Ali Massumi Cardiac Arrhythmia Symposium

Implantable Cardioverter-Defibrillators and Wearable Defibrillators:

Guidelines and Updates

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Implantable cardioverter-defibrillators (ICDs) have been a preferred treatment for ventricular arrhythmias. Clinical data have consistently supported their use; however, determining which patients will or will not benefit from treatment remains difficult.

A documented episode of sustained ventricular tachycardia/ventricular fibrillation (VT/VF) without reversible cause warrants ICD implantation (class IA indication) to potentially treat episodes in the future.[1] In patients without prior VT/VF, decreased left ventricular ejection fraction (LVEF) is the primary indication for preemptive ICD implantation. If the LVEF is ≤0.35 despite maximal guideline-directed medical therapy, or coronary revascularization was performed 90 or more days previously, then ICD implantation is a class I indication,[1] in ischemic or nonischemic cardiomyopathy. An LVEF ≤0.35 in a patient with myocardial infarction (MI) who has been on medical therapy for 40 days also meets the guidelines for ICD implantation.[1]

In addition to LVEF, other factors indicate which patients may benefit from ICD therapy. Diagnostic electrophysiologic studies (EPS), for example, have been part of risk-stratifying patients for more than 20 years. The Multicenter Unsustained Tachycardia Trial (MUSTT) investigators categorized post-MI patients with nonsustained VT and an LVEF ≤0.40 according to whether ventricular arrhythmias were induced during EPS; the patients with inducible VT during EPS benefited from ICD implantation.[2] Inducible VT/VF during EPS is also an indication for ICD implantation in patients with coronary artery disease who are at risk for ventricular arrhythmias, which present as unexplained syncope, immediately after MI.[1]

Cardiac imaging is another diagnostic method that is playing a more prominent role in stratifying the risks of sudden death. In particular, cardiac magnetic resonance (CMR) has shown promise in evaluating intrinsic myocardial scarring and predicting cardiac death in patients with hypertrophic cardiomyopathy.[3] However, its usefulness in determining the need for ICD therapy has not been fully established. An ongoing clinical trial, Cardioverter-Defibrillator Implantation to Prevent Tachyarrhythmias following Acute Myocardial Infarction (PROTECT-ICD) (NCT 03588286), is evaluating the use of both EPS and CMR to identify which post-MI patients could benefit from ICD treatment.

It is unclear how best to monitor and prevent ventricular arrhythmias in patients with a decreased LVEF who are still undergoing optimal medical therapy within 90 days after MI. While being considered for ICD treatment, these patients may benefit from treatment with a wearable cardioverter-defibrillator. This vest-like device, which is worn under clothing, continuously monitors heart rhythm and delivers a shock to restore sinus rhythm in patients who have sustained VT/VF. Currently, using a wearable defibrillator is a class IIB indication in patients who are at high risk for sudden death but do not meet other immediate indications for ICD therapy.[1] The Vest Prevention of Early Sudden Death Trial (VEST) investigators randomized post-MI patients with LVEF ≤0.35 in a 2:1 ratio to receive a wearable defibrillator and medical therapy (device group) or medical therapy alone (control group). There were no differences between groups in the primary outcome of arrhythmic death (device group, 1.6%; control group, 2.4%; P=0.18), whereas the overall mortality rate was lower in the device group (3.1% vs 4.9%; P=0.04).[4]

An inherent limitation of the wearable defibrillator is compliance. For example, VEST trial participants wore it for only 14 hr/d, on average.[4] In addition, the relatively low event rate suggests that the trial was underpowered to evaluate differences within the groups. Although no clear benefit was found with regard to arrhythmic death, the lower mortality rate in the defibrillator group suggested benefit from monitoring rhythm.

In summary, ICD treatment remains important in managing ventricular arrhythmias. Current guidelines support ICD implantation in patients with prior episodes of VT/VF, and LVEF ≤0.35, or both. Further studies should clarify the value of wearable defibrillators and confirm the roles of EPS and CMR in determining which patients will benefit most from ICD implantation.

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