Role of the Historical Electrocardiogram in Identifying Acute Coronary Syndrome

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Introduction. Sensitivity and specificity for diagnosing acute coronary syndrome (ACS) in prehospital ECGs of chest-pain patients is insufficient. The guidelines state that comparison of prehospital ECGs and a previous ECG tracing is valuable, particularly in patients with pre-existing ECG abnormalities, but this is logistically difficult and the diagnostic gain has never been quantified. Our study investigates the additional value of a the most recent historic ECG in ACS identification.

Methods. Used data belong to the SUBTRACT study, which includes couples of 10-second 12-lead prehospital (acquired in the ambulance) and historical ECGs from 1182 patients, 169 of whom resulted affected by ACS. During the SUBTRACT study, in each patient 12-lead 10-second ECG couples were collected: a prehospital ECG in the ambulance, and the most recent preceding elective historic ECG recording. A total of 1182 patients were included in the study, 169 of them were during hospital admission diagnosed with ACS. For each ECG couple, 47 features were computed and grouped in two sets: the first set included 18 direct measurements from the prehospital ECG, while the second set included the 18 measurements of the first set plus 29 additional differential prehospital-historical measurements. The two feature sets were used to create two dendrograms (hierarchical clustering tools that do not consider reference classification of data). Each dendrogram discriminated patients into two clusters, successively labeled as ACS cluster (i.e. including over 50% of ACS patients) and non-ACS cluster. Sensitivity (SE) and specificity (SP) were used to evaluate goodness of clustering.

Results. Clusters obtained using the second set of features provided higher values of SE (71%) and SP (69%) than those obtained using the first set of features (SE:22%; SP:57%).

Conclusion. Inclusion of differential measurements, improves identification of ACS in ambulances, indicating that historical ECG provides additional diagnostic value with respect to prehospital ECG only.