Antitachycardia pacing to terminate ventricular tachyarrhythmia: new insights into how to reduce painful implantable cardioverter defibrillator shocks

Joerg O. Schwab*
Department of Medicine – Cardiology, University of Bonn, Sigmund-Freud-Str. 25, 53105 Bonn, Germany

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This editorial refers to ‘Safety and efficacy of programming a high number of antitachycardia pacing attempts for fast ventricular tachycardia: a prospective study’ by R.P. Martins et al., on page 1457 and ‘First inappropriate implantable cardioverter defibrillator therapy is often due to inaccurate device programming: analysis of the French OPERA registry’ by A. Leenhardt et al., on page 1465.

The termination of life-threatening fast ventricular tachycardia (FVT) by the delivery of antitachycardia pacing (ATP) through the right ventricular implantable cardioverter defibrillator (ICD) lead was first investigated by Wathen et al.1 in a prospective randomized trial. They demonstrated that the ATP approach did not take longer than 6 s to stop FVT compared with conventional ICD shock delivery as the common type of therapy. One interesting finding in this study was that the fear of syncope or delay of the life-saving ICD shock was no longer justified since no difference between the two groups was detected. Over the following years, ATP has become a valuable option to treat all VT episodes. Large-scale studies, including PainFree Rx II, EMPIRIC, PREPARE, or ATPonFastVT, demonstrated the efficacy and safety of this approach.2–5 Moreover, the number of painful ICD shocks delivered was reduced dramatically.

Properties of antitachycardia pacing

In general, physicians are able to programme ATP consisting of individual determinants. These include the number of runs delivered, the number of impulses per train, and the cycle length of impulses (usually programmed as a percentage of the mean VT intervals before VT detection with optional shortening of the cycle length). In the first trial investigating the ability to terminate FVT, ATP consisted of two runs of eight impulses with an 88% coupling interval.1 In another prospective randomized trial, the effectiveness of the number of impulses increased from 8 to 15 per train was tested. The results demonstrated no significant difference between the two types of ATP.6

Clinical evidence

In this issue of the journal, two reports from centres in France are of interest. The safety and efficacy of a high number of ATP attempts to stop FVT were investigated by Martins et al.7 who found out that 98.3% of all FVT episodes were terminated by the first two attempts at ATP, and an increase in successful termination of FVT was observed with up to five ATP therapies. Adding another ATP attempt did not result in any improvement in terms of ATP success or ICD shock prevention. Although it was not a randomized trial, these registry results are of interest, prompting physicians to program at least two ATP therapies in the FVT-zone like in the PainFree or ATPonFastVT study.1,5

In the second report, from the OPERA registry, Leenhardt et al.8 identified three main mechanisms for inappropriate ICD therapy: 32% were due to template mismatch, 18% of these interventions were caused by continuation of the arrhythmia leading to activation of the ‘sustained rate duration’ algorithm. This discriminator was introduced to deliver ICD therapy despite the nature of an ongoing arrhythmia after a discrete amount of time (a default setting of 3 min). Although nearly all ICD manufacturers provide this feature, in my opinion, it has no significant value in modern ICD programming and should probably be turned off by default. Another problematic issue in this cohort is that 11% of patients suffered from a genetic disorder. Usually, in a patient with Brugada...
or long QT syndrome one would program an ICD with a ventricular fibrillation (VF) zone starting a 230 min$^{-1}$ including a long detection interval.

In general, these two studies provide new insights into programming of ATP as a modern type of ICD therapy, and emphasize the need to program ATP as first-line therapy up to ventricular rates of 240 min$^{-1}$. However, when looking at the cited literature and these reports, one has to keep in mind that the latest investigations were only performed in patients with Boston ICD devices. Furthermore, patient populations were different in these studies in terms of primary and secondary prevention indications and the type of ICD devices, i.e. with or without cardiac resynchronization therapy (CRT). As shown in Figure 1 ATP was clearly successful in two-thirds of cases in all randomized trials. In some cases, ATP terminated nearly three of four ventricular episodes.

### Consequences and strategic implications

When looking at the increasing numbers of guidelines on management of patients with heart failure in recent years, I would like to ask the European Heart Rhythm Association (EHRA) to come up with a recommendation about ‘How to program an ICD/CRT-D’. I am sure that this guideline would help physicians cope with these complex devices and put some pressure on the manufacturers to set the ‘default programming’ of their ICD devices as close to the recommendations as possible.

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### References