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| **Title:** | Analyzing Systolic-Diastolic Interval Interaction Characteristics in Diabetic Cardiac Autonomic Neuropathy Progression | | |
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| **Abstract:** |  |
| Cardiac autonomic neuropathy (CAN), one of the major complications in diabetes, if detected at the subclinical stage allows for effective treatment and avoiding further complication including cardiovascular pathology. Surface ECG (Electrocardiogram)-based diagnosis of CAN is useful to overcome the limitation of existing cardiovascular autonomic reflex tests traditionally used for CAN identification in clinical settings. The aim of this paper is to analyze the changes in the mechanical function of the ventricles in terms of systolic-diastolic interval interaction (SDI) from a surface ECG to assess the severity of CAN progression [no CAN, early CAN (ECAN) or subclinical CAN, and definite CAN (DCAN) or clinical CAN]. ECG signals recorded in supine resting condition from 72 diabetic subjects without CAN (CAN-) and 70 diabetic subjects with CAN were analyzed in this paper. The severity of CAN was determined by Ewing's Cardiovascular autonomic reflex tests. Fifty-five subjects of the CAN group had ECAN and 15 subjects had DCAN. In this paper, we propose an improved version of the SDI parameter (i.e., TQ/RR interval ratio) measured from the electrical diastolic interval (i.e., TQ interval) and the heart rate interval (i.e., RR interval). The performance of the proposed SDI measure was compared with the performance of the existing SDI measure (i.e., QT/TQ interval ratio). The proposed SDI parameter showed significant differences among three groups (no CAN, ECAN, and DCAN). In addition, the proposed SDI parameter was found to be more sensitive in detecting CAN progression than other ECG interval-based features traditionally used for CAN diagnosis. The modified SDI parameter might be used as an alternative measure for the Ewing autonomic reflex tests to identify CAN progression for those subjects who are unable to perform the traditional tests. These findings could also complement the echocardiographic findings of the left ventricular diastolic dysfunction by providing additional information about alteration in systolic and diastolic intervals in heart failure. | |