Graphic Visualization of ECG Estimated MI Size using the 17 Segment Bull's Eye Presentation

RE Gregg*, SH Zhou, ED Helfenbein

Advanced Algorithm Research Center, Philips Healthcare
Andover, MA, USA

Background: The size of myocardial infarction (MI) presented as a proportion of the left ventricle (LV) can be estimated using the Selvester scoring system based on ECG. The method sums points assigned to 50 ECG criteria resulting in a final estimate of MI size. In this study we report our effort to automate and then visualize the MI size score on the 17 segment LV bull's eye common to cardiac imaging.

Method: The automated Selvester scoring algorithm was implemented based on the 50 criteria. The algorithm was then validated using a database. After excluding LBBB (n=17), the database contained 688 ECGs with and without MI. Each ECG was manually scored by two cardiologists. Two MI scores were averaged to serve as gold standard. Computer based measurements were redefined according to the definitions of the scoring algorithm but not adjusted for the data set. The automated and manual MI size scores were correlated to assess the accuracy of the automated algorithm. Visualization of the MI extent and location was accomplished by mapping the automated Selvester scores with corresponding locations in LV using the 17 segment bull's eye.

Results: The correlation between the automated and manual scores was 91%. The regression slope (m) and intercept (b) ($y = m x + b$) was 0.99 and 0.64 respectively. With 2 ms added to the duration criteria and exclusion of cases with rS pattern interpreted as Q wave due to 20μV R-wave (n=18), the results were improved to achieve a correlation of 94% with slope and intercept of 0.99 and 0.30

Conclusion: The bull's eye display of MI size is commonly used in cardiac imaging, including echocardiography, cardiovascular magnetic resonance and nuclear imaging. Automated ECG graphic display of MI size serves as a tool to assist cardiologists to visualize the MI size in LV.