Resting and Exercise Systolic Intervals

To the Editor:

Drs. McConahay, Martin, and Cheitlin (Circulation 45: 592, 1972) report their experience with measurement of systolic time intervals corrected for heart rate in normal subjects and patients with coronary artery disease. There are serious technical and conceptual problems in this paper which are pertinent to future studies attempting to test the systolic time intervals clinically. It is noteworthy that the authors chose to measure systolic time intervals from the mean of measurements made “on five consecutive cardiac cycles, each read to the nearest millisecond.” All who work with systolic time-interval measurements are aware of the beat-to-beat changes which result from respiratory and cycle variations. Unless an appropriate sampling of data is made, one will of necessity have wide variation in these measurements, a factor which will broaden variability in the data and obscure correlation. The measurement of the systolic time intervals to the nearest millisecond, as indicated in this paper, can be accomplished only by reading to the nearest 0.1 ml, a highly improbable technical feat unless the tracings were magnified. Further, the observations on systolic time intervals immediately following exercise were corrected for heart rate according to regression equations which were developed in resting supine subjects. To date, there is no justification for extrapolating the heart rate range of supine subjects to the exercise state for correcting intervals in this manner. One must hence raise serious doubt as to the meaning of the exercise data in this paper.

From the conceptual viewpoint, there is a problem which relates to the overall meaning of the systolic time-interval determinations. In adapting systolic time-interval measurement to clinical usage, one must be cognizant that these data provide measures of cardiac performance which are not the same as other hemodynamic variables. What is pertinent to their clinical usage is the fact that these noninvasive measurements deviate from normal at the same time and in parallel with other hemodynamic measures. That they do not have perfect correlation with these variables should be expected since they encompass different events, i.e. time rather than pressure or volume changes. In evaluating systolic time intervals as a measure of left ventricular performance, it is important to relate them to other more standard hemodynamic measures. However, such relationships do not imply, as the authors do, that one is measuring or even predicting those hemodynamic variables such as ejection fraction or LVdp/dt from the systolic time intervals.

There is one other interpretive problem in the paper by McConahay and co-workers. Having viewed their data by critical comparison with hemodynamic events they conclude: “The STI failed to detect hemodynamic alterations which were not already clinically obvious.” The use of the term “clinically obvious” is somewhat unfortunate in this context. Were the authors referring to clinical observations of signs and symptoms or do they imply that the data obtained during cardiac catheterization were clinically obvious? In fact, they do not mention what clinical observations were made in these patients.

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The author replies:

To the Editor:

The authors readily acknowledge the valuable contributions of Dr. Weissler and his associates in the area of systolic time intervals (STIs) and welcome the opportunity to respond to his comments. Each STI in our study was calculated from measurements made with the aid of calipers and with the patient’s respirations suspended at normal end-expiration, thereby obviating the effects of varying phases of respiration. Contrary to Dr. Weissler’s experience, we did not find a “wide cycle-to-cycle variation” in our measurements using this technic. In fact, the raw measurements used in the calculations of the STIs rarely varied by more than 10 msec over the five consecutive cardiac cycles. “Estimating” such
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