Acute MI Detection Derived From ECG Parameters Distribution

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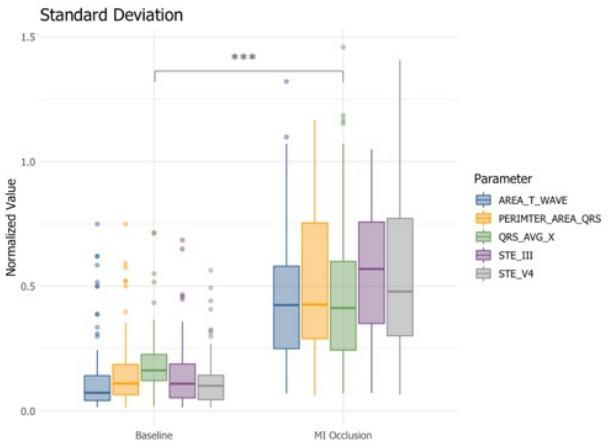
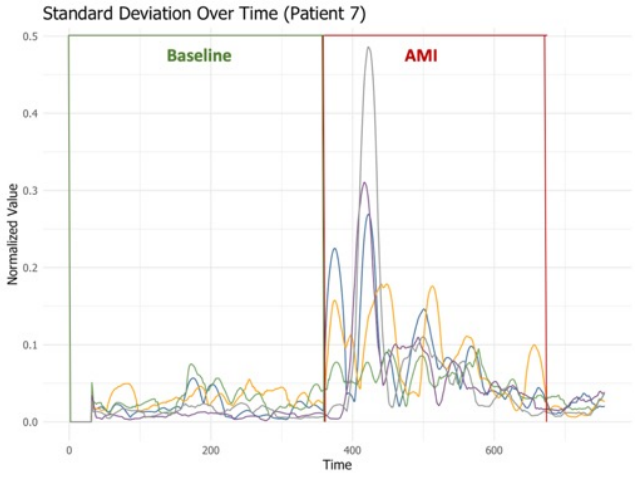
Aims: Several studies have evaluated the use of different ECG-based features to diagnose acute myocardial infarction (AMI). This was generally done by looking at how well a feature reflects differences between baseline (no AMI) and AMI. This approach tends to underestimate false positives when implemented into a continuous monitoring setting and therefore appears inadequate for it. This has hindered the implementation of those features in clinical practice. In this research, we focused on the distribution properties of ECG-based features for the detection of AMI.

Methods: We used the PhysioNet STAFF III database as data source. This database consists of standard 12-lead ECG recordings from 104 patients with stenotic coronary arteries, who received elective percutaneous transluminal coronary angiography (PTCA) in one of the major coronary arteries, thus simulating AMI episodes in patients. We analyzed the distributions of a set of six ECG-based features (derived from the 12-lead ECG) for AMI detection. In order to characterize the distributions of the different features, we calculated the standard deviation, kurtosis, skewness and symmetry of the distributions during both baseline and AMI situations.

Results: When comparing ECG-based feature distributions between baseline and AMI condition, we observed significant changes (p-value < 0.001) in the symmetry and standard deviation of the distributions. Additionally, we observed changes over time in the distribution parameters, which suggests that the longitudinal analysis of the ECG-based features may help in the continuous monitoring and evaluation of AMI.



This figure shows differences between baseline and AMI situation using standard deviation distribution parameter. Differences are significant for all the variables (p-value < 0.001).



This figure shows standard deviation distribution parameter in baseline and AMI situation for Patient number 7 of the database.

Conclusions: Distributions of ECG-based features for AMI detection show significant differences between baseline and AMI, thus suggesting the use of those features for continuous monitoring and evaluation of AMI.