Distinguishing Between Supply Ischaemic and Non-Supply Ischaemic ST Events using a Relevance Vector Machine

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ST segment changes provide a sensitive marker in the diagnosis of myocardial ischaemia in ECG recordings. It is also known that changes in the ST segment can result from a wide variety of other causes such as changes in heart rate, conduction pattern, position of the subject, and noise in the ECG. The characteristics of the various ST events are different for each phenomenon. Demand (heart rate-related) and ischaemic events are considered transient ST segment events and are characterized by length and extremum deviation. In contrast, body position changes and conduction changes events are characterized by a sudden shift in the ST level and by the time at which they occur. Heart-rate related, body position and conduction change ST events can be grouped together as a non-supply ischaemic (NSI) or artefactual ST changes. Ischaemic ST events and NSI ST events manifest themselves as very similar ST changes. This suggests that it is better to rely on a comprehensive set of ECG parameters to distinguish between ischaemic and NSI ST events. We investigated heart rate, ST level, ST slope, duration of ST episodes, absolute deviation of ST segment, upward and downward slopes of QRS segment, and duration of the QRS complex. A Relevance Vector Machine (RVM), using these as input features, was then trained to classify detected events as ischaemic or NSI ST events. The trained RVM was applied to annotated ST-related episodes all from the records contained in the Long-Term ST Database taken from PhysioNet, which contains 1130 ischaemic events and 234 NSI events. The dataset was divided into training and testing subsets. The training dataset comprises 100 ischaemic events and 100 NSI events while the testing dataset comprises 132 and 1026, respectively. The RVM achieved a sensitivity and specificity of 84.3% and 79.5%, respectively on the testing dataset.