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REVIEW

Cardiac Implantable Electronic Devices and End-of-Life Care: An Australian Perspective

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Cardiac implantable electronic devices (pacemakers and defibrillators) are increasingly common in modern cardiology practice, and health professionals from a variety of specialties will encounter patients with such devices on a frequent basis. This article will focus on the subset of patients who may request, or be appropriate for, device deactivation and discuss the issues surrounding end-of-life decisions, along with the ethical and legal implications of device deactivation.

Keywords End-of-life • Palliative care • Cardiac electronic implantable devices • Pacemakers • Implantable defibrillators

Introduction

Cardiac implantable electronic devices (CIED) have long been used to treat brady-arrhythmias, and, more recently, indications for CIEDs have expanded to include prevention of sudden cardiac death and treatment of congestive heart failure through use of implantable cardiac defibrillators (ICD) and cardiac resynchronisation therapies (CRT) [1].

Increasing clinical indications coupled with an ageing population mean that the number of patients with CIEDs continues to grow year on year [2–4]. Indeed, the 2013 Australian and New Zealand cardiac pacemaker and ICD survey demonstrated the highest implant rates yet for both ICDs and permanent pacemakers (PPM) [2], with absolute implantation numbers higher for PPMs, but higher relative increase in ICD use [2]. As such, many health professionals from a variety of specialties will encounter patients with a CIED who may request, or be appropriate for, device deactivation and need to be cognisant of the issues involved surrounding end-of-life decisions, along with the ethical and legal implications of device deactivation.

It is generally accepted that withdrawal of ''heroic'' or ''extraordinary measures'' at the end of life is appropriate. Deactivation or ''turning off'' ICD therapies, specifically a defibrillating shock for a malignant arrhythmia, falls into this category and is appropriate in a patient who either requests or is not suitable to be resuscitated from a sudden cardiac arrhythmia. However multiple studies have demonstrated a lack of understanding of this area with a key barrier being physician uneasiness [5,6]. Additionally, there are also data to indicate patients are unaware the option exists to deactivate their CIED at end of life and as such few have advanced health directives which include management of their CIED [7–9]. Furthermore, decisions are often left too late. One must remember, that ultimately all patients will succumb to either progression of their chronic cardiac disease or a non-cardiac terminal illness and an awareness and discussion

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Table 1 Factors affecting decision process on end-of-life care and cardiac implantable electronic devices

Key issues to address
Device indication
Patient capacity/ medical power of attorney (surrogate decision-maker)
Patient understanding of CIED function
Patient autonomy
Competing risks - futility
Expected consequences of de-activation
Legal aspects
Physicians right to decide / principle of non-abandonment

of end-of-life care issues should be an important component of routine device follow-up (Figure 1).

With respect to pacemakers, these are primarily indicated for the treatment of symptomatic bradyarrhythmias and are the most common form of CIEDs. It is likely that PPM dependence will compete with end-of-life issues due to other comorbidities. Allowing an already implanted pacemaker to continue to function is by no means an extraordinary measure and the decision to deactivate in a pacing-dependent patient may be viewed as more complex.

This commentary will review and integrate the key points raised in the European and Heart Rhythm Society (HRS) expert consensus statements [10,11] as there are currently no national guidelines on deactivation of CIEDs. In addition, the review will present and discuss a series of cases that outline some of the key points that need to be considered (Table 1). We also propose a framework, which may aid in decision-making (Figure 1).

Case 1 - ICD Deactivation in the Patient with a Terminal Illness

A 65-year-old male with a background history of primary prevention ICD for ischaemic cardiomyopathy is now in the terminal phase of metastatic lung adenocarcinoma. He has requested deactivation of his ICD.

Discussion

This scenario raises the key points of understanding device function, expected consequences of device deactivation, competing risks and patient autonomy (Table 1). A common misconception from patients, relatives and physicians is that turning off an ICD equates to death. This is not true, with deactivation simply removing the potential to treat ventricular arrhythmias and in a terminal illness this may be appropriate. Therefore, evaluation of competing risks is key in patients with a guarded prognosis, not only with terminal cancer, but any non-cardiac disease that has progressed into its terminal phase. If palliation is the primary goal of treatment, one should consider disabling ICD therapies. However, this often does not occur in clinical practice with up to 20% of ICD-enabled patients experiencing shocks in the final weeks of life [6].

With respect to patient autonomy, from an ethical and legal viewpoint, patients have the right to choose which treatments to undertake and to ask for treatment to be withheld. This stance is supported by HRS and European consensus statements as it supports patient autonomy [10,11].

However, clearly patients need to be able to make informed decisions and careful explanation of device indication and function, prognosis and treatment options is required. This is particularly pertinent in patients who have experienced frequent ICD shocks, which is often physically painful and psychologically distressing [12]. Although the fundamental principles of autonomy and self-determination remain valid, it would be ideal to delay decisions until the patient has recovered from the acute distress and is able to make an informed decision (Figure 1). In instances where the patient requests shocks be disabled, it is prudent to discuss other options including the use of anti-tachycardia pacing alone and/or changes to detect times to minimise inappropriate shocks or treatment of conscious ventricular tachycardia [13,14]. It is also important for the physician to document the discussion clearly, i.e. what has been discussed (including the implications of deactivation of the CIED), what has been decided (exactly what has been deactivated and how), and who was informed. The procedure of device deactivation differs between institutions and is beyond the scope of this paper; it is reasonable to expect all device follow-up centres to have a policy that outlines the process at their institution.

Case 2 - ICD Deactivation in the Patient with End-stage Heart Failure

An 82-year-old female with a CRT defibrillator for non-ischaemic cardiomyopathy has refractory NYHA Class IV heart failure symptoms despite optimal medical therapy.

Discussion

This scenario again highlights the issues of device function and competing risks (Table 1). However, it is more complicated than the first case due to the fact that it is extremely challenging to predict when patients with end-stage heart failure enter the terminal phase [15]. It is also more complex as the CIED has two functions – biventricular pacing and the prevention of sudden death through its defibrillating capability. One should be cognisant that it may be appropriate to continue one therapy (biventricular pacing) for symptoms while disabling another function (ICD).

This reflects the concept of futility, as ICD therapies are unlikely to alter this patient's prognosis. Indeed, ICD therapies in this setting may cause significant anxiety and distress [6]. Therefore, active decision-making surrounding ICD