High-resolution Catheters for Arrhythmic Driver Detection: Preliminary Results in Atrial Fibrillation

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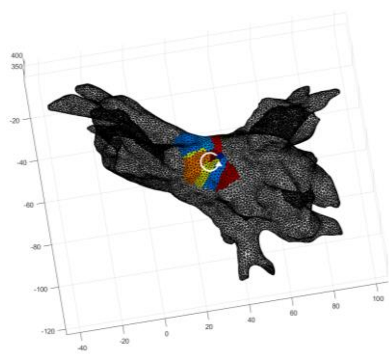
Mechanisms that sustain atrial fibrillation (AF) are not yet clearly identified. Recently, there has been an increasing interest in detecting spiral waves and rotors and in understanding how these potential drivers sustaining AF might be therapeutic targets for catheter-based ablation. The aim of this study was to understand if arrhythmic drivers may be detected using electrograms (EGMs) acquired with a new high-resolution catheter.
EGMs were acquired using the Advisor™ HD Grid (Abbott) mapping catheter. Spatiotemporal organization of atrial fibrillation was studied applying a previously developed and validated algorithm based on phase analysis for local activation timings (LATs) detection and on the persistence of phase singularities for meandering and stable rotor identification on the left atrium (LA) wall.
The rotor identification approach was tested on synthetic data showing excellent results (100% of correct classifications).
On in vivo data, we analysed 28 segments of ten second duration in three patients. Six stable rotors were identified; two rotors had a persistence of 10 seconds; the remaining 4 rotors were shorter (mean persistence in time: 291 ± 284 ms).
Results show the proposed analysis is feasible and processing of EGMs acquired with high-resolution catheters allows detection of stable rotors. Probably due to low spatial coverage of the catheter, meandering rotors were not tracked.
These results need confirmation on a larger dataset and hold promise for a comprehensive arrhythmic driver detection with different mapping catheters.



3D phase map from EGMs acquired with a high-resolution mapping catheter, superimposed to the patient-specific anatomical model; the white arrow shows the anatomical regions around a phase singularity point.