Do the ECG Intervals Depend on the Heart Rate, on the Body Habitus or on the Amplitude? Insights from a Large Study Group

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Introduction It is known that among other parameters the QT interval is heart-rate-dependent. Moreover, it can be hypothesized that the electrical axes are influenced by the body habitus. We wanted to know if these effects can be found in young males of a certain age category or whether there is another important correlation. Methods A database of 41,806 young Swiss (age 19.3±1.1) who underwent compulsory conscription for the Swiss Army was compiled. Along with other medical data, an ECG was taken. All abnormal ECGs reviewed by two independent cardiologists were excluded. All ECGs for which no automatic measurement was possible or body habitus not available or the conscript was a female were excluded, too. ECG subgroups were reviewed and global measurement parameters manually adopted where needed. We produced 2D contour plots, calculated correlation coefficient and regression lines. Results Minimal value, mean±standard deviation, and maximal value for weight, height and BMI were 40, 73±12, 187 kg; 118, 178±7, 207cm and 13, 23±4, 58 kg/m^2. The linear relationship between BMI and Paxis, QRSaxis and Taxis was -1*BMI+71 ($R^2 = 0.03$), -2*BMI+108 ($R^2 = 0.07$), and -1.5*BMI+76 ($R^2 = 0.13$). The linear relationship between RR (351, 859±162, 1751 ms) and PP, PQ, QRS and QT interval was 0*RR+110 ($R^2 = 0.02$), 0*RR+146 ($R^2 < 0.01$), 0*RR+89 ($R^2 = 0.02$) and 0.1*RR+248 ($R^2 = 0.65$). The correlation was larger than $R^2 = 0.1$ for more than half of the interval-amplitude relationships. Conclusions Although no relevant correlation was found between RR and PQ, QRS and PP, a correlation was detected between QT/RR (known) as well as for amplitude-duration couples. The measurement error corresponding to the difference between the maximal and minimal value is 14 ms, 2 ms, 11 ms and 188 ms for the PP, PQ, QRS and QT interval focusing on heart rate dependency. The regressed P axis values range from 57 down to 8 for minimal and maximal BMI, 83 down to -2 for the QRS axis and from 55 to -16 for the T axis.