Mortality Rate and Cause of Death in Patients Post-Myocardial Infarction (MI)

The 3 main causes of death in patients with chronic heart failure (CHF) and post MI on standard medical treatment are HF, arrhythmic death, and other etiologies, depending on the New York Heart Association (NYHA) classification, and sudden cardiac death (SCD) accounts for 33–64% of those in NYHA class II–IV (Figure 1). The ratio of SCD decreases with progression of HF. However, treatment consisting of angiotensin-converting enzyme inhibitor/angiotensin-receptor blocker and/or β-blocker improves not only the all-cause mortality and HF, but also SCD. However, the ratio of SCD to all-cause death continues to be more than 35%.

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When comparing annual mortality rates between that of other Western countries and Japan in the mega-trials, the annual mortality rate in Japan is approximately 20% less than that of the Western countries and the percentage of ischemic heart disease is half that of the West.

In 1983–1988, the mortality rate was 7.6% of 2,733 patients with acute MI during an average of 2.9 years. In 1991–1994, 48 patients (9.7%) died during the follow-up period (48±13 months): 23 from cardiac and 25 from noncardiac causes out of 495 consecutive myocardial survivors, of which 350 (71%) received acute reperfusion therapy. In the primary percutaneous coronary intervention (PCI) era (77.8% underwent PCI and 3.7% underwent coronary artery bypass graft surgery), the mortality rate was 13.1% and SCD 1.2% during an average follow-up of 4.1 years. In a comparison with Western countries (the MADIT II trial), the mortality rate was 19.8% in the conventional-therapy group, which contained patients with a left ventricular ejection fraction (LVEF) ≤30% during an average follow-up of 20 months. Furthermore, in the SCD-HeFT trial of 847 patients (medication only) with NYHA class II or III CHF and LVEF ≤35%, there were 244 deaths (29%) during a median follow-up of 45.5 months. These data suggest a better prognosis and fewer patients with ischemic heart disease in Japan as compared with other Western countries.

Predictors of Cardiac Mortality

There are many predictors of cardiac death, such as a lower LVEF, age, acute reperfusion therapy, number of ventricular premature beats, nonsustained ventricular tachycardia (NSVT),
induction of VT/VF during electrophysiological testing, QT prolongation, signal average, T-wave alternans (TWA), baroreflex sensitivity, heart rate variability (HRV), and norepinephrine level.

Kaplan-Meier survival analyses show that mortality rates are higher among patients aged ≥70 years (log-rank test, P<0.0001); in HF on admission (Kapll test ≥2, P=0.001); who did not receive acute reperfusion therapy (P=0.004); and had LVEF ≤35% (P=0.02). In a study from the primary PCI era, 8 LVEF was 1.2% and mortality was 13.1%. Patients with LVEF ≤30%, ≤40% or >30% were at increased risk for SCD and mortality, compared with patients with LVEF >40%, during an average follow-up of 4.1 years. The Kaplan-Meier estimates of SCD in patients with LVEF ≤30% were 2.9%, 5.1% and 5.1% at 1, 3 and 5 years, respectively. The authors of that report finally concluded that there was a low incidence of SCD in survivors of an MI in the primary PCI era, although the LVEF is a predictor of increased risk for SCD.

Currently, acute reperfusion is standard therapy in more than 80% of patients with acute MI in Japan, which is inadequate as a predictive value for cardiac death. It is very important to obtain a clinical parameter to predict SCD rather than cardiac mortality because we can presently reduce SCD to 7% by using an implantable cardioversion device or cardiac resynchronization therapy (Figure 2); however, we cannot reduce death from HF with the conventional standard therapy.

The Holter ECG is a very useful tool for obtaining predictive parameters for SCD because the number of ventricular premature beats, NSVT, and HRV can be assessed simultaneously. Moreover, it recently became possible to use it for signal averaging, TWA and heart rate turbulence (HRT) assessment.

The LVEF is the strongest predictive factor for cardiac mortality and SCD, even in post-MI Japanese patients. Unfortunately, there are currently no clinical parameters other than a lower LVEF to satisfactorily predict cardiac mortality, so a multiparametric approach, such as reported by Hoshida et al in this issue of the Journal, is recommended.

Hoshida et al simultaneously recorded TWA based on a modified moving average method (MMA-TWA) and the HRT in patients after MI. They conclude that both the MMA-TWA and HRT were significant predictors and furthermore, they emphasize that the MMA-TWA was more associated with arrhythmic events than cardiac mortality in the post-MI patients.

Although this method will be useful and is convenient, we should be careful when using these parameters. Because the usefulness of noninvasive microvolt TWA testing remains controversial, there are both affirmative and negative opinions. Hoshida et al note several limitations, especially regarding patient selection. They excluded patients who had chronic-paroxysmal atrial tachycardia, intraventricular conduction disturbances, and those implanted with a permanent pacemaker or undergoing CRT, because of the inability to perform the tests or to perform a reliable data analysis. It is well known that the incidence of atrial fibrillation, intraventricular conduction disturbances, and the use of a permanent implanted pacemaker or CRT increases with the severity of HF. We cannot ignore these exclusion criteria for the prediction of SCD in all patients with an MI.

Finally, their noninvasive method is interesting and has appeal as a predictor for serious cardiac events, but the above limitations remain. Further examination will be needed to obtain more precise predictors of SCD.

References