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QT correction methods in children

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Introduction: accurate determination of the QTc interval in children is important especially when considering a drug's ability to prolong cardiac repolarization. Previous work suggests the most appropriate correction formula is $QTc = QT/RR^{0.38}$ We set out to compute the best population derived and age related formula correction factor in our normal childhood population.

Methods: we enrolled a cohort of 1200 healthy children. In a quiet state a digital 12 lead electrocardiogram (50 mm/second) was recorded and stored.   The QT and RR intervals were measured digitally in lead 2. Subjects were divided into 4 age groups; 0-1 years (n= 379); 1-5 (n = 280); 5 - 10 (n = 268) and > 10 years (n =273). For each age group the QT/RR curve was fitted with 2 regression analysis, a linear regression for constant α, whereby $QTc = QT + α \times (1-RR)$, and natural log-linear regression analysis for constant β whereby $QTc = QT/RR^{β}$. Furthermore, linear regression analysis of QTc/RR for the two formulae were performed (least squares method), obtaining slope and R^2.

Results: Mean age: (0-1 years age group) 0.3 years, SD + 0.27; (1-5) 2.8 SD + 2.8 years; (5-10 years age group) 7.3 SD + 1.4 years; (> 10 years age group) 13.3 SD + 1.2 years. From linear regression analysis correction factor was α = 0.275, β =0.43 for 0-1 years, α = 0.26, β = 0.46 for 1-5; α = 0.19, β = 0.41 for 5 – 10; α = 0.18, β= 0.39 for > 10 years.   Linear Regression plots of QTc against RR intervals: QTc linear: slope < 0.005, R^2 < 0.01 for the 4 formulae; QTc log-linear slope: < 0.001, R^2 $5*10^{-2}$ for the 4 formulae.

Conclusion: For the full range of pediatric subjects studied the optimum population-based correction factor α and β, decreased with increasing age. It appears that more specific correction factors, based on age and gender, are required. These are being further evaluated.