|  |  |  |  |
| --- | --- | --- | --- |
| **Title:** | Effect of ECG-derived respiration (EDR) on modeling ventricular repolarization dynamics in different physiological and psychological conditions | | |
| **Author(s) Name:** | M. H. Imam, C. K. Karmakar, A. H. Khandoker & M. Palaniswami | | |
| **Contact Email(s):** | hasan.imam@aiub.edu | | |
| **Published Journal Name:** | Medical & Biological Engineering & Computing | | |
| **Type of Publication:** | Journal | | |
| **Volume:** | 52 | Issue |  |
| **Publisher:** | Springer Nature | | |
| **Publication Date:** | 27 August 2014 | | |
| **ISSN:** | 1089-7771, 1558-0032 | | |
| **DOI:** | 10.1007/s11517-014-1188-0 | | |
| **URL:** | https://doi.org/10.1007/s11517-014-1188-0 | | |
| **Other Related Info.:** | Page 851–860 | | |
|  | | | |

|  |  |
| --- | --- |
| **Abstract:** |  |
| Ventricular repolarization dynamics is an important predictor of the outcome in cardiovascular diseases. Mathematical modeling of the heart rate variability (RR interval variability) and ventricular repolarization variability (QT interval variability) is one of the popular methods to understand the dynamics of ventricular repolarization. Although ECG derived respiration (EDR) was previously suggested as a surrogate of respiration, but the effect of respiratory movement on ventricular repolarization dynamics was not studied. In this study, the importance of considering the effect of respiration and the validity of using EDR as a surrogate of respiration for linear parametric modeling of ventricular repolarization variability is studied in two cases with different physiological and psychological conditions. In the first case study, we used 20 young and 20 old healthy subjects’ ECG and respiration data from Fantasia database at Physionet to analyze a bivariate QT–RR and a trivariate model structure to study the aging effect on cardiac repolarization variability. In the second study, we used 16 healthy subjects’ data from drivedb (stress detection for automobile drivers) database at Physionet to do the same analysis for different psychological condition (i.e., in stressed and no stress condition). The results of our study showed that model having respiratory information (QT–RR–RESP and QT–RR–EDR) gave significantly better fit value (p < 0.05) than that of found from the QT–RR model. EDR showed statistically similar (p > 0.05) performance as that of respiration as an exogenous model input in describing repolarization variability irrespective of age and different mental conditions. Another finding of our study is that both respiration and EDR-based models can significantly (p < 0.05) differentiate the ventricular repolarization dynamics between healthy subjects of different age groups and with different psychological conditions, whereas models without respiration or EDR cannot distinguish between the groups. These results established the importance of using respiration and the validity of using EDR as a surrogate of respiration in the absence of respiration signal recording in linear parametric modeling of ventricular repolarization variability in healthy subjects. | |