The QRS width influences correction accuracy of the qt interval in a human experimental model of controlled heart rate

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Topic(s):
Arrhythmias, General – Diagnostic Methods: Electrocardiography

Citation:
Introduction: There is increasing interest in developing appropriate methods for computing corrected QT intervals in patients with prolonged depolarization of the ventricles.

Purpose: We aimed to analyze the effect of prolonged QRS intervals in the magnitude of the QT and in the diagnostic accuracy of different frequency-correction methods.

Methods: in 28 patients admitted for percutaneous self-expanding aortic valve implantation, sequential pacing was performed in the AAI mode in two different phases: before and immediately after the release of the prosthesis. We evaluated the accuracy of the Bazzet, Fridericia, Framingham and Hodges formulas with the reference of the QT at 60bpm (QTc/deviation).

Results: The widening of the QRS between both phases of the protocol (d-QRS) was the main contributor to the QT prolongation (Pearson 0.79; IC95%:0.75-0.84), with a constant contribution not affected by the heart rate (p=0.983). Prolongation in other intervals configuring the ST segment and the T-wave significantly contribute in the higher frequency range (p<0.05). The Bazzet formula displayed the highest QTc/deviation, while Framingham and Hodges retrieved the lowest QTc/deviation and the best fit (p<0.001). In addition, the Bazzet formula displayed the highest correlation between variations in the QTc/deviation and the widening of the QRS (Pearson coefficient -0.54; p<0.001) in comparison with the Fridericia, Framingham and Hodges formulas (Pearson coefficient -0.51, -0.37 & -0.38 respectively; p<0.001 all; Figure). There was also a linear effect of the heart rate in the QTc/deviation obtained with the Bazzet formula (p=0.015), not observed for other formulas (p=0.108, 0.934 & 0.973).

Conclusions: The prolonged depolarization of the ventricles introduces direct and linear prolongation in the QT interval, but also a non-linear distortion in cardiac repolarization that contributes for QT prolongation at the higher frequency range. The Bazzet formula displays significantly higher sensitivity compared to other formulas to prolongation of ECG intervals, decreasing the accuracy of measurements as the prolonged QRS also prolongs the length of the QT interval.
Abstract:
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