13. Combined automatic implantable cardioverter-defibrillator and permanent pacemaker systems

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INTRODUCTION

The automatic implantable cardioverter-defibrillator (ICD) has become widely accepted as an effective treatment for patients with ventricular fibrillation or hemodynamically unstable ventricular tachycardia, as it has been proven to effectively prevent sudden death in those patients [1]. However, a small number of patients with implanted defibrillators may die suddenly due to bradyarrhythmias either occurring spontaneously or postdefibrillator discharge.

1. NEED FOR BRADYCARDIA SUPPORT PACING

The delivery of a shock may result in the termination of ventricular tachycardia or ventricular fibrillation but may yield sinus bradycardia, sinus arrest, or complete heart block in a significant number of patients. Occasionally, episodes of bradycardia and asystole may be prolonged and may require immediate backup pacing. Some 10 to 30% of the patients who need an ICD, also require cardiac pacing for the management of associated bradyarrhythmias [2, 3].

Ideally the ICD might eliminate the necessity for antiarrhythmic therapy after device implantation. However, in a large series of patients equipped with an ICD [2], up to 69% of the patients received one or more antiarrhythmic drugs to suppress nonsustained tachyarrhythmias that might cause frequent device discharges. In addition, 55% of the patients were given atrioventricular (AV) node blocking drugs to control episodes of atrial fibrillation or flutter. Antiarrhythmic drugs can alter pacing and defibrillation thresholds and tachycardia rates; rendering antitachycardia pacing more difficult and ICD recognition of the tachycardia impossible if the tachycardia rate declines below the cutoff rate of the ICD. Moreover, they may result in the necessity for ventricular pacing as they may induce conduction dis-
turbances in patients with normal atrioventricular conduction prior to the implantation of the device.

2. PACING FOR TACHYCARDIA PREVENTION

The clinical role of permanent antibradycardia pacing for the prevention of ventricular arrhythmias is limited. Rare patients presenting with congenital QT prolongation and torsade de pointes, may benefit from this modality as may patients with bradycardia-dependent malignant ventricular arrhythmias. Ventricular pacing at a rate faster than the intrinsic rhythm, but still in the ‘physiologic’ range, has been shown to decrease spontaneous ventricular ectopy, when used as a primary antiarrhythmic modality [4]. In a small group of patients with life-threatening ventricular arrhythmias, right ventricular pacing in combination with an antiarrhythmic drug regimen proved successful [5]. However, due to the proarrhythmogenic effect of antiarrhythmic drugs and the poor long-term results, pharmacological treatment of ventricular tachyarrhythmias still remains a matter of debate.

3. PACING FOR TERMINATION OF TACHYCARDIA

Antitachycardia pacemakers are useful, as they can terminate a tachycardia effectively and painlessly in some patients. However, initial enthusiasm with antitachycardia pacemakers was tempered by the realization of the dangers and difficulties associated with their use, particularly in the treatment of ventricular tachycardia. As antitachycardia pacing for ventricular tachycardia is associated with an increased risk of acceleration of ventricular tachycardia or the induction of ventricular tachycardia or the induction of ventricular fibrillation, a backup implantable defibrillator is required in patients equipped with an antitachycardia pacemaker.

4. COMBINED USE OF A PERMANENT PACEMAKER AND AN AUTOMATIC IMPLANTABLE CARDIOVERTER DEFIBRILLATOR

Some patients who need an ICD also require cardiac pacing either to treat associated bradyarrhythmias, post-discharge bradycardia, drug-induced conduction disturbances, or to prevent bradycardia-related ventricular arrhythmias. On the other hand, patients equipped with an antitachycardia pacemaker may also need an ICD to treat tachycardia acceleration. Therefore the concomittant use of pacemaker and an ICD is common and may result in several potentially harmful interactions.