

## HF-564-03

### EFFECT OF SITE-SPECIFIC PACING IN SYMPTOMATIC PATIENTS WITH NON-OBSTRUCTIVE HYPERTROPHIC CARDIOMYOPATHY

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**Background:** Treatment options for symptomatic patients with non-obstructive hypertrophic cardiomyopathy are limited.

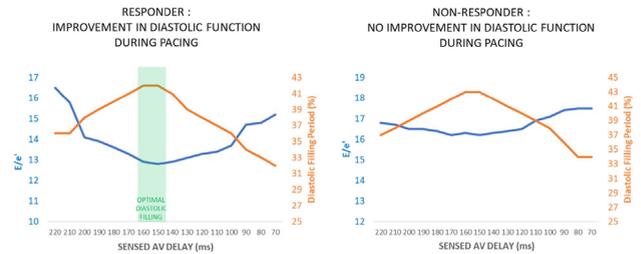
**Objective:** We studied the effect of dual chamber pacing at different ventricular sites on the diastolic function and functional capacity in patients with nHCM.

**Methods:** Nineteen patients with symptomatic nHCM and normal LV systolic function were prospectively enrolled. Inclusion criteria included an  $E/e' \geq 15$  and an indication for ICD implantation. A Doppler echocardiographic study was performed during sinus rhythm and atrial synchronous ventricular pacing at various atrioventricular (AV) intervals. Pacing was performed at three right ventricular sites: RV apex (RVA), RV mid-septum (RVS), and RV outflow tract (RVO). The site and sensed AV delay (SAD) at which optimal diastolic filling occurred was chosen based on diastolic filling period and  $E/e'$ . During ICD implantation, the RV lead was implanted at the site selected by the pacing study. Devices were programmed in DDD mode at the optimal SAD. During follow up, diastolic function and functional capacity (NYHA Class, 6 Minute Walk Distance (6MWD)) were assessed.

**Results:** Among the 19 patients (age  $47.6 \pm 7.8$  yrs, males 73.9%, ESC SCD Risk  $3.9 \pm 0.4\%$ ), the baseline PR interval, E/A and  $E/e'$  were  $178.2 \pm 19.5$ ms,  $2.4 \pm 0.5$ , and  $17.2 \pm 2.3$ , respectively. There was an improvement in diastolic function (E/A,  $E/e'$ ) in 16 patients (responders) when pacing from the RVA ( $1.5 \pm 0.3$ ,  $p < 0.001$ ;  $12.9 \pm 3.1$ ,  $p < 0.001$ ) compared to the RVS ( $2.2 \pm 0.5$ ,  $16.5 \pm 2.4$ ) and RVO ( $2.2 \pm 0.4$ ,  $16.8 \pm 2.1$ ). There was no improvement in diastolic function in the three other patients (non-responders). In responders, optimal diastolic filling occurred at an AV delay of 130-160ms during RVA. At shorter and longer SAD, there was a worsening of  $E/e'$  (Fig). Baseline RBBB (25% vs. 0%,  $p = 0.212$ ) and lower LGE (12.4% vs. 23.2%,  $p = 0.004$ ) were more common among responders. During follow up ( $9.8 \pm 1.8$  months), ventricular pacing was  $98.3 \pm 1.4\%$ . Compared to baseline, there was an improvement ( $\Delta$ ) in diastolic function ( $E/A -1.0 \pm 0.3$ ,  $E/e' -4.1 \pm 0.5$ ), NT proBNP ( $-51.4 \pm 13.2$ pg/ml), and functional capacity (NYHA  $-1.4 \pm 0.3$ , 6MWD  $-51.2 \pm 6.7$  m). There was no change in LVEF during follow up.

**Conclusion:** In a subset of patients with nHCM, dual chamber pacing from the RVA improved diastolic function and functional capacity.

### EFFECT OF DUAL CHAMBER PACING FROM THE RV APEX AT VARIOUS AV DELAYS ON DIASTOLIC FUNCTION



## ABSTRACT CA-529:

### Mapping Techniques to Elucidate Mechanisms and Aid Ablation Strategy in Atrial Fibrillation Ablation

Friday, April 29, 2022

1:00 PM - 2:00 PM

## CA-529-01

### RENEWAL THEORY: A STATISTICAL APPROACH TO IMPROVE PATIENT SELECTION FOR PULMONARY VEIN ISOLATION-ONLY STRATEGY IN ATRIAL FIBRILLATION ABLATION

Alvin Quah

**Background:** Outcomes from pulmonary vein isolation (PVI)-only approach in AF remain suboptimal, especially in persistent AF (persAF) patients. However, results from STAR-AF 2 trial suggest the presence of a subgroup of persAF patients who were responders to PVI-only. While research efforts have primarily focused on which non-PVI ablation techniques to pursue in persAF patients, there has been a paucity of data to define a cohort of AF patients who are "PVI-only responders"

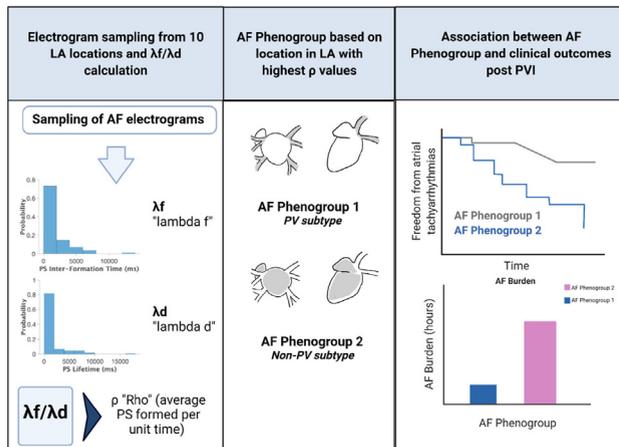
**Objective:** We recently showed a physiological assessment of fibrillatory dynamics could be performed using renewal theory, which determines rates of phase singularity formation ( $\lambda_f$ ) and destruction ( $\lambda_d$ ). Using the renewal approach, we aimed to define a cohort of patients who would be responsive to PVI-only approach, independent of the persAF status.

**Methods:** RENEWAL-AF is a prospective multicentre observational study recruiting AF ablation patients. Unipolar electrograms were obtained from sixteen biatrial locations using a 16-electrode Advisor TM HD-Grid catheter. Renewal rate constants  $\lambda_f$ ,  $\lambda_d$  and the rho ( $\rho$ ) values ( $\lambda_f / \lambda_d$ ) were calculated. All patients had radiofrequency ablation using a PVI-only approach.

**Results:** N=48 AF patients were recruited (mean age  $59.1 \pm 9.4$  years, 28.5% females). Two groups were analyzed; Phenogroup 1 (Ph1), highest  $\rho$  in pulmonary veins, Phenogroup 2 (Ph2), highest  $\rho$  in LA body. Ph1 patients had a lower CHA<sub>2</sub>DS<sub>2</sub>-VASc score ( $P = 0.02$ ), and a smaller LA volume index ( $P = 0.04$ ) compared to Ph2. After a follow-up of  $5.15 \pm 1.6$  months, Ph1 was associated with lower atrial tachyarrhythmia (AT) recurrences ( $P = 0.047$ ) with a lower AF burden ( $P = 0.026$ ). No association was found between persAF status with AF Phenogroup classification ( $P = 0.68$ ), AF burden ( $P = 0.58$ ), or AF recurrence ( $P = 0.52$ ). Additionally, AF Phenogroup was a significant predictor of AF recurrence in both univariate ( $\beta +0.32$ , 95% CI 0.002 0.64,  $P = 0.048$ ) and multivariate analysis ( $\beta +0.34$ , 95% CI 0.039 0.65,  $P = 0.028$ ).

**Conclusion:** Renewal theory approach provides a useful signal-based electrophysiological approach to the assessment of AF fibrillatory dynamics, linked to underlying AF-related clinical risk

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



## 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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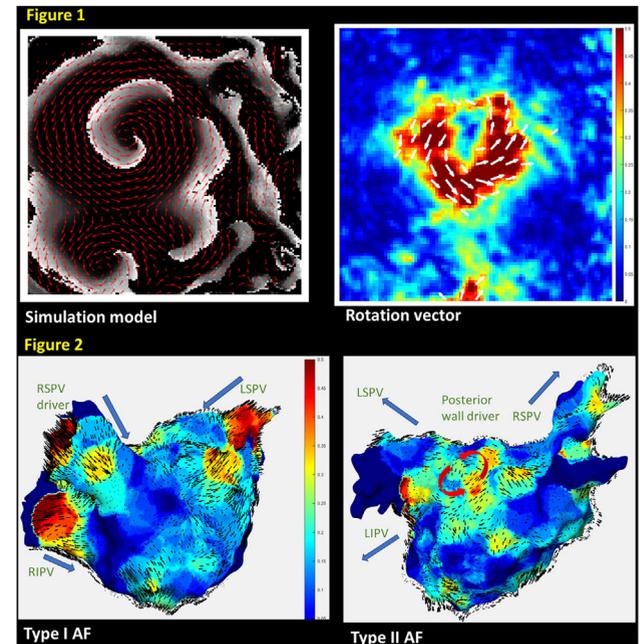
**Background:** We used a novel vector field (VF) mapping to illustrate the stationary wavefront propagating during AF. This approach recomposed regional bipolar fibrillatory electrograms to compute the global propagation patterns of AF.

**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 field 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  $0.44 \pm 0.13$  vs  $0.13 \pm 0.09$ , ( $P=0.02$ ), 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 ( $27.3 \pm 19.5$  cm<sup>2</sup> per patient, with 49% located in the PV/antra region). 36 patients (60%) of type I pts had an average  $2.2 \pm 1.1$  drivers inside PV and  $1.8 \pm 0.4$  drivers outside PV in the LA. 24 patients of type II pts had 0 drivers inside PV ( $P=0.02$ ) and  $1.7 \pm 0.73$  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.



## 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 ( $64 \pm 10$  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 ( $68.3 \pm 25.4\%$  vs  $45.8 \pm 26.9\%$ ,  $p<0.001$ ). 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