Abstract

Electrocardiography (ECG) is one of the most widely used diagnostic methods to examine the development of cardiovascular diseases (CVD). It is important to have a long-term continuous ECG recording to properly monitor the heart activity, which can be measured by placing two or more electrodes on the skin. Ag/AgCl gelled electrodes are often used for the ECG measurement, but they are not suitable for long-term monitoring due to the dehydration of the gel over time and skin irritation. Textile-based electrodes could have an important role in replacing the gelled electrodes and avoid their associated problems. This paper focuses on the development of a textile-based electrode and studying its ECG detecting performance. We developed silver printed textile electrodes via a flat-screen printing of silver ink on knitted polyester fabric. The surface resistance of silver-coated PET fabric was 1.78 Ω/sq and 3.77 Ω/sq before and after washing, respectively. Stretching of the conductive fabric from 5% to 40% caused a 6% to 18.28% increase in surface resistance. The silver-printed PET fabric stayed reasonably conductive after washing and stretching which makes it suitable for wearable applications. Moreover, the ECG measurement at static condition showed that the signal quality collected before and after washing were comparable with the Ag/AgCl standard electrodes. The P, QRS, T waveforms, and heartbeat before washing in respective order were 0.09 mV, 1.20 mV, 0.30 mV for the silver printed fabric electrode and 72 bpm, and 0.10 mV, 1.21 mV, 0.30 mV, and 76 bpm for Ag/AgCl standard electrode.

Key words: ECG; textile electrode; flat-screen printing; silver-coated PET