Patients and their implantable cardioverter-defibrillators

Smaller, smarter and MRI-compliant

Introduction

Implantable cardioverter-defibrillators (ICDs) are increasingly being used worldwide and also in South Africa. The latest World Survey of Cardiac Pacing and ICDs (2009), covering more than 80% of all pacemakers and ICDs implanted, shows this significant increase, expectedly in Europe and America, but also in the Middle East and Africa.¹

A more recent survey on the use of electronic cardiac devices in Africa over the period 2011-2016 has shown that South Africa performed 132 ICD implants per million of the population annually during this period.²

As technology advances, more patients are becoming eligible for implantation and are set to benefit from this additional cardiac protection.

Launch in South Africa of world’s smallest 3T full-body ICD and cardiac resynchronisation therapy-defibrillator (CRT-D) devices

The need to offer ICDs with greater longevity, reliability and ease of implantation with the least patient discomfort is now being met following the recent launch in Europe of the world’s smallest 3T full-body MR conditional ICD and CRT-D devices. These devices will soon be widely available in South Africa (Link to video).

One of the most important clinical features of these new devices (the Rivacor range) is their extended battery life: up to 15 years for the ICDs³ and nine years for CRT-Ds.⁴ This lowers the need for device replacement, resulting in reduced risk and distress to patients and fewer procedure costs.

“I thought the Rivacor device was fairly intuitive to use and programme. So implantation of what is essentially a new device was straightforward and routine. Ease of implantation, intuitive programming, length of battery life and obviously the smoother edges make it a winner.”

Dr Razeen Gopal
**Focus on the CRT-D device**

In 2013, South African centres implanted 790 CRT-D devices and CRT pacemakers; an implant rate of 14.5 per million population.²

The selection of the CRT-D device is key to successful outcomes. Following with a unique characteristic of the Rivacor device is its BioShape, ultraslim 10mm design, which lowers the risk of skin erosion, achieving a greater patient comfort rating. For physicians, the slenderness of this family of devices plays a key role in making the insertion procedure easier and improving how the device looks after implantation.

Also, for clinicians and patients, the extended longevity and effectiveness of these devices is reassuring, as CRT-D patients are exposed to a higher risk of complications than single- or dual-chamber ICD patients (Table 1),⁴ as can be seen from this 2007-2009 prospective study.

**First in Africa experience of Rivacor device**

The Cape Town AF centre at Panorama Hospital recently implanted the first Rivacor device in Africa. Dr Razeen Gopal, cardiologist/electrophysiologist, comments: “I thought the Rivacor device was intuitive to use and programme. So implantation of what is essentially a new device was straightforward and routine. Ease of implantation, intuitive programming, length of battery life and obviously the smoother edges make it a truly significant development for our patients.”

![Figure 1. Rates of major (top) and minor (bottom) 45-day complications by defibrillator type](image)

**Remote monitoring and improved clinical outcome**

These devices offer continuous remote monitoring. Cardiovascular data from the Rivacor devices can be transmitted to the physician on a daily basis with programmable alerts about relevant changes in patient health and device status. A randomised controlled trial of this alerting system (IN-TIME) has demonstrated a more than 60% reduction in all-cause mortality when these CRT-Ds are used with remote monitoring.⁶ Where ICDs are concerned, the remote monitoring facility has been clinically shown to help physicians detect atrial fibrillation earlier,⁷ as well as reduce the number of inappropriate shocks by 90% and related hospitalisation rates by 73%.⁸

The value of this IN-TIME approach has resulted in its being included in the 2016 ESC guidelines for the diagnosis and treatment of acute and chronic heart failure (Table 1) using these devices.
Table 1. Recommendations in respect of exercise, multidisciplinary management and monitoring of patients with heart failure*  

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Multiparameter monitoring based on the ICD IN-TIME approach may be considered in symptomatic patients with HFrEF (LVEF ≤35%) to improve clinical outcomes.

*Level evidence B: data derived from a single randomised clinical trial or a large non-randomised study.

Continuous CRT optimisation

An important feature of this CRT-D device is its ability to automatically adapt to fit a patient’s individual needs and provide continuous CRT adaptation—automatically adjusting to changes sensed (Figure 2).

To fit each patient’s individual and dynamic pacing needs, CRT AutoAdapt every minute:

- takes the patient’s individual A-RV and A-LV conduction patterns into account,
- adjusts the AV delay and
- configures the pacing chamber selection.

In patients with sinus rhythm and normal AV conduction, LV-only pacing with appropriate AV delay can result in superior ventricular function.

Automatic detection of MRI scanning

In recent decades, the number of magnetic resonance imaging (MRI) scans has doubled every five years. It is estimated that 28% of ICD patients will have an indication for MRI scanning in a four-year period with more than one-third of patients needing more than one scan. The AutoDetect sensor of this device senses MRI environments and self-adjusts for the duration of the scan only. This facility can be activated with a single visit to the physician and has a 14-day window for planning. It can be used for 3T high-resolution MRI scanning and full-body scanning.

Conclusion

New technology is ‘game-changing’ in the management of heart failure and arrhythmias. As implantable devices become easier to implant and monitor, while lasting longer, costs are reduced in respect of surgery, replacement procedures and hospitalisation over time. Patients wearing these devices for a decade and more are now able to achieve an improved quality of life, while physicians are better placed to deal with the complexities of caring for these patients and treating any comorbidities that may occur.
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References
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3. Acticor/Rivacor VR-T Standard conditions. 15.4 years @ 40 ppm; 0% pacing @ 2.5V/0.4ms; 500 Ohms; 2 max. energy shocks/year (Data on file).

4. Acticor/Rivacor HF-T QP, 9.3 years @ 60 ppm; RA 15%, RV/LV 100% pacing, RA/RV/LV @ 2.5 V/0.4 ms; 500 Ohms, 2 max. energy shocks/year (Data on file).


This CPD accredited report was compiled by Julia Aalbers on behalf of deNovo Medica.