Pacemaker selection: time for a rethinking of complex pacing systems

The article by Musilli and Padeletti is a thought-provoking challenge to the widespread use of DDD pacing. They suggest that single-chamber devices, AAI and VVI, are a more rational choice in most cases of sinus node disease (SND) and AV block, respectively.

The authors advocate VVI systems instead of DDD systems because of non-inferiority with regard to stroke and mortality, as shown by MOST, CTOPP, PASE, and UKPACE. However, in patients paced for a slower intrinsic rate, a significantly higher mortality has been reported using VVI vs. DDD systems. These studies also show that VVI pacing increases the risk of developing chronic atrial fibrillation (AF) by 20%. AF is the leading arrhythmia cause of hospitalization, increases the risk of stroke by fivefold, and doubles mortality, but the number needed to treat with a DDD system (CTOPP) to prevent AF is nine. MOST showed heart failure hospitalization reduction of 27% with DDD pacing.

MOST and PASE show the incidence of pacemaker syndrome (PMS) to be about 25–33%, which occurred early and was resolved immediately by reprogramming to DDD mode. It is likely that the lower incidence of PMS reported in CTOPP is because reoperation rather than reprogramming was required biasing their results. If 30% of patients require an upgrade to the DDD mode early after implantation of a VVI system, the effects on patients’ quality of life and healthcare costs will be marked. A recent meta-analysis showed that the cost difference between single and dual-chamber systems over 5 years is small—£700 more for dual-chamber devices.

The authors suggest AAI systems, by reducing ventricular pacing, should be used instead of DDD systems in patients with SND because of ‘low’ requirement of upgrade to DDD (0.6–8.4%). This is not insignificant, and therefore, AAIR implantation for SND is only 1–3% in the US and central Europe. Manufacturers have addressed this by developing algorithms that reduce ventricular pacing to a minimum with a ‘pseudo-AAI’ mode with backup ventricular pacing, if required. It is likely that the benefits observed by Nielsen et al. with AAI pacing can be extrapolated to these new DDD devices. This is further supported by the linear relationship of ventricular pacing percentage and heart failure hospitalization and risk of AF in MOST. Large studies with these newer DDD systems may show superiority over VVI pacing and should be awaited before prematurely abandoning DDD pacing.

DDD devices also improve patient diagnostics allowing accurate arrhythmia detection and enhanced pacemaker programming and can inform or monitor drug treatment and need for anti-coagulation. AF episodes recorded in this way have been shown to predict stroke and improve treatment by reducing AF-related hospitalizations. With home telemetry of Holter data, these monitoring features are going to become a crucial aspect of modern devices.

Technological advances in device therapy will continue. With clearer identification of treatment goals, for example, less arrhythmia symptoms, reduced arrhythmia burden, beneficial remodelling effects, improved quality of life, or better exercise capacity, we will understand whether increasing complexity of device hardware is beneficial and cost-effective. It is our opinion that these objectives will not be met by the use of simple systems.

Reference


Letters to the Editor

Pacemaker selection: time for a rethinking of complex pacing systems: reply

We appreciate the interest in our article expressed by Silberbauer and colleagues. We are surprised to read that we 'advocate VVI systems instead of DDD systems because of non-inferiority with regard to stroke and mortality as shown by MOST, CTOPP, PASE, and UKPACE.' Indeed, we never mentioned UKPACE trial, published in July 2005, until the submission of our article. UKPACE trial (in which John Camm is one of the top investigators) compared the clinical effects of VVI(R) pacing and DDD(R) pacing in elderly patients with high-grade AV block. No significant differences were observed between the two pacing modes in the rates of deaths from all causes, atrial fibrillation, heart failure, or a composite of stroke, transient ischaemic attack, or other thromboembolisms. This confirms exactly what we wrote about the treatment of patients with AV block.

Regarding the pacemaker syndrome, data from CTOPP trial are totally confirmed by UKPACE. The clinical significance of this has been underlined by Toff et al.: 'The low crossover rate (3.1%) from single-chamber to dual-chamber pacing in our study was similar to that in the CTOPP trial (2.7%) suggesting that single-chamber pacing is well tolerated.'

Moreover, in CTOPP, the percentage of patients who crossed from DDD to VVI mode at 5 years was 17.1%. If we consider that in this group the annual rate of patients developing atrial fibrillation and consequently crossed to ventricular pacing was 5.3%, the difference in part or entirely is to be ascribed to intolerance of dual chamber stimulation. Thus, we greatly appreciate what was written by Toff et al.: 'Our results, supported by the PASE and CTOPP trials, suggest that the clinical benefits associated with dual-chamber pacing for atrioventricular block have been overestimated.'

This reply gives us the opportunity to introduce an important point that we did not consider in our article: the incidence of perioperative complications in dual-chamber pacing resulted significantly higher in both UKPACE1 and CTOPP trials. The consequence of this is a further increase of difference in costs between dual-chamber and single-chamber devices.

Concerning the new DDD pacemakers equipped with algorithms for minimizing the ventricular pacing in patients with sinus node disease (SND), we believe that: (i) in the absence of data from large trials, it is not scientifically correct to extrapolate the benefits observed by Nielsen et al.4 with atrial pacing to these new devices; (ii) the percentage of patients with SND who develop AV block is low even if not insignificant in some reports, as mentioned by Silberbauer et al.; a strategy of routine implantation of such a pacemaker whose cost is higher by at least €2000 to one SSIR is totally unjustified; (iii) these new DDD devices in the presence of advanced AV block work just as the traditional ones; the reasons why they may show superiority over VVI pacing and furnish different results from UKPACE1 and PASE2 trials remain yet to be explained.

Reference