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New QT and JT correction methods in right bundle branch block in children

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Introduction: QT interval prolongation on the surface ECG is a known marker of abnormal repolarization and the potential for arrhythmogenesis. In patients with right bundle branch block (RBBB), the assessment of ventricular repolarization remains controversial. We set out to compute the best derived QT and JT formula correction factors in children with RBBB.

Methods: we enrolled a cohort of 96 children with RBBB. In a quiet state a digital 12 lead electrocardiogram was recorded and stored. In 9 patients, >1 ECG at different time intervals were obtained (total of 129 ECG's studied) The QT, JT and RR intervals were measured digitally in lead 2. The QT/RR and JT/RR curves were fitted with 2 regression analysis. Firstly a linear regression for constant α , whereby $QT_c = QT + \alpha \times (1-RR)$, and $JT_c = JT + \alpha \times (1-RR)$ and secondly a natural log-linear regression analysis for constant β whereby $QT_c = QT/RR^\beta$ and $JT_c = JT/RR^\beta$. Additionally, linear regression analyses of QT_c/RR and JT_c/RR for each two formulae were performed as well as QT_c/JT_c vs QRS duration to obtain slope and R². A slope and R² close to zero judged to eliminate the effect of heart rate on QT interval.

Results: mean age 8.4 years, range 0.3 -18 years, median 7.0 years, Mean QRS duration was 124 ms SD + 18 ms, median 120 ms, range 90– 174 ms. From linear regression analysis, correction factor for JT was $\alpha = 0.19$ and $\beta = 0.43$ and for QT α was 0.22 and β 0.39. Linear Regression plots for QT_c and JT_c against RR intervals: QT_c linear: slope < 0.005, R² < 0.01 QT_c log: slope < 0.05 R² < 0.01, JT_c linear slope 0.039 R² > 0.001, JT_c log slope -0.03 R² < 0.001. QRS duration plotted against JT_c α R² 0.028 and JT_c β R² 0.019; QT_c α R² 0.3, QT_c β 0.32.

Conclusion: Correction for heart rate was good for both JT and QT new formulae. For QRS duration correction, unsurprisingly, the JT formulae were superior. For pediatric subjects with RBBB, these new JT_c and the QT_c correction formulae perform well.