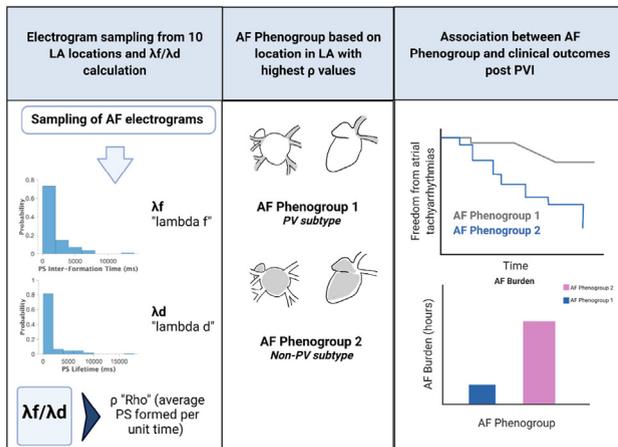factors and left atrial structural remodeling which identifies a cohort of AF patients who had improved clinical outcomes post PVI-only procedure.

Electrogram sampling from 10 LA locations and λf/λd calculation	AF Phenogroup based on location in LA with highest ρ values	Association between AF Phenogroup and clinical outcomes post PVI

CA-529-02

PROSPECTIVE EVALUATION OF THE WAVE DYNAMICS USING HIGH DENSITY VECTOR FIELD MAPPING FOR PERSISTENT ATRIAL FIBRILLATION TO DETECT THE ARRHYTHMOGENIC SOURCES

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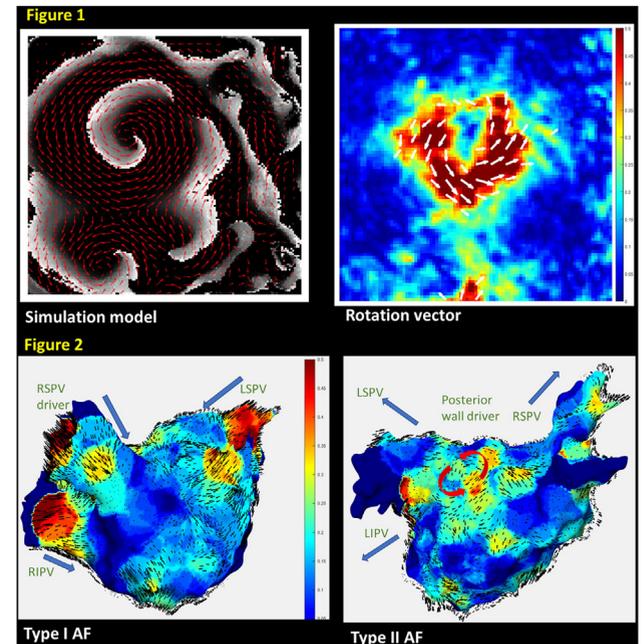
Background: We used a novel vector field (VF) mapping to illustrate the stationary wavefront propagating during AF. This approach recomposed regional bipolar fibrillatory electrograms to compute the global propagation patterns of AF.
Objective: The effectiveness of utilizing the AVF mapping to identify the AF sources in persistent AF was demonstrated.
Methods: In phase 1 study, we applied a cellular automation technique to simulate the electrical wave propagation. The spatial and temporal changes of the similarity index (SI) vector filed around and within the metastable rotors were characterized, and then we determined the thresholds for the SI vector (Figure 1). In Phase 2 study, we enrolled 60 pts with persistent AF prospectively, the global VF map was reconstructed by regional sequential map using multielectrode PentaRay catheter (Carto 3, 20 electrodes, 1000 sites per chamber). The AF cases could be categorized into 2 functional patterns according to the stable location of the drivers. The type I showed the dominant AF drivers emanating from 1 or more PVs. In Type II, drivers were in stable location in the LA with passive activation to PVs. Then, circumferential PVI was successfully performed in all cases and response of PVI was assessed (Figure 2).
Results: In phase I study, SI vector was the 0.44 ± 0.13 vs 0.13 ± 0.09, (P=0.02), with cut off threshold of 0.4 (AUC=80%) in prediction of AF drivers. In phase II, in total 60 patients analyzed, 184 AF drivers were identified (27.3 ± 19.5 cm^2 per patient, with 49% located in the PV/antra region). 36 patients (60%) of type I pts had an average 2.2 ± 1.1 drivers inside PV and 1.8 ± 0.4 drivers outside PV in the LA. 24 patients of type II pts had 0 divers inside PV (P=0.02) and 1.7 ± 0.73 drivers outside PV (P=0.24, compared to type I). In type I, 14 patients (36%) have procedural termination at the AF driver region, and 16 (47%) patients had PV triggers and 12 (27%) non-PV triggers identified in the LA region during sinus rhythm. No patient of type II responded PVI by procedural termination (0%, P=0.02, compared with type I).

Conclusion: VF mapping of persistent AF revealed the wavefront dynamic of the entire atrial chamber and revealed the spatially stable AF drivers. The arrhythmogenic drivers with PVs/antra are predictive of the successful PV isolation in patients with persistent AF.

Figure 1

Simulation model | Rotation vector

Figure 2

RSPV driver | LSPV | LSPV | Posterior wall driver | RSPV

RIPV | LIPV

Type I AF | Type II AF

CA-529-03

NOVEL DETECTION OF ATRIAL TACHYCARDIA-LIKE ISLANDS DURING ATRIAL FIBRILLATION PREDICTS RESPONSE TO ABLATION

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Background: A major limitation of identifying organized activity in atrial fibrillation (AF) has been the use of analytics that are difficult to confirm visually by experts. An intuitive metric of AF organization that does not require frequency, phase, or complex mathematical constructs may better guide therapy.
Objective: To test the hypothesis that AF exhibits spatial regions of repetitive 1:1 electrograms (EGMs), analogous to 'islands of AT' and, further, that these islands are more predictive of response to ablation than clinical features or traditional metrics of AF organization.
Methods: We recruited N=224 patients (64 ± 10 Y, 29.5% women) with global 64 pole AF recordings (Abbott, IL), in whom ablation terminated AF in N=122 ("Term") or did not ("Non-term"; demographics p=NS). In a development cohort (N=60), repetitive EGMs in 2x2 areas was quantified over 4 sec by correlation. Maps of repetitive EGM activity (REACT; Fig B) indicate high (red) or low (blue) repetition. We now applied REACT to the independent cohort (N=164), and compared its predictive value for Term to 48 clinical variables, dominant frequency width (DF), and SD of cycle length (CL).
Results: Repetitive islands (Fig B) were larger in Term than Non-term patients ($68.3\pm25.4\%$ vs $45.8\pm26.9\%$, p<0.001). Cluster analysis using 48 clinical variables alone failed to separate groups. However, adding REACT yielded 4 clusters (Fig. C) with progressively greater likelihood for termination (p<0.001). REACT provided AUC for termination which was higher than for