Use of Normalized Correlation Function to Discriminate Outcome of Persistent Patients Undergoing Electrical Cardioversion

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Atrial activity (AA) during atrial fibrillation (AF) is a process characterized by different short- and long-term recurrent behaviors. In this work we hypothesize that the features derived from these behaviors contain an information on the lead locations that discriminate the most between persistent AF patients recurring after electrical cardioversion from those who do not. This is done by focusing on the self-similar behavior in AA propagation.

Body surface potential maps (BSPMs, 120 anterior, 64 posterior electrodes) were recorded in 63 patients in persistent AF prior to electrical cardioversion (32 recurrences after 4-6 weeks). A correlation function (CF) was computed for each electrode, and normalized in order to make it independent of its magnitude. Finally, the first min and max values of the normalized CF from each electrode were used to discriminate patients outcome.

Two body surface spatial maps of first min and first max contributions per electrode were generated from the electrodes locations. Both maps showed that electrodes with the highest values are located on the front of the torso, centered around V1. A Wilcoxon rank-sum test was used to compare maps of recurrent and non-recurrent AF patients and find electrodes with significantly different magnitude. A significant difference was observed on the upper and lower parts of the torso, with higher values for the non-recurrent AF patients (higher recurrence or self-similarity of the underlying AA propagation patterns).

Features characterizing short- and long-term recurrent behaviors in persistent AF patients can be used to highlight differences in how AA propagation patterns reflect on the body-surface of recurrent versus non-recurrent AF patients after electrical cardioversion.