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Letters to the Editor

Physiologic Timing for Objective Checking of Instantaneous Maximal Aortic Stenotic Area

Feuchtner et al. (1) recently proposed a new and successful method for imaging and evaluating aortic valve area (AVA) in aortic stenosis (AS) using a 16-row multislice computed tomography (MSCT) scanner. The investigators reasonably indicated that MSCT was not a primary diagnosis imaging technique, recalling the feasibility and cost-effectiveness of the usual echo–Doppler techniques in clinical practice. I agree with these general considerations and appreciated the study. Some comments are needed about the methodology they used to acquire images.

On the one hand, an obvious discrepancy exists between the described method in their study, assuming an approximate value of 50 ms for isovolumetric contraction (IC), and the diagram shown in their Figure 1 (top row). This 50-ms time interval is stated to be subtracted from the duration of the cardiac cycle for the reconstruction of the first image. Everyone may agree with the 50-ms approximation for IC. Figure 1, however, shows that the so-called IC starts with QRS of the electrocardiogram (ECG) and covers the full duration of the QRS complex. This illustration raises a didactical issue: the total QRS duration normally ranges about 120 ms and, thus; widely exceeds 50 ms. The QRS onset is the initial marker of the pre-ejection period, of which IC is only a component, succeeding to the electromechanical delay, and ending with the opening of the aortic valve, marker of ejection onset. The IC has a physiologic interest because it corresponds to the rapid rise of left ventricular pressure, which requires mitral valve closure and lags behind QRS onset.

In brief, if only 50 ms were subtracted, the latest part of pre-ejection, which is precisely IC, would be integrated into the duration of the cardiac cycle. This may be of limited consequence on final imaging measurements, but, regrettably, it makes Figure 1 erroneous and confuses the reader.

On the other hand, MSCT enables one to directly image instantaneous AVA, which varies along systole. The assumption that maximal AVA coincides with the maximal pressure drop has been substantiated by studies using the continuity equation over systole (2). No significant difference was reported either between timings of maximal Doppler jet flow AVA and maximal pressure gradient (3). Rather than studying reconstructed images generated during the entire mid-late systole every 50 ms in order to identify the phase of maximal AVA (1), a less empiric way of selecting maximal AVA would consist of triggering the image at peak velocity of the stenotic jet recorded by continuous-wave Doppler. Peak velocity has a reproducible timing (3). The reliable ultrasound assessment of AVA it provides could easily be applied to other imaging modalities. Advantages of this specific timing are 3-fold: 1) it relies on a physiologic substrate; 2) it enables comparison between laboratories; and 3) it facilitates follow-up of patients by relying on an objective landmark.

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doi:10.1016/j.jacc.2006.08.024

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