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Echocardiographic Assessment of Left Ventricular Twisting and Untwisting Rate in Normal Subjects by Tissue Doppler and Velocity Vector Imaging: Comparison of Two Methods

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Dear Editor,

In November 2013, we published an article entitled: "Echocardiographic Assessment of Left Ventricular Twisting and Untwisting Rate in Normal Subjects by Tissue Doppler and Velocity Vector Imaging: Comparison of Two Methods". Dr. Karvandi requested further information on the equations that we used in that paper; accordingly, with great thanks and respect, we wish to present the following explanations:

First, we calculated left ventricular (LV) rotation by integrating the rotational velocity, as determined by tissue Doppler imaging (TDI), and the VVI velocities of the septal and lateral regions by correcting R (t) for the LV "radius" over time:

$$R(t) = R(0) + \frac{\int_0^t [\mathrm{Va}(t) - \mathrm{Vp}(t)].\mathrm{dt}}{2}$$

Therefore, as we mentioned here and in our article, we used radius R (0) in equation 1 and not a diagonal line or diameter, for the use of which there is no reason whatsoever (similar to references 1-3) (1-3).

Second, we calculated the LV rotational velocity from averaged tangential velocity corrected with R (t). Although we have drawn a large number of LV global and segmental rotational curves (over time), it is obvious and evident that time is included and used in our formula and all our calculations necessarily and naturally. Nevertheless, it is preferable if we include it in the formula as follows:

$$\mathrm{Vrot}\,(t) = \frac{(\mathrm{Vl}(t) - \mathrm{Vs}(t))}{2 \times R(t)}$$

Third, as we mentioned in our article, chiming in with other previous major reports, we used degree/s as the unit of LV rotational velocity throughout the paper (1-4). In addition, in any equation, if the unit of our result was radian/second, we convert it into degree/sec.

As we know:

degree = rad × (180°/π)

degree/s = (rad/s) × (180°/π)

Consequently, the numbers and limits in our results evidently show that we used degree/s and not rad/s (e.g. 13 degree ≈ 0.23 rad and 90 degree/s ≈ 1.57 rad/s), which is similar to the majority of reports on LV torsional parameters. (We have referenced one of the most valid studies as reference 1) (1).

Additionally, given the aim of this study, we need to convert the TDI results into degree for twist or degree/sec for twisting rate for comparison with the VVI method data, which are naturally presented as degree/sec (1, 3, 4).

As a result, we believe that there is no need to revise our statistical analyses, diagrams, and Tables.

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