Issues in Arrhythmia Management

Current Antiarrhythmic Therapy Overview

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Summary. Cardiac arrhythmias are commonplace in the Western world and vary in their degree of seriousness from benign to life threatening. In general, arrhythmias may be managed in one of five ways: reassurance only, physical maneuvers, antiarrhythmic drugs, implantable electronic devices, and surgical or transvascular ablation. Treatment is designed to terminate ongoing arrhythmias, to prevent recurrence of arrhythmias, or to control the rate of the arrhythmia. Occasionally, the propensity to arrhythmia may be cured by abolition of the anatomic substrate for the arrhythmia. Which of these modalities and approaches to the management of cardiac arrhythmia will be chosen by the physician for any individual patient is very much dependent on the character of the arrhythmia and the patient's underlying disease.

Key words. antiarrhythmic drugs, implantable cardioverter defibrillator, ablation, amiodarone

Cardiac arrhythmias are commonplace and antiarrhythmic treatments are even more common. Consequently, in an overview it is only possible to dip into those treatments to give an idea of the context in which drugs are currently used for the management of cardiac arrhythmias.

In the United Kingdom, it is estimated that there are 500,000 patients with paroxysmal supraventricular tachycardia out of a population of a little more than 50 million, so about 1% of the population have paroxysmal supraventricular tachycardia. The prevalence of atrial fibrillation or paroxysmal atrial fibrillation in the elderly population is about 10%, and there are between 50,000 and 100,000 sudden unexpected cardiac deaths each year in the United Kingdom, which is approximately 0.1% of the population, or more importantly, 10% of all deaths. One in 500 live births have a Wolff-Parkinson-White electrocardiographic pattern, but only an as yet unknown proportion of these develop the full-blown syndrome with arrhythmias and symptoms related to the arrhythmias. The number of pacemakers implanted each year in the United Kingdom is rather low, 10,000 per annum in a population of about 50 million, compared with almost 100,000 pacemakers per annum in the United States, with a population of about 250 million. As for the approach to the management of these patients with cardiac arrhythmias, it is necessary to look first at strategies and secondly at the modalities of treatment.

Strategies and Modalities of Treatment

The strategies for the management of cardiac arrhythmias (Table 1) include trials to terminate ongoing arrhythmias, attempts to modify the arrhythmia in some way, usually by slowing it sufficiently to render it tolerable, attempts to prevent recurrence of arrhythmias, and attempts to effect a cure by removal of the substrate, for example, by ablation of an accessory pathway responsible for the Wolff-Parkinson-White syndrome. The various modalities of treatment that can be used to effect these ends include physical maneuvers; electrotherapy; antiarrhythmic drugs; ablation techniques, which comprise not only transvascular catheter-based techniques, but also surgical techniques, and the use of implantable electronic devices.

Reassurance Only

Doing nothing but providing reassurance can be the right therapy for arrhythmias that are trivial, not incapacitating, and that occur only infrequently. However, in most instances one of the other therapies must be chosen, especially for those patients who can be identified as at high risk. Postmyocardial infarction patients with poor left ventricular function and a high incidence of ventricular ectopic activity or ventricular tachycardia may have a 40% first-year mortality. Certainly, survivors of hospital cardiac arrest have a 30–40% chance of dying within the ensuing year if not adequately treated.

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Table 1. Strategies for management of arrhythmias

- Nothing
- Vagotonic maneuvers
- Antiarrhythmic drugs
- Implantable electronic devices
- Ablation techniques

Although paroxysmal supraventricular tachycardias are usually not fatal, they are certainly disabling and may require treatment of the symptoms they produce. Atrial fibrillation, particularly chronic atrial fibrillation, is not a completely benign arrhythmia. It is an arrhythmia that many physicians tell patients is probably benign, because they feel very little can be done about it. However, studies have shown that there is a two- to threefold increased mortality in association with atrial fibrillation.

Physical Maneuvers

Vagotonic maneuvers are of course restricted to the termination, and to some extent the identification, of supraventricular tachycardias. They compete with the wide variety of other possible therapies that can be used to terminate an ongoing supraventricular tachycardia, including drugs or electrical methods. Among the available drugs, it would be wise to single out the calcium-channel antagonists, which are the therapeutic gold standard in this regard, and adenosine, which, although used in France for many years, has only recently been introduced into other parts of Europe and North America.

Of the physical maneuvers, carotid sinus massage has been found to be effective in abolishing arrhythmia in 33 of 68 patients: in 25 by a single application of carotid sinus massage and in eight additional patients by multiple applications of carotid sinus massage. Of the remaining patients, 24 had their arrhythmia abolished by carotid sinus massage with edrophonium, three by the Valsalva maneuver, two by Valsalva maneuver with edrophonium, and six by phenylephrine [1].

In a recent study [2] of carotid sinus massage, the Valsalva maneuver, and the diving reflex, the Valsalva maneuver was found to be the most effective of the three, particularly while patients were lying supine rather than standing erect. Arrhythmia was abolished by the Valsalva maneuver in 60% of 25 patients who were evaluated with all three maneuvers. This was not the case with carotid sinus massage. It was also found that these physical maneuvers were more effective with atrioventricular reentry than with atrioventricular nodal reentry and were only effective in young patients, presumably because their autonomic systems are far more effective than those of older patients. To some extent, it was possible to detect whether these maneuvers might be effective by trying them in sinus rhythm to see what effect they might have on the sinus rate. This is presumably a way of assessing the integrity of the patient's autonomic nervous system.

Antiarrhythmic Drugs

The wide spectrum of antiarrhythmic agents is shown in Table 2, arranged in the modified Vaughan-Williams classification in accordance with their mechanism of action. There are three groups of membrane-stabilizing drugs—Class IA, IB, and IC; a group of antiadrenergic compounds—Class II; a group of compounds that prolong the action potential—Class III; and a group of cardioactive calcium antagonists—Class IV. The degree of efficacy and safety of these agents varies among patients and arrhythmias, and is not reliably predictable.

It is not feasible to discuss all of these antiarrhythmic compounds in a brief overview, but a few comments about amiodarone will serve to illustrate some of the problems encountered with new antiarrhythmic agents. Amiodarone is an important drug that was released in many parts of the world during the last decade [3]. The most remarkable thing about amiodarone is its efficacy. An excellent response in 55–71%