

Editorial Comment

Transvenous Catheter Defibrillation for Prevention of Sudden Cardiac Death*

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The concept that life-threatening ventricular tachyarrhythmias could be terminated in closed chest subjects by means of internally delivered electrical countershocks, and that this maneuver could be performed automatically by an electronic device permanently implanted in high risk patients to protect them from arrhythmic death, goes back to the late 1960s (1,2). Initially, the idea was not well received by critics (3) and hardly captured the imagination of either clinicians or engineers. In fact, only a handful of workers became committed to its practical implementation. It should not be surprising, therefore, that the time needed for the solution of the multitude of problems inherent in such an endeavor was longer than expected (4-10).

Since the first automatic defibrillator was implanted in a human being (10), the clinical acceptance of internal automatic defibrillation has been growing steadily. Significantly enough, technologic advances have kept pace with the clinical progress. Although the initial model of the device only detected and treated ventricular fibrillation, cardioverting capabilities were soon added to the design, expanding the diagnostic and therapeutic potential of the system to include the broad spectrum of ventricular tachyarrhythmias. Recently, the first fully hybridized version of the device was introduced (VENTAK, Cardiac Pacemakers, Inc.), facilitating the manufacturing process and assuring the availability of pulse generators. Smaller and more advanced models, incorporating pacing for tachy- and bradyarrhythmias, programmability, memory and so forth, have already left the drawing board and are about to enter clinical trials.

So far, >2,500 patients have been treated with the automatic implantable cardioverter-defibrillator, also known by

its acronym AICD. Experience indicates that the device performs its designed functions satisfactorily, that the risks associated with its use are moderate and frequently avoidable and, most importantly, that its impact on the survival of the implantees is dramatic indeed. Although the sudden death mortality in the types of patients operated on ranges between 27 and 66% at 1 year (11-14) in historical control patients, it has been consistently found to be <2% in those who received the AICD (15-21).

The transvenous defibrillating catheter. In this issue of the Journal, Winkle and colleagues (22) report on what certainly will become another milestone in this rapidly evolving field. In comparing the defibrillation efficacy of the conventional spring-patch electrode configuration with that of a single intravascular defibrillating catheter in patients undergoing AICD implantation, these investigators found that permanent use of such a catheter would have been practical in almost 50% of their patients. Moreover, the defibrillating catheter displayed suitable pacing thresholds and sensing functions even after delivery of the countershock.

The data of Winkle et al. considerably extend the field of internal automatic defibrillation. The message is that implantation of the AICD might not require a thoracotomy in a significant proportion of patients. Although current implantation techniques are associated with a relatively low incidence of major complications, the use of a nonthoracotomy approach could reduce the risk even further. A fully transvenous implantation approach is also expected to markedly reduce the cost of the procedure.

Although the biologic feasibility and effectiveness of catheter defibrillation in humans was demonstrated by our group >15 years ago (4,6), Winkle and his colleagues have successfully applied this technique in a setting directly aimed at preventing sudden arrhythmic death. In their hands, the transvenous defibrillating catheter has become an integral part of the automatic implantable cardioverter-defibrillator, adding a new dimension to the practical use of this new treatment.

Implications. If the history of artificial cardiac pacing is any guide, implantation of the automatic cardioverter-defibrillator will soon be transformed into a simple and relatively noninvasive intervention. With further anticipated improvements in defibrillating catheter technology, it is not unreasonable to expect that nonthoracotomy approaches will become routine implantation techniques. The clinical relevance of such a development cannot be underestimated at a time when the AICD is being recognized as an essential modality in the management of survivors of arrhythmic cardiac arrest and of other patients suffering from malignant ventricular tachyarrhythmias.

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