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SUDDEN CARDIAC DEATH AND THE ROLE OF IMPLANTABLE CARDIAC DEVICES IN ITS PREVENTION

Nika Kuridze

Caucasus University, Caucasus Medicine School, Tbilisi, Georgia;
G. Chapidze Emergency Cardiology Center, Rhythmology Department, Tbilisi, Georgia

Background: Sudden cardiac death (SCD) remains a major global public health challenge, accounting for a substantial proportion of cardiovascular mortality. It is most commonly associated with ventricular tachycardia (VT) and ventricular fibrillation (VF), particularly in patients with structural heart disease, heart failure, and inherited arrhythmogenic disorders. Despite advances in cardiovascular diagnostics and pharmacological treatment, identifying individuals at the highest risk of SCD and implementing effective preventive strategies remain critical clinical priorities.

Objective: To review the role of implantable cardioverter-defibrillators (ICDs) in the primary and secondary prevention of SCD, focusing on current indications, supporting clinical evidence, and the importance of individualized risk assessment.

Methods: The review provides a narrative overview of contemporary guideline recommendations and major clinical trials evaluating ICD therapy. Evidence from the DEFINITE, SCD-HeFT, MADIT-II, and DANISH trials is discussed, alongside current approaches to risk stratification in ischemic and non-ischemic cardiomyopathies and inherited arrhythmia syndromes.

Results: Clinical evidence supports ICD implantation as an effective strategy for preventing arrhythmic death in appropriately selected patients.[1] The SCD-HeFT trial demonstrated a 23% relative reduction in all-cause mortality with ICD therapy,[2] while MADIT-II reported a 31% reduction in mortality among patients with previous myocardial infarction and left ventricular systolic dysfunction.[3] The DEFINITE trial demonstrated a significant reduction in arrhythmic sudden death in patients with non-ischemic dilated cardiomyopathy.[4] The DANISH trial subsequently showed a significant reduction in SCD among patients with non-ischemic systolic heart failure, without a statistically significant reduction in overall mortality.[5] These findings highlight the importance of competing risks, age, comorbidities, and the underlying cardiac substrate when selecting candidates for primary prevention. Secondary prevention remains a major indication for ICD implantation in survivors of cardiac arrest due to VT/VF or patients

with hemodynamically unstable ventricular arrhythmias, provided reversible causes have been excluded. Beyond reduced left ventricular ejection fraction, risk assessment may incorporate cardiac magnetic resonance imaging, genetic testing, arrhythmic history, and disease-specific markers in selected patients with cardiomyopathies and inherited arrhythmia syndromes.

Conclusion: ICD therapy is a cornerstone of SCD prevention, particularly in patients at high risk of life-threatening ventricular arrhythmias. Optimal patient selection requires integration of guideline-based indications, ventricular function, arrhythmic history, disease-specific risk factors, comorbidities, and life expectancy. Combining comprehensive risk stratification with optimized guideline-directed medical therapy is essential to maximize clinical benefit and improve outcomes.

Keywords: Sudden cardiac death, implantable cardioverter-defibrillator, primary prevention, secondary prevention, risk stratification.