Autocorrelation Maps from 12-lead ECG for Classification of Left Bundle Branch Block Patients

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Patients with various cardiac disorders often show notable differences in their electrocardiograms (ECGs). Computing autocorrelation maps (ACMs) from body surface potential maps was proposed as a new method for the evaluation of ventricular activation. In this work, the ACMs were computed from the standard 12-lead ECG.

Using data from the PTB-XL database, the work focuses on comparing groups of left bundle branch block (LBBB) patients to other patient groups, with further analysis of the complete left bundle branch block (CLBBB) group with respect to co-occurring disorders ("mixed" groups) – patients without any co-occurring disorders are aggregated into "pure" groups. The presence of anticorrelated values was evaluated and compared across selected groups of recordings, with primary focus on CLBBB groups and the reference NORM-pure group.

After computing weighted anticorrelation values, a clear distinction emerges between CLBBB-pure and NORM-pure groups, with mean values of approximately 9% and 13%, respectively (31% relative difference), and medians of 9% and 14% (36% relative difference). Statistical tests confirm these findings. The Two-sample Kolmogorov-Smirnov test yields p=8.79E-57 between CLBBB-pure and NORM-pure groups, and p=2.12E-10 between CLBBB-pure and CLBBB-mixed groups. The Wilcoxon rank sum test yields p=1.87E-43 and p=6.89E-14 for the respective pairs. Both tests confirm that the CLBBB-pure group is statistically distinct from both the NORM-pure and CLBBB-mixed groups.

Furthermore, differences between CLBBB-pure and CLBBB-mixed subgroups suggest that co-occurring conditions such as myocardial infarction and hypertrophy may also be differentiable using ACMs.

Overall, the results indicate that ACMs derived from standard 12-lead ECGs can serve as a viable method for the identification and classification of patients with CLBBB.