In search of an improved QT correction formula in children

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Introduction: The Bazett and Fridericia formulae are most frequently used to correct QT interval for heart rate in children. At higher heart rates they over- or under-correct the QT interval. We set out to compute the best formula in our children population.

Methods: we enrolled a cohort of 650 healthy children. In quiet state a digital 12 lead electrocardiogram (50 mm/second) was recorded and stored. The QT and RR intervals were digitally measured in lead 2. The QT/RR curve was fitted with 2 different regression analysis, a linear regression for constant \( \alpha \), whereby QTc = QT + \( \alpha \times (1-RR) \), and a log-linear regression analysis for constant \( \alpha \) whereby QTc = QT/RR\(^\alpha\). Furthermore, linear regression analysis of QTc/RR for the two formulae were performed (least squares method), obtaining slope and R2. A slope and R2 close to zero were judged to eliminate the effect of heart rate on QT interval. Same analysis was performed using Bazett and Fridericia as comparison.

Results: Mean age: 2.2 years, SD + 4.0 (range 0 - 18 years). Mean QT 301 + 35 ms, RR mean 530 + 137 ms; QTc Bazett 414 + 17 ms; QTc Fridericia 370 + 16 ms. Computed linear regression formula was QTc = QT + 0.2308*(1-RR), QTc linear = 409 + 16 ms. Computed log-linear regression formula was QTc = QT/RR0.44, QTc log –linear = 402 + 21 ms. Linear Regression plots of QTc against RR intervals: QTc linear slope 0.000005, R2 10^-7; QTc log-linear slope 0.0001, R2 5*10^-5; QTc Bazett slope – 0.06, R2 0.16; QTc Fridericia slope 0.053, R2 0.15

Conclusion: the new linear and log – linear regression formulae corrected well, linear regression being marginally better. Both these new derived formulae look promising, best corrected the effect of RR on QT interval, even in infants, and showed superior dissociation of the QTc interval from RR interval (least slope and lowest R2). Both formulae are superior to the Bazett and Fridericia formulae. Further evaluation is in progress.