(Tpeak-Tend)/QRS and (Tpeak-Tend)/(QT x QRS): novel markers for predicting arrhythmic risk in Brugada syndrome

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I read the recent paper by Zumhagen and colleagues with great interest, who demonstrated that the interval from the peak to the end of the electrocardiographic T wave (T_{peak} – T_{end}) and (T_{peak} – T_{end})/QT ratio, were strongly risk markers for Brugada patients with life-threatening ventricular arrhythmias \(^1\). These ratios reflect the transmural dispersion of repolarization (TDR), increases in which can lead to unidirectional conduction block and reentry \(^2\).

Nevertheless, T_{peak} – T_{end}, (T_{peak} – T_{end})/QT ratio and TDR do not take into account the contribution of cellular depolarization or action potential conduction, which is abnormal in Brugada syndrome \(^3\). The latter finding is in keeping with prolonged QRS duration on the electrocardiogram that suggests intra-ventricular conduction delay \(^4\). Pre-clinical experiments suggest that excitation wavelength, \(\lambda\), given by conduction velocity x effective refractory period), may be a better predictor of arrhythmogenicity, because it combines both depolarization and repolarization parameters. However, a major disadvantage of \(\lambda\) is that it must be determined invasively. A recent study proposed calculating the ratio of the time taken of repolarization to that of depolarization, i.e. QT/QRS (index of Cardiac Electrophysiological Balance, iCEB) \(^5\). The advantage of this index is that it can be easily determined from the electrocardiogram and can be used by the bedside to approximate \(\lambda\).

Given that T_{peak}-T_{end} interval is a better predictor of arrhythmic risk than QT interval, it follows that it should replace QT interval in the calculation of iCEB. Thus, I propose two novel markers, (T_{peak}-T_{end})/QRS and T_{peak}-T_{end} / (QT x QRS) for stratification of arrhythmic risk. (T_{peak}-T_{end})/QRS can easily be calculated by the bedside or in the clinic, whereas (T_{peak}-T_{end})/(QT x QRS) is potentially more accurate for use in epidemiological studies. Both indices are firmly based on physiological principles that \(\lambda\) is critical in the determination of arrhythmic tendency. Their validity will require further investigation, and may ultimately provide better predictive values than T_{peak}-T_{end} or (T_{peak} – T_{end})/QT ratio.
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References