

**Heart Rhythm Podcast**

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**Hello, this is Dr. Peng-Sheng Chen, the Editor-in-Chief of Heart Rhythm.** Thank you for listening to this podcast, summarizing the **August 2020** issue of the journal. The first paper is by Roger Winkle et al, titled **“High Power Short Duration Atrial Fibrillation Ablations using Contact Force Sensing Catheters: Outcomes and Predictors of Success Including Posterior Wall Isolation.”** The authors examined 4-year outcomes and predictors of freedom from AF after AF ablation for 1250 consecutive patients using high power short duration contact force sensing catheter ablation. There are 6 independent predictors of worse outcome after initial ablation: older age, female gender, persistent AF, larger LA size, posterior wall isolation and use SmartTouch vs. TactiCath catheter. At redo ablations, the outcome was better if more veins had reconnected and could be re-isolated. This paper also documented the safety and efficacy of this new approach to ablation.

Next paper is titled **“Sex-specific efficacy and safety of cryoballoon versus radiofrequency ablation for atrial fibrillation: An individual patient data meta-analysis”** by Jeanne du Fay de Lavallaz et al. The authors searched for randomized controlled trials and observational prospective studies comparing cryo and RF ablation with at least 1 year follow-up. For both sexes, the procedural time was shorter with cryo than with RF. Men had lower failure rates with cryoablation than with RF ablation, but no differences were found in women. The mechanisms of these observations remain unclear.

Coming up next is **“Stereotactic arrhythmia radioablation for refractory scar-related ventricular tachycardia”** by Carola Gianni et al. This is a pilot, prospective study of 5 patients. Radioablation was delivered without acute complications. During a mean follow-up of 12 months, all patients experienced clinically significant mid- to late-term ventricular arrhythmia recurrence; two patients died of complications associated with their advanced heart failure. The authors conclude that radioablation did not result in effective arrhythmia control in the long term in a selected, high-risk population of patients with scar-related VT. The safety profile was confirmed to be favorable, with no radiation-related complications observed during follow-up. These disappointing results strengthen the argument for further investigation of this new method of treating ventricular arrhythmias.

Alessio Gasperetti et al wrote the next article titled **“Novel risk calculator performance in athletes with arrhythmogenic right ventricular cardiomyopathy”**. Twenty-five athletes with definite ARVC, undergoing clinical detraining, were enrolled. Data were collected over a median follow up of 5.3 years. The Cadrin-Tourigny algorithm was used to calculate the a-priori predicted ventricular arrhythmia risk, which was compared with the observed outcomes. That algorithm used age, sex, syncope, number of inverted T waves, maximum 24 hr PVC count, history of sustained VT and RV ejection fraction to predict the arrhythmia outcomes. The authors found that clinical de-training is associated with PVCs burden reduction in athletes with ARVC. The novel risk prediction algorithm does not appear to need any correction for its application in ARVC athletes.

The next article is titled “**Left ventricular endocardial pacing is less arrhythmogenic than conventional epicardial pacing when pacing in proximity to scar**” by Caroline Mendonca Costa et al. The authors used computational models of 24 ischemic cardiomyopathy patients to simulate left-ventricular (LV) epicardial and endocardial pacing at 0.2-3.5cm from a scar. These patient-specific models with a physiological APD gradient predict that endocardial pacing decreases VT risk compared to epicardial pacing when pacing within 0.2 cm of scar. The authors concluded that the endocardial pacing is less arrhythmogenic than epicardial pacing when pacing proximal to scar and is less susceptible to pacing location relative to scar. The physiological repolarization sequence during endocardial pacing mechanistically explains reduced VT risk compared to epicardial pacing.

Coming up next is “**Peri-Aortic Ventricular Tachycardia in Structural Heart Disease: Evidence of Localized Reentrant Mechanisms**” by Takuro Nishimura et al. Forty-nine peri-aortic monomorphic VTs were analyzed in 30 patients. Localized reentrant patterns of activation were demonstrated in 63%, and 37% of VTs showed centrifugal activation consistent with a focal breakout pattern. 96% of VTs fulfilled criteria for a reentrant mechanism. The authors conclude that peri-aortic VTs were observed in 25% of non-ischemic cardiomyopathy patients with scar-related VT. Localized reentry confined to this anatomically challenging region was demonstrated as the predominant mechanism by high-resolution circuit activation mapping.

Reginald T. Ho et al wrote the next article titled “**The Various Manifestations of Concealed Nodo-Fascicular/Nodo-Ventricular Bypass Tracts**”. The authors reviewed 11 patients with concealed nodal pathways who underwent electrophysiologic study and ablation for symptomatic SVT. The nodal fascicular and nodal ventricular bypass tracts were active bystanders during AVNRT or participants during orthodromic reentrant tachycardia. The majority had nodal origin in the slow pathway and 64% presented as long RP SVT. Ablation of the SP targeting the inferior extension eliminated concealed nodal pathways - associated SVT in all patients. The authors also noted that all nodal pathways in this study were concealed, which in contrast to their manifest counterpart do not permit activation mapping of its distal fascicular/ventricular end.

Next article is titled “**Real World Experience of Leadless Left Ventricular Endocardial Cardiac Resynchronisation Therapy; A Multicenter International Registry of the WiSE-CRT Pacing System**” written by Benjamin J. Sieniewicz et al. BiV endocardial CRT can be delivered by a new wireless LV ENDO pacing system called WiSE-CRT without requiring lifelong anti-coagulation. The authors performed a registry study of 90 patients across 14 European centers. Successful implantation and chronic delivery of BiV ENDO pacing was achieved in 94.4% of patients. Among them, 70% patients experienced an improvement in their heart failure symptoms. The authors conclude that BiV ENDO pacing with the WiSE-CRT System appears technically feasible with a high success rate. Three procedural deaths were observed during the study. Procedural complications mandate adequate operator training and performance in centers with immediate cardiothoracic and vascular surgical support.

The following article is also about CRT. The paper was written by Johnny Chahine et al titled “**Cardiac Venous Injuries: Procedural Profiles and Outcomes during Left Ventricular Lead Placement for Cardiac Resynchronization Therapy.**” Out of 5000 patients with CRT, coronary sinus injury occurred in 35. In patients with dissection in the absence of perforation, attempts at CS lead placement after dissection were successful in 21 of 29 patients. In those with perforation (n=6), CS lead placement was successful in one of them. The authors conclude that CS injury is not common during CRT implants and did not preclude successful lead placement in 23 of 35 patients during index procedure and 6 of 6 during subsequent attempted procedures. A low rate of mortality was observed in such patients, but CS injury was associated with increased morbidity.

Annika Winbo et al contributed to the next article, titled “**Genetic testing in Polynesian Long QT Syndrome probands reveals a lower diagnostic yield and an increased prevalence of rare variants** “. The data came from New Zealand national cardiac inherited disease registry. Of 264 LQTS probands, 160 reported European, 79 Polynesian, and 25 other ethnicities, with comparable clinical characteristic across ethnic groups. A class III-V LQTS variant was identified in 35% of Polynesian probands, compared to 63% of European and 72% of Other probands. Polynesians were more likely to have non-missense variants, as well as LQT1-3 variants not reported elsewhere. The authors conclude that genetic testing of Polynesian LQTS probands has a lower diagnostic yield, despite comparable testing and clinical disease severity. Rare LQTS variants are more common in Polynesian LQTS probands. These data emphasize the importance of increasing the knowledge of genetic variation in the Polynesian population.

Next up is a paper titled “**Usefulness of Positive T Wave in Lead aVR on Predicting Arrhythmic Events and Mortality in Patients with Hypertrophic Cardiomyopathy**” by Firdevs Aysenur Ekizler et al. This study investigated consecutive 421 patients with HCM. During a median follow-up period of 6 years, 53 patients experienced major arrhythmic events. On multivariable competing analysis, after adjusting for other confounding factors, the presence of positive T wave in aVR was found to be as an independent and strong predictor of primary composite endpoint. However, in subgroup analysis, a positive T in aVR lost statistical significance in apical HCM patients but remained significant in all other hypertrophy patterns. These findings indicate that a positive T wave in aVR is associated with major arrhythmic events in HCM patients, independently of and incremental to traditional risk factors.

The next article is “**Cardiovascular Autonomic Reflex Function following Bilateral Cardiac Sympathetic Denervation for Ventricular Arrhythmias**” by Veronica Dusi et al. Eighteen cardiomyopathies patients with refractory ventricular arrhythmias were studied. Palmar electrodermal activity responses to stressors were abolished after sympathectomy, while maximal finger pulse volume and BP responses were preserved. There was a better tolerance of active standing after bilateral cardiac sympathetic denervation as compared to before. The authors conclude that cardiomyopathy patients with refractory ventricular arrhythmias on optimal medical therapy have detectable but

blunted adrenergic responses, that are not disrupted by bilateral cardiac sympathetic denervation.

Coming up is “**Cost-effectiveness of in-home automated external defibrillators for children with cardiac conditions associated with risk for sudden cardiac death**” by Meredith B. Haag et al. For children at intermediate risk of SCD, the utility and cost effectiveness of in-home automated external defibrillators (AED) are unclear. Utilizing hypertrophic cardiomyopathy (HCM) as the proxy disease, a theoretical cohort of 1,550 ten-year old children with HCM was followed for 69 years. Model inputs were derived from the literature, with a willingness-to-pay threshold of \$100,000 per quality adjusted life years. The authors found that for children at intermediate risk of SCD and HCM, in-home AED is cost effective, resulting in fewer deaths and increased quality adjusted life years for a cost below the willingness-to-pay threshold. These findings highlight the economic benefits of in-home AED utilization in this population.

The next article is “**Atrial tachycardia eliminated at the ventricular side in patients with congenitally corrected transposition of the great arteries: electrophysiological findings and anatomical concerns**” by Chen-Xi Jiang et al. Background: The unique malformation of congenitally corrected transposition of the great arteries (cc-TGA) makes the pulmonary outflow tract a possible origin of atrial tachycardia. The authors report that atrial tachycardia was eliminated at the pulmonary outflow tract in 5 of 6 cc-TGA patients. The earliest activation site of the pulmonary outflow tract was in the vicinity of the left-facing pulmonary sinus cusp in 3 cases and the non-facing pulmonary sinus cusp in 2 cases. Ablation at this site successfully eliminated the AT in all 5 cases. The authors conclude that AT arising adjacent to the pulmonary outflow track is not an uncommon tachycardia in patients with the situs solitus type cc-TGA, and can be safely eliminated by ablation targeting the earliest activation site in the pulmonary outflow track.

Jeffrey K. Yang et al contributed to the next article, titled “**Pectoral Nerve Blocks Decrease Postoperative Pain and Opioid Use After Pacemaker or Implantable Cardioverter-Defibrillator Placement in Children.**” A total of 74 patients underwent pacemaker or ICD placement with 20 patients undergoing pectoral nerve blocks. Patients who underwent PECS had lower mean cumulative pain score than controls over the 24-hours post-implant. The authors conclude that pectoralis nerve blocks reduce postoperative pain scores and lower total opioid usage after ICD or pacemaker placement. Pectoralis nerve blocks should be considered at the time of transvenous device placement in children.

The next paper is by Daniel J. Friedman et al, titled “**Impact of Interruptions in Radiofrequency Energy Delivery on Lesion Characteristics.**” Forty-two RF ablation lesions were created in the ventricles of six swine using power control mode with one of three conditions: 15s ablation, 30s ablation, or two 15s ablations at the same site separated by a two-minute pause. The results show that the lesion volume was significantly larger for 30s lesions compared to the other two ablation methods. Differences in lesion volume were driven mainly by differences in lesion width rather

than depth. The authors conclude that compared to lesions resulting from continuous RF ablation, lesions resulting from interrupted ablation have a smaller overall lesion volume, predominantly due to smaller lesion width. These data suggest that if disruption in energy delivery occurs, lesions may need closer spacing to avoid gaps.

Coming up next is “**Altered heart rate variability in Angiotensin II mediated hypertension is associated with impaired autonomic nervous system signaling and intrinsic sinoatrial node dysfunction**” by Tristan W. Dorey et al. The study was performed in a mouse model of angiotensin II mediated hypertensive heart disease. Autonomic nerve activity was assessed through HRV analysis as well as direct recordings of vagal nerve activity and renal sympathetic nerve activity from anesthetized mice. Time and frequency domain analysis demonstrates that mice infused with angiotensin II had reduced HRV and elevated renal sympathetic nerve activity. Angiotensin II caused an increase in SAN beating interval variability in isolated atrial preparations and isolated SAN myocytes. The authors conclude that reduced HRV in hypertension occurs in association with altered sympatho-vagal balance as well as intrinsic SAN dysfunction and reduced responsiveness of SAN myocytes to autonomic nerve agonists.

The final original research article of this issue is titled “**Combined Local Impedance and Contact Force for Radiofrequency Ablation Assessment**” written by Kara Garrott et al. The purpose of the study was to evaluate the utility of local impedance combined with contact force in assessing RF ablation efficacy. The authors found that local impedance drop correlated with lesion depth both in vitro and in vivo, informing sufficient lesion creation if the drop was  $> 20\Omega$  and warning of excessive heating if the drop was  $> 65\Omega$ . The authors conclude that addition of local impedance to contact force provides feedback on both electrical and mechanical load. This provides information on tissue type and catheter-tissue coupling, feedback on whether volumetric tissue heating is inadequate, sufficient, or excessive, and reduces ablation time.

These original articles were followed by 3 contemporary review articles titled “**Cardiac Radioablation**”, “**Leadless Pacemakers Reduce Risk of Device Related Infection: Review of The Potential Mechanisms**” and “**Linking Cellular Energy State to Atrial Fibrillation Pathogenesis: Potential Role of Adenosine Monophosphate-Activated Protein Kinase**”. Finally, Ashkan Ehdaie contributed a Hands-on article titled “**How to use intracardiac echocardiography to guide catheter ablation of outflow tract ventricular arrhythmias**”.

I hope you enjoyed this podcast. For Heart Rhythm, I'm Editor-In-Chief, Dr. Peng-Sheng Chen.