

## Proceedings of the Second Electrophysiology Symposium of the PR Chapter of the ACC

On February 15 and 16, 2013, the Puerto Rico Chapter of the American College of Cardiology (ACC), co-sponsored by the Heart Rhythm Society (HRS), presented the 2<sup>nd</sup> Electrophysiology Symposium in San Juan, Puerto Rico.

### Program Highlights

#### Ventricular Tachycardia

*Dr. Samuel Asirvatham, Dr. Francis Marchlinski and Dr. David Callans.*

The surface electrocardiogram (ECG) can be very useful to determine the anatomic origin of ventricular tachycardia (VT) and to guide ablation, especially in patients without structural heart disease. VT arising from the right ventricular outflow tract (RVOT) demonstrates an ECG pattern that is characterized by left bundle branch block (LBBB) morphology with a right inferior axis and negative QRS complexes in leads aVR and aVL. RVOT VT is associated with exertion and typically responds to beta-blockers or calcium channel blockers. It may be easily approached with ablation in patients with syncope, uncontrollable palpitations or tachycardia-induced cardiomyopathy.

Idiopathic left ventricular (LV) VT can also occur in these patients, but in contrast, the surface ECG of such a patient is characterized by right bundle branch block (RBBB) with a left superior axis and positive QRS complexes in the aVR and aVL.

Idiopathic VT and ventricular premature depolarization (VPD) origin can be determined from careful examination of a 12-lead ECG. These may originate from the perivalvular regions, papillary muscles, moderator band, Purkinje fibers, or LV apex.

Most patients with VPD require observation, and reassurance is usually sufficient to alleviate their concerns. Some patients may develop symptoms such as palpitations, fatigue, or dyspnea on exertion. A VPD burden exceeding 25,000 is worrisome because such a burden has been associated with progression into VPD-induced cardiomyopathy (CMP). In these patients, the elimination of the primary VPD focus has been shown to improve LV function.

The role of implantable cardioverter-defibrillator (ICD) therapy for primary and secondary prevention of sudden cardiac death (SCD) is well established. Although shock therapy may be viewed as life saving, patients who receive appropriate shocks for VT/VF are known to have an increased mortality rates. Therefore, it is important to reduce the probability of ICD shock by means of appropriate device programming, drugs, or ablation therapy. If ablation is used, the best results are usually obtained early in the course of treatment.

#### Atrial Fibrillation

*Dr. Samuel Asirvatham*

Knowledge of anatomy is helpful in the management of atrial arrhythmias, particularly when ablation is being considered. Typical atrial flutter (AFL) is defined by a circuit that includes the cavotricuspid isthmus (CTI) as a localized area of slow conduction. The most common form of typical AFL is counterclockwise, which is characterized by a negatively directed “saw tooth” waveform in the inferior leads with positive F waves in V1 on a 12-lead ECG. Ablation of the CTI is the treatment of choice for typical AFL. It was previously thought that the fibrillatory activity originated exclusively within the pulmonary veins, but advances in mapping techniques and the failure of such an approach to eliminate all fibrillatory activity lead to a critical understanding of the role of other elements in the atrial anatomy. The pulmonary vein (PV) antrum, the posterior wall of the LA, the ligament of Marshall and the SVC are crucial for AF.

#### New Oral Anticoagulants

*Dr. Brian Olshansky*

The CHADS2 and CHA2DS2-VASc scores estimate the individual risk of thromboembolic events in patients with atrial fibrillation. Warfarin was the only therapeutic option available.

Patients commonly have variable times in the therapeutic range (TTR), which limits warfarin's efficacy. In fact, patients who have a median TTR < 65% while on warfarin show no reduction of stroke prevention compared with those being treated with clopidogrel plus aspirin. This may, in part, explain why newer oral anticoagulants (NOACs) have a clear role in embolism prevention in patients with AF.

Among the NOACs, dabigatran, rivaroxaban, and apixaban have been approved by the FDA for the prevention of ischemic stroke in patients with non-valvular AF. The RE-LY trial (dabigatran), ROCKET-AF trial (rivaroxaban) and ARISTOTLE trial (apixaban) all showed their respective drugs to be either not inferior or, in fact, superior to warfarin.

However, the advantages these agents confer must be balanced against the increased costs, lack of reversal agents, lack of reliable ways to monitor patient compliance, concerns about drug-drug interactions, and short track records.

#### Novel Approaches to AF Management

*Dr. Samuel Asirvatham*

Ablation of the pulmonary veins, or pulmonary vein isolation (PVI), changed the management of atrial fibrillation. Image integration such as tridimensional electroanatomic mapping and intracardiac echocardiogram (ICE) has also contributed to the success of AF ablation techniques. These techniques ensure that

appropriate contact with the tissue is made for successful ablation. The complications of PVI include: pulmonary vein stenosis, coronary artery damage, atrio-esophageal fistula formation, cardiac perforation, and thrombus formation. All of these may be prevented with careful catheter manipulation, the use of less energy and proper anticoagulation.

### Post-AF Ablation Arrhythmias

*Dr. Francis Marchlinski*

Atrial Tachycardias/Atrial Flutters (AT/AFL) are common arrhythmias following AF ablation. They are frequently more symptomatic and difficult to treat. In this specific setting, ATs are typically caused by pulmonary vein reentry. Surface ECG and coronary sinus activation can be helpful to determine the mechanism or location of AT/AFL. Pulmonary vein ATs usually manifest in the surface ECG as positive P waves in the precordial leads V1 through V6 and II, III, and aVF (inferior axis). Counterclockwise mitral annulus flutters manifest in the surface ECG with an inferior P wave axis, a negative P wave in V1, and a negative component of the P wave in V2. In order to prevent these ATs from developing, it is important to ensure complete bidirectional block across any ablation lines. The operator should always confirm that the pulmonary veins have not reconnected; otherwise, re-isolation should be sought.

### Updated Pacing Guidelines

*Dr. Brian Olshansky*

The 2011 HRS/ACCF expert consensus on pacemaker device and mode selection recommends the following:

- a. Dual-chamber (DDD) pacing over single-chamber atrial (AAI) pacing and single-chamber ventricular (VVI) pacing in patients with sinus node dysfunction (SND). Rate-adaptive pacing is also recommended in patients with SND and chronotropic incompetence.
- b. The minimization of ventricular pacing in patients with SND and intact atrioventricular (AV) conduction can prevent atrial fibrillation.
- c. AAI pacing in selected patients with SND and normal AV conduction.
- d. DDD pacing in patients with AV block.

### Strategies for ICD Shock Prevention

*Dr. Laurence Epstein*

An unnecessary ICD shock is defined as a shock that is given in response to a non-sustained, non-life-threatening arrhythmia. On the other hand, an inappropriate shock

is defined as a shock given in response to anything other than true VT/VE, such as AF, supraventricular tachycardias, T wave oversensing, lead fracture, or electromagnetic interference. Appropriate, inappropriate, and unnecessary ICD shocks are associated with increased mortality rates, without truly reducing the initial intended benefits of such shocks. Strategies to reduce shocks include higher cut-off values for detection zones, optimizing the use of anti-tachycardia pacing, and prolonging detection times. Syncope may occur with more aggressive ICD programming.

### Cardiac Resynchronization Therapy

*Dr. David Callans*

In well-selected patients with systolic heart failure (HF), an improvement in symptoms and LVEF as well as reduced mortality can be achieved through cardiac resynchronization therapy (CRT). Patients with LVEFs  $\leq 35\%$ , LBBBs with a QRS  $\geq 150$ ms, normal sinus rhythms, and New York Heart Association (NYHA) functional class II, III, or ambulatory IV symptoms on optimal medical therapy receive a Class I indication for CRT.

Patients who benefit the most from CRT are women, those with non-ischemic CMP, those with a QRS width  $> 150$  ms, LBBB, those who have been previously hospitalized with heart failure (HF) hospitalization, those with a baseline LV end-diastolic volume  $\geq 125$  mL/m<sup>2</sup>, and those with a left atrial volume  $< 40$  mL/m<sup>2</sup>.

### Lead Management

*Dr. Laurence Epstein*

Given the increasing rate of device implants in the US, along with increasing longevity of patients with such devices, lead management has become an important issue. Globally, the most common cause for lead extraction is infection. However, there are other situations in which early lead extraction should be considered and in which lead abandonment is not free of risk. Currently it is recommended that lead extraction should be performed at a center whose personnel are experienced in the

Topic	Speakers	Affiliations
Ventricular Tachycardia	Dr. Samuel Asirvatham Dr. Francis Marchlinski Dr. David Callans	Mayo Clinic, Rochester, MN. University of Pennsylvania, Philadelphia, PA. University of Pennsylvania, Philadelphia, PA.
Atrial Fibrillation	Dr. Samuel Asirvatham	Mayo Clinic, Rochester, MN.
New Oral Anticoagulants	Dr. Brian Olshansky	University of Iowa, IA.
Novel Approaches to AF Management	Dr. Samuel Asirvatham	Mayo Clinic, Rochester, MN.
Post-AF Ablation Arrhythmias	Dr. Francis Marchlinski	University of Pennsylvania, Philadelphia, PA.
Updated Pacing Guidelines	Dr. Brian Olshansky	University of Iowa, IA.
Strategies for ICD Shock Prevention	Dr. Laurence Epstein	Brigham and Women's Hospital, Boston, MA.
Cardiac Resynchronization Therapy	Dr. David Callans	University of Pennsylvania, Philadelphia, PA.
Lead Management	Dr. Laurence Epstein	Brigham and Women's Hospital, Boston, MA.

procedure and that has advanced multispecialty support.

Current indications for lead extraction include infections, even if just involving the pocket; recurrent or persistent bacteremia; chronic, intractable pain; lead malfunction that may pose a danger to the patient; and a need for venous access.

### Conclusion

We summarize here the key topics in clinical cardiac electrophysiology. It is essential to understand ventricular tachycardia in normal hearts and in structural heart disease, given the potential for increased morbidity/mortality and the

novel and more successful approaches for its management. Atrial fibrillation has gained more attention lately, owing to newer techniques for mapping and ablation and the advent of the NOACs for the prevention of thromboembolism. Device-based therapy for SND, AV block, and HF has gained wider support from guidelines, as are the topics of ICD shock prevention and lead management.

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