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REVIEW

Implantable Cardioverter Defibrillators (ICDs) in Octogenarians

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Octogenarians are a growing section of the community. Implantable cardioverter defibrillator (ICD) implantations and replacements in this age group are becoming frequent. There are no randomised control trials or large observational studies of octogenarians and indications for ICD implantations are extrapolated from published primary and secondary prevention trials, where the age group has been in its sixties. About 75% of ICDs are implanted for primary prevention guided by patient's ejection fraction.

Most patients who have ICDs do not have a clear idea about the function and limitation of ICDs. Patient education about ICDs is an important aspect which deserves consideration, particularly in this age group. The use of ICDs in octogenarians should be individualised and carefully scrutinised. It should take into consideration overall health status, symptom severity, co-morbidities and intermediate and long-term prognosis. There should be detailed discussion about patient preference and expectations. Physicians must provide a realistic appraisal of potential benefits and risks and address device management issues at end of life. This discussion should also take place when ICD replacement is considered.

Keywords Octogenarians • ICDs • ICD deactivation • ICD indications • ICD subgroup analysis

Introduction

There are only limited options in treatment of life threatening ventricular arrhythmias.

1. Antiarrhythmic drugs: which do not prolong life and have significant side effects.
2. Radiofrequency ablation: which has a limited role in patients who already have an ICD.
3. Implantable Cardioverter Defibrillators (ICDs): provide complete treatment for ventricular tachycardia/fibrillation and bradyarrhythmia including, where indicated, biventricular pacing. ICDs have also been shown to improve survival in many primary and secondary prevention trials; however, ICDs have their own limitations.

With increasing life expectancy, octogenarians are a growing sector of the population.

One in eight ICD implants in the USA are in patients aged 80 years or more, according to a paper published in 2009, and is currently estimated to be one in five [1,2]. While Australian figures of ICD implants in octogenarians are not available, the number of ICD implants is certainly increasing. This article is an attempt to analyse the available data and attempt to rationalise the use of ICD in octogenarians.

ICDs are implanted for primary and secondary prophylaxis against sudden cardiac deaths. At present, a greater number of ICDs are implanted for primary rather than secondary prophylaxis. In the ACT (Advancement in ICD) trial, 75% of implants were for primary prophylaxis [1].

Currently, the only criterion for ICD implantation for primary prevention is a low ejection fraction. In an editorial on ICDs for primary prevention of sudden death, Dr. Alfred Buxton [3] cites a case of an 83 year-old with EF of 20%, functional class 3 with co-morbidities, referred for primary prevention ICD. There are many such examples in the literature of octogenarians receiving ICDs just because of an EF $\leq$ 35%. In addition to new implants, another important consideration is ICD replacements in this age group. ICD replacements receive less stringent scrutiny than new implants because of the perception that ICDs are for life.

ACC, AHA and HRS 2008 guidelines for ICD implantation [4] do not specify an age criterion for ICD implantation. These guidelines state that 'ICD therapy is not indicated

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for patients who do not have a reasonable expectation of survival with an acceptable functional status for at least one year, even if they meet ICD implantation criteria specified in the Class I, IIa and IIb recommendations'. This statement is frequently used as an endorsement for ICD implantation in octogenarians.

Age Limit in Published Primary and Secondary ICD Trials

Table 1 lists secondary and primary prevention ICD trials. In all these trials the age range of patients was much lower than 80 years. Only a small number of octogenarians are represented in these major trials and there is no randomised trial data of ICDs in this age group. Low number of elderly patients in these trials has led to the use of variable age cut off for subgroup analysis. Age limits of 65, 70 and 75 years have been used as 'elderly' for the purpose of subgroup analysis. This precludes a clear consensus about ICD implants in octogenarians.

Subgroup Analysis of the ICDs in the Elderly

(1) Healy et al. [5] reported on the role of secondary prevention in patients ≥75 years. This was a subgroup analysis of secondary prevention ICD trials, AVID, CASH and CIDS amongst elderly patients aged 75 years and over. They compared 1614 patients under the age of 75 and 252 patients 75 and over. In under the age of 75, survival for ICD patients was much better compared to medical therapy (<0.0001) while there was no statistical difference between the two arms in patients aged 75 and over ($P = 0.79$). The same difference applied to freedom from arrhythmic death.

(2) Huang et al. [6] performed a similar subgroup analysis of primary prevention trial MADIT 2. They compared 1028 patients under the age of 75 with 204 patients above the age of 75. An important limitation of this analysis was a short mean follow up of 17 months. One hundred and twenty-one out of 204 patients were 79 ± 3 years. Although the survival in above 75 years group was much lower ($P = 0.01$ vs. $P = 0.08$), the authors concluded that ICDs were associated with equivalent reduction in mortality and quality of life in patients aged 75 and over *in appropriate eligible patients*.

(3) While subgroup analysis of another large primary prevention trial SCD-HeFT [7] is not available the authors stated that ICD benefit was much less pronounced in patients over the age of 65 years.

(4) Mezu et al. [8] reported on a cohort of 152 patients age range 84 + 4 (range 80–96), 72% were men and 87% had ischaemic cardiomyopathy; 140 were octogenarian and 12 were nonagenarians. ICD patients had better one-year survival compared to non-ICD (72% vs. 52%). However, ICD did not confer survival benefit using multivariate Cox model (HR 0.78). None of the ICD recipients had any true instances of documented VF. They also point out that patients aged >80 years have a lower incidence of Sudden Cardiac Death (SCD). The implantation of ICDs in octogenarians is based on the extrapolation of data from large randomised trials in which mean age was in the sixties.

(5) A subgroup analysis by Pellegrini et al. [9] of survival after ICD implantation demonstrated significantly reduced survival in ICD patients above the age of 75 years.

(6) Krahn et al. [10] reported on the diminishing proportional risk of sudden death with advancing age and concluded that although the incidence of death increases with advancing age the proportion of SCD diminishes.

Trials Supporting ICD Implantation in the Elderly

(1) Strimmel et al. [11] report on 84 patients with a mean age of 82.68 years who had primary and secondary prevention ICDs. They report 'low complication' rate of 9.4% with serious complications in 4.8% but no mortality. Half of the patients received CRT-D implants. Survival during the follow-up period was good, 60% at five years but the benefit was mainly in the CRT-D group.

Table 1 Age Range in ICD Trials.

Secondary Prevention Trials			Primary Prevention Trials		
Trial	**Total Patients**	**Age Range (in years)**	**Trial Patients**	**Total (in years)**	**Age Range**
AVID	1016	65 ± 11	MUSTT	704	66 median
CIDS	659	63 ± 9	MADIT II	1232	64 ± 10
CASH	191	58 ± 11	DINAMIT	676	61.5 ± 10.9
			SCD-HeFT	2521	60.1 median
			DEFINITE	458	58.4 mean