Risk Stratification of Ventricular Fibrillation by Two-Dimensional Functional Image of Repolarization Dispersion and T-Wave Alternance Using Synthesized 187-Channel ECG

Kenji Nakai, Manabu Itoh, Takashi Komatsu, Yoshihiro Sato, Mahito Ozawa, Fusanori Kunukida, Hideki Tachibana
Department of Internal Medicine of Dentistry and Cardiology, Iwate Medical University, Japan

We developed synthesized 187 channel high-resolution ECG (187ch DREAM-ECG) that can evaluate simultaneously two-dimensional functional images of late potential (LP), RTpeak-end and T-wave current alternance (TWCA) using Mason-Likar lead system. We evaluated the significance of a risk stratification for ventricular fibrillation (VF). The subjects consisted of 20 healthy subject (CONT) and 10 patients with VF (1 idiopathic VF (IVF), 5 long QT syndrome, 2 Brugada syndrome, 1 sarcoidosis and 1 myocardial infarction). We recorded 10 min of 187ch DREAM-ECG. Two-dimensional functional images of recovery time (RTpeak-end; RTp-e) dispersion and LP were obtained by the signal-averaged 187ch VP-ECG. The TWCA value was determined from the relative changes in the averaged current density in the T-wave zone (Tpeak ± 50 ms) for two T-wave types. In the IVF and LQT with VF case, values of RTpeak-end dispersion and TWCA were higher than those in CONT (RTp-e dispersion; 63 ± 12 ms vs. 26 ± 16 ms, TWCA; 6.5 ± 7.3% vs. 0.5 ± 0.2%). For the Brugada syndrome with VF, positive LP and increased RTp-e dispersion was demonstrated. For the MI and sarcoidosis with VF, positive LP and increased RTp-e dispersion were associated. We conclude that a novel algorithm using 187ch DREAM-ECG might provide new insights on a risk stratification of VF.

Keywords: T-wave alternans, body surface mapping, repolarization heterogeneity