Correction equation for QT interval

Thank you for giving me the opportunity to reply to Dr Evans (1985) comments.

The point of contention is that in deriving a correction for QT intervals for cycle length each individual contributed several data pairs to the data which was analysed to give a global correction fit.

The formulae discussed were of the form \( K = QT/RR^n \); with \( n = 0.5 \) we have the square root formula of Bazett. Linearisation is achieved by putting

\[ \log QT = \log K + n \log RR. \]

This type of correction rather than a straight line was selected because of the slight concavity towards the abscissa noticeable when QT is plotted against RR. A number of groups of workers have felt a non-linear correction desirable: of the formulae tabulated by Simonson eight are non-linear.

An alternative approach to the analysis of these data which avoids the theoretical difficulties inherent in global analysis is to analyse each individual separately as follows. To each subject's data is fitted a regression line for the linearised formula with fixed selected values of \( n \). Considering the pharmacologically interesting cases; when a range of heart rates was obtained with parasympatholytics, atropine provided a total of 17 individual data sets which were analysed separately. The residual mean squares (RMS) was calculated; 16 had a lower RMS when a cube root correction was employed rather than a square root one. With hyoscine providing a range of heart rates 12 individual data sets show nine better with a cube root and three better with a square root.

Further additional data derived from subjects who received hydralazine (i.v. 5, 10, 15, 25 mg and oral 50, 75 mg) in a tilt table (30°) study gives 18 further data sets. The subjects were of similar age and weight to those studied previously. In this case the cube root correction gave a better fit than the square root in 15 of the 18 cases.

The corresponding constants (K), mean and s.d., are atropine 0.385 ± 0.014, hyoscine 0.383 ± 0.015 and hydralazine 0.400 ± 0.033.

Application of the Wilcoxon matched pairs signed ranks test shows these RMS differences to be significant as follows; atropine \( P < 0.01 \), hyoscine \( P < 0.05 \) and hydralazine \( P < 0.01 \).

That there is an optimum value of \( n \) in a correction formula of this kind is seen when plots of the residual mean square (RMS) are made for a range of values of \( n \) for each subject. In this way a set of parabolae is produced with minima centering around 0.3. A set of such plots for five subjects who received atropine is shown in Figure 1. When the value of \( n \) is optimal mean values for the corresponding constants (K) are for atropine 0.385 ± 0.015, hyoscine 0.397 ± 0.030 and hydralazine 0.400 ± 0.033.

![Figure 1](image)

Plot of residual mean square (RMS) against values of \( n \) for regression using formula \( K = QT/RR^n \) for five subjects who received atropine.

These findings thus support the original contention that, when using a correction formula of this type, the cube root formula of Fridericia offers a better correction than the square root formula of Bazett.

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Reference