ST Changes Observed in Short Spaced Bipolar Leads Suitable for Patch Based Monitoring

Michael Jennings, Daniel Guldenring, Raymond Bond, Ali Rababah, Jim McLaughlin, Dewar D Finlay

Ulster University
Newtownabbey, UK

Introduction: Patch based ECG monitoring has seen increased interest in recent years. This has been coupled with the influx of mobile devices that allow ECG recording. Previously, researchers have shown the utility of bipolar leads optimised for the detection of ECG changes associated with myocardial infarction. This article investigates the selection of an optimal ECG lead for the detection of ST changes more likely to appear in patch systems with closely spaced leads.

Method: We analysed body surface potential maps (BSPMs) from 44 subjects undergoing percutaneous transluminal coronary angioplasty (PTCA). BSPMs were recorded at 120 sites and these were expanded to 352 nodes (Dalhousie torso) using Laplacian interpolation. A total of 88 BSPMs were investigated. This included the 44 subjects at baseline and the 44 subjects at peak balloon inflation (PBI). At PBI the subjects had various coronary arteries occluded (14 LAD, 15 LCX, 15 RCA). All possible bipolar leads were calculated for each subject. Leads were ranked based on the maximum ST-segment change between baseline and PBI for each subject. Leads with electrode spacing of more than 100 mm were excluded. The highest ranked lead was chosen as the short spaced lead (SSL) on the anterior torso.

Result: The median ST-segment change for the chosen SSL for each vessel was LAD = 134 μV, LCX = 65 μV, RCA = 166 μV. The maximum ST segment change observed for the same lead was LAD = 277 μV, LCX = 166 μV, RCA = 257 μV . For comparison, the highest median ST-segment change observed on the 12-lead ECG for each vessel was LAD = 137 μV (V3), LCX = 130 μV (III), RCA = 196 μV (III)

Conclusion: Our analysis has shown that a SSL can perform comparatively with the existing 12-lead setup for detecting ST-segment changes during coronary artery occlusion.