External cardioversion in patients with implanted cardiac devices: is there a problem?

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As the indications for implantable cardiac devices [pacemakers, cardioverter-defibrillators (ICDs), and cardiac resynchronization systems (CRT)] have been extended over the last decade, the need for elective external cardioversion (ECV) in patients with such devices and concurrent atrial fibrillation (AF) has also increased. In addition, the overall requirement for ECV has also been extended by the increasing age of the population in most developed countries and a requirement for ECV has also been extended by the increasing age of the population in most developed countries and a more aggressive approach to the management of recent-onset and haemodynamically compromising AF.

The use of ECV in patients with implanted devices has long been a cause for concern with regard to the potential for adverse effects on the generator and/or leads, with the result that this simple and effective therapy may have been delayed or even denied to some patients. These concerns were largely fuelled by a number of reports in the 1970s and 1980s suggesting the potential for device interference or lead failure. Devices implanted within the last decade, however, are considerably more sophisticated, more likely to use bipolar lead configurations, and better protected against external interference than those of the period from which these reports arose, leaving the question of safety in patients with modern implantable devices open. In addition, ECV has evolved over recent years with the development of equipment able to deliver biphasic shocks resulting in an increased efficacy and lower energy requirements.

As CRT has become accepted for the management of refractory heart failure, it has become clear that the presence of persistent AF almost certainly reduces the efficacy of this therapy, making the need for early ECV likely to be even more important in such patients.

The current (2006) AHA/ACC/ESC guidelines for the management of patients with atrial fibrillation advise the use of an antero-posterior paddle position in patients with implanted pacemakers and defibrillators, but these recommendations are based on considerations of devices and leads designed in the early 1980s and 1990s and result from case reports of malfunction after cardioversion, rather than controlled studies with current pacemakers and ICDs. In addition, ECV used in these early reports utilized monophasic waveforms, whereas most modern ECV now utilizes biphasic waveforms, an approach which allows greater success rates at lower energies.

In this issue of the European Heart Journal, Manegold et al. have examined the effects of ECV for AF in patients with permanent pacemakers or ICDs. They present their findings from a prospective, randomized comparison of biphasic vs. monophasic shock energy application in a group of 44 patients with implanted devices undergoing elective ECV. The patient population was unselected with a mean age of 71 ± 10 years and mean body mass index of 27 ± 4 kg/m² and included all patients with implanted devices referred to a University hospital for ECV during a 9-month period. The investigators did, however, exclude patients already known to have sensing abnormalities that could not be safely corrected by re-programming. The majority of patients had dual-chamber pacemakers (29), whereas the rest had ICDs (9 dual-chamber and 3 CRT) and CRT systems. Of the low energy leads, 62 were bipolar and nine unipolar; 10 high energy leads were bipolar and five unipolar. Devices and leads came from most of the manufacturers represented in the European market. All systems were checked immediately before and after, and at 1 h and 1 week after ECV. Apart from small (statistically but not clinically significant) reductions in pacing impedance and ventricular sensing immediately post-shock, there was no evidence of device or lead malfunction in response to ECV. All parameters had returned to pre-shock values within 1 week after ECV was immediately successful in 95% of patients (93% at 1 h) and cumulative energy was (predictably) lower with biphasic as opposed to monophasic shocks.

The comparison between monophasic and biphasic shocks showed no difference in device response and one patient in each group failed to convert to sinus/atrial paced rhythm. The shock protocols used were as recommended from
previous studies — 100, 150, 2 × 200 J biphasic and 200, 300, 2 × 360 J monophasic.6,9

The need for prevention of thrombo-embolism was not, of course, ignored; all patients were anticoagulated with an INR between 2.0 and 3.0 for at least 3 weeks prior to cardioversion or, if not previously anticoagulated, underwent transoesophageal echocardiography to exclude atrial thrombi before ECV.

So what can we learn from this new study? It is valuable and timely to have current ESC guidelines confirmed and endorsed by new scientific studies and it is also important to have aspects of complex and weighty guidelines highlighted to prevent inappropriate management of a common arrhythmia in a growing group of patients. As the practice of ECV is developing towards a nurse-led process in many countries,10 studies such as this can help to streamline the procedure and reduce the need for immediate technical support for cardioversion. The results of this study suggest that devices should be interrogated before ECV to exclude lead dysfunction, but that post-ECV interrogation should be delayed at least 1 h and may, perhaps, not be needed at all.

The limitations of this study are, of course in patient numbers; although representing an increasing population in need of ECV, even a large implanting centre will not encounter hundreds of patients each year with new-onset AF. The complete lack of any lasting effects on device performance (independent of shock waveform) would suggest that these data can probably be extrapolated to regular practice without concern; although the very small numbers of CRT patients may cause concern here. The performance of unipolar and/or coronary vein leads does not appear any different, however, and a previous study with low-energy internal cardioversion did not suggest any adverse effects with leads placed in the coronary sinus.11 Such patients, however, are unlikely to be discharged without considerable post-ECV interrogation and re-programming as the onset of AF is likely to induce some degree of decompensation in left ventricular function with a need for re-assessment of the pacing programme.

Given the current recommendations for paddle position in patients with implanted cardiac devices, it is perhaps not surprising that the authors did not address a comparison of anterior-lateral vs. anterior-posterior position; although the latter, recommended, position is less easy in the sedated/anaesthetized patient this is a minor practical issue and probably of less concern than the ethical considerations of undertaking a study using a paddle position not recommended by current guidelines.

This timely and valuable study should help all practitioners in this field to deliver rapid and effective ECV with confidence to this group of patients and might, perhaps, encourage a few to re-visit the 94-page guidelines regarding management of this common arrhythmia.

Conflict of interest: none declared.

References