Assessment of Oxygen Uptake During the Six-Minute Walk Test in Patients With Heart Failure

To the Editor:

We read with interest the recent article by Cahalin and colleagues (August 1996)\(^1\) on the 6-min walk test (6'WT) in patients with heart failure. Compared to conventional symptom-limited exercise testing, the 6'WT is usually better accepted by heart failure patients since it mimicks daily activities and is well tolerated. Furthermore, this test is easy to perform and does not require an expensive apparatus for respiratory gas analysis.

We would like to report our recent experience with a group of 26 patients with moderate to severe heart failure due to left ventricular systolic dysfunction in whom exercise tolerance was evaluated both by oxygen uptake (\(\text{VO}_2\)) at peak of symptom-limited cardiopulmonary exercise test on an upright bicycle and by distance walked during a 6'WT. In addition, during the 6'WT \(\text{VO}_2\) and carbon dioxide production were measured using a recently validated (unpublished data; University of Freiburg; Freiburg, Germany; April, 1995) portable device (Cortex-Metamax, Leipzig, Germany). Of interest, we found a correlation \((r = 0.63)\) between distance walked during the 6'WT and peak \(\text{VO}_2\) during the maximal exercise testing which was very similar to that reported by Cahalin et al \((r = 0.64)\).\(^1\) Furthermore, three of four patients who walked 300 m or less were admitted to the hospital in the following few months because of clinical deterioration, and one patient died of progressive heart failure. On the other hand, only three of the remaining 22 patients walking more than 300 m were hospitalized for severe heart failure in the same period (distance walked was 340, 372, and 466 m, respectively). Thus, although our study population was small, our data seem to support the results of Cahalin et al\(^1\) indicating that a reduction of distance walked during the 6'WT may identify those patients with a worse prognosis in the short term.

Another point of interest of our study, in our opinion, was the finding that the \(\text{VO}_2\) at the end of 6'WT was, on average, only 15% lower than that measured at the peak of symptom-limited exercise \((12.9 \pm 4.4\) and \(15 \pm 4 \text{mL/kg/min},\) respectively); furthermore, in seven of 26 patients \((27%)\) the 6'WT \(\text{VO}_2\) was equal or even higher than peak exercise \(\text{VO}_2\). In addition, anaerobic threshold was identified in 19 patients during the 6'WT and in 23 patients during maximal exercise; \(\text{VO}_2\) at anaerobic threshold was similar in the two tests \((11.9 \pm 4.2\) and \(12.2 \pm 3.5 \text{mL/kg/min},\) respectively). According to these results, in at least one fourth of heart failure patients, the distance walked during 6'WT, usually considered an index of submaximal exercise capacity, probably better reflects maximal exercise tolerance. Furthermore, in most patients the energy expenditure required during the 6'WT seems supported, at least in part, by anaerobic metabolism (work above the anaerobic threshold).

Obviously, the data we report need to be verified in larger study populations, since, to the best of our knowledge, there is only one published paper\(^2\) reporting the measurement of \(\text{VO}_2\) during the 6'WT in a small group of heart failure patients. We think that these results, if confirmed, should be considered when interpreting the information obtained from the 6'WT in these patients. Finally, it remains to be determined whether respiratory gas analysis during 6'WT, performed by means of a portable device system, adds insights which can be useful for the functional evaluation of heart failure patients, compared to the measurement of distance walked alone.

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REFERENCES


Defining Patients’ Abnormal Pulmonary Function

To the Editor:

Lefante and colleagues (August 1996)\(^1\) are to be commended for demonstrating the correlation between FEV\(_1\)/FVC and FVC expressed as a percentage of the predicted value (FVC\(_\%\)PRED) in 656 working men with reduced values of FEV\(_1\)/FVC. The lower the FEV\(_1\)/FVC, the lower was the FVC\(_\%\)PRED.

The decrease in FVC in patients with airflow obstruction due to COPD (and the even greater decrease in FVC in some patients with asthma) has been documented previously.\(^2\) Also, Robert Garrett and I\(^1\) proposed a graph of FVC\(_\%\)PRED vs FEV\(_1\)/FVC\(_\%\) (that is, FEV\(_1\)/FVC*100), which stresses the importance of this relationship in the interpretation of spirometry.

However, a confidence band of FVC\(_\%\)PRED vs FEV\(_1\)/FVC\(_\%\) is needed, particularly for patients known to have COPD, in order to distinguish between obstructive defects and combined obstructive and restrictive defects. The authors’ data can provide such a boundary line (although the cause of their subjects’ airflow obstruction is not defined). How much can FVC be reduced solely by airflow obstruction due to COPD? I have used the following rule of thumb: if FVC\(_\%\)PRED is less than FEV\(_1\)/FVC\(_\%\), the reduction in FVC is too great to be ex-

\[\text{FEV}_1/FVC = \frac{\text{FEV}_1}{\text{FVC}}\]

\[\text{FVC\%PRED} = \frac{\text{FVC\%PRED}}{100}\]

\[\text{FEV}_1/FVC\% = \frac{\text{FEV}_1}{\text{FVC\%PRED}}\]

\[\text{FEV}_1/FVC\%*100 = \frac{100}{\text{FEV}_1/FVC\%}\]

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**FIGURE 1.** A rule-of-thumb lower limit line (dashed line; FVC\(_\%\)PRED=100\*FEV\(_1\)/FVC) plotted on the graph of Lefante and coworkers.\(^1\)