VE/VCO2 slope: What is the most powerful independent predictor of survival: overall, initial or final VE/VCO2 slopes?

A study in 786 consecutive patients with left ventricular systolic dysfunction

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Introduction:

Previous studies clearly demonstrated that VE/VCO2 slope measured during a cardiopulmonary exercise test is a powerful independent predictor of survival in patients with left ventricular systolic dysfunction. However, some patients exhibit two slopes of VE/VCO2. The prognostic impact of the VE/VCO2 slope pattern or the absolute values of VE/VCO2 slopes is unknown.

Aim:

To study the prognostic value of the number of VE/VCO2 slope, and the prognostic value of each VE/VCO2 slope, i.e overall, initial or final VE/VCO2 slopes, in patients with left ventricular systolic dysfunction.

Methods:

Between 2004 and 2007, 786 ambulatory patients with LV systolic dysfunction (LV ejection fraction <45%), with stable heart failure under optimal medical treatment, underwent clinical examination, 12 leads ECG, echocardiography and a metabolic stress test. We determined the number of VE/VCO2 slope during exercise, and we measured the overall slope for each patient and the initial and final slopes for patients with 2 slopes.

Characteristics of the population

Mean age was 56±12 years old, with 83% of men. Mean LVEF was 38±12% with 48% of ischemic cardiopathy, and 25% of patients with complete left bundle branch block (LBBB). 98% received renin-angiotensin inhibitors and 95% betablockers.

Metabolic stress test

Mean peak VO2 was 18.2±6.2 ml/min/kg or 69±20% of maximal predicted VO2. Most of the patients exhibited two VE/VCO2 slopes (84%), with an overall VE/VCO2 slope of 33.7±7.7, an initial slope of 29.9±6.6 and a final slope of 47.3±15.7.

Follow up

During a median follow-up period of 1443 days, there were 136 cardio-vascular deaths and 9 urgent transplantations or left ventricular assist devices.

Univariate analysis

• Patients with two VE/VCO2 slopes had a better survival rate compared to patients with one slope.

Results:

• In univariate analysis, ROC curves and bivariate analyses, the overall VE/VCO2 slope was a better predictor of cardiac survival compared to the initial or the final VE/VCO2 slopes.

Multivariate analysis

Independent predictors of cardiovascular mortality were peak VO2, peak systolic blood pressure and overall VE/VCO2 slope. Besides metabolic stress test, other predictors were left bundle branch block, mitral restrictive pattern and left atrial volume. Qualitative multivariate analyses, using cut-off values (determined by ROC analyses) gave similar results.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Wald</th>
<th>p</th>
<th>HR (95% CI)</th>
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<tbody>
<tr>
<td>% VO2</td>
<td>25.4</td>
<td>&lt;0.0001</td>
<td>0.97 [0.959-0.982]</td>
</tr>
<tr>
<td>LBBB</td>
<td>18</td>
<td>&lt;0.0001</td>
<td>2.19 [1.52-3.14]</td>
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<tr>
<td>Peak systolic blood pressure</td>
<td>15.4</td>
<td>&lt;0.0001</td>
<td>0.99 [0.98-0.99]</td>
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<tr>
<td>Overall VE/VCO2 slope</td>
<td>8.6</td>
<td>0.003</td>
<td>1.03 [1.01-1.05]</td>
</tr>
<tr>
<td>Mitral restrictive pattern</td>
<td>7.9</td>
<td>0.005</td>
<td>1.72 [1.18-2.5]</td>
</tr>
<tr>
<td>Left atrial volume</td>
<td>5.45</td>
<td>0.02</td>
<td>1.01 [1.001-1.02]</td>
</tr>
</tbody>
</table>

Conclusion:

VE/VCO2 slope is a powerful independent predictor of cardiac survival. Patients with two VE/VCO2 slopes have a better survival than patients with one VE/VCO2 slope. However, the overall VE/VCO2 slope value is a better predictor of survival than the value of initial or final VE/VCO2 slopes.