exercise ECG testing (EET) in patients with suspected coronary artery disease (CAD) has limited diagnostic accuracy.
- Analysis of high-frequency QRS (HFQRS) components was recently shown to be more accurate than ST changes in identifying stress-induced ischemia.
- We aimed to evaluate the diagnostic value of HFQRS in patients referred for angiography.

RESULTS

- Angiographically significant CAD was identified in 20/54 (37%) patients
- HFQRS analysis was available in 32/54 (59%) patients
- HFQRS provided higher sensitivity (67% vs. 33%), specificity (80% vs. 75%) and overall accuracy (75% vs. 59%) than either ST-segment analysis or clinical interpretation (Table)
- Additionally, combining HFQRS analysis with EET interpretation provided improved diagnostic performance in all patients, with 10% increase in the overall accuracy.

TABLE 1

<table>
<thead>
<tr>
<th>Patient with valid HFQRS</th>
<th>N (#sick)</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFQRS analysis</td>
<td>32(12)</td>
<td>67%</td>
<td>80%</td>
<td>75%</td>
</tr>
<tr>
<td>ST-segment analysis</td>
<td>32(12)</td>
<td>33%</td>
<td>75%</td>
<td>59%</td>
</tr>
<tr>
<td>EET interpretation</td>
<td>32(12)</td>
<td>42%</td>
<td>70%</td>
<td>59%</td>
</tr>
<tr>
<td>Patient with valid HFQRS or EET</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HFQRS + EET interpretation</td>
<td>49(18)</td>
<td>72%</td>
<td>74%</td>
<td>73%</td>
</tr>
<tr>
<td>EET interpretation</td>
<td>49(18)</td>
<td>56%</td>
<td>68%</td>
<td>63%</td>
</tr>
</tbody>
</table>

CONCLUSIONS

- HFQRS analysis improved the sensitivity, specificity and the overall accuracy of ST-segment analysis and clinical EET interpretation in diagnosing CAD
- Thus, HFQRS may aid in enhancing the non-invasive diagnosis of CAD.

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FIGURE 1: hemodynamic relevant RXC-stenosis and the time-intensity-curve obtained from leads V1-V6 in an ischemic subject

FIGURE 2: schematic flow of the production of the HyperQ signal

TABLE 2: Baseline characteristics of the patients included. Used abbreviations: BMI (body mass index), CAD (coronary artery disease). Values are displayed as mean±standard deviation for continuous variables.