NOVEL CARDIAC ELECTRICAL BIOMARKER FOR DETECTION OF ACUTE MYOCARDIAL ISCHEMIC INJURY

Poster Contributions
Poster Hall B1
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Background: The measured 12-lead electrocardiogram (mECG) describes a dipolar electric field such that only 3 leads are needed to construct a derived 12-lead ECG (dECG). A new cardiac electrical biomarker (CEB) that is a measure of dipolar energy has been identified from the dECG, directly from a cardiac monitor, that can detect acute myocardial ischemic injury (AMII) in real time. The objective is to measure the CEB diagnostic accuracy for detection of both STEMI and NSTEMI patients.

Methods: This is a retrospective, case control, blinded study of 310 archived mECGs including 53 STEMI and 14 NSTEMI cases. The dECG is constructed from measured leads I, aVF, and V2. ECGs were included if acquired ≤ 1 day from patient presentation. ECGs were interpreted by 2 blinded physicians (emergency medicine and cardiology), and adjudicated by consensus. ECGs were excluded for excessive noise, baseline wander, age < 18, and ectopic beats in the acquisition sample. Diagnostic accuracy measures of sensitivity, specificity, positive and negative predictive values (PPV, NPV) and likelihood ratios (LR-, LR+) were stratified by STEMI and NSTEMI. Measured vs. derived ECG correlations were quantitatively and qualitatively compared using Pearson correlation (r) and percent agreement methods.

Results: CEB sensitivities for STEMI and NSTEMI detection were 92.2% and 92.3% respectively, and CEB specificities were 92.9% and 92.9% respectively. CEB NPVs for STEMI and NSTEMI were 98.1% and 99.5% respectively, and CEB PPVs were 74.6% and 42.9% respectively. CEB (LR+, LR-) for STEMI and NSTEMI were (13.02, 0.084) and (13.04, 0.083) respectively. All diagnostic accuracy measures were significant at p < 0.05. Derived and measured 12-lead ECGs showed high correlation with r = 0.868. Physician intra-agreement analysis for mECGs and dECGs with AMII was 99.4%.

Conclusion: The CEB detects STEMI and NSTEMI with high diagnostic accuracy. The 12-lead ECG is derived with accuracy from 3 leads. The measured and derived 12-lead ECGs show high qualitative and quantitative correlation. The CEB allows an immediate, cost-effective, and efficient means of identifying patients with AMII who are being monitored in acute care settings.