Pacemaker recipients

In terms of physical capacity, most patients needing cardiac stimulation are restricted both by age and by limitation of their maximum cardiac rate during exertion. Their exertional capacity will therefore depend on both their own physical capacity and the type of pacemaker implanted\(^1,\2\).

A large number of patients with complete and permanent A-V block still have a fixed rate pacemaker (VVI). They have only two ways of increasing their exertional VO\(_2\) rate: by an increase in both stroke volume and the arteriovenous difference in oxygen. However, these patients, usually quite advanced in age, are not able to make good use of the Starling effect, particularly if there is a lack of synchronization in the auricular and ventricular beats or even a retrograde ventricular capture of the atrium which hinders ventricular filling. However, by a mechanism similar to that of training in patients with arteritis of the lower limbs, physical training might well improve their aerobic and anaerobic muscular metabolism and hence their functional capacity.

In patients with non-permanent atrioventricular block, increase in sympathetic drive during physical activity enhances atrioventricular conduction so that atrioventricular block often disappears with exertion. In such cases the limitations of physical capacity are no longer due to a disturbance of the cardiac rhythm as long as the sinusatrial function is maintained.

In patients with rate-dependent ventricular stimulation the pacemaker detects exertion, depending on the make, by various means, such as muscular vibrations, changes in respiratory rate, a shortening of the QT interval, and variations in temperature or blood oxygen content in the right cavities\(^3,\4\). However, to get the best from these means of stimulation it is necessary to make adjustments after implantation. These adjustments depend on the sensitivity of detection and on the slope of elevation of the stimulation rate that can be adapted.

It is advisable to use both treadmill and bicycle testing. The treadmill transmits walking vibrations to the pacemaker's vibration detector, whereas the bicycle promotes a more gradual increase in respiratory rate. The aim of rate-dependent pacemakers is to allow the patient greater physical activity and this should be encouraged. However, if the atrioventricular block is permanent, or if there is permanent atrial fibrillation, one must remember that loss of the auricular end-diastolic filling implies a marked reduction in cardiac output during exertion.

The use of dual chamber pacemakers (DDD mode: atrium and ventricle; atrial triggered and ventricular inhibited) has increased considerably in the last few years. When they work perfectly they maintain atrioventricular synchronization, thus promoting an increase in stroke volume by better ventricular performance. However, if they are to play a physiological role, the sino-atrial rhythm must be detectable, otherwise the stimulation drops to a VVI (ventricle-ventricle inhibited) or VVIR (rate responsive) mode, and the sino-atrial rhythm must be able to accelerate appropriately during exertion. In the case of chronotropic incompetence, a DDDR (rate responsive) mode is necessary to ensure acceleration of auricular stimulation to a rate appropriate to the intensity of the effort. In addition, the duration of the interval of stimulation between atrium and ventricle can only be adjusted during an exertion period. It takes at least 2 months to stabilize the sensitivity of the pacemaker sensor to atrial activity during a period of exertion, so the final adjustments cannot be made until at least 2 months after implantation.

In cases of paroxysmal atrial fibrillation alternating with sinus bradycardia, atrioventricular ablation has become popular. Here again a VVIR stimulation is mandatory and must be adjusted using repeated exercise tests.\(^1\)

Once the adjustments appear to be adequate and stable it is possible, and useful, to offer a physical training programme adapted to the cardiac, muscular, and articulatory possibilities of these patients. The risk of fainting having been removed, patients should be encouraged to take up an active lifestyle again, including driving, regular exercise, odd jobs and gardening. Implantation in elderly patients should enable them to live a more or less normal life rather than discourage any activity because of the very slight risk of Stokes Adams syndrome.

References