Abstract: P972

Endoatrial contact phase mapping in atrial fibrillation using the PentaRay catheter: is any rotor there? Yes, but not around for long

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Topic(s):
Atrial Fibrillation - Pathophysiology and Mechanisms

Citation:

Background: Electrical rotors role in sustaining atrial fibrillation (AF) and as therapeutic targets in the ablation procedure have been extensively investigated. Up to now, rotors detection and locationing during ablation have been based on basket catheter mapping, which is aimed at a simultaneous acquisition of electrograms (EGMs) from the whole left atrium (LA). However, this mapping might be hampered by low spatial resolution and poor contact of electrodes to the atrial wall.

Purpose: To evaluate rotor detection and locationing performed by means of the PentaRay catheter, which is characterized by lower spatial coverage, higher resolution and better contact.

Methods: Eight patients with persistent AF (age: 57 to 82 y, 3/8 male) were assessed. All patients underwent ablation procedure using CARTO3 mapping system. Unipolar atrial EGMs were acquired using the PentaRay catheter. For each patient several EGMs acquisitions ("epochs"), lasting 2.5 seconds each, were analyzed. A previously developed modified version of the sinusoidal recomposition method and the Hilbert transform were applied. Phase maps were constructed on the portion of the 3D geometry of the LA covered by the catheter; to each point on the anatomy was assigned the phase value computed considering the signal from the nearest electrode. Rotor was defined when a phase singularity with a lifespan greater than one AF cycle length was detected. The implemented algorithm was able to detect both spatially stable and meandering rotors and to quantify their persistence in time.

Results: An example of a detected rotor is shown in the figure. On the left panel we show the phase signals derived from four EGMs; on the right panel the phase signals are color-coded on the LA surface in four different timings (A-D) and the corresponding phase singularity points are shown with the white star. Considering 10 mm as the maximum distance between the electrodes and the atrial wall, the computed coverage of the PentaRay catheter was 12.4%±2.5% of the whole endoatrial wall. The dominant frequency estimated and used for the sinusoidal recomposition method was 4.1±0.3 Hz. For each patient 9.4±6.3 epochs were analyzed, in 5.3±4.6 of which at least a rotor was detected (46.9±32.2%). In the 2.5 sec epochs with at least a rotor, the number of detected stable rotors was 1.7±0.6, with a persistence in time of 283±39 ms (max: 926 ms) while no meandering rotors were detected.

Conclusions: We applied an independent phase mapping approach for 3D rotor detection on the LA surface. Preliminary results show that using the PentaRay catheter spatially stable rotors in the LA can be detected. However, in our patients, such rotors were found to have a very short persistence in time. We may hypothesize that LA chamber coverage has a central role for the detection of meandering rotors, whose pivot is not stable in the small portion of mapped atrial wall.
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