8 October 1958, D Day for the implantable pacemaker

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After the introduction of temporary transcutaneous cardiac pacing by Paul Zoll in 1952, and of the temporary endocardial approach by Seymour Furman in the USA in 1958, the first definitive electronic pacemaker was implanted by Senning and Elmqvist in Sweden on 8 October 1958 using a thoracotomy to suture two epicardial electrodes. Actually, the 'definitive' unit placed in the abdominal wall of the pacemaker recipient, Arne Larsson, fired for only three hours. The first replacement, done the following morning, was followed by more than 22 units and numerous surgical interventions until Mr Larsson died in 2001.[1] Despite all the initial technical and medical failures, the daily resuscitations of this patient caused by recurrent AV block were over and Mr Larsson could be discharged after several months of hospitalisation to resume his daily life and activities. For the Netherlands, the D Day of this cardiac electrotherapy was 3 January 1962 when the cardiac surgeon Professor G. Brom of the University Hospital Leiden implanted the first permanent epicardial pacemaker, soon followed by implantations by Professor Homan van der Heide in the University Hospital Groningen and afterwards in many general hospitals. For detailed information about the early days of cardiac pacing in our country, see the following pages of this issue.

The impressive progress of chronic cardiac pacing is embodied by the normalised life expectancy of most pacemaker recipients and also, very importantly, a much better quality of life than before pacing.[2] In the early days, nobody could foresee that besides pacing for slow cardiac rhythms, biventricular pacing could support medical treatment of congestive heart failure. After the introduction of the latter electrotherapy, Dutch implanters embraced this approach, shown by the steep rise in the number of implants in our country over the past five years. Notably, our annual nationwide figures for cardiac resynchronisation therapy (CRT), with or without ICD, are high compared with other Western countries. This figure contrasts strongly with the annual number of electronic pacemaker units implanted for the accepted bradycardia indications, which is lower than the European average; the reason why remains obscure.

While D Day of World War II followed after enormous preparations of strategies, supplies and equipment, the weaponry of cardiac pacing in humans was only started in the early 1950s but has developed rapidly in the past five decades. Improved longevity of the batteries (from nickel-cadmium cells to lithium powered), better electronic circuits and infinitely programmable algorithms and memories of the pacemaker connected to one to three superb leads now allows us to pace and sense almost all desirable endocardial sites. This equipment facilitates tailoring of electrotherapy to the variable needs of the individual patient over many years of pacing. We experienced that on the one hand the ideas and developments of the manufacturers sometimes 'created' clinical needs as exampled by disputable pacing electrical 'therapies' to interrupt or prevent paroxysmal atrial fibrillation.[3] On the other hand the device designers responded very quickly and adequately to new concepts and ideas originating in the clinic, as reflected by the fast release of products for biventricular pacing. These events mirror the mutual cooperation between the implanting cardiologists and their allied professionals and the engineering departments of device companies. In the early days, the Dutch Vitatron company was a typical embodiment of that cooperation with the implementation of the ideas and experiences of many Dutch cardiologists into their pacemaker designs.

After 50 years of cardiac pacing, the cardiology profession has taken over nearly all device implantations and replacements from the surgeons and this task has

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become one of the major components of the cardiac speciality 'invasive arrhythmology'. Because reading, interpretation and programming of the current electronic devices has become very complex and time consuming, specialised allied professionals were needed to assist the cardiologist in daily practice. Indeed, the contribution of the device technicians and nurse practitioners to the implantation procedure and follow-up of pacemaker patients has increased substantially. Whether home monitoring of implanted devices and the fully 'automated pacemaker' can replace the allied professionals to some extent remains guesswork. Nevertheless, strict regulations for the education, experience and certification of these allied professionals are required to guarantee the benefits, safety and cost-effectiveness of cardiac electrotherapies in the next decades.

Next to continuous education and audit of the 102 implanting centres in the Netherlands, annual surveys of our national implantation data and related patient and device characteristics are indispensable for monitoring the quality of the care with implanted devices. In the past 25 years, the Netherlands Pacemaker Registry Foundation (Stichting Pacemaker Registratie Nederland, SPRN) covered more than 85% of all implantation and replacement data in the Netherlands and distributed the annual findings, as summarised in this issue. In March 2008, the new registry of implantable electronic devices, called DIPR (Dutch ICD, Pacemaker Registry), proposed by the Netherlands Society of Cardiology, took over the SPRN registry; the Society is now primarily responsible for monitoring this sort of care.

In recent years we have been faced with several unforeseen circumstances in cardiac pacing. For more than 40 years the right ventricular apex was considered a safe haven for chronic pacing and used in millions of pacemaker patients. However, nowadays its potentially detrimental effect on ventricular function has sparked the debate about the best right ventricular pacing site. Second, despite the tremendous technical improvements of devices and leads, the number of recalls and 'Dear Doctor letters' has increased dramatically, reflecting our wish for the arrival of human products with 100% perfection. The response to these advisories for replacement often ends in infinite debates between experts, and unnecessary replacements with high risks. Third, hospital management, health authorities and insurance companies strive to influence the choice of devices because of arguments of budget constraints without understanding that the quality of cardiac electrotherapy fully relies on local long-term experience and familiarity with specific types and products as well as the support of manufacturers in terms of training and troubleshooting. The consequences of this strategy are unpredictable and can damage the current level of care.

It is the purpose of this issue to bring to mind several aspects of pacemaker therapy after nearly 50 years of chronic pacing in the Netherlands, and to put our current management and strategies for implantation, follow-up and related issues into perspective. Experts in bradycardia pacing have been invited to deliver their points of view on specific matters with a wink to history and the future. Although biological pacing by gene and cell therapy is a serious target,[4] we assume that in the coming decade thousands of new Dutch patients with slow heart rates will profit from the implantation of the current smart and small electronic devices that indicate their D Day of improvement. ■

References

1 Larrson B, Elmqvist H, Ryden L, Schüller H. Lessons from the first patient with an implanted pacemaker. *PACE* 2003;**26**:114-24.
2 van Eck JWM, van Hemel NM, van den Bos A, Taks W, Grobbee DE, Moons KGM. Predictors of improved quality of life one year after pacemaker implantation. *Am Heart J* 2008, in press.
3 De Voogt W, van Hemel NM, de Vusser Ph, Mairesse GH, van Mechelen R, Koistinen J, et al. No evidence of automatic atrial overdrive pacing efficacy on reduction of paroxysmal atrial fibrillation. *Europace*, 2007;**9**:798-804.
4 Boink GJJ, Seppen J, de Bakker JMT, Tan HL. Biological pacing by gene and cell therapy *Neth Heart J* 2007;**15**:318-22.