EDITORIAL COMMENT

Tincture of Time

When to Implant a Prophylactic Cardioverter-Defibrillator Following Coronary Revascularization?*

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The implantable cardioverter-defibrillator (ICD) has been shown to prevent cardiovascular mortality and sudden cardiac death in high-risk patients, particularly those with significantly depressed left ventricular function after a remote myocardial infarction (1,2). However, not all patients in this high-risk group experience a benefit from the ICD (3,4). The Coronary Artery Bypass Graft (CABG)-Patch Trial Investigators previously reported that a prophylactic ICD did not confer a survival benefit for patients with left ventricular dysfunction undergoing coronary artery bypass surgery, thus supporting the importance of coronary artery revascularization for the prevention of sudden death in this high-risk group (4).

In this issue of the Journal, Goldenberg et al. (5) report the effects of elapsed time following coronary revascularization on the benefits of a prophylactic ICD in a subset of the Multicenter Automatic Defibrillator Implantation Trial (MADIT)-II. These investigators observed that patients enrolled more than six months following coronary revascularization enjoyed a significant survival benefit due to the ICD, whereas no survival benefit was found in the group enrolled six months or less following revascularization. The authors conclude that this effect was due to the low risk of sudden cardiac death early after coronary revascularization. The authors suggest that implantation of a prophylactic ICD can be deferred for a period of time following coronary revascularization.

The observations of this study are mechanistically intuitive. Acute ischemia is believed to be an important trigger for sudden death due to sustained ventricular arrhythmias. If culprit vessels are successfully revascularized and recurrent ischemia prevented, the risk of sudden death should be ameliorated (6). Nevertheless, the risk of sudden death in the MADIT-II population did increase more than six months after coronary revascularization. Whether this increased risk of sudden death over time reflects the incompleteness of coronary artery revascularization or progression of coronary artery disease in other vessels is uncertain. No data are available concerning the completeness of revascularization in the MADIT-II study population. It is possible that differences in risk for sudden death after revascularization are influenced by the number of diseased vessels and the completeness of the revascularization procedure (7). Compared to percutaneous coronary intervention, coronary artery bypass surgery provides more complete revascularization of the coronary arteries. Patients with revascularization within six months of receiving an ICD were more likely to have undergone percutaneous coronary intervention, whereas patients undergoing ICD implantation more than six months after revascularization were much more likely to have undergone coronary artery bypass surgery. Although the sample size in this study was too small to permit a detailed comparison of the type of revascularization procedure on the risk of sudden death early and late following coronary revascularization, the data do suggest that both approaches are associated with similar low rates of sudden death early after revascularization.

It is possible that patients who were enrolled in the MADIT-II study early after revascularization were sicker, with more heart failure and thus at increased risk of non-sudden cardiac death. Against this hypothesis, patients receiving an ICD early after revascularization had better preserved left ventricular systolic function (5).

Do the present study observations apply to the MADIT-II-like population in 2006? It is possible that advances in therapy for coronary heart disease that have been introduced since the MADIT-II study commenced in 1997 might confer more protection from sudden cardiac death after coronary revascularization than was reported in this study. Only 65% of the MADIT-II population were on lipid-lowering therapy, and most were likely not on the higher doses of statins that have been shown recently to prevent recurrent ischemia (8). Seventy percent of the MADIT-II population were taking beta-blockers, and less than one-half of those patients were taking carvedilol compared with other beta-blockers (9). Carvedilol has been reported to significantly reduce cardiovascular mortality and sudden death compared with metoprolol (10). Whether higher utilization of beta-blockers, and carvedilol in particular, in this study population would extend the benefits of coronary revascularization for prevention of sudden death is unknown. Whether the increased use of drug-eluting stents and greater success with multivessel revascularization using percutaneous coronary interventions would influence the risk of sudden death in this population also is unknown.

These study results suggest that there is no need to rush to implant a prophylactic ICD after coronary revascularization. The data indicate that implantation of a prophylactic ICD could be deferred for up to six months after coronary

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revascularization. This approach would allow reassessment of ventricular function after revascularization to identify those patients who might experience a significant improvement in systolic function as a consequence of recovery of stunned or hibernating myocardium (11,12). Such patients might no longer fit the criteria for a prophylactic ICD. To date, the impact of coronary revascularization on recovery of systolic function and subsequent risk for sudden cardiac death has not been studied in the MADIT-II–like patient population.

The results of the CABG-Patch study (3) and this more recent MADIT-II subgroup analysis (5) confirm the importance of coronary revascularization for the prevention of sudden cardiac death. Whether recent advances in the treatment of coronary heart disease have altered the risk of sudden death over a longer time frame following revascularization procedures or whether completeness of the revascularization procedure modifies the risk of sudden death will require further study.

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