Investigation on Two-year Peritoneal Dialysis Patients: Does the Cardiovascular Condition Affect ECG Biometrics?

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Introduction: Biometrics is anatomical, physiological or behavioral characteristics different from person to person. Electrocardiogram is previously verified as a new biometric for human identification. However, it is still unclear if any internal, external or temporal factors may affect the biometric. Previous evidence indicates that ECG biometric is robust from 1-3 year observation for healthy subjects. However, it is uncertain if changes of cardiovascular conditions may cause any difference. In general, end-stage renal disease patients provide an accelerated process on vascular calcification, atherosclerosis and peripheral arterial disease. Hence, the research investigates if cardiovascular conditions may impact ECG biometrics. Method: Twenty-three peritoneal dialysis patients were monitored for two year period (2007-2009) under IRB regulation at Tzu-Chi General hospital, Taiwan. The cardio-ankle vascular index (CAVI) and ankle-brachial index (ABI) were measured to evaluate cardiovascular conditions. Then, their ECG signals have been recorded for 5 minutes at supine position for two years, which are sampled at 500 sps and filtered for bandwidth from 0.01Hz to 50 Hz. Seventeen fracture features (Shen 2005) were extracted and the template matching method is applied for observing the difference on ECG morphology. Our ECG templates were generated at first year and tried to match the signal at two year after. Total of 25% outliner heartbeats were eliminated on 5 min recordings for all subjects. Results and conclusions: From above population, the average ABI increased 5.2% and the average CAVI decreased 14.9%. All features demonstrated no significant, except the feature, RS amplitude divided by TS amplitude. It correlates ABI significantly for two year period (-.627 and -.497, $p<0.05$). Our results show that ECG is still able to identify individuals, even the average correlation coefficients decreased from 0.985 to 0.877 after two years. Hence, we suggest that ECG biometric may calibrate after years on peritoneal dialysis patients.