

Correlation Between Rotors and Changes in Atrial Fibrillation Cycle Length in PersAF

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Background

Identifying ablation targets for persistent atrial fibrillation (PersAF) is still challenging despite attempts to guide ablation using Highest Dominant Frequency (HDF) and rotors.

Objective

The objective is to investigate the spatial correlation between rotor sites and sites of Atrial Fibrillation Cycle Length (AFCL) changes that lead to AF termination in PersAF.

Methods

Ten patients underwent a first time HDF-target PersAF ablation in the left atrium (LA). LA was mapped using non-contact array (Ensite, Abbott / St. Jude Medical). Virtual electrograms (VEGMs) from 2048-channels (30 s duration) were exported into MATLAB and QRST-subtraction was performed, then target HDF sites were identified and ablated. LA AFCL was measured pre- and post-ablation of each of the HDF sites. The pre- and post-ablation rotors sites and sites of AFCL changes during ablation were compared using spatial correlation, for terminated and non-terminated patients.

Results

AF was terminated in 40% of enrolled patients. Although the results suggest poor spatial correlation between rotors sites and sites of AFCL changes in terminated and non-terminated patients, higher correlation was found in terminated patients (spatial overlapping percentage $25\pm 4.2\%$ Vs. $11\pm 3.7\%$, respectively). Additionally, global HDF decreased for terminated patients (pre: 9.4 ± 1.1 Hz Vs. post: 8.2 ± 0.4 Hz, $P < 0.001$) and increased in non-terminated patients (pre: 7.8 ± 1.7 Hz Vs. post: 9.3 ± 0.8 Hz). In terminated patients, LA ablation reduced the number of rotors (pre- Vs. post-ablation, 19 ± 7.8 Vs. 4.2 ± 0.2), rotor lifespan (9.6 ± 0.09 ms Vs. 8.7 ± 0.1 ms, $P < 0.001$), rotor displacement (3.3 ± 1.3 mm Vs. 2.3 ± 1.3 mm) and rotor velocity (2.8 ± 0.9 mm/ms

Vs. 1.4 ± 0.8 mm/ms). Conversely, LA ablation increased the number of rotors (pre- Vs. post-ablation, 11 ± 3.8 Vs. 22 ± 8.2), rotor lifespan (7.7 ± 0.11 ms Vs. 8.4 ± 0.1 ms, $P < 0.001$) and rotor velocity (0.9 ± 0.7 mm/ms Vs. 1.3 ± 0.5 mm/ms) in non-terminated patients, and reduced rotor displacement (3.5 ± 1.4 mm Vs. 2.3 ± 0.6 mm).

Discussion

Our results have shown that using 30 s noncontact VEGMs rotors sites demonstrated poor simultaneous spatial overlapping of the location of rotors and sites of AFCL changes that lead to AF termination suggesting that, if there is interaction between these 2 proxies of PersAF, the dynamics of such interaction is more complex than a simple simultaneous spatial correlation. The number of rotors and rotors' parameters did change following HDF-target ablation in terminated patients.