

“Temporal Stability of Rotors in Patients with PersAF”

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BACKGROUND:

Tracking the spatiotemporal change of organized ‘rotors’ in human atrial fibrillation (AF) is important for using them as targets for ablation. The aim of this study is to track the spatiotemporal stability of rotors over 5 min during persistent atrial fibrillation (PerSAF).

METHODS:

This study recruited 10 PersAF patients, who underwent catheter ablation. 2048 non-contact unipolar virtual unipolar electrograms (VEGMs) were simultaneously collected utilizing the balloon array (St Jude EnSite, velocity, 2034Hz), and resampled at 512Hz. After QRST subtraction. The VEGMs were reconstructed using a sinusoidal wavelet fitting approach (Kuklik *et al.*), based on dominant frequency of individual VEGMs. Phase maps were calculated using Hilbert transform and phase singularities points (PS) were identified using topological charge index. A rotor was defined as a PS, which stays for at least 100 ms with spatial threshold of 5-node distance between consecutive frames. Subsequent density maps of rotors were generated. The VEGMs were divided into total of 60 segments of different durations starting from 5 s. The segments were divided into; group A < 30 s, group B > 30 s. To investigate the minimum time duration required to track sustained rotors. Density maps of different time durations were compared with full length 300 s (figure 1).

RESULTS:

An, increase in the number rotors was observed with time duration (5s = 17.2 ± 8.8 Vs. 300 s = 998.3 ± 436.5). Rotor density maps in segments recorded in group A differed significantly from group B, (CORR: group A 10 s = 0.47 ± 0.064 Vs. 30 s = 0.69 ± 0.067 Vs. group B 45 s = 0.76 ± 0.066 Vs. 60 s = 0.80 ± 0.063; P < 0.0001). Rotor density maps for group B showed higher similarity and lower variation (0.88 ± 0.092) when compared to group A (0.53 ± 0.134).

CONCLUSIONS:

Our results suggest that time duration < 30s is not sufficient to detect/track temporally stable rotors in PersAF patients. As time duration increases correlation with 300s improves.

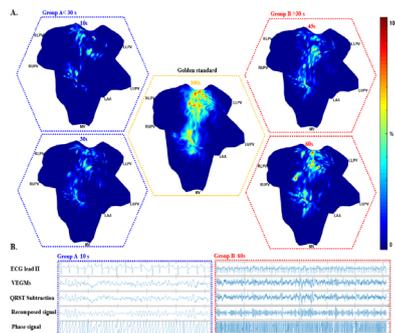


Figure 1: (A), a comparison of rotor density maps against the full length density map golden standard 300s for one patient. The similarity results for group A were (45%, 64%) Vs. group B (76%, 81%). The colour bar indicates the region hosting sustained rotors for each density map