Abstracts

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, the arrhythmogenic drivers with PVs/antra were predictive of the successful PV isolation in patients with persistent AF.

Figure 1

Simulation model

Type I AF

Type II AF

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.

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 2×2 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±25.4% vs 45.8±26.9%, 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
Pulmonary vein isolation (PVI) is the cornerstone of atrial fibrillation (AF) ablation. 

**Congenital Heart Disease**

CA-529-04

**EFFECT OF PULMONARY VEIN ISOLATION ON ELECTROGRAPHIC FLOW-IDENTIFIED EXTRA-PULMONARY VEIN SOURCES PRE- V. POST-ABLATION**

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**Background:** Pulmonary vein isolation (PVI) is the cornerstone of atrial fibrillation (AF) treatment; however, its efficacy for persistent AF remains suboptimal. Electrographic Flow (EGF) mapping visualizes near real-time cardiac action potential flow to identify extra-PV sources and flow directionality over time.

**Objective:** Analyze effect of PVI on extra-PV AF source activity (SAC), AF cycle length (CL) and stability of flow angle variability (FAV).

**Methods:** Pre-PVI, unipolar electrograms were recorded for 1 min from a 64-pole basket to generate EGF maps. Relevant AF sources are identified as reproducible patterns of centrifugal EGF activation with prevalence of SAC >20% calculated over 60 sec. EGF pattern determines whether flow directionality remains stable over time or shows high FAV, measuring by how many degrees mean flow vector angle changes. Post-PVI EGF maps recorded once PVI confirmed.

**Results:** Prospective study of 14 patients undergoing de novo PVI, mean age 63.9±9.0 years, mean LA size 42.9±4.7 mm, mean AF duration 25.9±29.6 months. Pre-PVI, 44.7% (21/47) of sources in LA; 55.3% (26/47) in RA. Of sources remaining post-PVI, unipolar electrograms were recorded once PVI confirmed.

**Conclusion:** Elimination of electrical conduction from PV triggers results in increased extra-PV SAC; slowing AF CL and stabilization of FAV. PVI may unmask extra-PV AF drivers and stepwise elimination of drivers starting with PV triggers followed by extra-PV sources simplifies AF conduction patterns.

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**ABSTRACT CI-524:**

**Appropriate, inappropriate or delayed ICD shocks: current data**

Friday, April 29, 2022
1:00 PM - 2:00 PM

CI-524-01

**THE IMPACT OF SMART PASS ALGORITHM STATUS ON INAPPROPRIATE SHOCK RATES IN THE UNTOUCHED STUDY**

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**Background:** The current Subcutaneous ICD (S-ICD) incorporates SMART Pass (SP) to improve sensing and discrimination capabilities to reduce inappropriate shocks (IAS). SP status is programmable but may be disabled automatically based on electrogram (EGM) characteristics.

**Objective:** To evaluate SP status’ impact on IAS, appropriate shocks (AS), complications and mortality in the UNTOUCHED S-ICD trial.

**Methods:** Primary prevention patients (pts, n=1111) with ejection fraction <35% and no pacing requirement were followed for up to 18 months. SP status during a study visit was programmed ON or OFF and status between visits was either consistently ON, OFF or automatically disabled (DIS). The impact of SP status on pt outcomes was evaluated using Kaplan-Meier (K-M) analysis. Multivariable proportional hazard analysis identified IAS predictors.

**Results:** Percent of pts with SP always ON, always OFF, ON with DIS, and OFF then ON with no DIS were 56, 16, 15, and 13%, respectively. High blood pressure (81.3%, p<0.001), heart failure (93.6%, p<0.001), and kidney disease (17.0%, p<0.05) were highest in pts with SP always OFF. Reasons for SP DIS included PVCs and low EGM amplitudes. K-M IAS rates differed significantly with SP status: pts post DIS had significantly higher IAS rates (log); SP ON vs OFF was a significant predictor of fewer IAS. While neither AS (p=0.58) nor complication (p=0.58) rates changed significantly, mortality differed significantly between pts with SP always ON, always OFF, ON with DIS, and OFF then ON with no DIS (4.8, 9.1, 3.1, and 3.7%, respectively; p=0.044).