Evaluation of the Reduction in Time-to-defibrillation due to CPR Artifact Suppression in Long Duration Out-of-hospital Cardiac Arrest Records

Erik Alonso*, Elisabete Aramendi, Unai Irusta, Unai Ayala and Digna Gonzalez

Bilbao, Bizkaia, Spain

Chest compressions artefacts during cardiopulmonary resuscitation (CPR) make rhythm diagnosis by automated external defibrillators (AED) unreliable. Adaptive filters that suppress the CPR artefact have been tested on short duration corrupted signals. The aim of this study is to evaluate the accuracy of an adaptive filter with long duration OHCA records and to quantify how filtering reduces time-to-defibrillation. We analysed two groups of OHCA records, corresponding to intervals between two consecutive defibrillation attempts. The first group contained 127 ventricular fibrillation (VF) records with corrupt and clean subintervals and a mean duration of 152 ± 111 seconds. The second group contained 64 records with three clear intervals: first an interval of non-shockable asystole with clean and corrupt subintervals, followed by a transition interval from asystole to VF during chest compressions and finishing in a VF interval with clean and corrupt subintervals. The mean duration of these records was 212 ± 211 seconds. We filtered the ECG with an adaptive dual-channel CPR suppression filter based on the chest compression depth. The filtered ECG was continuously diagnosed in 9.6 second nonoverlapping segments using a commercial AED algorithm. For the first group, the sensitivity in the last clean interval preceding defibrillation was 97.6%. After filtering, continuous shock was diagnosed in 93/127 records and during 95.8% of the time of all records. For the second group, the specificity in the initial clean interval was 98.4% and the sensitivity in the final clean interval was 95.3%. After filtering the change in diagnosis from non-shockable to continuously shockable occurred in the transition interval in 55/64 records. The first shock diagnosis occurred 7 times in the non-shockable interval and 57 times in the transition interval. The mean reduction in time-to-shock was 94 ± 73 seconds. This is the first time that real time to shock reductions due to diagnosis during CPR are reported.