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THE CURRENT STATE OF CARDIAC ELECTROPHYSIOLOGY

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In this issue of the *Methodist DeBakey Cardiovascular Journal*, we focus on new developments in cardiac electrophysiology. As is true for any field in medicine, cardiac electrophysiology (EP) continues to evolve, but its changes have been particularly dramatic over the past few years. The birth of cardiac EP can be traced back to the invention of the electrocardiogram (EKG) by Einthoven in 1903. Within a few decades, the EKG became a clinical tool worthy of the 1924 Nobel Prize in Physiology or Medicine. Clinical EP came of age in the 1970s as a diagnostic discipline devoted to the understanding and interpretation of intracardiac electrograms and their responses to pacing maneuvers. In the early 1990s, a true revolution began with the advent of catheter ablation technologies, most saliently radiofrequency ablation, which rapidly became the standard of care for supraventricular and ventricular arrhythmias.

Despite these advances, atrial fibrillation (AF) remained a tremendous challenge—not only because our understanding of its mechanisms lagged behind that of other arrhythmias but also because of the magnitude of the health care problem it represented. Atrial fibrillation affects millions of people in the United States and is a major cause of stroke, disability, dementia, and mortality. In 1998, a novel catheter ablation technique for atrial fibrillation was proposed by Haissaguerre in Bordeaux, France, and was rapidly adopted worldwide. This technique led to dramatic changes in clinical practice since it was the first time we had a tool that could cure a debilitating disease. Challenges remained, however, due to the procedure's technical complexity (pulmonary vein isolation required a new set of procedural skills), risk of complications, and suboptimal efficacy.

The last 10 years have seen tremendous growth in the technical aspects of ablation, and we attempt to highlight these advances in this special issue of the *Methodist DeBakey Cardiovascular Journal*. Myriad technical tools have been developed to help us deliver the more-or-less standardized lesion set required to achieve pulmonary vein isolation, including ablative technologies such as radiofrequency, laser, cryoablation and others, and precise mapping and navigation technologies such as a 3-dimensional tracking of catheter positioning, integration with computed tomography or magnetic resonance images, and remote magnetic or robotic navigation. While all these technologies are admirable engineering feats, they have not generated a major qualitative change in our AF ablation success. New mechanistic understanding is needed to improve our results.

In this issue of the Journal, some of the world's foremost experts in AF review the merits of pulmonary vein isolation versus those of extensive substrate modification, the value of rotor mapping, and the role of the autonomic ganglia. Arguably, the biggest impact AF treatments could have on a population level is stroke prevention. Since the realization that the left atrial appendage (LAA) is the origin of most AF-related strokes, therapies to eliminate the LAA from the circulation through ligation, occlusion, or clipping have been developed and are in various stages of development, and their discussion is prominently featured in this issue. Finally, sudden cardiac death remains a critical healthcare challenge. Although defibrillators certainly have had a significant impact on outcomes, there is still much room for improvement. The last paper in this series discusses the technical challenges of addressing sudden cardiac death as well as timing of ablation of ventricular tachycardia. We hope readers find this issue enlightening and informative and enjoy it as much as we have throughout its preparation.