

Windowed Cross-Correlation to Assess the Interatrial Coupling During Persistent Atrial Fibrillation

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Aims. Non-stationarity of intracardiac electrograms (EGMs) during persistent atrial fibrillation (pAF) precludes the use of cross-correlation to quantify the association between EGMs. We hypothesized that windowed cross-correlation (WCC is largely used in psychotherapy to assess nonverbal synchrony between patient and therapist) may help assess the strength of coupling between atrial regions and predict ablation outcomes.

Methods. In 40 patients (61 ± 8 y, sustained AF 19 ± 11 m), pulmonary vein isolation and left atrium (LA) ablation were performed until pAF termination or cardioversion. 20-sec EGMs were synchronously recorded before ablation at the right (RAA) and left (LAA) atrial appendage and the coronary sinus (CS). Following rectification, [1-20] Hz bandpass filtering and normalization, the EGMs were cross-correlated in windowed segments of one second duration for positive and negative time-lags up to 250 ms. The coupling between two EGMs was defined as the average of absolute cross-correlations over the entire 20-sec interval (Figure, panel A).

Results. pAF was terminated within the LA in 70% (LT - left terminated) of the patients, while 30% (NLT - not left terminated) were not. We found that (1) NLT patients displayed lower coupling between the two appendages and CS ($p < 0.05$ RAA-CS) compared to LT patients, and (2) the coupling between RAA and LAA was similar among the subgroups.

Conclusion. Windowed cross-correlation appears to be a promising tool for visualizing the dynamics of interatrial coupling and identification of pAF unresponsive to ablation.

