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QT correction during exercise testing: performance of new QT formulae computed from normal cohort at baseline

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Aim: We studied the performance of new QT correction formulae computed from electrocardiograms (ECG) from a normal cohort of children preceding exercise testing. Formulae were applied to all exercise stages and compared to QTc Bazett.

Methods: 74 healthy children underwent graded exercise tests (bicycle or treadmill), heart rate reached > 85% expected maximum for age. Digital 12 lead ECGs recorded and stored at baseline, maximum exercise, one, two, four, and six minutes post exercise (all erect posture). For all stages, ECGs retrieved, QT and RR intervals measured on screen (lead II or V5). From baseline ECG, the QT/RR and natural log RR/natural log QT were plotted. New formulae obtained from linear regression analysis. Regression analysis QT/RR computed $QTc = QT + constant\ \alpha \times (1-RR)$, whilst regression analysis natural log QT/natural log RR computed $QTc = QT/RR^{\beta}$. New formulae were applied for all stages procuring QTc values. QTc Bazett ($QTc = QT/RR^{1/3}$) was calculated for comparison. Descriptive and analytical statistics were calculated, significance level set p= < 0, 05.

Results: median age 10.4 years, mean 10.7 (range 5.05-15.9 years) Gender: 40 males and 34 females. $\alpha = 0.19$, $\beta = 0.4$ Log QTc rest: median 409ms + 17, peak 380ms + 22, 1' 385ms + 23, 2' 403ms + 25, 4' 416ms + 14, 6' 420ms + 14; Linear QTc rest: median 412ms + 15, peak 374ms + 14, 1' 381ms + 17, 2' 400ms + 16, 4' 414ms + 12, 6' 419ms + 12. QTc Bazett rest: Median 424ms + 20, peak 426ms + 24, 1' 423ms + 27, 2' 435 + 27, 4' 442ms + 16; 6' 442ms + 17. Median heart rate beats/minute rest 92 + 14, peak 185 + 11, 1'149 + 20, 2' 121+ 20, 4' 106 + 16, 6' 102 + 14.

Conclusion: both new formulae exhibit significant QTc decline at peak exercise p< 0.01, returns to normal by 4 minutes. In contrast, Bazett QTc Increases at peak exercise, then dips and surges significantly P<0.01. These new formulae appear promising in the evaluation of congenital long QT syndrome and drug QTc monitoring.