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Commentary

Is there a role for wearable cardioverter defibrillators after myocardial infarction?

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Myocardial infarction poses a risk of sudden cardiac death due to ventricular arrhythmias. This risk is especially pronounced during the first month at about 2.3%.[1] The risk of sudden cardiac death is particularly high in the subgroup with reduced left-ventricular ejection fraction. However, two studies, published 2004 and 2009 respectively, were unable to demonstrate a benefit for implantable cardioverter defibrillator (ICD) therapy soon after myocardial infarction.[2,3] Therefore, the current guideline discourages implantation during the first 40 days, and most patients recover from low ejection fraction during the subsequent months after myocardial infarction.[4] With modern strategies for revascularization and optimal pharmacological therapy, ejection fraction may improve above cut-offs for primary-prevention ICD. Nevertheless, during the vulnerable period after myocardial infarction it seems reasonable to offer protection from sudden death. A solution to this could be the wearable cardioverter defibrillator (WCD), which is capable of terminating life-threatening ventricular arrhythmias.

The WCD weighs around 0.8 kg and is worn under the clothes, and can be temporarily removed for bathing.[5] Three defibrillator panels incorporated in a washable elastic fabric are attached to the skin; a conductive gel is released

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immediately before defibrillation. The monitoring unit is placed at the waist. In the case of sustained ventricular arrhythmia (>30 s) above the detection zone, there will be vibration and sound signals. This enables patient-activated inhibition by pressing two buttons at the same time. If the patient becomes unconscious, the inhibition is cancelled and a 75-150 Joule biphasic shock is delivered up to five times. Notably, there is remote monitoring including how many hours/day the patient wears the vest.

The use of WCD has been evaluated in different clinical settings presented as observational studies.[6,7]

A more widespread use of this technology demands the foundational data that only a randomized controlled trial can offer. This was the rationale for the Vest Prevention of Early Sudden Death Trial (VEST), published in 2018.[8] From 2008-2017, 13,744 patients were screened and 2,302 enrolled (mean age 61 years; 27% females). The enrolled patients had a recent myocardial infarction (≤7 days), ejection fraction ≤35%, and were followed for 90 days after randomization to either WCD or conventional treatment in a 2:1 ratio. The primary outcome was a composite of sudden death or death from ventricular arrhythmia at 90 days. There was no statistical difference between the WCD group and controls (1.6% vs 2.4%; relative risk, 0.67; 95% confidence interval, 0.37 to 1.21; p=0.18). It has been claimed that the study was underpowered and that the primary outcome was a challenge to discern because an indeterminate cause of death was not counted but could have been arrhythmic. All-cause mortality was lower in the WCD group (3.1% vs 4.9%; relative risk 0.64; 95% confidence interval, 0.43-0.98; p=0.04).

Notably, a fifth of the patients crossed over between groups, and the compliance with WCD decreased over the study period (mean 14.1 hours per 24 hours) from 81% at enrollment to 41% at 90 days. The distribution of wearing time exhibited a bimodal pattern, with some patients barely wearing the WCD at all. The reasons for non-compliance could be low motivation, device alarms, skin irritation, emotional distress, and an inappropriate shock (0.6%). Only 1.4% received an appropriate shock while 4.6% had aborted shocks. In a noteworthy as-treated analysis there were significantly fewer deaths when the patients were wearing the WCD compared to when not wearing it. Actual WCD wear time was associated with a relative risk reduction of 60% arrhythmic death, as well as a 1.41 per 100 person-month reduction in all-cause death (0.5 vs 1.91/100 months). As-treated WCD patients had a lower risk of the primary outcome (0.37 vs 0.86/100 months, relative risk 0.43; 95% confidence interval 0.21–0.91; p=0.03). However, as-treated analyses are prone to bias; low-arrhythmia-risk patients in the WCD group had a greater proportion of wear time, leading to a perceived decrease in arrhythmic death which may not be attributable to the WCD.

Totally, 25 adjudicated sudden deaths occurred in the WCD group, of whom 16 were not wearing the WCD at the time of death. Moreover, 4 of the 9 patients with WCD-treated ventricular arrhythmia had recurrent lethal arrhythmias or agonal rhythms. Among the 48 deceased patients in the WCD group (all-cause death) only 12 were wearing the WCD at the time of death.

The WCD can only save lives when it worn. Thus, it is crucial to educate and motivate patients who are eligible for WCD. In addition, close follow-up using remote monitoring and phone contact/visits seems necessary when low compliance is encountered. Advancements in WCD technology with bradycardia protection could improve outcomes. Thus, despite non-significant benefits with regard to the primary outcome in the VEST study, there is a place for WCD in patients with recent myocardial infarction who are highly motivated, at least in selected cases.

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