sensitive to physiologic interference. Changes of the sampling frequency should be very carefully applied.

doi:10.1016/j.jelectrocard.2007.03.427

Posters

COM-18

Importance of body surface potential field representation fidelity: assessment of arrhythmia vulnerability

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Introduction: Judging from recent studies, the complex substrate of malignant arrhythmias needs a detailed spatiotemporal noninvasive characterization of low-amplitude dynamic changes in beat-to-beat cardiac repolarization. From this aspect, body surface potential mapping should have an essential role because of its ability to access all of the bioelectrical information available on the body surface.

Methods: Body surface potential mapping records were taken from 14 healthy male and female subjects (age, 20-80 years), and from 6 ventricular arrhythmia patients, 4 of them with implanted cardioverter defibrillators (ICDs). Records were taken continuously, for 5 minutes, in resting supine position. Beat-to-beat QRS and QRST integral maps, Karhunen-Loeve coefficient time series (KL_i, i = 1-12), RR, and nondipolarity index (NDI) time series were computed.

Results: The first-order statistical properties of the spatiotemporal variability of subsequent QRST integral maps were characterized by the mean body surface signal power (M2) and signal variance (SD2). The SD2/M2 values of the QRST integral maps in the normal group ranged between 0.0057 and 0.008 (ie, 0.075 < 0.089). In ICD patients, SD2/M2 values went up to 0.021 to 0.069 (ie, 0.14 < 0.26). Autocorrelation functions of the individual KL_i components revealed an essentially white noise type beat-to-beat variability character, superimposed on a bandwidth-limited noise. In ICD patients, some of the KL component SDs (SDi) increased considerably. The higher the SDi/Mi relative KL_i variability, the higher and more frequent were the NDI spikes.

Conclusions: Beat-to-beat dynamics of white noise components of high-resolution body surface potential mappings are able to stratify arrhythmia vulnerability, especially if the mean value of the KL_i components is low. The temporal distribution of extreme NDI spike formations is random; the frequency is associated with the relative KL_i component noise levels.

doi:10.1016/j.jelectrocard.2007.03.428

COM-19

Heart rate variability and arterial oxygen saturation at different altitudes in healthy middle-aged subjects

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Introduction: Studies of autonomic cardiac nervous system activity during acute exposure to hypobaric hypoxia have suggested a depression of autonomic functions and a shift in the sympathovagal balance toward relatively more sympathetic and less parasympathetic activity at high altitudes. This study was performed to investigate the relationship between autonomic nervous cardiac influence and arterial oxygen saturation at different altitudes/hypoxic conditions.

Methods: The electrocardiogram was recorded in 9 nonacclimatized healthy alpine rescuers (age, 43.7 ± 7.3 years), at rest in supine position and at 3 different altitudes: 400 (reference altitude), 3200, and 4200 m. The autonomic cardiac function was evaluated by means of heart rate variability analysis by using the Poincaré plot. SD1 and SD2 indexes are used as a marker of vagal and sympathetic activities, respectively, whereas SD1/SD2 ratio indicates the vago/sympathetic balance being SD1 and SD2 as the 2 axes of the ellipse that contains the Poincaré points. The arterial oxygen saturation was measured on a finger by a pulse oximeter at all 3 altitudes.

Results: Our results demonstrated a statistically significant increase of heart rate (P < .001) and decrease of SD1 (P < .005) and SD2 (P < .03) parameters at both higher altitudes in comparison with the reference level. No significant changes were detected, comparing these Poincaré plot parameters between the 2 altitudes (3200 and 4200 m). Arterial oxygen saturation was significantly lower at both higher altitudes compared with 400 m (P < .005), as well as at 3200 m compared with 4200 m (P < .05).

Conclusions: This study showed a similar decrease of cardiac sympathetic and parasympathetic modulation with a shift of vago/sympathetic balance toward the sympathetic activity at both different hypoxic conditions, whereas the arterial oxygen saturation progressively decreased when altitude increased and reached the lowest value at 4200 m.

doi:10.1016/j.jelectrocard.2007.03.429

COM-20

New approaches to the diagnosis of left and right ventricular hypertrophy by means of dipolar electrocardiotopography

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Introduction: The aim of this work was to describe a new approach to noninvasive differential diagnosis of the left and right ventricular hypertrophies (LVH and RVH) caused by arterial or lung hypertensions.

Methods: The vectorcardiographic measurements performed using the McFee-Parungao lead system were analyzed by means of dipolar electrocardiotopography technique based upon a simplified spherical model of the heart. The characteristics of LVH an RVH are obtained from the decartograms of activation duration. The regions of the decartogram, where the surfaces of the left and right ventricles are projected, are considered. The integral indices of hypertrophy for the left ventricle and right ventricle (ILVH and IRVH) are the surface integrals of activation duration calculated over the aforementioned regions. The diagnostic decision is made through the comparison of ILVH and IRVH with specified threshold values. For comparison, the sums of wave amplitudes used in the orthogonal vectorcardiography, Rx + Sz for LVH and Rz + Sx for RVH, were also considered.

Results: The study included 141 males and 191 females aged 45 ± 15 years, with reliably verified state of the heart, in particular, 143 persons without hypertrophy, 129 persons with LVH, and 60 persons with RVH. Using the receiver operating characteristic curves, the following integral characteristics of classification efficiency were obtained: 86% and 91% for the indices ILVH and IRVH, and 85% and 88% for the indices Rx + Sz and Rz + Sx, respectively. For the reasonable value of specificity 95%, the indices ILVH, IRVH, Rx + Sz, and Rz + Sx provide the sensitivities 63%, 75%, 57%, and 72%, respectively.

Conclusions: The proposed dipolar electrocardiotopography method, initially intended mainly for intelligible pictorial visualization of vectorcardiographic data, also provides some increase of diagnostic accuracy in recognition of the LVH and RVH as compared with the standard electrocardiography and orthogonal vectorcardiography.

doi:10.1016/j.jelectrocard.2007.03.430