A New Wavelet-Based ECG Delineator for the Evaluation of the Ventricular Innervation

T-wave amplitude (TWA) has been proposed as a marker of the innervation of the myocardium. Until now, TWA has been calculated manually or with poor algorithms, thus making its use not efficient in a clinical environment. We introduce a new wavelet-based algorithm for the delineation QRS complexes and T-waves, and the automatic calculation of TWA. When validated in the MIT/BIH Arrhythmia database, the QRS detector achieved sensitivity and positive predictive value of 99.84% and 99.87%, respectively. The algorithm was validated also on the QT database and it achieved sensitivity of 99.50% for T-peak detection. In addition, the algorithm achieved delineation accuracy that is similar to the differences in delineation between expert cardiologists. We applied the algorithm for the evaluation of the influence in TWA of anticholinergic and antiadrenergic drugs (i.e., atropine and metoprolol) for healthy subjects. We found that the TWA decreased significantly with atropine and that metoprolol caused a significant increase in TWA, thus confirming the clinical hypothesis that the TWA is a marker of the innervation of the myocardium. The results of this paper show that the proposed algorithm can be used as a useful and efficient tool in clinical practice for the automatic calculation of TWA and its interpretation as a non-invasive marker of the autonomic ventricular innervation.