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Author's response to Letter to the Editor from Perez and Froelicher

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We read with interest the Letter to the Editor by Perez and Froelicher and are pleased to respond to the suggestions raised.

There has been a great deal of controversy as to appropriateness of the terminology used in association with early repolarization (ER) patterns in the ECG. These semantic issues have been previously addressed by us.¹ In our editorial comment (ref) we have attempted to once again illustrate the diversity of electrocardiographic patterns that can result from early repolarization of the cardiac ventricular epicardial action potential. Figure 1 of the commentary illustrates the cellular basis for these ECG manifestations and provides clear justification for the terminology. Attempts to subclassify these ECG patterns on the basis of the presence or absence ST segment elevation, accompanying J waves, or J point elevation, while admirable, is of questionable value in that these ECG phenotypes can vary from hour to hour and day to day.²⁻⁴

An ER pattern on the ECG was first described in 1936 by Shipley and Hallaran. They studied four-lead ECGs of 200 healthy young men and women and described J deflection as slurring or notching of the terminal part of QRS complex and considered it as a normal variant.⁵ In subsequent years, ST-segment elevation was added to these electrocardiographic manifestations and the complex was designated "early repolarization" based on the presumption that early repolarization was responsible, although no data were available to support this assertion. Experimental support for the hypothesis was first advanced with the identification of the cellular basis for the J wave in 1996.⁶

Perez and Froelicher are correct in pointing out that commercial automated analysis ECG programs base their diagnostic statement of "early repolarization" mainly on the ST level, likely due to the fact that algorithms to recognize J-waves, J point elevation and terminal slurs of the QRS are more difficult to deal with. But to propose that acceptance of these ECG vendor algorithms validate the definition of ER is unacceptable in our view.

We wholeheartedly agree that there is a need to strive to develop better definitions and that risk stratification features discussed in our editorial comment need careful validation and revalidation.

Finally, we respectfully disagree with the "solutions" proposed by Perez and Froelicher. It is not clear on what basis they suggest that "Early Repolarization" should require the presence of ST elevation, other than to bend to the dictates of currently designed machine algorithms. The experimental evidence suggests otherwise and the clinical evidence clearly indicates that the most malignant forms of ER do not include ST segment elevation.^{7,8} The suggestion that J-waves and slurs be called an R wave downslope phenomena representing "late depolarization", rather than "early repolarization", is also contrary to experimental data and to our knowledge is not consistent with any evidence-based clinical science.¹ Of note, sharp notches on the terminal part of the R wave resembling J waves, may indeed be due to

delayed conduction or other depolarization abnormalities. As we have previously proposed, these could be distinguished on the basis of their response to an atrial premature beat (not encroaching on the relative refractory period).¹ If diminished in magnitude, they are most likely due to a repolarization defect and if accentuated, they are more likely due to depolarization abnormality. It is also possible that these manifestation could be the result of both depolarization and repolarization abnormalities. The overriding take home message, however, is that regardless of the underlying mechanism, these electrocardiographic patterns appear to be helpful in risk prediction in certain clinical circumstances.²

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