

Heart Rhythm Journal Podcast

Month: May 2020

Language: English

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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 **May** 2020 issue of the journal.

The first article is an editorial by David Haines, titled “**A Paradigm Shift to Address Occupational Health Risks in the EP Laboratory**”. Despite identification of occupational health challenges of making the interventional EP laboratory a safer environment (3), safety in the EP laboratory has advanced too slowly. For this reason, the Heart Rhythm Society, in conjunction with the American College of Cardiology, the American Society of Echocardiography, and the Society of Cardiovascular Angiography and Interventions, has endorsed the document entitled: SCAI Multi-society Position Statement on Occupational Health Hazards of the Catheterization Laboratory: Shifting the Paradigm for Healthcare Workers’ Protection. The editorial highlighted the important suggestions made by that position statement.

The first original article this month is “**Focal Source and Trigger mapping in Atrial Fibrillation: Randomized controlled trial evaluating a novel adjunctive ablation strategy**” by Chauhan et al. The authors conducted a randomized controlled pilot study in 80 patients evaluating the feasibility and efficacy of Focal Source and Trigger (FaST) computational algorithm as an adjunct to pulmonary vein isolation (PVI) in reducing AF recurrence. The results show that freedom from AF recurrence at 12 months was higher in PVI+FaST vs. PVI for patients off antiarrhythmic drugs, but did not reach statistical significance. While the difference is statistically insignificant, the data from this pilot study can be used to support future larger clinical trials on this technology.

Sugumar et al wrote the next article titled “**Arrhythmia recurrence is more common in females undergoing multiple catheter ablation procedures for persistent atrial fibrillation: Time to close the gender gap.**” This is a multicenter observational study to determine the long-term arrhythmia outcomes in patients undergoing more than one catheter ablation for persistent AF. They evaluated 281 patients with a mean follow up of 45 months. The results show that female gender was independently and strongly associated with arrhythmia recurrence in patients undergoing multiple procedures for persistent AF, in spite of fewer reconnected PVs in women. These findings suggest that new approaches will be needed to close the gender gap of recurrence rate after ablation.

Next up is “**Predicting Atrial Fibrillation using a Combination of Genetic Risk Score and Clinical Risk Factors**” by Okubo et al. The authors screened a cohort of 540 AF patients and 520 non-AF controls for single nucleotide polymorphisms (SNPs) previously associated with AF by genome-wide association studies (GWASs). They identified five SNPs associated with AF. There was a 4.92-fold difference in AF risk between the highest and lowest weighted genetic risk scores calculated using these 5 SNPs ($P = 2.32 \times 10^{-10}$). The predictive logistic model constructed using a combination of weighted genetic risk score and AF clinical risk factors including age, body mass index, sex, and hypertension demonstrated even better discrimination of AF. This novel predictive model of combined AF-associated SNPs and known clinical risk factors can

accurately stratify AF risk in the Japanese population. This score may be useful in making early diagnosis of asymptomatic AF and prevent its complications.

The next article is titled **“Oral Anticoagulant and Reduced Risk of Dementia in Patients with Atrial Fibrillation: A Population-Based Cohort Study”** by Mongkhon et al. They conducted a retrospective cohort study using UK primary care data. Among 84,000 patients with AF, 35,000 patients were anticoagulated while 49,000 were not. Over a mean follow-up of 5.9 years, anticoagulation was associated with a lower risk of dementia or cognitive impairment compared to no anticoagulation, with a hazard ratio of 0.85-0.95. No significant difference in dementia risk was observed for direct oral anticoagulants versus warfarin. Interestingly, dual therapy with oral anticoagulation plus an antiplatelet agent) was associated with a higher risk of dementia or cognitive impairment with no treatment, with a hazard ratio of 1.05-1.31. These findings suggest that oral anticoagulation therapy can reduce dementia and cognitive dysfunction, but dual therapy has opposite effects. Prospective randomized clinical trials are warranted to confirm these observations.

Coming up is an article by Dusi et al, titled **“Prognostic Impact of Atrial Rhythm and Dimension in Patients with Structural Heart Disease Undergoing Cardiac Sympathetic Denervation for Ventricular Arrhythmias”**. Between 2009 and 2018, 91 patients underwent left or bilateral cardiac sympathetic denervation. The median follow up was 14 months. The authors found that in patients with structural heart diseases undergoing cardiac sympathetic denervation, left atrial volume index predicts death or orthotopic heart transplant. Atrial arrhythmia burden, already low at baseline, was unchanged after bilateral cardiac sympathetic denervation, while the need for atrial pacing increased. An implication is that left cardiac sympathetic denervation does not increase atrial arrhythmias. However, because of low baseline atrial arrhythmia burden, it is unclear if denervation can be used to control atrial arrhythmias in patients with structural heart diseases.

Barbhaiya et al wrote the next article titled **“Esophageal Temperature Dynamics During High Power Short Duration Posterior Wall Ablation”**. Luminal esophageal temperature was studied in 16 patients undergoing LA posterior wall ablation at 50 Watts for 6 seconds. The authors found that LA posterior wall ablation can result in severe esophageal temperature increases. Significant luminal esophageal temperature increase will be undetected when lesions are >20mm away from a temperature sensor. Additive luminal esophageal temperature increase was observed with consecutive lesions placed less than 20 mm apart within 60 seconds. This study calls for careful esophageal temperature monitoring during high power short duration posterior wall ablation.

The next article is titled **“Long-term transesophageal echocardiography follow-up after percutaneous left atrial appendage closure”** by Staubach et al. The authors prospectively studied a total of 63 patients. Median time from implantation until long-term TEE was 3.1 years. Major peri-device leaks were detected in 2 patients. Device thrombus was found in 8 patients. Of 5 patients who suffered an ischemic stroke during

long-term follow-up, 1 showed a peri-device leak > 5 mm. None of the patients with detected device thrombus developed a stroke. The authors conclude that peri-device leaks and device thrombi continue to occur during long-term follow-up following left atrial appendage closure. The clinical impact of these late complications remains unclear.

Next up is a paper titled “**Coronary venoplasty during cardiac resynchronization therapy device implantations: acute results and clinical outcomes**” by Boey et al. Of 422 consecutive CRT recipients treated between 2012 to 2018, 29 (6.9%) patients required percutaneous coronary venoplasty, which was successful in 21 cases. No complications occurred. Over a mean follow-up of 33.0 months, no difference in lead performance, CRT response, 2-year survival were observed compared to the control group. The authors conclude that percutaneous coronary venoplasty during CRT device implant is typically successful, safe and associated with long-term clinical outcomes comparable to patients who did not need venoplasty. This is an important technique to optimize LV lead placement and maximize CRT response.

Coming up is an article by Minier et al, titled “**Age at Diagnosis of Brugada Syndrome: Influence on Clinical Characteristics and Risk of Arrhythmia**”. The authors enrolled 1613 French patients and divided into 3 groups according to age. During median follow-up of 5.5 years, 91 patients experienced an arrhythmic event, including 7 (13%) of patients younger than 17, 80 (6%) in patients between 17 and 59 years old and middle-age patients, and 4 (1%) in the oldest patients. Annual event rates were 2.1%, 1%, and 0.3%, respectively. The authors conclude that age on diagnosis changes the clinical presentation of Brugada syndrome. Children present the highest risk of sudden cardiac death, which is an argument for early and extensive familial screening. The oldest patients present the lowest risk of sudden cardiac death. This study helps to risk stratify patients with Brugada syndrome.

Hermans et al wrote the next article, titled “**Improving Long QT Syndrome Diagnosis by a Polynomial-Based T-wave Morphology Characterization.**” The authors used a retrospective cohort consisting of 333 patients with LQTS and 345 genotype-negative family members. They found that baseline QTc cutoffs were specific but had low sensitivity in diagnosing LQTS. The model with T-wave morphology features, QTc, age, and sex had the best overall accuracy (84%). The authors conclude that T-wave morphologies can be characterized by fitting a linear combination of the first 2 Hermite-Gauss polynomials. Adding T-wave morphology characterization to age, sex, and QTc in a support vector machine model improves LQTS diagnosis. These data indicate that the T wave morphology can be described with mathematical equations and improve the diagnosis of LQTS.

Next up is “**Outcomes for catheter ablation of anteroseptal and midseptal accessory pathways in pediatric patients**” by Kovach et al. They report 255 EP procedures in 223 patients, including 178 anteroseptal, 72 midseptal pathways. Acute success rate was 87%, with 18% recurrences. Significant complications occurred in 1.2% of procedures, though no patient suffered from complete heart block. The authors

conclude that ablation of anteroseptal and midseptal pathways remains challenging. While both ablation energy modalities were equally successful, cryoablation may be associated with a higher chance of recurrence. Recurrences and repeated procedures may be anticipated to minimize risk to normal AV conduction during ablation in these regions.

Lévesque et al wrote the next paper, titled “**Implantable Cardioverter-Defibrillators and Patient-Reported Outcomes in Adults with Congenital Heart Disease: an International Study**”. The authors studied a total of 3,188 patients from 15 countries, including 107 with ICDs and 3,081 weight-matched controls without ICDs. Defibrillators were implanted for primary and secondary prevention in 38% and 62%, respectively. Those with secondary compared to primary prevention indications had a significantly lower quality of life score. The authors conclude that in an international cohort of adults with congenital heart diseases, ICDs were associated with a more threatening illness perception, with a lower quality of life in those with secondary compared to primary prevention indications. However, marked geographic variability in patient-reported outcomes was observed. These data are important in understanding the psychological impact of ICD in patients with congenital heart diseases.

Next up is “**Mechanism and magnitude of bipolar electrogram directional sensitivity: characterizing underlying determinants of bipolar amplitude**” by Gaeta et al. Use computational modeling and clinical data to establish the mechanism and magnitude of directional sensitivity of bipolar electrograms. The authors studied a clinical database of 18,740 EGMs recorded from the left atrium of 10 atrial fibrillation patients during pacing. A theoretical model was derived describing the effect of changing angle of incidence, electrode spacing, and conduction velocity on the local activation time difference between a pair of electrodes. The authors found that directional sensitivity occurs because bipolar amplitude is reduced when component unipolar EGMs overlap, such that neither electrode is “indifferent.” At the electrode spacing of clinical catheters, this is predicted to occur regardless of catheter orientation. This suggests that bipolar directional sensitivity can be lessened but not overcome by recently introduced catheters with additional, rotated electrode pairs.

The next paper is “**Distinct Calcium/Calmodulin-dependent Serine protein Kinase domains control cardiac sodium channel membrane expression and focal adhesion anchoring**” by Beuriot et al. In the heart, the protein CASK, or Calcium/Calmodulin-dependent Serine protein Kinase negatively regulates the main cardiac sodium channel, NaV1.5 by preventing its anterograde trafficking. The authors performed a study in adult rat cardiomyocytes unravel the mechanisms of CASK-mediated negative sodium current regulation. They authors demonstrate that the multi-modular structure of CASK confers an ability to simultaneously interact with several targets within cardiomyocytes. This study is the first to identify a sodium channel partner with the potential to control ion channels delivery to adhesion points in cardiomyocytes.

Meijborg et al wrote the next paper titled “**Stellate ganglion stimulation causes spatiotemporal changes of ventricular repolarization in pig**”. The authors measured

ventricular repolarization at multiple sites in 5 anesthetized pigs before and after left and right stellate stimulation. They found that left stellate ganglion stimulation caused a biphasic response in repolarization in the lateral and posterior wall of the LV. Right stellate ganglion stimulation shortened repolarization mainly in the anterior LV wall, but the effects were smaller than those of Left stellate ganglion stimulation. The authors conclude that left stellate ganglion stimulation first prolongs and then shortens repolarization. The effect of left stellate ganglion stimulation was prominent in the posterior and lateral, not the anterior, LV wall. The heterogeneous responses may underlie the mechanisms of ventricular arrhythmias during stellate ganglion activation.

Coming up is a paper by Kumar et al, titled “**Skin Sympathetic Nerve Activity as a Biomarker for Syncopal Episodes during a Tilt Table Test**”. The authors recorded skin sympathetic nerve activity in 50 patients with a history of neurocardiogenic syncope undergoing a tilt table test. They found that patients with syncope do not have elevated sympathetic tone at baseline or during the tilt table test except immediately before syncope when there is a transient surge of skin sympathetic nerve activity followed by sympathetic withdrawal. An implication is that preventing these transient sympathetic surges might be useful in controlling syncope.

That article was followed by two contemporary reviews on pacing in vasovagal syncope, summarizing recent findings on this topic.

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