

Combination of QT and RR Analysis in the Detection of Long QT Syndrome

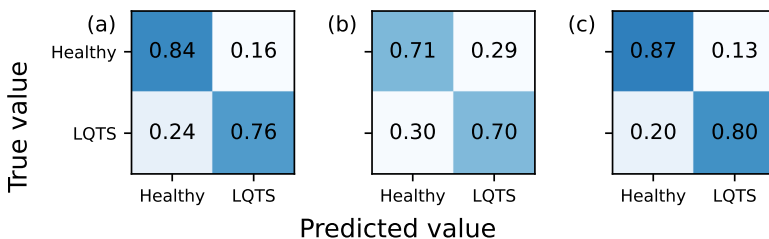
Matias Kannianen*, Teemu Pukkila, Esa Räsänen

Tampere University, Tampere, Finland

Aims: Conventionally, long QT syndrome (LQTS) is diagnosed from the prolonged corrected QT (QTc) interval. However, recently it has been shown that also RR interval analysis, especially with detrended fluctuation analysis (DFA), can be used to discriminate LQTS patients with a reasonable accuracy. Here, we examine a *combination* of these approaches, that is, analysis of (i) QT(c) interval length and (ii) RR interval sequences with DFA. The aim is to improve the discrimination of LQTS subjects from the healthy controls.

Methods: We used 5-minute segments in resting conditions extracted from 24-hour Holter recordings from *Telemetric and Holter ECG Warehouse* with 182 healthy control samples and 339 genetically confirmed LQTS samples. The beta-blocker (BB) treatment of the LQTS is accounted for. We analyzed the RR intervals with DFA and calculated the corrected QT intervals with conventional QTc methods of Bazett and Fridericia and a recently developed transfer-entropy method (AccuQT). For the classification, we used a logistic regression model.

Results: Independent QTc analysis yields a classification accuracy of 0.74–0.80 depending on the correction method. Independent DFA of RR intervals yields an accuracy of 0.70. A combination of these two approaches leads to a high accuracy of 0.84 when using the Bazett QT correction. For the BB subgroup of the LQTS subjects the accuracy is as high as 0.89, and for the non-BB subgroup it is 0.79. In conclusion, LQTS discrimination can be improved by combining QTc length analysis with RR interval analysis with DFA. Furthermore, the DFA approach can be used also as a prediagnostic tool by monitoring the RR intervals with wearable devices before thorough ECG measurements including QT intervals.



Confusion matrices for the LQTS classification with (a) QTc (Bazett), (b) DFA for RR intervals, and (c) the combination of (a) and (b).