Novel Classifiers to Differentiate Focal and Macroreentrant Atrial Flutter using 12-Lead Surface Electrocardiogram

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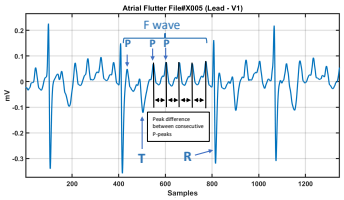
Aim: This study seeks to differentiate the mechanism of atrial flutter (AFL) between focal and macroreentrant from the surface ECG. This study hypothesize that the variability of cycle length of visible consecutive P-waves (F-waves) from the surface ECG can differentiate the mechanism (focal or macroreentry) of atrial flutter. Furthermore, early identification of the AFL mechanism from non-invasive techniques can improve the efficacy of invasive ablation.
Methods: 12-lead surface electrocardiograms of AFL were collected from 48 patients whose mechanism was diagnosed by catheter ablation. 42 out of 48 recordings are associated with a macroreentrant and remaining 6 are focal mechanism.
The proposed model incorporates a wide range of features based on morphological and temporal properties of atrial activity. The wrapper technique has been used for the selection of best feature subsets and its performance is evaluated by using three different classifiers: Linear Discriminant Analysis (LDA), Logistic Regression (LOG), and Support Vector Machine (SVM). An oversampling technique has been used to balance the dataset at seven different ratios.



Proposed of measures peak-to-peak interval between consecutive P-waves of extract F-waves in AFL

Results: The best performance, at 5 times of minority (focal) dataset, has been achieved by LOG with maximum accuracy and specificity of 92.41% and 99.26% respectively. Moreover, SVM has also performed well and maximum accuracy and specificity are 91.23% and 99.26% respectively.
Conclusion: The variability in cycle length of consecutive P-waves from the surface ECG has differentiated the focal AFL from macrorrentrant AFL.