

# On the Horizon in Pacing and Electrophysiology

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More than 1500 physicians and 5000 associated professionals met at the 21st Annual Scientific Sessions to review recent advances in the management of cardiac bradyarrhythmias and tachyarrhythmias. Approximately 800 abstracts were presented, along with core curriculum sessions, symposia, and meet-the-expert forums. Several areas emerged as "hot" topics.

## **Biventricular Pacing**

Enthusiasm is increasing for the use of biventricular pacing in patients with class II to IV heart failure and an ejection fraction of less than 35%. A variety of papers presented data on the outcomes of patients who had a QRS duration longer than 120 ms and were paced from both the right ventricular apex and a left ventricular lateral epicardial vein. These data, from both European and US studies, continue to demonstrate an improvement in symptoms, quality of life and, in some cases, ventricular performance. Although no trial, to date, has been pow-

ered sufficiently to assess the impact of biventricular pacing on mortality, several large clinical trials have been designed to address this issue. Until results of such trials are available, data are limited to those emerging from the relatively small, nonrandomized studies.

Devices capable of both biventricular pacing and defibrillation are under examination in several clinical trials. These are particularly interesting, given the high risk of sudden death in patients with ventricular dysfunction, as indicated by the Multicenter Automatic Defibrillator Implantation Trial and the Multicenter Unsustained Tachycardia Trial. The current data are reminiscent of those from early  $\beta$ -blocker trials of the late 1980s and early 1990s. If larger pacing studies show mortality benefit, this field will grow exponentially and the implantation of such pacing systems will explode with a new indication for nonpharmacologic therapy.

Early results are available of limited clinical studies examining the use of subthreshold stimulation as a means to improve ventricular performance. It is too early in the investigative cycle to

know whether these devices will substantially impact symptoms in patients with heart failure.

Several sessions highlighted advances in the understanding and management of patients with hypertrophic cardiomyopathy, arrhythmogenic right ventricular dysplasia, and the Brugada and long QT (LQT) syndromes. In many of these conditions, the genetics underlying the clinical presentation are being elucidated and the accompanying channelopathies clarified.

## **Hypertrophic Cardiomyopathy**

Data from the hypertrophic cardiomyopathy registry are showing the occurrence of appropriate defibrillator shocks in 10% to 30% of patients with implanted defibrillators. While no data clearly demonstrate an improvement in total mortality with device implantation, many patients with implants and this disease are at risk for serious ventricular arrhythmias, which can be suitably treated with the implanted defibrillators. In addition, ongoing registry efforts will, hopefully, identify specific patients who are at greatest risk for untoward events and in whom devices

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should be implanted. A mortality trial in this area may be extremely difficult to conduct, given the limited number of patients with this disease process.

### QT Syndrome

The genetics behind the LQT syndrome continue to emerge from a variety of basic science laboratories. LQT1 occurs because of a defect in chromosome 11. Patients with this problem frequently have events triggered by exertion or stress. The LQT2 version occurs because of a defect on chromosome 7 in the HERG gene. These individuals may have episodes occurring with auditory stimuli. An additional affected gene in the LQT3 syndrome is an abnormality encoding sodium channel repolarization at the SCN5A gene locus. Affected individuals may have episodes of ventricular arrhythmias during sleep or under resting conditions. Unfortunately, these 3 general gene abnormalities only account for 50% of patients with this disorder. Other affected genes are also being identified. The preeminence of device therapy in these patients was reviewed. Additional studies will be required, however, to specifically identify which patients are better served by  $\beta$ -blocker or device therapy.

### Brugada Syndrome

The Brugada syndrome comprises the occurrence of sudden death or serious ventricular arrhythmias in the setting of a right bundle branch block–appearing QRS complex in leads  $V_1$  to  $V_3$ , accompanied by ST elevation. The syndrome also occurs because of an underlying sodium channel disorder producing dispersions of repolarization in conduction, leading to ventricular arrhythmias. This process can be

### Main Points

- Data from small trials of biventricular pacing show improvement in symptoms and quality of life in patients with congestive heart failure.
- Patients with hypertrophic cardiomyopathy and at risk for ventricular arrhythmias are candidates for implanted defibrillators.
- Focal ablation and dual-chamber pacing are options to either cure or prevent atrial fibrillation.

brought out during electrophysiologic (EP) testing through the administration of procainamide or flecainide. Treatment is usually in the form of an implanted defibrillator.

### Atrial Fibrillation

Several large studies involving more than 200 patients continued to demonstrate a 70% success rate in eliminating paroxysmal atrial fibrillation (AF) through focal ablation in a single pulmonary vein. When more veins are involved, the ultimate success rate may be between 60% and 70%. The enthusiasm for this procedure was dampened somewhat by the continuing 30% to 50% recurrence rates, requiring additional ablative interventions. Haissaguerre and co-workers reported a 54% success rate in eliminating chronic AF with a similar procedure.

### Atrial Pacing

Additional studies reviewed the utility of dual-chamber atrial pacing as a means of preventing AF. The success rates of overdrive atrial pacing or atrial defibrillation also suggest device therapy as an alternative, nonpharmacologic means of dealing with this common arrhythmia. At present, these modalities seem to be used best in conjunc-

tion with other therapies. The EP community is looking forward to the American Heart Association meeting in November, when additional late-breaking trial results will be presented.

### External Defibrillation

The 2-year American Airlines automatic external defibrillator study examined the use of external defibrillation devices implemented by flight attendants for apparent cardiac arrest in passengers on commercial airline flights. When the system was activated, ventricular fibrillation (VF) was correctly identified in 22 individuals and normal rhythm was never misdiagnosed. Twenty-one patients received a defibrillating shock. A relative of 1 patient refused treatment. Nine of 21 patients who received shocks and were hospitalized survived to leave the hospital. The remaining patients expired and were believed to have been in the terminal phase of their event when detected by bystanders. In some cases, the individuals in VF were thought to be sleeping, thus delaying treatment. The high “save” rate underscores the utility of these devices when they are available to patients with heart disease. This report also provides incentive for further investigations of public access defibrillators. ■